Lou Harrison’s “Old Granddad”: A Composer’s Guide

by

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ABSTRACT

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American composer Lou Harrison was known for his activity in blending the music of the world’s cultures and, later in life, building instruments. An example of this is the creation of his “American Gamelan” in the late 1960s and early 1970s. He and William Colvig created a set of tuned pipes and aluminum slabs that were fixed to a single key; and, because the instruments were highly resonant metallophones, they became known as the “American Gamelan” (even though Harrison’s own compositional practice with them bore little resemblance to the music of Indonesia at this point). The music of these instruments (which came to be known at “Old Granddad”) are a truly significant achievement in the history of Western music.

The first three chapters of this document include a history of the Old Granddad instruments, technical diagrams and descriptions, and a discussion of their tuning. Their purpose is to help future musicians build a replica. The following three chapters analyze Harrison’s three major works for Old Granddad: the opera Young Caesar (1971); the oratorio La Koro Sutro (1972); and the Suite for Violin and American Gamelan (1974). Their purpose is to provide a model for composers who wish to write more works for the instrument. A synthesis of this historical, technical, and theoretical information offers practical details that may be of use to future
composers. The document concludes with *Laurel*—a commissioned piece by Shane Monds that tests the conclusions of my research.
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and professional collaboration. I am excited to see what you will contribute to our profession.

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Introduction

“To make an instrument is in some strong sense to summon the future. It is as Robert Duncan has said of composing, ‘A volition. To seize from the air its form.’ Almost no pleasure is to be compared to the first tones, tests & perfections of an instrument one has just made. Nor are all instruments invented & over with, so to speak. The world is rich with models - but innumerable forms, tones & powers await their summons from the mind & hand. Make an instrument - you will learn more in this way than you can imagine.”

Lou Harrison (1917–2003) is, fifteen years after his death, rightly seen as one of the earliest clarion voices for an original American art music – an artistic vision achieved in a country founded on a “melting pot” ethos of inclusion and synthesis. By his fiftieth birthday in 1967, he had already contributed in significant ways to several strains of the American musical experience. But this was the year that he finally melded many of these compositional strains together in a major creative and innovative burst. It is also the year he met his professional and romantic partner, William Colvig. This meeting turned out to be the watershed event that culminated in the creation of the so-called “American Gamelan.” Together, Colvig and Harrison built this ensemble of instruments, comprised of electrical conduit, oxygen tanks, and assorted pieces of sheet metal, tuned and repurposed to create a metallophone.

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1 Lou Harrison, Music Primer (Lebanon, NH: Frog Peak Music, 1971), 42.
orchestra set in just intonation. They later referred to it as “Old Granddad.” Harrison produced three large-format works for the ensemble: his puppet opera *Young Caesar* (1971); the pseudo-oratorio *La Koro Sutro* (1972); and *Suite for Violin and American Gamelan* (1974).

Given the importance of these instruments, it is clear that the creation of Old Granddad was a significant development in Harrison’s life. This document will provide a history of the creation of Old Granddad; catalogue the physical attributes of the various components of the instrument; analyze the existing repertoire for guidance concerning melody, harmony, and orchestration; and synthesize this information as a guide for future composers and performers. The first two have already served as a composer’s guide to Old Granddad—a test case for a new composition by Dr. Shane Monds. The third section will be this composition and a discussion of how the first two sections were used in its creation.

In the first section of this document, I will detail and catalogue Old Granddad’s physical design specifications, accounting for the distinctions between each of the four existing sets of the instruments. This will start with a description of the historical context in which Old Granddad #1 was created, including the relevant experiences from Lou Harrison’s life, and the symbiotic relationship between the ensemble and its repertoire. I will discuss the creation of the three copies of the original Old Granddad, accounting for important distinctions in each version. I also include diagrams, pitch maps, and a discussion of intonation. A spectrogrammatic analysis and discussion of timbre is made possible through a series of field recordings I made. Finally, I will describe the performance practice of the
instrument. Section 1 will provide all the information necessary to recreate the instrument in whole or in part, as well as any physical characteristics (ambitus, tempos, implement choices) necessary to write for it. The recordings may also be used as a tool to aid in digital methods of composition for Section 3.

In Section 2, I will provide historical background and musical analysis for each of the three major works for Old Granddad, as well as a discussion of several other works associated with all or part of the instrument. These works include the Solo to Anthony Cirone (1972) by Harrison, and compositions several others. Richard Pennington of Augustana College wrote several new pieces for his Old Granddad, one of which is discussed. Additionally, a new project has begun at the Massachusetts Institute of Technology under the guidance of Professor Evan Ziporyn; new music from his project is briefly discussed. No other new compositions have been created since 1974. This section will also include a discussion of Harrison’s cultural influences, many of which are not Javanese. Necessary components of the analyses include form and structure, melodic and harmonic materials, and orchestration. In my effort to provide a fertile starting ground for future compositions, I have crafted analyses to show how Harrison envisioned his instruments could be used. It is my hope that this composer’s guide will allow for many more ensembles, in the vein of Old Granddad, to be built and used with regularity by contemporary composers.

Much of the scholarship surrounding Harrison’s life and works is fragmented, but several general resources were invaluable to this document. The biographies Composing A World: Lou Harrison, Musical Wayfarer by Leta E. Miller and Fredric
Lieberman and *The Music of Lou Harrison* by Heidi von Gunden have heretofore been the standard comprehensive texts for Harrison’s music. They contain a biographical narrative of Harrison’s life and varying degrees of critical commentary. The Miller/Lieberman text provides a critical series of appendices, which include the first comprehensive list of Harrison’s works, indexed through several distinct methods. Von Gunden’s *The Music of Lou Harrison* contains many fascinating extended interviews with Harrison’s colleagues. Both of these books describe the circumstances surrounding the creation of Old Granddad, but mostly refer to it erroneously as a stepping stone on the way to Harrison’s larger Javanese-inspired repertoire after 1974.

The most significant resource for this project is the newly-released biography *Lou Harrison: American Musical Maverick*, by Bill Alves and Brett Campbell. This book is a biography of Harrison’s life, from his early childhood in Oregon through his death in Indiana in 2003. Alves and Campbell wrote this book based on their long personal friendships with both Harrison and Bill Colvig. It was compiled after decades of research at the Harrison archives (housed at The University of California at Santa Cruz) and a series of interviews with Harrison and his colleagues. The authors discuss many of Harrison’s works as they pertain to events in Harrison’s life, mostly as a way to augment their narrative. While this deeper descriptive format provides a better historical foundation for the creation of Old Granddad and its affiliated works, there is less analysis than in some other resources. Though physical descriptions and specifications about the instruments are not broached, Alves and Campbell fill in many of the narrative gaps surrounding
the creation of Young Caesar, La Koro Sutro, and Suite for Violin and American Gamelan.

A fascinating historical perspective on Harrison’s works is A Lou Harrison Reader compiled by Peter Garland. This book is a collection of essays, articles, and correspondence between Harrison and his contemporaries. Along with Harrison’s own Music Primer, the Reader presents Harrison’s compositional process and techniques. These books and their authors’ analyses helped me to tease out which elements of Old Granddad’s compositions might be idiosyncratic to Harrison’s writing (like the use of the Indian jhala or the technique of isorhythm) and which elements were idiomatic to Old Granddad itself. In guiding all of the information in this document toward its eventual goal – the creation of new repertoire for Old Granddad – it was paramount to relay the information for composers in a concise and meaningful way; the book How to Write for Percussion by Samuel Z. Solomon was an excellent guide in structuring and disseminating the necessary information for future artists.

In the first section, my schematics for Old Granddad are largely modeled on “The Mills College Gamelan: Si Darius and Si Madeleine” by Will Ditrich. Found in Balungan, the journal of the American Gamelan Institute, this article includes a complete diagram of the instruments contained in one of Harrison’s later Javanese-inspired ensembles. The only resources that exist detailing the material and pitch specifications of Old Granddad are “An American Gamelan” by William Colvig, which is a short overview of the ensemble’s construction; and “Will the Real American Gamelan Please Stand Up?: Gamelan Tunings by Lou Harrison,” a paper by Jody
Diamond and Jim Dalton that summarizes the just-intoned schema of Harrison’s ensembles, both Javanese-inspired and Old Granddad. The technical diagrams from Section 1 of this document will be updated from Ditrich’s article, but the method of measurement remains the same. Other supplementary information about Old Granddad’s construction, intonation, and assembly will be gleaned from personal interviews with Richard Cooke, who helped Harrison and Colvig construct the other extant copies of Old Granddad.

The analyses contained in the second section will be informed by some general resources on Harrison’s writing style and process, such as the biographies mentioned above, and Harrison’s own Music Primer. In addition to the biographical and analytical work contained in their book, Leta Miller and Fredric Lieberman also wrote an article titled “Lou Harrison and the American Gamelan” that will provide further insight into the pieces for Old Granddad. The work that has the largest amount of scholarship specifically pertaining to Old Granddad is Dr. Patrick Gardner’s dissertation La Koro Sutro: Historical Perspective, Analysis, and Performance. It goes into great analytical detail regarding form, melody, and the libretto of the piece, in addition to providing historical context. As part of his research, Gardner interviewed Harrison extensively; this personal association proved invaluable to the depth of his document. No such scholarship exists on either Young Caesar or Suite for Violin and American Gamelan, so Gardner’s work is a good starting place for my own. The Alves/Campbell book provides much more historical information on Young Caesar and the Suite than any other source, especially the
genesis of Old Granddad before writing *Young Caesar* and Harrison’s eventual collaboration with violinist Richard Dee.

Because Old Granddad’s repertoire and much of Harrison’s work bears at least the light fingerprints of Javanese and/or Balinese music, it is also helpful to have a background in the instruments and compositional process of these traditions. Resources include *Javaphilia: American Love Affairs with Javanese Music and Dance* by Henry Spiller; *A Guide to the Gamelan* by Neil Sorrell, *Javanese Gamelan: Traditional Orchestra of Indonesia* by Jennifer Lindsey; and “The Five-Tone Gamelan Music of Bali” by Colin McPhee (historically, one of the first scholars of Indonesian music).
Chapter 1

A History of Lou Harrison’s “Old Granddad”

1.1. Childhood and World Music Influences

“People have lived before and not been fools because of that: and people have lived in other places and not been fools because of that.”

As with every composer, the sum of Lou Harrison’s life experiences led him to the moment of creation, in this case the creation of Old Granddad and its repertoire. Harrison was born in Portland, Oregon in 1917 to Clarence and Calline Harrison, who owned and managed The Silver Court Apartments. His mother was “attracted to the allure of Asia and regarded exotic artifacts as exemplars of refined

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taste.” Along with instilling a love of music in her son, Cal (short for Calline) also engendered in Lou a fascination with Asian culture and visual art. Their home included such fineries as Japanese wallpaper and lanterns, Persian rugs, and Chinese furniture. This created a magical atmosphere that Harrison would try to reproduce through music in his later life. He would spend the rest of his life trying to find that magic in the musical cultures he immersed himself in, music that he learned to value as highly as any Western art music. The sum of every composer’s experiences helps produce a compositional voice; but in Harrison’s case, these experiences were spread over three millennia and several continents.

After moving with his family to California, Lou Harrison developed an interest in Mission art and architecture, as well as the Spanish Renaissance and Baroque music that inspired it. As part of his self-taught California history, Clarence Harrison also began to drive Lou into San Francisco to sing in the Mission Dolores church choir. Here Lou learned early music theory and history, including modal theory and chant repertoire. This appreciation for modal music, which he considered a true and beautiful economy of material, was the beginning of his hallmark melody-oriented style. This California Mission period was also crucial to his later percussion music of the 1930s and 1940s, as he included many indigenous instruments (rattles, drums, etc.) in his writing. He also developed an ethos that would later lead him to study Greek and medieval musical temperaments.

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4 Ibid 3
5 Ibid 7
6 Ibid 11-12
During his short college career at San Francisco State University, Lou Harrison worked part-time at Wilson’s Record Library. It was here that he first encountered Javanese and Balinese music in recorded form. He also heard recordings of these exotic metallophone orchestras from his housemate Dorothy James Russell. He became fully and indelibly enamored with Indonesian music in the Spring of 1935 when he enrolled in Henry Cowell’s course “Music of the World’s Peoples” and heard some of the seminal Balinese recordings made by Colin McPhee. It was from this course that he learned an important mantra from Cowell: “Don’t underestimate hybrid musics BECAUSE THAT’S ALL THERE IS.” Cowell would continue to be an important mentor for the young Harrison.

It was not until The Golden Gate International Exposition of 1939 that Harrison encountered a live performance of Indonesian music; he saw a Balinese gamelan performance and later a Javanese dance exhibition, which affected him deeply. His early experience of various Asian music already available in Chinatown (Chinese opera, Korean orchestras, etc.), together with this transformative experience at Treasure Island, he came to believe that European music was only one of the “cultivated traditions” of the world and that even European music was Asian. When asked about his views on Europe and its continental style, Harrison said, “[It] is no more a continent than I am, it is simply the other end of Asia.” Unlike many previous composers of the exotic (Debussy, Ravel, and the like), Harrison did not

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9 Lou Harrison, Music Primer (Lebanon, NH: Frog Peak Music, 1971), 45.
10 Ibid 47
perceive the exotic as something “other” that he could use as a curiosity; rather, it was part of a vast palette of compositional materials, of which the European tradition was only a small part. Harrison himself said, “When I was quite young, I laid out my toys on a very large acreage, and I go from one to the other and have all the rest of the time.”

1.2. Cage, Cowell, and Dance: The Beginning of Percussion Music in America

“Trying to recapture the lost treasures of my youth... I discovered that if I couldn't make enough money to buy them, at least I could make some.”

San Francisco’s underground music community was born out of the Great Depression and the resulting Works Progress Administration grants. There was an amazing amount of close collaboration and cohabited artistic space among all the visual artists, writers, actors, dancers, and musicians. As an example, the 1939 Golden Gate Exposition, where Harrison first heard Balinese gamelan and saw Javanese dancing, was also home to a commission for muralist Diego Rivera. Many relationships that Harrison developed in the Mills College and San Francisco State University academic music circles also brought him into contact with the visual arts and a collaborative circle that included artists and dancers. This was the breeding

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ground for Lou Harrison, John Cage, and Henry Cowell’s self-styled “drums along the Pacific” movement of postmodern, avant-garde music.

The genesis of this percussion music was found in the practices of German dancer Mary Wigman and later Lester Horton. By the early 1930s, Horton was keeping various percussion instruments in his collection to help train dancers; eventually these instruments were used in performance as well. These choreographers found that percussion instruments were preferable to other instruments, like a piano, because they did not require a musician with specialized training. Nevertheless, trained musicians became interested in this use of percussion; Henry Cowell began teaching rhythm and percussion classes at Mills College and Stanford University in 1935. As a student of Cowell’s in the Spring of 1935, Harrison was drawn to the musical potential of both Cowell’s dance compositions and the radically new worlds found in his world music course. For Harrison, percussion music was also extremely practical and even necessary during the height of the Great Depression — could form musical ensembles with friends, write compositions, and create an artistically satisfying product that was innovative in many ways, without ever having to gain the approval of the “musical elite” in either New York or Paris.

John Cage had been following a parallel path, composing music for dance in Los Angeles at the University of California Los Angeles. Here, Cage had studied with the Viennese composer Arnold Schoenberg, after having met Henry Cowell at another regional offshoot of his “Music of the World’s Peoples” course in New York.
Cowell encouraged Cage to come to San Francisco to meet another of his proteges; Cage showed up on Harrison’s doorstep in 1938 and they began a historic series of summer concerts that would last until Cage moved to Chicago in 1941 (Harrison would move to Los Angeles to study with Schoenberg shortly thereafter). These concerts, primarily in and around San Francisco, featured repertoire that today is considered the core of early percussion ensemble repertoire in much the same way that Haydn string quartets form the core of string chamber music. Harrison and Cage scoured the Bay Area for not only Eastern instruments like gongs and cymbals, or Western percussion instruments like drums and woodblocks, but also Cowell’s “wickedly subversive”\textsuperscript{16} instruments, such as brake drums and pipes. They even included many of Harrison’s favorite Native American instruments, like rattles and the quijada (the jawbone of an ass).\textsuperscript{17} The pair, plus Cage’s wife Xenia, and several other friends went on to perform works such as Harrison’s \textit{Simfony #13}, Cage’s \textit{Third Construction}, and their seminal collaboration \textit{Double Music} (all premiered at the same concert on May 14, 1941).

Thereafter, Cage and Harrison’s styles began to diverge. Cage began to veer into the avant garde, for which he is well known, while Harrison further embraced a highly personal and syncretic style.

“Health Harrison freely used a wide variety of techniques, he never used them as a way to remove his own voice from the resulting notes; Cage’s experiments were abstract and impersonal. Harrison cared more about having fun and creating beauty than about Cage’s self-conscious avant-gardism.”\textsuperscript{18}

\textsuperscript{16} Ibid 59
\textsuperscript{17} Ibid 59
\textsuperscript{18} Ibid 54
Harrison’s search for subjective beauty through his personal voice stood opposed to what Cage referred to when he composed “percussion music as revolution.” For Cage, percussion music was a way to further emancipate unpitched sounds, another evolutionary step forward from Luigi Russolo’s *The Art of Noise*. Cage’s percussion music was one stop on the road to his complete abdication of composer’s control through his chance music. For Harrison, on the other hand, percussion music was relatively familiar as a comforting sonority of his youth in San Francisco’s Chinatown, where Japanese Gagaku orchestras and Chinese shadow puppet theater were freely available. Brake drums, temple blocks, pipes, and the like were all instruments to reclaim from the “lost treasures” of his childhood.

The percussion ensemble became the first creative community that Harrison felt he was part of; this community structure would become essential to his compositional process. For the rest of his life, he avoided writing alone and for large performing forces, preferring instead to write chamber music for groups that often included his friends and himself. Both Harrison’s percussion ensemble music and his later fascination with Gamelan reflected his political beliefs, crystallized in his *Political Primer* from 1958. Here he vehemently espoused pacifism, cross-cultural synthesis, and humanistic cooperation. The concept of a “leaderless group cooperation,” which he admired in Gamelan, was already present in his percussion ensemble; it was a microcosm of the way he wanted the world to be. This would

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19 Ibid 57
continue in his Chinese ensemble of the 1960s, which was the direct predecessor for the original Old Granddad performing ensemble.

1.3. Harrison’s Introduction to Just Intonation

One of the defining moments in Harrison’s life was his nervous breakdown in 1947. He was living in New York City, where he had received considerable acclaim for his work and for bringing the music of Charles Ives to prominence. But city life did not agree with him, and, after John Cage found him wandering the streets in a panicked haze, he had to be admitted to the psychiatric hospital in Ossining, NY. In the process of rebuilding his life, Harrison found that metropolitan living, reliance on technology, and increasing homogeneity in his life were all causes of his dissatisfaction.

Trying to fit into the box that New York artistic circles had created was also part of this dissatisfaction, so he started searching for ways to extricate himself from a modernist style. Harrison received a copy of Harry Partch’s *Genesis of a Music* in 1949 from Virgil Thompson, who asked him, “see what you can make of this.” Partch’s book was a history of just intonation and temperaments, laid out with some of his theoretical musings and compositional methods. Succinctly put, just intonation is a system wherein all pitches are related by simple ratios. For example, the frequencies of a given pitch and another a perfect fifth above it has a relationship of 3:2 (A=440Hz would produce an E above it at 660Hz). Partch

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famously divided the octave into 43 tones, creating many of his own instruments to execute this tuning. Harrison at first reviewed Partch’s book rather unenthusiastically, believing that just intonation was a distraction from the advancement of 12-tone process. But he became more intrigued by its possibilities over time, eventually christening it “the most important composer-written work of music theory this century.”

Harrison befriended Partch, a fellow Californian, and continued to explore various just intonation schemata for the rest of his life, finally rejecting the “industrial gray” of equal temperament outright. But in his initial relationship with Partch, Harrison was timid about diving into the world of instrument creation. For over fifteen years he tried to adapt these alternate tunings in conventional settings, for example in his *Strict Songs* for 8 baritones and orchestra from 1955. As Leta Miller and Fredric Lieberman put it in their book:

“Just Intonation is hardly a topic most musicians would seize upon for a crusade against an indifferent and impersonal society. But for Lou the system of twelve mathematically equidistant half steps accepted in Western music during the past two centuries represents an eradication of difference, a standardization that, by making everything equivalent, makes everything dull . . . We have been trained, he would argue, to value standardization over diversity.”

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Harrison began to read extensively about Baroque and Renaissance musicians not only as composers, but also as instrument makers and tuners in their own right. To these early composers, the study of temperament and tuning was an integral part of musical life. Harrison saw their professional ethos as descending from the writings of al-Farabi, Boethius, and Ptolemy, who valued rational order in music as a reflection of the rational order of the universe. In an interview with Winston Leyland in 1973, Harrison espoused the classical Greek and the later Arab musical flourishings as two of the greatest eras in history, and he was happy to consider himself a part of this lineage: “It’s very exciting, this world of intonation across the planet and through civilizations.” Harrison also came to view Schoenberg and his 12-tone methods as the logical consequence of equal temperament. True consonance, as obtained through a rational relationship among pitches, was impossible to achieve in equal temperament; as such, serialism and its processes were the only way of bringing any semblance of order to the tones. Although he would always have a deep admiration and respect for his former teacher, Harrison essentially abandoned the world of serialism when he moved from his temporary teaching position at Black Mountain College to Aptos, California.

In California, Harrison began to experiment with tuning schemes, studying and performing music from earlier periods in the tunings they were written for.

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“To finally hear the modes of the ancient Greeks, the music of the Renaissance humanists, or the keyboard music of the baroque in the tunings intended by those composers felt like stripping away centuries of grime from the frescoes of the Sistine Chapel.”

Harrison wanted not only to recreate the sounds of the past, but also to explore a possible future. Most composers working with just intonation used the concepts to expand their pitch resources (as in Partch’s 43 divisions of the octave), what is now referred to as “microtonalism.” For Harrison, music in just intonation was beautiful on its own, devoid of the ‘beats’ inherent in the intervals of equal temperament. He also believed that just intonation was the “aural equivalent of a healthy diet.” This set him significantly apart from composers like Harry Partch or Ben Johnston, who found inspiration in an increasing number of divisions of the octave and the subsequent expanded palette.

At his home in California, Harrison reconnected with the music of Asia. He firmly believed that the West Coast and its inhabitants were more firmly tied to the culture of Asia than Europe. His research into tuning began to overlap with his interest in world music and he began working with the modes and scales used in other world cultures, complete with their indigenous tunings. Of great interest to him were pentatonic scales, which, he recognized as a global phenomenon. As he says, they are “spread planet-wide, alike in highly ‘civilized & in ‘primitive’ cultures. They constitute every human’s more important tonal heritage.” This information was later compiled in his *Music Primer* of 1971, where Harrison lists pentatonic

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29 Ibid 214
scales with their rational frequency relationships. An example is found in the image below, where one can see the rational relationships between each successive pitch and the rational relationship between pitch #1 and all the others:

![Diagram of pitch relationships](image)

**Figure 1.1 – Lou Harrison, Music Primer page 28**

In 1961, Harrison travelled by boat to the East-West Music Encounter in Tokyo, a US Government-funded exercise in Cold War soft power. Some of his compatriots at the conference included Virgil Thompson, Henry Cowell, and Elliott Carter. The trip to this conference was musically fruitful. During the voyage, he pored over a volume of “Ancient and Oriental Music” from the *New Oxford History of Music* and proceeded to compose the *Concerto in Slendro* for Richard Dee. Besides the violin soloist and two accompanying percussionists, this concerto involved two pianos with tacks embedded in the hammers and a celeste, all tuned to a just

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intonation scheme. The reference to Slendro, a Javanese scale, was not a specific cultural allusion to Indonesia as much as it was a clever synonym for the anhemitonic pentatonic scale that Harrison was composing with. The piece itself was very Chinese in style, regardless of the title.

While in Asia, Harrison travelled to Korea on a Rockefeller grant and proceeded to study the country’s rich musical heritage. He studied with Lee Hye-Ku, eventually earning the right to teach *piri* flute in the United States. The *piri* flute was one of the first instruments he attempted to build, upon his return to the United States. He also built several mbiras and a *zheng*, a large Chinese string instrument similar to a zither. He was beginning to fully realize the integration of his passions: world music, just intonation, and his instrument building.

### 1.4. The Arrival of William Colvig

After the twenty-five-year association with Cage and Cowell, the beginning of Harrison’s relationship with William Colvig was possibly the most musically significant period in Harrison’s life. Bill was also eminently even-keeled and balanced out some of Harrison’s emotional swings, “acting as a sponge for the composer’s unpredictable temper.”

Harrison and Colvig had much in common, both musically and otherwise (they both loved nature and the West Coast and were ardent pacifists). In the interview with Winston Leyland, Harrison described Colvig

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as having rescued him from alcoholism and a profound distaste for composition; they became “an exitricable compound.”

In addition to being a partner in life, Colvig was embedded in all aspects of Lou’s creative activities. Colvig would organize and keep up Lou’s Aptos home, eventually building a workshop to create instruments with the composer. After moving in with Harrison, Colvig immediately took to building instruments, such as the Cuban marimbula (large bass mbira). Most significantly, they constructed the Colvig-Harrison monochord. This was a stringed device exactly one meter in length, with adjustable stops that allow the user to create divisions in the length of the string that had real-number ratios with each other. Harrison and Colvig used this instrument to recreate various just intonation schema on a “transfer harp,” so called because they would transfer pitches from the monochord to it.

Colvig also became a part of Harrison’s life of musical performance. In his childhood, Bill had been a trombonist and pianist. He now found himself learning the sheng, a Chinese mouth organ that requires a considerable amount of air support, along with many of the other instruments Harrison had collected throughout his travels and earlier life. The two started performing around the Bay Area in a small Chinese music ensemble alongside Richard Dee and Lily Chin, Harrison’s students from San Jose State University. They would eventually play over three hundred concerts together. Among their repertoire were new compositions

by every member (Colvig included) and chamber arrangements of earlier pieces.

They began to add instruments other than the traditional Chinese ones, including
the Indian jaltarang, a set of tuned porcelain bowls played with small dowels or
chopsticks. By adding a precise amount of water to each bowl with an eye dropper,
the bowls could be tuned to specific pitch sets. The tuning process was painstaking
and slow.

After tuning a set of jaltarang one night, the musicians left to eat dinner.

Upon their return, they noticed that the bowls produced only a dull thumping sound.
This was due to the formation of air between the water and porcelain, which
insulated the bowl and prevented it from resonating. Though they learned that they
could avoid the problem by adding glycerin to the water, Colvig and Harrison set
about to find a more permanent solution.

1.5. Old Granddad #1 and Young Caesar

It seemed as though Harrison's life experiences had been building toward
this moment—the American Gamelan was merely “the natural result of a lifetime of
experimentation with new means of solving the problems of composition.”38 After
dealing with the problems of tuning a jaltarang using water, Harrison found a
solution in metal. He had remembered an instrument called a bangyang, a set of
sixteen tuned iron slabs used in traditional Korean music and set out to create a
metal keyed instrument of his own. Harrison had previously suggested a similar

38 Patrick Grant Gardner, “La Koro Sutro: Historical Perspective, Analysis and Performance
Considerations” (PhD dissertation, University of Texas at Austin, 1981), 116.
solution to the problem of keeping Harry Partch’s instruments in tune. Partch, who
built many keyed percussion instruments or tuned idiophones, responded “I like
wood and bamboo. Why don’t you do metal?”39 This moment crystallized a
confluence of Partch’s advice and Harrison’s previous experience. It also fit with
Harrison’s compositional palette: his percussion works had often featured metal
timbres like brake drums and in other works he loved to use celeste and the
metallic-sounding tack piano. Metal would provide him with a material that would
be both musically satisfying and practical, as it would seldom go out of tune. He
would later refer to aluminum tubing as “the source of some of our most ravishing
sound.”40 He liked that players of various experience and talent levels could achieve
his music. Even highly trained players wouldn’t need to be “trained or cajoled to use
their ears to tune justly as would an orchestra of string players.”41

Colvig’s first experiments with tuning metal started on one-inch aluminum
conduit, using only his and Harrison’s ears and the previously invented monochord
as a tuning reference. Colvig quickly improved the tuning process by purchasing an
oscilloscope kit to get exact measurements. They would now be able to achieve their
tuning by observing waveform patterns.42 This experimental set was tuned to a just-
intoned, 5 limit D-major scheme, called Ptolemy’s Diatonic Syntonen (for more on
this system, see Chapter 3). This scheme was seen the best method for reproducing

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39 Lou Harrison, “On Harry Partch” (unpublished document in Harrison Archives, University
of California at Santa Cruz, 1980).
40 Lou Harrison, “Four Items,” in A Lou Harrison Reader, ed. Peter Garland (Lebanon, NH:
41 Patrick Grant Gardner, “La Koro Sutro: Historical Perspective, Analysis and Performance
Considerations” (PhD dissertation, University of Texas at Austin, 1981), 117.
Asian musical practice in a Western diatonic system. As Harrison put it in an interview with Patrick Gardner:

“I was aware that I was reaching toward Asian practice within a diatonic set-up from Europe and the Mediterranean. That was my thought, and also to find how many of those Asian sounding, or Asian, let me say - schemas would be possible within the basic diatonic system. It was a conjunction idea - a larger tuning from the West which could be found in a perfectly presentable Asian style.”

Colvig would later expand the single set of experimental pipes into a fully fleshed-out metallophone orchestra, which he describes in his article “An American Gamelan.” He constructed four sets (two pairs) of tube instruments and two instruments from pitched slabs. A pair of one-inch diameter tubes (and later 1 ⅛ inch), pitched from A=440Hz to E=2607 11/27Hz, were called “soprano bells.” One set of pipes was built out of aluminum, the other out of steel. The second pair of tubes, 1 ¼ inch (later 1 1/2 inch) in diameter and pitched from A=220Hz to B=977Hz, was also built out of aluminum and steel. After completing the tubes, Colvig created two instruments out of slabs of aluminum ¼ inch in thickness and 3 ½ inches in width: a bass octave pitched from A=55Hz; and a baritone set pitched from A=110hz to D=293 1/3Hz. The bass instrument was separated into two sections, as the lowest of the notes required resonators approximately 5 feet tall. The resonators for both the bass and baritone instruments were constructed from No. 10 food service cans, called “billy cans.” Though this new orchestra resembled some of the metallic sounds of the Indonesian court instruments, it was created

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43 Patrick Grant Gardner, "La Koro Sutro: Historical Perspective, Analysis and Performance Considerations" (PhD dissertation, University of Texas at Austin, 1981), 126.
purely as an experiment in just intonation and only later referred to as ‘An American Gamelan.’

Figure 1.2 – Aluminum Tenor Bells from Old Granddad #3

Figure 1.3 – Aluminum Soprano Bells from Old Granddad #4

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Although this metallophone orchestra, referred to as “Old Granddad” by Colvig and Harrison, was originally designed to be used in their Chinese ensemble, it was quickly used in other settings, such as the puppet opera *Young Caesar*, commissioned by the Encounters Music Series in Pasadena and the Judith S. Thompson Foundation (premiered 1971). Old Granddad was to be used as one voice among a large assortment of instruments from several cultures, including the violin, harp, ocarina, piri flute, organ, percussion, and sheng. The 5-piece chamber ensemble that played the music for the premiere of the opera was tasked with playing all these instruments. Following *Young Caesar*, Harrison immediately began composing *La Koro Sutro* for a performance at the World Congress of Esperanto in 1972. This piece, an oratorio-like setting of the Buddhist “Heart Sutra,” uses Old Granddad in a more central role, alongside organ and full choir. Additionally,
Harrison added other percussion instruments: tam-tams, trash cans, large ranch triangles, and a Balinese gentorak (what Harrison sometimes referred to as “sweet bells”). Most visually striking were a set of cut off oxygen or acetylene tanks, played with small baseball bats. In future iterations of Old Granddad, these “bells” were generally considered part of the ensemble and obtained at the same time as the other metallophones. The trash cans were frequently replaced, as they were quickly beaten “out of tune” during performances. Stories abound of Harrison and Colvig coming to a new city for a performance and Colvig promptly disappearing for several hours on a hunt for new cans.

Figure 1.5 – Oxygen Tanks and Trash Cans from Old Granddad #1. Photo by Fredric Lieberman (1996)

Harrison would be introduced to the Javanese master musician and composer K.P.H. Notoprojo, colloquially known as “Pak Cokro” and Javanese gamelan more properly, in 1975. Notoprojo and his student Jody Diamond would

become Harrison’s principal teachers, and at that point he began composing for more traditional gamelan ensembles. But before this dramatic shift to the full-time study of Indonesian music, he would compose the *Suite for Violin and American Gamelan* with his friend Richard Dee in 1974. This work was his final composition for Old Granddad and was scored for only the gamelan instruments and solo violin, with no auxiliary percussion or other instruments. After working with Pak Cokro and Diamond, he and Colvig built another set of instruments called “Si Betty,” that was fully modeled on Javanese instruments and a reflection of Harrison’s study of gamelan. Though *La Koro Sutro* and *Suite for Violin and American Gamelan* were widely played for the rest of Harrison’s life, he never again composed for the full Old Granddad ensemble.

### 1.6. Old Granddad #2 and #3

After two decades of Old Granddad performances, Harrison and Colvig’s first set of instruments fell into disrepair. Colvig had originally built the instruments to be easily disassembled for transportation in a Volkswagen van or a Greyhound bus. But now it was being shipped across the continental United States, as well as internationally. For example, it was sent to Tokyo in 1993 for Michael Tilson Thomas to perform the *Suite for Violin and American Gamelan* and *La Koro Sutro* at the Pacific Music Festival (PMF). Not only was getting the instruments to Japan a
challenge (PMF had to pay for a set of shipping cases to be built\textsuperscript{48}), getting them through the Tokyo airport was also an ordeal. After all travel-related problems were dealt with, they still needed a significant amount of repair; Soltes describes spending an entire day assembling the instruments and visiting various Japanese hardware stores for screws, grommets, and extra parts. “They were like an erector set,” she exclaimed. There was an incredible emotional reaction to Harrison’s works in Japan, but this international excitement would be hard to sustain without a functioning Old Granddad. The idea of creating a second, more portable set of instruments began to percolate.\textsuperscript{49}

One of the attendees at the festival was Leonard Bernstein’s assistant conductor Michael Barrett, who was in the process of planning a music festival in Moab, Utah. It was here Bernstein met Harrison and Colvig; he invited them to attend the upcoming 1994 festival and asked them to bring Old Granddad with them. Barrett had also asked Richard Cooke, a flutist and instrument maker based in Moab, to attend; it was thought that, because many of Cooke’s self-made instruments were percussion instruments, he might be amenable to working with Harrison’s percussion music. Cooke was among a number of non-percussionists tasked with performing on Old Granddad that summer. The instruments were shipped to Moab ahead of Harrison and Colvig’s arrival. Cooke and his fellow performers were rehearsing quite a lot and not making satisfactory progress in anticipation of Harrison’s arrival, so they decided to move the instruments to

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\textsuperscript{48} Bill Alves and Brett Campbell, Lou Harrison: American Musical Maverick (Bloomington, IN: Indiana University Press, 2017), 405.
\textsuperscript{49} Eva Soltes in discussion with the author and Jody Diamond, June 2018.
\end{flushright}
Cooke’s house. When Harrison and Colvig got to Moab, they immediately set about to tune the instruments. Begrudgingly, they were required to go to Cooke’s house. Upon Harrison’s arrival, Cooke left Harrison and Colvig momentarily, giving them time to explore the collection of homemade percussion instruments (many of which were similar to Lou’s) stored in the same space as Old Granddad. He further described the “mischievous impulse” to lure Harrison over:

“I knew [declining to return the instruments] would upset him even more, but he was so busy . . . I was probably never going to get him over to my house, even though I knew I had a house full of instruments that he would want to see... It was one of the most amazingly successful pieces of small subterfuge that I’ve ever managed to be involved in, because when I got back fifteen or twenty minutes later, Lou just walked over to me and put his hand on my shoulder and he said, 'We need your help. Will you build us another gamelan?’”

Harrison, Cooke, and Eva Soltes immediately mounted a campaign to fundraise for Old Granddad #2. The largest portion of this fundraising came from a benefit concert conducted by Tom Davies, brother of Cabrillo Festival director Dennis Russell Davies (both were long-time collaborators with Harrison). Among the highlights from this concert were a panel discussion concerning Old Granddad involving Harrison, Colvig, and Cooke; and perhaps the first public recitation from beat poet Gary Snyder’s monumental *Mountains and Rivers Without End* (published in 1996). For this performance, Harrison musically accompanied Snyder’s speech.

The creation of Old Granddad #2 was essentially a reproduction. Cooke did not do much to adjust Colvig’s design, but he did suggest that the tin can resonators

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50 Richard Cooke in discussion with the author and Jody Diamond, June 2018.
51 Eva Soltes in discussion with the author and Jody Diamond, June 2018.
be exchanged for PVC. What seemed a modern innovation to Cooke proved to be an irritation for Harrison, who travelled to Moab several times to check on the construction of his instruments. After building the instruments, Harrison was dissatisfied with the sound. He thought the crenellations inside of the soup cans of Old Granddad #1 helped the upper partials of the instruments, whereas Cooke’s resonators created an undesirable echo chamber.\(^5\) Harrison eventually acquiesced to Cooke’s innovation. Old Granddad #2 was finally pressed into service in 1997, for a performance in New York at the 92nd Street YMCA that was part of Harrison’s 80th birthday celebration.

In the intervening time, Cooke had been playing music on the reproduction, giving performances at art installations and hosting group improvisations utilizing Old Granddad #2. The thought of no longer having the instruments as a resource was enough for Cooke to take a month off of everything he was doing to build another set for himself. This became Old Granddad #3, which included several improvements. The most striking was the horizontal mounting of the bass instruments and the coupling of bass and baritone keys (see pictures below, bass instrument located on the right side).

\(^5\) Richard Cooke in discussion with the author and Jody Diamond, June 2018.
Each bass key was coupled with two baritone keys, their resonators stacked on top of each other. The benefit of this layout was twofold: first, it allowed for one player to perform both the bass and baritone voices in performance, as they often have similar lines; second, because each trio of bass/baritone keys was mounted separately, this instrument could be easily carried into remote locations around
Moab for performances. Cooke also built a stand-alone set of baritone keys that used the same pitches as Old Granddad #1 and #2 (see the image above, located on the left side). After several years in Moab, Richard Cooke moved to Durango, Colorado. In Moab, he had a storage unit for the instruments, but in Durango he had to store them outside in his yard under a tarp, where they too fell into disrepair. They were rusted over and covered in mold. Upon learning of the existence of Harrison’s instruments in Durango, the local Ft. Lewis College percussion department, under supervision of Dr. John Pennington, struck a deal in which Cooke agreed to refurbish the instruments if Pennington would mount a performance of La Koro Sutro. The project took about a year, but the performance happened successfully, and Old Granddad #3 came back into rotation as performing instrument.\footnote{Richard Cooke in discussion with the author and Jody Diamond, June 2018.} Dr. Pennington has continued to work with the instruments, advocating for the “American Gamelan” and creating his own compositions (like Gitanjali, from 2014). Old Granddad #3 is now in the possession of Dr. Pennington and was used in the recent revival performance and recording of Young Caesar by The Industry in Los Angeles.  

### 1.7. Refurbishing Old Granddad #1

After Colvig’s death in 2000 and Harrison’s death in 2003, Old Granddad #1 was rescued from Harrison’s estate and placed in the care of a friend, who ended up lodging the instruments in a garage. The instruments were in terrible shape from
decades of performances and their poor storage situation; yet Hanson knew that they would be put in a crate and lost forever if they were among the estate materials donated to the library at the University of California at Santa Cruz. At the time, the idea formed among Richard Cooke, John Pennington, and Gary Cook (who was then President of the Percussive Arts Society) to acquire Old Granddad #1, pay for Cooke to refurbish it, and place it in residence for performances at the PAS museum in Indianapolis. The original oxygen tanks and gentorak from Old Granddad #1 Harrison’s estate were likely lost after his death.

1.8. Old Granddad #4

Old Granddad #4 was created through a commission from the Boston Modern Orchestra Project, under the direction of Gil Rose. Richard Cooke supervised a team of craftsmen and tuners to complete this set of instruments in a very short time. Yet, there are a number of technical innovations that make Old Granddad #4 the best sounding yet. In William Colvig’s original article on “An American Gamelan,” he states:

“Much experimenting can be done with developing the American Gamelan. The tubes could be resonated (bulk a problem), the tubes could be small slabs (bars) instead and resonated (that’s a celeste), wooden (xylophone), the big slabs could be adjusted in width to give consonant overtones (5th or octave most desirable), all sorts of arrangements could be made to mount the elements and decorate them for visual beauty.”

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Indeed, Richard Cooke did much of this and more. The bass and baritone instruments are separated again, as in Old Granddads #1 and #2, but the bass instrument keys were widened and given much larger resonators. Each resonated key stands over 53 inches tall (see image below).

![Figure 1.8 – Old Granddad #4, image from Trinity Church Concert, 2017](image)

Additionally, Cooke also began to balance the X and Y axes of the pipes. Because of anomalies created in the extrusion and welding process, the different axes of vibration can produce different pitches or pitches of different resonance. This is more pronounced on steel tubing than on aluminum. The difference can cause a waver in the pitch of the pipe. In the smaller tubes, this can be quite fast and
have a dissonant quality. Cooke’s solution, gleaned from years of creating other metal percussion instruments, was to find the lower pitched axis of vibration and face it parallel to the ground. Cooke called this side-to-side vibration the $Y$ axis. After drilling out holes for suspension at the nodal points, Cooke then tuned the remaining axis of vibration (perpendicular to the ground – the $X$ axis) down to meet the $Y$ axis. This creates a much cleaner sound, using a process that was not available on the earlier Old Granddad models. A set of oxygen tank bells were also created for Old Granddad #4, but by a Boston company not affiliated with Cooke, to avoid the cost of shipping the heavy tanks from Colorado.\footnote{Richard Cooke in discussion with the author and Jody Diamond, June 2018.}

After the 2009 commission and a 2014 recording of La Koro Sutro and Suite for Violin and American Gamelan, Old Granddad #4 was acquired by Jody Diamond, Harrison’s teacher and orchestrator for Javanese gamelan, and a close friend to both Harrison and Colvig.

Now Old Granddad #1 resides at the Percussive Arts Society Rhythm! Discovery Center in Indianapolis, Indiana; Old Granddad #2 is housed at the University of California at Santa Cruz under the care of William Winant; Old Granddad #3 is at Augustana University in Sioux Falls, South Dakota under the care of John Pennington, and Old Granddad #4 is at Massachusetts Institute of Technology, where Diamond and Evan Ziporyn started a composers’ group to write new pieces for the instruments.
Chapter 2

The Instruments

The four sets of “Old Granddad” instruments have changed over time. The second set was built with portability in mind. The third set was modified to facilitate Richard Cooke’s performance needs, though the pipe and slab lengths generally remain the same as the first two sets. The fourth set is the most dramatically changed and it was constructed after Harrison and Colvig’s deaths. Richard Cooke used his considerable professional experience to improve on the acoustic design of several of the instruments. As an example, the bass keys were widened to ten inches and the resonators were widened to fifteen inches in diameter.

Throughout the years, the suspension of the various pipes and slabs improved from simply resting them on a felt pad, to leather slings and screw-hooks/screw-eyes, and eventually to a more complex system of suspension posts more reminiscent of a modern marimba or vibraphone. Many of these improvements were made to increase portability and instrument-life, but in some cases (the expansion of bass keys, for example) the improvements drastically improved the resonance and musical color of each instrument. Suspending all the resonating elements increased volume and note length. Changing the size of the bass
keys and resonators was the most dramatic improvement, substantially increasing the volume and presence of the low voices. As stated in Chapter 1, the Baritone and Bass keyed instruments originally had resonators made of #10 food service cans (“billy cans”); this was upgraded to PVC in Old Granddad #2 and subsequent iterations. I will limit further commentary to only the latest technical iteration, Old Granddad #4.

The names of the various instruments have changed over the years. In the 1971 version of *Young Caesar*, Harrison refers to the pipes as “D bells (S)” and “D bells (T)” and the slabs as “Gendér” (pronounced with a hard “G” sound). The word “Gendér” is problematic. In classical Indonesian music, “Gendér” refers to a relatively-high pitched, keyed instrument with tuned resonators. In Harrison’s usage, “Gendér” refers to his baritone and bass instruments (likely because they are also keyed). The pitch discrepancy is likely due to Harrison’s inexperience with authentic Indonesian music (he would not study Javanese gamelan until several years later). In the 2017 performance of *Young Caesar*, the pipes are referred to as “Bells I” and “Bells II,” and the slabs as “Gendér.” He does not differentiate between the baritone and bass instruments, as they normally double each other at the octave.

In *La Koro Sutro*, Harrison refers to the pipes as “High Bells (Saron)” on the Instrumentation page of the front matter. This use of the word “saron” is problematic as well. Saron refers to another high-pitched Indonesian instrument, but with a trough resonator. While the pitches of a “saron” more closely imitate the pitches of the pipes in Harrison/Colvig’s orchestra, the trough resonator does not. In any case, for most of the score Harrison only denotes “High Bells” without the
“saron” modifier. In this case though, he does not indicate which of the four pipe instruments is to be played when “High Bells” are called for, asking the player to decide based on the range of pitches present. For the slabs, he uses “Gender (medium)” and “Gender (low)” throughout the score.

In the *Suite for Violin and American Gamelan*, Harrison does not label instruments, instead numbering the parts 1–6. This is because there are no other instruments playing alongside the gamelan and the ranges are self-explanatory in the same manner they were in previous pieces. He also composed these pieces for his friends to play with him, in which case further explanation was not necessary.

Harrison’s small *Solo to Anthony Cirone* from 1976, which was a work dedicated to a close colleague, was never published but is written explicitly to be played on “Tenor Bells.” In every score, Harrison does not indicate a difference between the steel and aluminum bells. He wanted the “sweetness” from the steel and the resonance from the aluminum, together forming a composite sound — thus, each pair of bells is composed for in unison. For the purposes of this document, I will refer to the instruments as: “Soprano Bells - Steel,” “Soprano Bells - Aluminum,” “Tenor Bells - Steel,” “Tenor Bells - Aluminum,” “Baritone Keys,” and “Bass Keys.” This will be in line with how Harrison referred to the instruments in most of his scores, how he referred to them in the reconstruction process with Richard Cooke, and also remove any cultural connotations.
2.1. **Soprano Bells - Steel**

The first set of Soprano Bells is a set of sixteen pipes, each made from extruded steel 1/16" in thickness, called Electrical Metallic Tubing (EMT). Steel EMT also has a weld joint running along the side where the extruded steel was joined during the manufacturing process. This weld is barely perceptible to the end user, though it does affect the tuning process (discussed in Chapter 1). These pipes are 1 1/8" in diameter, measured from the outside of each wall. They are suspended above resonators made from 1 1/2" PVC pipes. Each PVC tube functions in the same manner as any resonator on a keyboard percussion - they are half the length of the standing wave for each frequency and act to reinforce the vibration of the pipe. Some of the resonators are straight and some are angled to accommodate a longer wavelength. Each steel pipe is suspended at the acoustic nodal point, which is found 22.5% of the length of the pipe away from each end. The physical specifications of each pipe are listed in Table 2.1 below.

<table>
<thead>
<tr>
<th>Note Name</th>
<th>Frequency</th>
<th>Length</th>
<th>Nodal Point (from end)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>440 Hz</td>
<td>25 1/16&quot;</td>
<td>5 9/16&quot;</td>
</tr>
<tr>
<td>B</td>
<td>488 8/9 Hz</td>
<td>23 3/4&quot;</td>
<td>5 1/4&quot;</td>
</tr>
<tr>
<td>C#</td>
<td>550 Hz</td>
<td>22 3/8&quot;</td>
<td>5&quot;</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>----</td>
<td>----</td>
<td>----</td>
<td>----</td>
</tr>
<tr>
<td>D</td>
<td>586 2/3 Hz</td>
<td>21 5/8&quot;</td>
<td>4 3/4&quot;</td>
</tr>
<tr>
<td>E</td>
<td>660 Hz</td>
<td>20 3/8&quot;</td>
<td>4 1/2&quot;</td>
</tr>
<tr>
<td>F#</td>
<td>733 1/3 Hz</td>
<td>19 5/16&quot;</td>
<td>4 3/8&quot;</td>
</tr>
<tr>
<td>G</td>
<td>782 2/9 Hz</td>
<td>18 11/16&quot;</td>
<td>4 1/8&quot;</td>
</tr>
<tr>
<td>A</td>
<td>880 Hz</td>
<td>17 19/32&quot;</td>
<td>3 7/8&quot;</td>
</tr>
<tr>
<td>B</td>
<td>977 7/9 Hz</td>
<td>16 5/8&quot;</td>
<td>3 11/16&quot;</td>
</tr>
<tr>
<td>C#</td>
<td>1100 Hz</td>
<td>15 11/16&quot;</td>
<td>3 1/2&quot;</td>
</tr>
<tr>
<td>D</td>
<td>1173 1/3 Hz</td>
<td>15 3/16&quot;</td>
<td>3 5/16&quot;</td>
</tr>
<tr>
<td>E</td>
<td>1320 Hz</td>
<td>14 9/32&quot;</td>
<td>3 3/16&quot;</td>
</tr>
<tr>
<td>F#</td>
<td>1466 2/3 Hz</td>
<td>13 1/2&quot;</td>
<td>3&quot;</td>
</tr>
<tr>
<td>G</td>
<td>1564 4/9 Hz</td>
<td>13 3/32&quot;</td>
<td>2 15/16&quot;</td>
</tr>
<tr>
<td>A</td>
<td>1720 Hz</td>
<td>12 5/16&quot;</td>
<td>2 3/4&quot;</td>
</tr>
<tr>
<td>B</td>
<td>1955 5/9 Hz</td>
<td>11 5/8&quot;</td>
<td>2 5/8&quot;</td>
</tr>
</tbody>
</table>

**Table 2.1 – Steel Soprano Bells physical characteristics, Old Granddad #4**

These bells and their corresponding resonators are mounted on a frame made of wood and PVC. The “accidentals” (F# and C#) are mounted above the “natural” notes in the same place they would be on a piano or marimba. This raised
structure also detaches from the main part of the case to allow for collapse during storage and shipment. The main case is raised off the ground by means of PVC legs, which are also easily detached for storage and shipment. The design of the case is such that the general ambitus of the pipes is 20 1/2” wide and 37” deep. The legs are cut in a manner that the “naturals” have a playing height of 33 3/4” and the “accidentals” are mounted in such a way that they have a playing height of 36 ¾,” each measured from the ground to the playing surface of the pipe. A diagram of the instrument, with specifications for the mounting structure, is found below.

Figure 2.1 – Steel Soprano Bells Isometric Drawing
2.2. **Soprano Bells - Aluminum**

The second set of Soprano Bells is a set of sixteen pipes, each made from extruded aluminum 1/8" in thickness, called Electrical Metallic Tubing (EMT). Aluminum EMT does not have a weld joint like the steel pipes. These pipes are 1" in diameter, measured from the outside of each wall. They are suspended above resonators made from 1 1/2" PVC pipes. As with the Steel Soprano Bells, some resonators are straight and some are angled. Each aluminum pipe is suspended at its acoustic nodal point. The physical specifications of each pipe are listed in Table 2.2 below.

<table>
<thead>
<tr>
<th>Note Name</th>
<th>Frequency</th>
<th>Length</th>
<th>Nodal Point (from end)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>440 Hz</td>
<td>22 31/32&quot;</td>
<td>5 1/16&quot;</td>
</tr>
<tr>
<td>B</td>
<td>488 8/9 Hz</td>
<td>21 3/4&quot;</td>
<td>4 3/4&quot;</td>
</tr>
<tr>
<td>C#</td>
<td>550 Hz</td>
<td>20 1/2&quot;</td>
<td>4 11/16&quot;</td>
</tr>
<tr>
<td>D</td>
<td>586 2/3 Hz</td>
<td>19 25/32&quot;</td>
<td>4 3/8&quot;</td>
</tr>
<tr>
<td>E</td>
<td>660 Hz</td>
<td>18 11/16&quot;</td>
<td>4 3/16&quot;</td>
</tr>
<tr>
<td>F#</td>
<td>733 1/3 Hz</td>
<td>17 21/32&quot;</td>
<td>4&quot;</td>
</tr>
<tr>
<td>G</td>
<td>782 2/9 Hz</td>
<td>17 3/32&quot;</td>
<td>3 5/8&quot;</td>
</tr>
<tr>
<td></td>
<td>Frequency</td>
<td>Length</td>
<td>Width</td>
</tr>
<tr>
<td>---</td>
<td>-----------</td>
<td>--------</td>
<td>-------</td>
</tr>
<tr>
<td>A</td>
<td>880 Hz</td>
<td>16 3/32”</td>
<td>3 3/8”</td>
</tr>
<tr>
<td>B</td>
<td>977 7/9 Hz</td>
<td>15 1/4”</td>
<td>3 1/4”</td>
</tr>
<tr>
<td>C#</td>
<td>1100 Hz</td>
<td>14 3/8”</td>
<td>3 1/16”</td>
</tr>
<tr>
<td>D</td>
<td>1173 1/3 Hz</td>
<td>13 15/16”</td>
<td>2 15/16”</td>
</tr>
<tr>
<td>E</td>
<td>1320 Hz</td>
<td>13 1/16”</td>
<td>2 3/4”</td>
</tr>
<tr>
<td>F#</td>
<td>1466 2/3 Hz</td>
<td>12 3/8”</td>
<td>2 5/8”</td>
</tr>
<tr>
<td>G</td>
<td>1564 4/9 Hz</td>
<td>12”</td>
<td>2 1/2”</td>
</tr>
<tr>
<td>A</td>
<td>1720 Hz</td>
<td>11 9/32”</td>
<td>2 3/8”</td>
</tr>
<tr>
<td>B</td>
<td>1955 5/9 Hz</td>
<td>10 11/16”</td>
<td>2 1/4”</td>
</tr>
</tbody>
</table>

Table 2.2 – Aluminum Soprano Bells physical characteristics, Old Granddad #4

The Aluminum Soprano Bells have a case that is almost identical to the Steel Soprano Bells: made of wood and PVC, with the same detachable “accidentals.” The design of this case is such that the general ambitus of the pipes is 20 1/4” wide and 34” deep. The legs are cut in a manner that the “naturals” have a playing height of 33 3/4” and the “accidentals” are mounted in a way that they have a playing height of 36 3/4,” each measured from the ground to the playing surface of the pipe. A diagram of the instrument, with specifications for the mounting structure, is found below.
2.3. Tenor Bells - Steel

The first set of Tenor Bells is a set of sixteen pipes, each made from Steel EMT 1/16" thick. Like the Steel Soprano Bells, the Steel Tenor Bells have a weld that...
affects the tuning process. These pipes are 1 1/2” in diameter, measured from the outside of each wall. They are suspended above resonators made from 1 3/4” and 2 1/4” PVC pipes and the resonator diameter changes at A=440Hz. As with both sets of Soprano Bells, some resonators are straight and some are angled. Each steel pipe is suspended at its acoustic nodal point. The physical specifications of each pipe are listed in Table 2.3 below.

<table>
<thead>
<tr>
<th>Note Name</th>
<th>Frequency</th>
<th>Length</th>
<th>Nodal Point (from end)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>220 Hz</td>
<td>40 11/16”</td>
<td>8 7/8”</td>
</tr>
<tr>
<td>B</td>
<td>244 4/9 Hz</td>
<td>38 21/32”</td>
<td>8 5/16”</td>
</tr>
<tr>
<td>C#</td>
<td>275 Hz</td>
<td>36 13/32”</td>
<td>8 1/16”</td>
</tr>
<tr>
<td>D</td>
<td>293 1/3 Hz</td>
<td>35 3/16”</td>
<td>7 3/8”</td>
</tr>
<tr>
<td>E</td>
<td>330 Hz</td>
<td>33 1/4”</td>
<td>7 1/8”</td>
</tr>
<tr>
<td>F#</td>
<td>366 2/3 Hz</td>
<td>31 15/32”</td>
<td>7”</td>
</tr>
<tr>
<td>G</td>
<td>391 1/9 Hz</td>
<td>30 7/16”</td>
<td>6 5/16”</td>
</tr>
<tr>
<td>A</td>
<td>440 Hz</td>
<td>28 11/16”</td>
<td>6 3/16”</td>
</tr>
<tr>
<td>B</td>
<td>488 8/9 Hz</td>
<td>27 3/16”</td>
<td>6”</td>
</tr>
<tr>
<td>C#</td>
<td>550 Hz</td>
<td>25 9/16”</td>
<td>5 1/2”</td>
</tr>
<tr>
<td></td>
<td>Frequency</td>
<td>Width</td>
<td>Height</td>
</tr>
<tr>
<td>----</td>
<td>-----------</td>
<td>---------</td>
<td>---------</td>
</tr>
<tr>
<td>D</td>
<td>586 2/3 Hz</td>
<td>24 13/16”</td>
<td>5 3/8”</td>
</tr>
<tr>
<td>E</td>
<td>660 Hz</td>
<td>23 1/4”</td>
<td>5”</td>
</tr>
<tr>
<td>F#</td>
<td>733 1/3 Hz</td>
<td>22”</td>
<td>4 3/4”</td>
</tr>
<tr>
<td>G</td>
<td>782 2/9 Hz</td>
<td>21 3/8”</td>
<td>4 1/4”</td>
</tr>
<tr>
<td>A</td>
<td>880 Hz</td>
<td>20 3/32”</td>
<td>4 1/8”</td>
</tr>
<tr>
<td>B</td>
<td>977 7/9 Hz</td>
<td>19 1/16”</td>
<td>4”</td>
</tr>
</tbody>
</table>

Table 2.3 – Steel Tenor Bells physical characteristics, Old Granddad #4

The Steel Tenor Bells have a case that is very similar to both sets of Soprano Bells (modified to support the larger pipes and resonators): made of wood and PVC, with the same detachable “accidentals.” The design of this case is such that the general ambitus of the pipes is 24 1/4” wide and 56 1/2” deep. The legs are cut in a manner that the “naturals” have a playing height of 33 3/4” and the “accidentals” are mounted in a way that they have a playing height of 36 3/4”, each measured from the ground to the playing surface of the pipe. A diagram of the instrument, with specifications for the mounting structure, is found below.
2.4. **Tenor Bells - Aluminum**

The second set of Tenor Bells is a set of sixteen pipes, each made from Aluminum EMT 1/8” thick. Just as with the Steel Soprano Bells, the Steel Tenor Bells have a weld that affects the tuning process. These pipes are 1 1/2” in diameter, measured from the outside of each wall. They are suspended above resonators made from 1 3/4” and 2 1/4” PVC pipes and the resonator diameter changes at A=440Hz. As with both sets of Soprano Bells, some resonators are straight and some
are angled. Each aluminum pipe is suspended at its acoustic nodal point. The physical specifications of each pipe are listed in Table 2.4 below.

<table>
<thead>
<tr>
<th>Note Name</th>
<th>Frequency</th>
<th>Length</th>
<th>Nodal Point (from end)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>220 Hz</td>
<td>39 15/32”</td>
<td>8 1/2”</td>
</tr>
<tr>
<td>B</td>
<td>244 4/9 Hz</td>
<td>37 1/8”</td>
<td>8 1/8”</td>
</tr>
<tr>
<td>C#</td>
<td>275 Hz</td>
<td>35 1/4”</td>
<td>7 7/8”</td>
</tr>
<tr>
<td>D</td>
<td>293 1/3 Hz</td>
<td>33 27/32”</td>
<td>7 1/8”</td>
</tr>
<tr>
<td>E</td>
<td>330 Hz</td>
<td>31 29/32”</td>
<td>7 1/8”</td>
</tr>
<tr>
<td>F#</td>
<td>366 2/3 Hz</td>
<td>30 1/4”</td>
<td>6 5/8”</td>
</tr>
<tr>
<td>G</td>
<td>391 1/9 Hz</td>
<td>29 9/32”</td>
<td>6 7/16”</td>
</tr>
<tr>
<td>A</td>
<td>440 Hz</td>
<td>27 15/32”</td>
<td>5 15/16”</td>
</tr>
<tr>
<td>B</td>
<td>488 8/9 Hz</td>
<td>26 5/32”</td>
<td>5 5/8”</td>
</tr>
<tr>
<td>C#</td>
<td>550 Hz</td>
<td>24 1/2”</td>
<td>5 1/4”</td>
</tr>
<tr>
<td>D</td>
<td>586 2/3 Hz</td>
<td>23 13/16”</td>
<td>5”</td>
</tr>
<tr>
<td>E</td>
<td>660 Hz</td>
<td>22 3/8”</td>
<td>4 3/4”</td>
</tr>
<tr>
<td>F#</td>
<td>733 1/3 Hz</td>
<td>21 7/32”</td>
<td>4 1/2”</td>
</tr>
<tr>
<td>G</td>
<td>782 2/9 Hz</td>
<td>20 11/16”</td>
<td>4 3/8”</td>
</tr>
<tr>
<td></td>
<td>Pitch</td>
<td>Diameter</td>
<td>Height</td>
</tr>
<tr>
<td>---</td>
<td>-------</td>
<td>----------</td>
<td>--------</td>
</tr>
<tr>
<td>A</td>
<td>880 Hz</td>
<td>19 5/16”</td>
<td>4 1/8”</td>
</tr>
<tr>
<td>B</td>
<td>977 7/9 Hz</td>
<td>18 9/32”</td>
<td>3 7/8”</td>
</tr>
</tbody>
</table>

**Table 2.4 – Aluminum Tenor Bells physical characteristics, Old Granddad #4**

The Aluminum Tenor Bells have a case that is very similar to both sets of Soprano Bells and almost identical to the Steel Tenor Bells: made of wood and PVC, with the same detachable “accidentals.” The design of this case is such that the general ambitus of the pipes is 24 1/4” wide and 56 1/2” deep. The legs are cut in a manner that the “naturals” have a playing height of 33 3/4” and the “accidentals” are mounted in a way that they have a playing height of 36 3/4”, each measured from the ground to the playing surface of the pipe. A diagram of the instrument, with specifications for the mounting structure, is found below.
2.5. **Baritone Keys**

The Baritone Keys is a set of eleven slabs, each made from Aluminum 1/4” thick and four inches deep. They are suspended above resonators made from 4 1/2” PVC pipes. Unlike the Soprano and Tenor Bells, all of these resonators are straight. Each aluminum slab is suspended at its acoustic nodal point. The physical specifications of each key are listed in Table 2.5 below.
<table>
<thead>
<tr>
<th>Note Name</th>
<th>Frequency</th>
<th>Length</th>
<th>Nodal Point (from end)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>110 Hz</td>
<td>21”</td>
<td>4 1/2”</td>
</tr>
<tr>
<td>B</td>
<td>122 2/9 Hz</td>
<td>19 15/16”</td>
<td>4 1/2”</td>
</tr>
<tr>
<td>C#</td>
<td>137 1/2 Hz</td>
<td>18 13/16”</td>
<td>4 1/4”</td>
</tr>
<tr>
<td>D</td>
<td>146 2/3 Hz</td>
<td>18 1/4”</td>
<td>4”</td>
</tr>
<tr>
<td>E</td>
<td>165 Hz</td>
<td>17 3/16”</td>
<td>3 3/4”</td>
</tr>
<tr>
<td>F#</td>
<td>183 1/3 Hz</td>
<td>16 1/4”</td>
<td>3 1/2”</td>
</tr>
<tr>
<td>G</td>
<td>195 5/9 Hz</td>
<td>15 3/4”</td>
<td>3 1/2”</td>
</tr>
<tr>
<td>A</td>
<td>220 Hz</td>
<td>14 7/8”</td>
<td>3 3/8”</td>
</tr>
<tr>
<td>B</td>
<td>244 4/9 Hz</td>
<td>14 1/8”</td>
<td>3 1/4”</td>
</tr>
<tr>
<td>C#</td>
<td>275 Hz</td>
<td>13 9/32”</td>
<td>3”</td>
</tr>
<tr>
<td>D</td>
<td>293 1/3 Hz</td>
<td>12 29/32”</td>
<td>2 7/8”</td>
</tr>
</tbody>
</table>

Table 2.5 – Baritone Keys physical characteristics, Old Granddad #4

The Baritone Keys are mounted on a box made of wood and PVC. The design of this box is such that the general ambitus of the instrument is 47 1/2” in width, 26 and 3/4” in depth on the low end, and 18 1/2” in depth on the high end. The legs are cut in a manner that the all notes have a playing height of 35”, measured from the
ground to the playing surface of the key. In keeping with the layout Colvig created for Old Granddad #1, the “accidentals” are mounted perpendicular to and in front of the “naturals.” Each key is permanently adhered to the two pieces of foam rubber at its nodal points, which in turn are permanently adhered to the case. A diagram of the instrument, with specifications for the mounting structure, is found below.

Figure 2.5 – Baritone Keys Isometric Drawing
2.6. **Bass Keys**

The Bass Keys are a set of seven slabs, each made from Aluminum 1/4” in thickness and ten inches in width. They are suspended above resonators made from 15” PVC pipes. Each aluminum slab is adhered to foam rubber at its acoustic nodal points, much like the Baritone Keys. The physical specifications of each key are listed in Table 2.6 below.

<table>
<thead>
<tr>
<th>Note Name</th>
<th>Frequency</th>
<th>Length (from end)</th>
<th>Nodal Point (from end)</th>
<th>Pedestal Height (to top of lip)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>55 Hz</td>
<td>37 1/4”</td>
<td>8 3/8”</td>
<td>none</td>
</tr>
<tr>
<td>B</td>
<td>61 1/9 Hz</td>
<td>35 5/16”</td>
<td>7 7/8”</td>
<td>6”</td>
</tr>
<tr>
<td>C#</td>
<td>68 3/4 Hz</td>
<td>33 3/16”</td>
<td>7 1/2”</td>
<td>12 3/4”</td>
</tr>
<tr>
<td>D</td>
<td>73 1/3 Hz</td>
<td>32”</td>
<td>7 1/4”</td>
<td>17”</td>
</tr>
<tr>
<td>E</td>
<td>82 1/2 Hz</td>
<td>30 3/8”</td>
<td>6 7/8”</td>
<td>22 3/4”</td>
</tr>
<tr>
<td>F#</td>
<td>91 2/3 Hz</td>
<td>28 13/16”</td>
<td>6 3/8”</td>
<td>26”</td>
</tr>
<tr>
<td>G</td>
<td>97 7/9 Hz</td>
<td>27 15/16”</td>
<td>6 1/8”</td>
<td>27 1/4”</td>
</tr>
</tbody>
</table>

**Table 2.6 – Bass Keys physical characteristics, Old Granddad #4**

Because of the large size of each key and its corresponding resonator, the notes are not connected to each other. Instead, each resonator rests on its own
pedestal, 16 3/4” square and made of plywood and carpeting. Each pedestal has a 2 1/2” lip at the top to keep the resonator from being knocked off. The pedestal heights can be found in Table 6 above. Above the pedestal and resonator, there exists a support structure made of angled steel and 4”x4”x15 3/4” lumber upon which the foam rubber for each nodal point is adhered. The common height for all seven keys is 53 1/4”. A diagram of the instrument, with specifications for the mounting structure, is found below.

![Figure 2.6 - Bass Keys Isometric Drawing](image)

![2.7 - Bass Keys Closeup Isometric Drawing](image)

Because the Bass Keys for Old Granddad #4 are individually mounted, they can be set up in numerous configurations and in any order. Below are the three most common recent configurations for the Bass Keys used in the Boston Modern
Orchestra Project 2014 recording session; the 2017 Lou Harrison Centennial Performance at Trinity Church by the Rutgers Percussion Ensemble and Rutgers Kirkpatrick Choir; and the current setup in use by the MIT composers’ project.
Figure 2.8 – Bass Keys Setup Diagram
2.7. Other Instruments

There are a few instruments that are unique in their usage alongside Old Granddad and generally are acquired at the same time as the gamelan. These are the oxygen tanks and gentorak called for in the score for *La Koro Sutro*. Although other percussion instruments are used in the score, many are commonly used or easily acquired. For example, the trash cans and large “ranch” triangles can be found in other Harrison works like *Concerto in Slendro*. The gentorak (sometimes spelled “gentorag”) is a rarely-used Balinese instrument, essentially a small tree comprised of various sizes of bells. The gentorak is relatively antiquated and no longer in use in the ensembles of modern-day Java. The bells are usually brass or bronze (see picture below). In the United States, people have fashioned gentorak out of any small bells they can salvage from stores and second-hand shops. Taken together, this set of bells is shaken to produce a glistening metallic texture that Harrison often uses to augment the organ clusters in *La Koro Sutro*. A gentorak should not be confused with a “Jingling Johnny” (also called a “Turkish Crescent”), which is Janissary in origin and is mounted to a tall rod (see picture below). Though Harrison and some of his colleagues sometimes confused these in conversation, they always had access to the accurate gentorak for performances.
The oxygen tanks are referred to in the score for La Koro Sutro as the “Big Bells”. They are tanks, formerly filled with oxygen, acetylene, or other gases, which have passed their usable expiration date (gas canisters have a maximum length of use determined by the rate of deterioration of the metal under pressure). They are cut off by means of a plasma torch and mounted to a hanging structure. There is no standardized diameter or thickness to the tanks, nor is there any specified pitch content from either Harrison’s personal instruments or indicated in his scores. Usually they are played with a small baseball bat or some large padded implement. A set of tanks created with Old Granddad #2 reside with the instruments at the University of California at Santa Cruz. One of Dr. John Pennington’s students at Fort Lewis College helped create a set of tanks for Old Granddad #3 and the Boston Modern Orchestra Project bought a set of tanks in Boston for use with Old Granddad #4.
Figure 2.11 – Oxygen Tanks and Pails from Old Granddad #1

Figure 2.12 – Oxygen Tanks from Old Granddad #2
2.8. A Note About “Change Out” Pitches

Present in the 1971 score for *Young Caesar* are annotations for “7-11 Bells (S), “7-11 Bells (T),” and “Genders 7-11” beginning in the Overture to Act II. These indications occur nowhere else in any of the extant repertoire that Harrison wrote.
and do not appear in later versions of *Young Caesar*. They indicate the use of the Old Granddad instruments, with two pitches replaced on each instrument. The notes C# and G are exchanged for C and G# (the 7th and 11th notes, respectively, of the harmonic series built off of the root note D), creating an entirely new pitch set from which to draw modalities. In *Young Caesar*, Harrison used the 7-11 scales to indicate a change to the location of Bythinia, the exotic East, in the same manner that previous Western composers had associated locations, characters, and ideas with scales and sounds through the use of leitmotif. Jim Dalton refers to these notes as “Change-out pitches.” Though physical specifications for each of the “Change Out Pitches” is not available, the notes and their associated frequencies can be found in Table 2.7 below (pitches for both sets of Soprano Bells will be the same, pitches for both sets of Tenor Bells will also be the same).

<table>
<thead>
<tr>
<th>Instrument Name</th>
<th>Pitch</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Soprano Bells</td>
<td>C</td>
<td>513 1/3Hz</td>
</tr>
<tr>
<td></td>
<td>G#</td>
<td>806 2/3Hz</td>
</tr>
<tr>
<td></td>
<td>C</td>
<td>1026 2/3Hz</td>
</tr>
<tr>
<td></td>
<td>G#</td>
<td>1613 1/3Hz</td>
</tr>
<tr>
<td>Tenor Bells</td>
<td>C</td>
<td>256 2/3Hz</td>
</tr>
<tr>
<td></td>
<td>G#</td>
<td>403 1/3Hz</td>
</tr>
<tr>
<td></td>
<td>Pitch</td>
<td></td>
</tr>
<tr>
<td>----------------</td>
<td>-------------</td>
<td></td>
</tr>
<tr>
<td><strong>C</strong></td>
<td>513 1/3 Hz</td>
<td></td>
</tr>
<tr>
<td><strong>G#</strong></td>
<td>806 2/3 Hz</td>
<td></td>
</tr>
<tr>
<td><strong>Baritone Keys</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>C</strong></td>
<td>128 1/3 Hz</td>
<td></td>
</tr>
<tr>
<td><strong>G#</strong></td>
<td>201 2/3 Hz</td>
<td></td>
</tr>
<tr>
<td><strong>C</strong></td>
<td>256 2/3 Hz</td>
<td></td>
</tr>
<tr>
<td><strong>Bass Keys</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>C</strong></td>
<td>64 1/6 Hz</td>
<td></td>
</tr>
<tr>
<td><strong>G#</strong></td>
<td>100 5/6 Hz</td>
<td></td>
</tr>
</tbody>
</table>

**Table 2.7 – Change Out Pitches for Old Granddad #1**
Chapter 3

Tuning and Timbre

“The tuning of any instrument is determined by its use. In this case, our instrument was built to be composed for by a composer so its tuning was specified by that composer (Lou Harrison). Certainly it could be made with ‘sharps and flats’ and all tuned up out-of-tune Western style in 12 equal tones so you could play ‘Stormy Weather’ on it. Why bother?”

In building Old Granddad, Lou Harrison and William Colvig selected a tuning scheme that would function equally well in many different musical contexts. They were currently performing in their Chinese ensemble with Western musicians and needed a system in which they could convincingly present their eclectic music.

This would satisfy not only the needs of the ensemble in their performances of music styles from the East, but also be acceptable to both Western audiences and Western performers. As Heidi von Gunden states, “This produced an acceptable

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57 Patrick Grant Gardner, "La Koro Sutro: Historical Perspective, Analysis and Performance Considerations" (PhD dissertation, University of Texas at Austin, 1981), 126.
justly tuned major scale that would not be foreign to musicians who were careful about pitch.”

The tuning scheme selected by Harrison and Colvig is a collection of ratios conceived of by the ancient Greeks and codified by Ptolemy as “Syntonon Diatonic” or “Intense Diatonic Scale.” It has been further labeled by Zarlino as the “Senario.” It is a justly-tuned pentatonic scale with two added pitches to create a full diatonic collection. Harrison had already been interested in the possibilities of pentatonic scales as the cradle of most of the world’s music; the connection to mathematics and the ancient Greeks was part of the synthesis that had defined Harrison’s thought processes. Ptolemy’s Intense Diatonic was closely related to the interval structure of the Prime Pentatonic, described in Harrison’s own *Music Primer*.

![Figure 3.1 – Prime Pentatonic from Lou Harrison, *Music Primer*, 27.](image)

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In Figure 3.1, the numbers inside the box correspond to the most closely related scale degree from Western music; the fractions above the box describe the musical interval of successive pitches as ratios between their frequencies; and the fractions below the box describe the ratios between the above pitch and the tonic note (the left-most number within the box, scale degree 1). The tuning scheme for Old Granddad is found in Figure 3.2 below and is an application of the “Prime Pentatonic” tuning scheme found in Figure 3.1.

![Figure 3.2 – Old Granddad tuning scheme from Jim Dalton and Jody Diamond, “Will the Real American Gamelan Please Stand Up?: Gamelan Tunings by Lou Harrison,” 4.](image)

The Old Granddad tuning scheme contains several layers of ratios that help describe how each note is related to the others. Most importantly, one can see the preponderance of the ratios 9/8 and 10/9 in both diagrams. These so-called “epimoric” or “superparticular” ratios, defined as the ratio of two consecutive integers, were fascinating to Harrison. They are both heard as whole steps, but of
different sizes, creating different connections to the tonic note. The difference between the prime pentatonic and Ptolemy’s Intense Diatonic is the addition of the fourth and seventh scale degrees, also related by familiar intervals. One can also see the 3/2, 4/3, and 5/4 epimoric ratios that relate notes that are Perfect 5ths, Perfect 4ths, and Major 3rds (respectively) away from each other. Though Harrison’s “prime pentatonic” contains no half steps (referred to as “anhemitonic”), the tuning scheme for Old Granddad does contain them. The 16/15 ratio is the half step in this system, making Old Granddad an instrument tuned in a “hemitonic” pentatonic collection. The three intervals 9/8, 10/9, and 16/15 comprise the various tetrachordal groupings from which Harrison composed.

In Just Intonation systems, “harmonic limits” are one of the ways composers impose constraints on sets of intervals, preventing an unlimited and undisciplined set of pitches to occur. Each of the ratios’ numerators and denominators must be derived from a product of a specific set of prime numbers. All of the intervallic relationships for Old Granddad belong to a “5-limit system,” which means the numbers in both the numerator and denominator for each interval can only be comprised of products of the numbers 2, 3, and 5. There are also other systems: a 7-limit system uses the numbers 2, 3, 5, and 7 to derive its ratios; a 13-limit system uses the numbers 2, 3, 5, 7, 11, and 13. In creating his “change out pitches” (referred to in both the score for Young Caesar [1971] and Jim Dalton’s “Gamelan Tunings by Lou Harrison), Harrison uses ratios of 11/8 and 7/4 to create the pitches G# and C.
These pitches were also identified as the "7th and 11th harmonics of the ‘D’ fundamental."\textsuperscript{60}

\begin{figure}[h]
\centering
\includegraphics[width=0.5\textwidth]{change_out_pitches.png}
\caption{Change Out Pitches tuning scheme from Jim Dalton and Jody Diamond, “Will the Real American Gamelan Please Stand Up?: Gamelan Tunings by Lou Harrison,” 4.}
\end{figure}

In transferring theory to practice, Colvig’s starting pitch was A=440Hz. From here, he used the ratio 3/2 to create a pure 5th below (D) and the ratio 4/3 to create a pure 4th below (E). The notes required to complete the prime pentatonic scale were derived from tuning an F#, a pure major third above the D at an interval of 5/4, and a B, a pure fourth above the F#. This tuning scheme also uses the 2/1 ratio to create octaves, which is not usually standard in Equal Temperament.

\begin{figure}[h]
\centering
\includegraphics[width=0.5\textwidth]{initial_tuning.png}
\caption{Initial Tuning from Miller/Lieberman, \textit{Composing a World}, 122.}
\end{figure}

\textsuperscript{60} Jim Dalton, “Gamelan Tunings by Lou Harrison,” 2.
To complete Ptolemy's Intense Diatonic, the pitch G was tuned a pure fourth above D (a 4/3 ratio) and the C# was tuned a pure fifth above F# (a 3/2 ratio). Leta Miller and Frederic Lieberman summarized the intervallic relationships in Figure 3.5.

![Figure 3.5 – Full Tuning from Miller/Lieberman, Composing a World, 122.](image)

The resulting pitches and their deviation from the corresponding equal temperament pitches can be found in Table 3.1 below. Because all octaves within Old Granddad are “unstretched,” one can assume octave equivalency, and thus cents deviation equivalency, across all instruments.
<table>
<thead>
<tr>
<th>Note Name</th>
<th>Cents deviation from 12TET</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>0</td>
</tr>
<tr>
<td>B</td>
<td>B1 -17.59</td>
</tr>
<tr>
<td>C#</td>
<td>C#2 -13.68</td>
</tr>
<tr>
<td>D</td>
<td>D2 -1.95</td>
</tr>
<tr>
<td>E</td>
<td>E2 +1.95</td>
</tr>
<tr>
<td>F#</td>
<td>F#2 -15.63</td>
</tr>
<tr>
<td>G</td>
<td>G2 -3.9</td>
</tr>
<tr>
<td>A</td>
<td>0</td>
</tr>
</tbody>
</table>

Table 3.1 – Ptolemy Intense Diatonic cents deviation chart. Note: “12TET” refers to a 12-tone equal temperament tuning.

Harrison continued to feel quite strongly about the relationship of ratios and integer mathematics to humans’ everyday life. His straw bale house in Joshua Tree, CA, built at the end of his life, is an ecological monument to sustainability, but the architecture is also infused with the same rational mathematics he revered in his music.61 The image below is an example of Harrison’s cross-disciplinary

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involvement in the arts and how he revered proportion: two diagrams of the Old Granddad tuning scheme, each colored by with watercolor paints.

![Figure 3.6 – Lou Harrison, watercolor prints of Old Granddad tuning scheme. From the Lou Harrison Archives at the University of California at Santa Cruz.](image)

**3.1. Timbre and Sound Quality**

**3.1.1. General**

Any prospective composer for the Old Granddad instruments needs to understand the qualities of each phase of the sound envelope, note duration, and articulation for each instrument. Because it is a percussion instrument, articulation also necessitates a discussion of implement choice. Additionally, it will be useful to
discuss the general timbral qualities of each instrument and what their possible correlates to Western instruments might be. In the 1988 transcription of Young Caesar, Harrison himself created possible instrumental combinations that mimicked Old Granddad. This allows us to know how the composer himself thought of how his instruments functioned sonically. The following section will be divided into two sections: bells and keys. The two families of instruments are separated by range, shown in Figure 3.7.

Every component instrument from Old Granddad is a percussion instrument of determinate pitch. One would also characterize them further as having little to no “noise content,” like cymbals, shakers, or a snare drum.62 Taken as a whole, the metallophone orchestra of Old Granddad presents a relatively homogenous sound profile across all the instruments.

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62 Samuel Z. Solomon, How to Write for Percussion (New York: Samuel Solomon), 11-12.
In each iteration of the instruments, from the original Old Granddad in 1971 to Old Granddad #4 built by Richard Cooke, the sound profile of each note has also significantly improved. Richard Cooke’s tuning process improved over time and Old Granddad #4 now has pipes that are balanced along the X and Y axes, producing a much clearer fundamental pitch and eliminating a waver that is present in some of the older notes (see Chapter 1). The baritone and bass voices are also significantly louder now than in any previous iteration, due largely to the increased accuracy in the length of resonators and the larger bar size in the bass instrument. These improvements have finally allowed the low voices to balance with the bells, something that was missing from early recordings of both Young Caesar and La Koro Sutro.

3.1.2. Bells

Lou Harrison and William Colvig created a set of pipes in aluminum and steel for each range, soprano and tenor. Harrison believed that steel created a sweet sound and aluminum added warmth and resonance. Played in pairs, they create a full and warm sound from the aluminum with a sweetened attack from the steel. The four instruments comprising the bells family all have similar waveforms and spectrograms. Their sound envelopes are also similar in that they have the same proportions of attack, decay, resonance, and release. The bells are characterized by an attack that is significantly louder than the resonance, with a quick decay. The
resonance, however, is quite long relative to many percussion instruments and tails into a very gradual release.

Figure 3.8 – Sample Waveform; Steel Soprano Bells, D=587Hz
The quality of attack for each pipe is dependent on the implement used to strike it. A set of implements was created for each instrument in each iteration of Old Granddad, but they are not necessarily the ideal. The pipes for Old Granddad #4, for instance, come with polyurethane discs attached to the end of dowels. These have worked well for Richard Cooke’s other instruments but are not usually used in performances with the Old Granddad instruments. They produce strong contact and frame noise that clouds the pitch and can decrease the overall volume of the instruments. Joe Tompkins, who led the Rutgers Percussion Ensemble in the performances of *La Koro Sutro* and the *Suite for Violin and American Gamelan* at Trinity Church in 2017, describes having used hard cord-wrapped vibraphone mallets on all of the pipe instruments to achieve optimal attack quality and articulation.63 Implement selection is usually left to performer’s discretion, unless a specific technique is requested.

The decay of each pipe very quickly leads to the resonance portion of the sound envelope, but in the spectrogram of the pitch below, one can see the prominent overtones that give the pipes such a high, crystalline quality. These overtones quickly fade and are not a significant part of the resonance, but they add brilliance to the first moment of each note’s sound. The resonance for each pipe varies depending on several factors: how uniformly each note is struck, the inconsistencies in the pipe due to smelting and extrusion, and how precisely each

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63 Joseph Tompkins in discussion with author, July 2018.
pipe was mounted, to name a few. The register of the pipe also changes its
resonance: the lower notes ring significantly longer than the higher ones; the steel
pipes have a shorter overall duration than the aluminum ones. The shortest note
duration is the Steel Soprano Bells note B=1956Hz, at approximately three seconds
long. The longest durations are the Aluminum Tenor Bell notes A=220Hz, B=244Hz,
D=293Hz, and E=330Hz, which all ring for approximately twenty-five seconds. See
Figure 3.9 for an example of the length of the resonance, as well as the presence of
overtones in the attack.
Figure 3.9 – Sample Spectrogram; Steel Soprano Bells, D=587Hz
The metal in both the steel and aluminum bells can degrade over time and become slightly out of tune. This is not a problem of pitch, but rather creates a waver in the resonance of certain notes, much like a vibraphone with the motor turned on. This waver tends to be more present in the aluminum pipes than the steel pipes, likely because of the more malleable characteristics of aluminum alloys. See an example of a typical waver in Figure 3.10.
Figure 3.10 – Waver diagram; Aluminum Soprano Bells, E=1320Hz
The Western percussion instruments that most closely correlate with the bells, in terms of quality of sound, are the keyboard percussion instruments. Marimba and xylophone produce the clarity of pitch and attack profile of the pipes, but the duration of the notes is not close. The low notes of a marimba do resonate for a longer duration, but the notes in the same range as the pipes do not. The vibraphone and glockenspiel are the closest in pitch clarity, timbre, and duration to the pipes. It is for this reason that the Old Granddad instruments in Young Caesar were transcribed primarily for keyboard percussion, often in combination. In a transcription of the Suite for Violin and American Gamelan, created by Harrison’s friend Kerry Lewis, the Old Granddad instruments are written into an ensemble that includes strings, piano, celeste, and two harps (which is also an instrumental combination Harrison used in the 1988 revision of Young Caesar for selected sections). These instruments retain a percussive attack and an element of resonance. The celeste is the best non-percussion instrument approximate to the original sounds.\textsuperscript{64}

No extended techniques were used on bells for Harrison’s compositions. Though he employed “gangsa” technique in Young Caesar, wherein the player dampens the note with a trailing hand, these can be considered more idiomatic to gamelan and less of an extended technique. Harrison does call for some notes to be muffled, but, again, this is standard practice for some percussion instruments. No

\footnote{\textsuperscript{64} For a further discussion of the timbre and pitch relationships between metal pipes and other percussion instruments, please see How to Write for Percussion by Samuel Z Solomon, Appendix H.}
alternate implements were called for, most of the textures remained the same throughout compositions.

### 3.1.3. Keys

The two instruments comprising the keys family also have similar waveforms and spectrograms. Their sound envelopes are similar in attack, decay, resonance, and release; they are in fact more similar within their family than the bell instruments are within theirs. The keys have a much less pronounced attack, very little decay, and in most cases a very long resonance.
Figure 3.11 – Sample Waveform; Baritone Keys, A=220Hz
The baritone instrument from Old Granddad #4 comes with a set of dedicated mallets. These mallets have large polyurethane rollerblade wheels on the end, covered in felt to reduce the brightness of attack. The larger head helps produce more fundamental pitch on the keys, which have a greater resonant mass than the pipes. The bass keys use standard Javanese gong mallets for their general playing, which are heavy padded mallets covered in felt and bound with cord (see Figure 3.12). There may be room for improvement in this area, as these mallets slightly muffle the keys as they are struck.

Figure 3.12 – Javanese gong mallets
While Harrison does not call for any alternative implements, extended techniques or non-standard textures in his writing for the bells, he does use them on the bass instrument, specifically in Scene XIV of Young Caesar, wherein the “gendér” player is asked to play with “hard sticks on edge.” This player was playing both bass and baritone instruments, which had not been separated yet. It is not known which exact implements were used at the 1971 premiere, but the directions indicate a sound profile which would have had a large amount of brilliant attack and a thin, nasal quality (this would be akin to using drumsticks or hard mallets directly on the nodal suspension point on a vibraphone). This sound is reflected in the recording.

The decay of each key is almost imperceptible leading to the resonance. In the spectrogram below, one can see an almost constant stream of a single pitch, as if a sine wave were being generated. There is a slight bump in the beginning, due to the creation of overtones at the moment of the implement’s impact. This is not as pronounced as in the bells and does not significantly contribute to the presence of the keys.

The resonance for each key varies depending on several factors, the largest of which is the room in which the instrument is being played. Because the wavelengths of these notes are long (in the case of A=55Hz, the wavelength is over twenty feet), the space in which they resonate can make a note less present in a significantly shorter time. The register of the keys does not appreciably change the duration of the note; all baritone and bass keys resonate for between six and ten seconds. It should be noted that the duration of resonance could change in different rooms and
with improved implements. See Figure 3.13 for a sample spectrogram of a keyed instrument.

Figure 3.13 – Sample Spectrogram; Baritone Keys, A=220Hz
The bass register of a marimba or timpani played with soft mallets are the closest Western analogs to the bass keys. None of these instruments quite reaches the depth of the bass keys; however, a thirty-two-inch timpani tuned to a D2 (one of its lowest achievable pitches) is 73Hz and a five-octave marimba extends down to C2, which is 65Hz. The soft mallets are crucial to approximate the attack profile of the keys. A better approximation to the keys would be tuned nipple gongs, though these are significantly more difficult to procure. The baritone keys are in a range that makes them sound like gongs in Thai music; the bass keys are in a range that makes them sound like deep Javanese gongs (which can be up to fifty-five inches in diameter). In Harrison’s own transcriptions, he often uses a combination of tack piano and harp in place of the keys. The tack piano was a favorite of Harrison’s, but it has a significantly more pronounced attack than the baritone or bass keys and is much brighter. The low range of a harp is mellow and warm, with a duration that approaches that of the keys. The harp is much quieter than the keyed instruments and would be more difficult to balance with an ensemble (especially an ensemble comprised of percussion instruments).

3.2. Conclusion

The tuning scheme created by William Colvig and Lou Harrison was something that Harrison felt quite strongly about. The use of Just Intonation was
both a musical and philosophical ideal for him. Beyond tuning, the instruments themselves provided a crystalline sound that had been a fascination of his since childhood. Moreover, as the technical diagrams in this chapter exhibit, the couple also created something durable that had only developed slight acoustic inconsistencies over a period of decades. It was the perfect musical vehicle upon which Harrison could compose his grand works of the early 1970s.
The period of Harrison's output that produced *Young Caesar* involved a great confluence of events and creative currents in his life. Meeting William Colvig and exploring instrument building converged with his knowledge of puppet theater traditions; he dove headlong into the world of intonation systems after digging into Partch's *Genesis of A Music*; and finally, he found his footing as a California composer steeped in the musical traditions of the East. Through studying the background leading up to the use of Old Granddad in *Young Caesar*, we can gain crucial understanding into how Harrison envisioned using the instruments while they were still being created. In evaluating the orchestration of his various revisions, we can see how the instruments functioned for him as he became a more mature composer.

### 4.1. Background and Influences

Lou Harrison had been steeped in theater and dramatic vocal works since his youth. As a young man in San Francisco, he regularly attended Chinese opera
performances. At Mills College, he encountered the Red Gate Players, a travelling Chinese shadow puppetry troupe. This medium continued to fascinate him during his period of renewed interest in Asian music in the 1960s, and he came to believe that Indonesian puppet dramas (called wayang kulit) and the puppet theater of China could dramatically expand the scope and grandiosity of conventional opera.\(^\text{65}\) Harrison had also studied a grand tradition of puppet theater in Europe: both the puppet operas of Haydn; and wayang transplanted to Vienna in the early twentieth century.\(^\text{66}\) Harrison also came to love Kachina puppets from the Hopi Native Americans during his Mission Period. These puppets were used to teach new brides about the gods and demi-gods that controlled the natural world and acted as spiritual messengers.

His greatest inspiration in this field was Manuel de Falla’s *El retablo de Maese Pedro* (1923), a one-act puppet drama that told the story of Melisandre held captive by the Moors. It depicted an expansive and historic epic with a Spanish Neo-Classical musical language, including a lot of percussion.\(^\text{67}\) Harrison had previously composed the opera *Rapunzel* in a modernist, serial musical style while at Black Mountain College—but Falla’s use of Spanish Baroque and Renaissance music, extensive percussion, and the innovative dramatic setting were much more in line with Harrison’s 1960s California aesthetic. Harrison would model his work on Falla’s music, but a suitable subject eluded him for some time. He writes, “I kept


\(^{67}\) Alves, 300.
thinking in terms of a sort of adobe stage with kachinas, and beautiful color in the puppets. But the music idea was a little restricting, I could only hear drums and maybe a flute or something.” Hearing of Harrison’s dilemma, William Colvig suggested he use a gay subject instead of a Native one. He immediately thought of several subjects, settling on Suetonius’ story of Julius Caesar’s affair with Nicomedes, the King of Bithynia. In this telling, Caesar, called Gaius, travels to Bithynia to collect a tribute of ships from the king, only to be entranced by the exotic culture of what is now Northern Turkey. A romantic relationship ensues between Nicomedes and Gaius; in the end, Gaius is bound in his duty to collect the ships from Nicomedes and return to Rome.69

In addition to openly discussing homosexuality, the opera would also broach the topics of militarism, duty, and the nature of beauty and love. Following a period of virulent anti-Vietnam War sentiment and the traumatic political events of 1968, this was a project that resonated with contemporary themes. Bill Alves describes its sociopolitical context:

“At the height of the Vietnam War, Harrison’s puppet opera would recount the tale of a young citizen of a powerful, militaristic Western kingdom, expected by society to fulfill the roles of husband, father, and soldier. Yet first he is assigned to go and confront the king of a province of the sensual East, where he encounters beauty and love. Without abandoning his duty, Gaius (Julius Caesar) gives himself openly to these pleasures and suffers the contempt of Western society as a result.”70

69 Alves, 301.
70 Ibid
In 1969, Harrison secured a commission from the Pasadena Encounters series, an organization dedicated to sponsoring composer-audience dialogues. Given the size of the project, Harrison was also able to secure additional funding from the Judith S. Thomas Foundation. He would eventually work to stage three versions of the opera, with a further two revisions produced after his death. The continued critical failure of the many revisions was one of Harrison’s greatest professional disappointments, what Alves calls his “forme fatale.”

4.1.1. 1971 Premiere Performance

From the very beginning, the Achilles heel of Young Caesar was its libretto. The libretto faced many challenges stemming from the complexity of the Roman political world and Gaius’ troubled family history, all of which was difficult to succinctly depict. Though puppet operas provided an opportunity to show epic scale (both in terms of time and geographic location), they have considerable difficulty showing the nuances of human conflict and motivations of the individual characters. Caesar’s duty to his wife, his daughter, and to Rome had to be contrasted with his attraction to the East in a short series of scenes that took place over several years. Showing both scope and nuance would be an unenviable task for the librettist. Harrison first reached out to Jack Larson, who created the libretto for Virgil Thomson’s 1958 Lord Byron, but he was unavailable and instead suggested Robert

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72 Alves, 299.
Gordon. Gordon eventually produced an enormous tome that would be whittled down to fourteen scenes, split into two acts. The first act includes the various scenes showing Gaius’s obligations: his manhood ceremony; marrying Cornelia after spurning Cossutia; the birth of his daughter Julia; and his time spent in the dictator Sulla’s army. The second act focuses on his time in Bithynia, first his fascination with the exotic Bithynian royal court and his growing attraction to Nicomedes, later his internal conflict over resuming his Roman duties.

For the production, he pared back Falla’s twenty-one-person chamber orchestra to just five players. For the premiere, these players were violinist Daniel Kobialka, Robert Hughes, Richard Dee, Bill Colvig, and Harrison himself. Each player would be required to perform on many instruments, in addition to the newly created Old Granddad. As Hughes and Dee had been involved in Harrison’s Chinese ensemble, many of the instruments would be Asian: the Korean piri, the Chinese zheng zither, and sheng mouth organ, to name a few. There would also be five singers singing a variety of roles and seven puppeteers. William Colvig built a stage with lighting and Harrison ended up helping create much of backdrops and other production materials. The theatrical logistics proved overwhelming and Harrison ended up having to go back to the Pasadena commission to ask for more funding. The team went through several puppeteers due to the risqué subject matter, finally settling on Bill Jones, an art director from the local KQED television station in San Francisco. He ended up creating over twenty hand and rod puppets, as

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73 Alves, 301.
well as a large variety of props and set pieces.\textsuperscript{75} Harrison himself was so overworked that he did not finish the score before the intended trial performance at the 1971 Cabrillo Festival. They mounted only seven scenes at San Francisco’s Old Spaghetti Factory instead. The first full performance was held at the California Institute of Technology in Pasadena and then again at the Legion of Honor Museum in San Francisco.\textsuperscript{76}

The premiere was generally well-received by audiences, but critically panned. There were significant hurdles to having puppets express complex emotions and actions, creating tender moments that were realized as something “unintentionally comical.”\textsuperscript{77} In the climactic orgy scene, titled “Eroticon,” the production featured flying phalli that were confused for butterflies by one audience member, but were so offensive to one of the donors that she pulled her support from the production.\textsuperscript{78} The music was a fascinating combination of Western and Eastern instruments, and Harrison’s new metallophones were praised. The libretto bore most of the scorn, with too much time spent on exposition and explanation. There was so much text to set that Harrison had had to create almost the entire work in a recitative style reminiscent of psalmic chant; there were no arias to pause and reflect on the action. Harrison later referred to these reflective moments as the work’s “take home pay,” and something that was missing entirely in 1971. He was incredibly disappointed with the premier and vowed to return to the work.

Nevertheless, the gay-themed KPFA public radio show “Fruit Punch” ran a recording

\begin{footnotesize}
\begin{enumerate}
\item Alves, 301-302.
\item Ibid 304.
\item Ibid 305.
\item Ibid 304.
\end{enumerate}
\end{footnotesize}
of the premiere for several Christmases after that. Harrison also performed several excerpts from the work at a festival in 1972 at the State University of New York College at Buffalo. The performance was reviewed by Tom Johnson in *Village Voice* in 1972:

> “Many of his pieces might just as easily have been written on some other continent in some other century... ‘Young Caesar’ certainly does not sound like American music or Chinese music, nor does it have much to do with 20th century or any other particular period. It is just music, very personal music, which transcends ethnic and historical categories.”

### 4.1.2. 1988 Revision

Harrison still had considerable personal and professional ties to the city of Portland, Oregon, and in 1986 he attended a performance of the Portland Gay Men’s Chorus, wherein he proposed to rehabilitate *Young Caesar*. His aim was to create a version of the work that would be more readily performed by opera companies, as the current version was not portable. A community group like the PGMC was a good opportunity to revive something with a history of failure that professional companies wouldn’t take on. He took 1987-1988 to revise the original, rescore it for Western instruments in equal temperament, and re-envision the production for live performance.

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actors.\footnote{Alves 392.} Additionally, he extended many instrumental sections and layered in parts for the men’s chorus that would produce the work.

The re-orchestration was created with the help of his friends Robert Hughes and Kerry Lewis. The instrumentation now included standard Western orchestral instruments (including Western percussion), piano, celeste, and tack piano. Many of the previously instrumental pieces now had choral parts added to them, simply because Harrison had a surplus of personnel. The parts for Old Granddad were revised into a “rather clangorous ersatz gamelan of vibraphone, celesta, and marimba.”\footnote{Ibid 393.} The gender parts were given to the cello, keyboards, and various low percussion sounds like tam-tam.\footnote{Heidi von Gunden, The Music of Lou Harrison (Metuchen, NJ: The Scarecrow Press Inc., 1995), 205.} This re-orchestration of the Old Granddad parts “grayed out much of the original’s charm”\footnote{Alves 392.} and, as Harrison himself put it, caused the entire production to lose its “jangling splendor of the East.”\footnote{Von Gunden, 202.} What is more, the Old Granddad 7-11 tunings that used to depict the Bithynian East (as separate from the diatonic tuning of the Roman West) were completely lost.\footnote{Ibid 205.} The live actors actually made it worse, creating melodrama in moments where puppets could have been better at creating an implied mythic scale, said Harrison’s collaborator Kathy Foley.\footnote{Alves, 393.} Harrison vowed to revise the work again.
4.1.3. 1998 and 2007 Revisions

A third version of *Young Caesar* was attempted after a chance meeting at Harrison’s 80th birthday celebration in New York City. John Rockwell, who had reviewed the first performance in 1971, had been newly appointed director of the Lincoln Center Festival and ran into Eva Soltes at the 92nd Street Y party. After the pair’s discussion, Lincoln Center Festival called Harrison to offer him a commission to revise *Young Caesar* for staging by a professional company. In addition to his desire to fulfill the promise of his original concept, he also wanted to complete the project as a statement of his long-held belief in homosexual equality. From an award acceptance speech at the Gay and Lesbian Music Awards, Harrison stated, “It is important to me to leave a work of art of music, serious classic music, on an overtly gay theme. Not suggested as in the Britten opera [*Death in Venice*, which premiered in 1973, two years after the original *Young Caesar*] but an overt scene, historically founded as the real thing. I think that’s important and it is that that I am working on now.”

He cut narrated descriptions, which could now be acted on stage. He added seven new arias and duets and expanded upon some of the previously written music (still principally Western instruments and no use of Old Granddad), allowing

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89 Alves, 429.
new themes to enter, giving the plot a chance to pause and reflect.\textsuperscript{91} He still refused to cut the libretto without Gordon’s permission and this created conflict with the Lincoln Center Festival artistic staff. After several director changes, the Festival sent Harrison a version of the libretto that had been changed without permission and Harrison very vocally expressed his dissatisfaction with the move. The production was called off. He immediately took the project to his friend Nicole Paiement, conductor at the UC Santa Cruz. She agreed to stage the opera, raising funds for the production and working with Robert Gordon to cut the libretto back. This fourth production included twenty-one musicians in a chamber opera setting, still using mostly Western instruments.\textsuperscript{92} This production was not staged until 2007, after Harrison’s death, but was still panned for its dramatic failings.

4.1.4. 2017 Los Angeles Philharmonic Reproduction

The centennial celebrations for Lou Harrison’s birth were to be celebrated around the country in 2017. As the planning began, the opera Young Caesar still only existed in several failed versions. On reflecting upon her long relationship with Harrison, Eva Soltes remarked, “Lou went to his death regretting that this opera never had a final production... It was really important to him that he leave this opera in good shape.”\textsuperscript{93} She had previously worked with the Lincoln Center Festival production in the 1990s and was intimately familiar with the work and its troubled

\textsuperscript{91} Alves, 429.
\textsuperscript{92} Ibid, 430-431.
\textsuperscript{93} Eva Soltes in discussion with author, August 2018.
history. Yuval Sharon and Marc Lowenstein, artistic director and music director for The Industry, a Los Angeles-based experimental opera company, had also been speaking about Young Caesar for several years. Lowenstein had a personal history with Lou Harrison, even travelling to his Aptos home and playing on the original Old Granddad instruments while Harrison was still alive. Conditions were ripe, and conversations began between Soltes and Sharon to stage another production. It was going to be only a production of The Industry, but in 2017 Sharon was named Artist-Collaborator of the Los Angeles Philharmonic Orchestra, adding significant institutional backing to the new Young Caesar project. In the end, the LA Philharmonic ended up funding a large portion of the project, even allowing the performance to be held in Walt Disney Concert Hall. This support allowed for the show to be a huge spectacle, complete with dancers and live puppetry.

About a year before the production was to take place, Lowenstein and Sharon began a weekend residency at The Lou Harrison House, the composer’s desert retreat that now functions as an archive and performance space. Eva Soltes, who runs the House, provided the creative team with documentary records of the various performances. From the videos of the 1988 Portland performance and the 2007 Opera Parallele performance, as well as scores collected from the University of California at Santa Cruz archives and Bob Hughes (who conducted the 1988 performance), they started formulating a plan to boil the opera down to its essence. Their goal was to get the libretto down to 90 minutes (in the end, the production ran

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94 Marc Lowenstein in discussion with author, August 2018.
about 100 minutes long) and eliminate the intermission. Marc Lowenstein describes
the evolution of the work and their reproduction:

“[In 1971,] Harrison was very much writing a Chinese opera, which
are five hours long and very recitative-heavy... [He wanted to] tell the story
with a faint, modal East-Asian background and a couple of flourishes... Each
one of his versions that went on from there became more and more Western.
So, we just decided to make it ‘fully on’ Western. Something that could be
done in a Western theater.”95

The desire to see it revived and produced was shared by the librettist Bob
Gordon, who was very enthusiastic and eagerly accepted the changes that
Lowenstein and Sharon made. Gordon saw Young Caesar as part of Harrison and his
unfulfilled legacy. According to Lowenstein, Gordon’s permission to edit was “the
big ‘go’ moment.”96

The musical concept behind the new production was to keep the Portland
instrumentation intact for the first act and then utilize some of the 1971
orchestration for act two, eliminating an intermission. Ultimately, they wanted to
capture the spirit of the Portland production, tighten it up the narrative, and add
some of the 1971 music back in. But this proved to be fairly difficult. Lowenstein
describes the “incredible nightmare”97 of adding the Old Granddad instruments back
into the second act and trying to fit them back into the choral parts from the 1988
production:

95 Ibid
96 Ibid
97 Ibid
"We encountered some tricky decisions and reconciliations between different editions. For instance, there originally was a slow migration in the modes of some of the movements from one performing version to the next. The new modes, however, sometimes didn’t work with the reintroduced non-Western instruments, so we reverted to the original musical modes along with original instrumentation."  

The creative team was originally conflicted about altering the revisions Harrison made to the 1988 and 2007 productions, but ultimately, they came to understand that Harrison himself took a very collaborative approach to music making, often accepting notes even from amateur players. From the liner notes to The Industry's *Young Caesar* recording, Marc Lowenstein states, "We were comforted knowing that Lou Harrison himself constantly revised the work, and we felt that we were continuing his own trajectory as honestly as possible, being true to his vision, and hopefully leaving a work that will live in the repertory."  

Bob Hughes, who also helped re-orchestrate the 1988 version, corroborated this impression of Harrison's creative process. He ended up sharing much of his performance practice from that production, including tempi and rehearsal advice.  

Using Old Granddad again would be difficult. The nearest set, Old Granddad #2, was at The University of California at Santa Cruz under the care of William Winant. Its condition had deteriorated over the years and it was not as resonant as it needed to be. There were serious discussions about the LA Philharmonic commissioning another set of instruments to be made by Dan Schmidt, a Harrison contemporary and gamelan-builder from Berkeley, but this idea was ultimately

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98 *Young Caesar*, liner notes.
99 Ibid
scraped. The set used in this performance was Old Granddad #3. However, this set of instruments does not contain the “change out” pitches called for by Harrison in the original score. The Industry ended up using only the D-diatonic set of notes for the entire production, which is present on its recording. Thus, this production uses the timbre of Old Granddad, but not the intonation change. Adapting these instruments and their just-intonation to a Western orchestra was not as much of a problem as anticipated.

A larger issue was that many of the other Eastern instruments, such as the sheng, did not balance well with a Western orchestra. The sheng specifically was also very difficult to keep in tune with an orchestra, as the instruments themselves are incredibly idiosyncratic and their capabilities vary widely from one instrument to another. It was also difficult to find players for the guzheng and the xiao. Using correct performance techniques on Old Granddad was also an issue, as many percussionists are not comfortable with some Indonesian techniques Harrison called for. The gangsa technique described in the 1971 score is a difficult dampening technique used in Balinese gamelan. Because of this difficulty, The Industry employed the Los Angeles Percussion Quartet (members Matt Cook, Justin DeHart, Nick Terry, and Cory Hills) and percussionist Wade Culbreath, who all had previous gamelan experience. Though Harrison wrote out all the notes, his technique also involved writing time-cycles akin to gamelan or Indian tala. This was a concept familiar to the percussionists, but it ultimately proved somewhat difficult for some of the Western-trained musicians of the Los Angeles Philharmonic New Music Group.
The production also used a mixture of live shadow puppetry and pre-recorded video puppetry projected onto animations that were inspired by Harrison’s own artwork and calligraphy. The players included Adam Fisher as Gaius, Hadleigh Adams as Nicomedes, Nancy Maultsby as Aunt Julia, Delaram Kamareh as Cornelia, Timur as Dionysus, and Bruce Villanch as the cocktail-drinking narrator. The single performance was held on June 13, 2017 and received wide acclaim:

“The arias are among the glories of Harrison’s score, these brief, lyric meditations on something beautiful or meaningful in life (becoming a man, grasping a daughter, taking chances). The recitatives that had been thought to be the opera’s longueurs here were shown to be, in fact, as subtly inflected as Gregorian chant.”

Forty-six years after the raucous premiere at San Francisco’s Old Spaghetti Factory and the subsequent decades of disappointment, the Los Angeles Times proclaimed, “A troubled 1971 opera by Lou Harrison is tightly reworked and marvelously reborn . . . Young Caesar lives.”

4.2. Musical Analysis

The various revisions of the score present some insight into Harrison’s ideas about orchestration. The 2007 score is the last version of Young Caesar that Harrison had a personal hand in creating. The instrumentation is all Western, a re-

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100 Mark Swed, “This ‘Young Caesar’ has finally conquered,” The Los Angeles Times, June 15, 2017.
101 Ibid
orchestration of the 1971 original. From this revision, we can see exactly how Harrison envisioned the musical roles that the Old Granddad instruments filled. Our understanding is further illuminated upon translating Harrison’s menagerie of Eastern instruments in the 1971 score to Western approximations in the 2007 version. The 2017 edition (which was performed in a single 100-minute continuous performance) was a combination of both the 1971 and 2007 scores, which added several Eastern instruments, and Old Granddad for the second act. The Western translations in the 2007 score created balance and timbral problems with the Old Granddad instruments in the 1971 score. For these reasons, the musical analysis below discusses the use of Old Granddad in Act One of the 1971 score and how these musical roles are filled in the 2007 and 2017 translations. For the Act Two analysis, I discuss how Old Granddad is used in both the 1971 and 2017 scores, highlighting the differences (and the subsequent reason for these difference) between versions. Additionally, it is necessary to discuss the elements of the 2007 orchestration that were retained.

4.2.1. General Concepts

One of the most startling things about any version of Young Caesar is that it does not include traditional scenic structure following either the Classical Italian or Wagnerian/post-Wagnerian model. Harrison takes his aesthetic vision largely from Chinese opera and Japanese theater. The role of Narrator is taken from the tayu in Japanese bunraku puppetry. This character sets the scenes and describes the action,
which is usually limited because of the crude mechanical nature of the puppets.\textsuperscript{102} It also provides critical linking material between large, static sections of Gordon’s monologues/dialogues.\textsuperscript{103} Because of the length and complexity of the narrative in the 1971 score, there would be no arias. The libretto was set in a quasi-recitative texture that is more akin to the chant from Harrison’s youth. The lines of text follow normal speech patterns with a “psalm tone” center and introduction/termination motives. Many times, these scenes happened over percussion ostinati that Harrison had learned from Henry Cowell and Japanese \textit{Noh} drama; they also included woodblock and clave punctuation between lines of dialogue, a technique taken from his childhood Chinese opera.\textsuperscript{104} Harrison also used medieval dance forms like the \textit{ductia} and the \textit{estampie} (in “Whirling Dance” and “The Eroticon,” respectively).\textsuperscript{105}

Beyond dramatic roles and form, the instrumentation and musical associations (especially in the 1971 score) are unique. From his Western percussion repertoire, he used cymbals, woodblocks, and trash pails; he also continued to use various bells, rattles, and rasps from his Mission Period. Moreover, Harrison used the violin, viola, organ, and a harp. Violin and Viola obbligato accompaniment are associated with Caesar and Nicomedes, respectively. From Chinese music, he used the \textit{zheng} zither, \textit{sheng} mouth organ, flute, and other percussion. From Korea, he used the \textit{piri}. From India, he used an \textit{ektara} and \textit{elephant bells} as Gaius moves in

\begin{itemize}
\item \textsuperscript{102} Alves, 302.
\item \textsuperscript{103} Von Gunden, 203.
\item \textsuperscript{104} Alves, 302.
\item \textsuperscript{105} Von Gunden, 205-206.
\end{itemize}
wonder through the Bithynian palace. He also uses a Ram’s horn, a slide whistle, ocarina, and a Greek syrinx (pan flute).

Old Granddad was indeed a new timbre for the Western palate at this point, even more so because of the several different tunings that Harrison employed. The traditional diatonic bar layout that Colvig designed was used to depict Roman and Western characters and ideas: Gaius’ aunt Julia, his tutor Gniphos, and the General Thermus. Eastern ideas, including the Bithynia and the court of Nicomedes, are associated with Colvig’s “7-11” tuning scheme (see Chapter 3). In some instances, musical material from the original diatonic Act One is directly translated to this new tuning to create striking contrast. Caesar’s character is caught between worlds: “the Roman who falls in love with the East, partakes of both types of scales.” As Caesar is further attracted to the East and Nicomedes, he becomes dissatisfied with Rome and uses more of the 7-11 tuning. One of the characteristics of these changeout pitches is the use of F♭s instead of F#s. Thus, we can see Gaius’ flirtation with F♭ as depicting his disillusionment in the line: “I realize now that I do not love the city itself” (see Figure 4.1).

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106 Alves, 303.
107 Ibid
4.2.2. Beginning

The opera opens with a Prelude to the Act One Overture, essentially a percussive announcement and an organ/horn call (this organ cluster also foreshadows a technique used in “Kunsonoro kaj Gloro” from La Koro Sutro). The baritone and bass keyed instruments from Old Granddad are played by one person (Player Five), in a role that might best be described as gongs (low Javanese-style gongs, not Chinese-style Chau gongs or tam-tams). In the 2007 and 2017 scores, this pitched material is covered by harp, tack piano, and tutti strings. The harp and attack of the tack piano add the same timbre and resonance as the original bass and baritone keys, but the tack piano adds an additional brilliance and the strings sustain the entire note length. The sustained length adds much more body to the low register, an addition that is likely necessary in larger spaces and with larger performing forces.
4.2.3. Overture to Act One

After a short introduction by the narrator, the full set of Old Granddad instruments mark the beginning of the Act One Overture. This is the first use of the Soprano and Tenor Bells (marked “D Bells (S.)” and “D Bells (T.)”) in the 1971 score and has an indication for “Gangsa teknic.” This note refers to the Indonesian technique of dampening the previous note with a trailing hand as the next note is struck. While this is relatively easy to accomplish on the lower manual of pipes, it would be significantly more difficult to accomplish on both the upper and lower manuals (as in mms 4-6) at the tempo indicated. The archival recording of the premiere suggests that the quarter notes were played with this technique, but not the eighth notes. There is no such indication for the bass and baritone keys.

The orchestration between the Soprano and Tenor bells doubles at the octave throughout this scene in the 1971 version of the score. Though the tenor and soprano bells appear to be notated the same, the first stave of the soprano bells in this Overture is marked with a treble clef and an “8,” designating an upward octave transposition. The technique of octave double is also pervasive, though not exhaustive, throughout the opera, where little contrapuntal writing between the bells exists (this changed with Harrison’s subsequent compositions). For much of the Roman-centered music, Harrison composes on A—a mode built on the fifth degree of the D-major pentatonic scale. He avoids using C/C# or G/G#, which are color-tones that might otherwise corrupt the open-sounding and pure brilliance of the Old Granddad instruments. The bass and baritone keys (this time in Player Four)
help outline and reinforce the notes of the bells, rather than playing any sort of contrapuntal or melodic material. The Old Granddad trio is set against a melody on piri and percussive interjections from pails and the gentorak.

In measure 26, there is an indication to “mute bells with hand,” producing a staccato sound much like a vibraphone with the damper bar up. This is an indication to mute the pipe that is being struck, as opposed to the trailing-hand “gangsa teknic” from before. In this instance, the low keys are not played at all. The 1971 recording has this movement played at 160 bpm, and so dampening with one hand while playing a sustained eighth-note passage with the other would have been incredibly difficult, though only the notes A, B, D, and E are dampened (the dampened area would still likely have been approximately twelve inches wide). In the 2007 and 2017 versions, the muffled indication remains on the keyboard percussion instruments. It is curious here that Harrison chose to use a similar technique as with the pipes, instead of orchestrating for a drier instrument or using dead strokes as an alternate technique.

In the 2007 and 2017 editions, the bells are orchestrated for the xylophone, marimba, and vibraphone. Because of the xylophone’s octave transposition, the previously doubled bell part is now spread across three octaves. The vibraphone is the lowest voice, likely because it is incredibly close in timbre to the Tenor bells. The bass and baritone keys are doubled in the harp, whereas in the 2007 version, the transcription was for harp and tack piano. This low voice doubling is another of the many instances in which balance to the larger ensemble required a greater low-
voice contribution. This time a sustaining voice, like strings, is not required, relying instead on the percussive attack of harp with the keys. The piri part has been orchestrated for the flute, English horn, trumpet, and viola, so balancing against a single set of low keys would be a problem. It is clear from all editions of the score that Harrison thought of this texture in four parts: the melody played first on piri and later in the Western quartet; the figuration and counter-melody in the bells and later the keyboard percussion; the accompanying bass line in the keys and later the cello and harp; and the cadential percussion parts in Player Five. In the later editions of the score, the melody is increasingly favored through orchestration.

4.2.4. Scene One

A pattern of twenty-four motoric eighth notes emerges from the Overture to link to Scene 1, and they continue in the quasi-recitative that follows. In the 1971 score, this underscoring is played by muffled Soprano bells. This must have been a difficult task at the premiere, because the player would have to have sustained eighth notes at 160 bpm for almost seven minutes with one hand, while muffling the pipes with the other. There must have also been some creative muffling to cover the F#. In the 2007 and 2017 scores, this part is played by marimba, which is able to effectively recreate the volume, if not the timbre, of the original bells. Also in the newer score, there is an aria for Gaius before his manhood ceremony, wherein the marimba stops playing its ostinato.
The Soprano bell ostinato continues in this new "To the Atrium" music, though unmuffled and at a slower tempo. It is joined by Tenor bells, piri, bass and baritone keys, pails, and the syrinx in the 1971 score. The marimba part is joined by flute, English horn, xylophone, vibraphone, gentorak, toms, harp, piano, violin, and viola in later editions. This music is centered on the interplay between piri and syrinx for the 1971 score, with the tenor bell interjections eventually assuming the primary underscoring role with the soprano bells at measure 26. There is Tenor bells and low keys announcement at measure 36 that signals the exit music, after which the piri/syrinx texture resumes without the bells. Throughout this scene, the bells are either in an underscoring role, or used in a church-bell role (mm. 19-20 and 54-56). At measure 61, however, the tenor bells engage in a duet with the syrinx to the end of the scene.

Many of the same roles are assumed in the 2007 and 2017 transcriptions, with the flute also taking the syrinx part, while the English horn, violin, and viola play the piri part. The exit music is instead signaled by vibraphone and the piano's right hand, likely an attempt to overcome the problem of balance in relationship to the three other players. The exit music is also extended via choral parts from the 1988/2007 versions and expanded in scope with harp and tutti strings.

4.2.5. Scenes Two Through Four

Scenes 2 through 4 contain no use of the Old Granddad instruments, which would otherwise be used to signify splendor and grandiosity. Much of the plot in
these scenes is difficult and negative for the protagonist, Gaius: the death of his father, his admittance to the priesthood, his duty to his Aunt Julia, and his spurning of Cossutia. These moments are all reflected in much more intimate wind sounds or even the *koto*, a Japanese plucked-string instrument. The contrast in volume, texture, and timbre between the previous percussive music would have had a persuasive emotional effect on the audiences of 1971, who were moved from the grandiosity of the epic to the quiet, personal moments of the characters. The exception to this is Scene Four, “Cossutia's Despair,” which uses octatonic scales on xylophone and other more aggressive sounds to characterize the more visceral negativity. This is doubled on marimba in the 2017 score. It is from the 1971 score, however, that we can discern Harrison’s true feelings toward equal temperament—he only uses it when conveying tension and difficulty, and only with tonal systems that produce no diatonicism or tonal hierarchy. Harrison considered equal temperament harsh to his ears and he only uses it in moments of extreme tension.

4.2.6. Scene Five

The scene between Gaius and Cornelia, with baby Julia, is a tender one with a new use of the bells (in the case of the 1971 score, the tenor bells are called “G bells”). They are at first used as chime-like interjections in an Indian flute part under narration and dialogue. Later in the scene, they are used in duet with the harp underneath one of the only original arias from the 1971 score, Gaius’ Lullaby to his
daughter. Here the bells play a repeating 3-beat figure and the harp plays a repeating 4-beat figure (see Figure 2), creating divergences and confluences of rhythmic and tonal material that only repeat every twelve beats, regardless of time signature or the speech patterns above. Gaius' voice is doubled by the violin.

Figure 4.2 – Tenor bells and harp duet, Scene 5: Lullaby

For the later versions of the score, the crystalline chime sound is created through a combination of celeste and glockenspiel. The transposition of both instruments creates a sound that is not only higher, but also spreads across two octaves instead of one. There is also the addition of Cornelia's Aria before Gaius's, which contains a celeste part with a descending contour (in contrast to the bells' ascending contour — see Figure 3).

Figure 4.3 – Celeste from Scene 5: Cornelia's Aria
The texture of Cornelia’s Aria is completed with a simple harp part and an innocent piccolo melody. In this later version, Cornelia and Caesar also sing a duet after the Lullaby over and expanded version of Gaius’s celeste and harp figuration. Both the 1971 and 2017 editions provide a meandering and mellow, semi-metallic texture underneath a very intimate moment between mother, father, and baby daughter.

4.2.7. Scene Six

This scene depicts Gaius’s fall from political favor, fleeing from the dictator Sulla and bargaining with Sulla’s sycophant Phagita, and Gaius’s exile to the military in Mitylene. This action and upheaval is depicted through semitone clusters in the organ, a driving percussion ostinato, and curious interjections by the ocarina and slide whistle. The bass and baritone keys are used as one voice, in a dissonant gong-like role at first. As the scene progresses, the keys also create a sound evocative of church bells and an impending disaster. They are not used in any harmonically significant way until the line “The captain paces back and forth,” wherein they add octave Es to their half-step figure. This solidifies an E centricity in the voices, slide whistle, and ocarina.

This dissonance in the 1971 score is recreated in the 2007 and 2017 scores with tack piano and harp double-stops on the notes C and B, with the original sixteenth-note figure played on cello and bass (using a combination of arco and pizzicato techniques). These mimic the sound of the original low keys but fail to
produce the same imagery. As Phagita accepts Caesar’s bribe, the low orchestration is reduced to piano alone, which gives a feeling of conclusion as the bottom drops out and the tension starts to subside.

4.2.8. Scene Seven

The beginning of the scene between Caesar and General Thermus involves no Old Granddad instruments. Only during the duet between Caesar and Dionysus in the 1971 score do we see the inclusion of low keys. In this instance, they play periodic pedal octave As only. This A-centricity does not bear tonal relationship to the opera as whole, but it is the dominant to the key of the instrument (D-major). The resultant just-intonation intervallic relationships produce a key for the work as a whole that is neither dissonant like Harrison’s octatonic writing, nor settled, as in a traditional dominant-tonic relationship. This intervallic relationship produces a different feeling when it is contained in an equal temperament setting, like the 2007 and 2017 editions. Here, though, the left hand of the piano and harp are accompanied by tam-tam hits on each of the transcribed low-key notes. Because of the lowness of the sound and the complexity in combination with tam-tam (an unpitched instrument), it must be assumed that this is a punctuating and percussive idea, not a totally melodic or harmonic one. At the end of the first act, it is clear that Harrison views the baritone and bass keys as textural percussion instruments and as contributors to the harmonic scheme of the work.
4.2.9. Overture to Act Two

The evening-long (approximately 3 hours) production of the 1971 *Young Caesar* was divided by a single intermission, after which the Old Granddad instruments radically changed in tuning. It was at this point that Harrison called for the “7-11 bells,” or the instruments tuned to the 7th and 11th overtones above D. These notes sound closest to C♯ and G# but are notated differently in different parts of the score — sometimes Harrison uses “7-11 bells” to indicate the change, sometimes he writes out the C and G# notes with accidentals, and sometimes he writes a single G# in the key signature of the staves. This tuning scheme produces a quasi-mixolydian quality and sounds much more “out of tune” to Western ears, producing the “jangling East” effect that Harrison so desired.

The music for this Overture is almost an exact copy of the music from the Overture to Act One, with all the F# rewritten as Gs and all the Bs rewritten as C♯s. This keeps the contour, texture, and most melodic material essentially the same while exploiting the new tuning scheme. The bells are again doubled at the octave. The low keys are labelled “Gendérs 7-11,” indicating their tuning change as well; they contain the same style transcription as the bells. The only difference is the lack of a Da Capo repeat and some new ending material that starts in measure 35. This ending material comes immediately after the muffled passage, with an indication of
“L.S.” in the score, meaning “Let Sustain.” This indication continues even through the linking material to Scene Eight. The open sound of the bells provides for a much more clangorous timbre as it opens into the exotic court of Nicomedes.

In the 2017 reproduction, this is the point at which the orchestra begins to use the Old Granddad instruments to display a timbral change to the “East.” The nomenclature for the Old Granddad instruments are “Bells I” for the soprano bells, “Bells II” for the tenor bells, and “Gendér” for the low keys. Because the LA Philharmonic production only had access to Old Granddad #3 and no access to change out pitches, the entirety of Act Two was done with the diatonic set of bells and low keys, regardless of what is notated in the score (this is reflected in the recording, which Marc Lowenstein calls the “document of the production”). Minus the discrepancies in the accidentals, the bells are a direct transcription from the 1971 score and replace the keyboard percussion from the 2007 score. The low keys are also a direct transcription, though they are reinforced with the harp. The 2007 score featured the use of tack piano with harp; this is not included in the 2017 score. It should also be noted that one of Marc Lowenstein and Yuval Sharon’s goals was to condense the production into one 100-minute show without an intermission, so this music came directly on the heels of the whirling wind instruments and strings of the end of Scene Seven.

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108 Marc Lowenstein in discussion with author, August 2018.
4.2.10. Scene Eight

As in Act One, there is tenor bells figuration linking to the next scene, underscoring the first part of the narration and dialogue. There is a large amount of narration setting up this scene in the 1971 score, which was deleted for the 2017 production. In both editions of the score, though, the bells are unmuffled. The next part of the scene in the throne room begins with the Procession, which utilizes the same music for Old Granddad as the Overture to Act Two; it opens with and is interrupted several times with a blown Ram's horn. For the 2017 production, the Ram’s horn is played instead on Trombone and there are choral parts from the 1987 Portland production layered in. The processional music ends on a hard stop in the orchestra just before Nicomedes’s speech receiving Gaius. During Nicomedes’s soliloquy, he gives Zilo, the doctor attending Gaius’ envoy, a mistaken kiss, which is echoed with a single set of octave As from the low keys. In the 2017 production, this kiss is again played on the bass and baritone keys, but when Nicomedes understands that Caesar is the true representative and presents him with a kiss, a deep Javanese gong is sounded in a bit of subtle messaging from Lowenstein/Sharon. In both instances, one can see the timbre of the instruments causing an emotional shift in the characters.

At this point in both the premiere and the LA Philharmonic production, Nicomedes exits to a repeat of the Processional entrance music. In the 1971 performance, however, there is additional material between Gaius and Zilo with
tenor bell and gendér underscoring. In the 2017 version of the music, this material is cut entirely. The music for the gendér and harp is also reinforced with low strings, giving a climactic finish to the scene.

4.2.11. Scene Nine

The Old Granddad instruments are not used in Scene Nine, an introspection by Gaius before his banquet with Nicomedes. The quiet instrumentation, played on ektara, cheng, and elephant bells in the 1971 premiere, is mimicked closely in the re-orchestration for harp and Guzheng in the 2017 production; the change was necessary based on available players in the Los Angeles area. This scene serves the same tone-shift for the second act that Scenes Two through Four played in the first act.

4.2.12. Scene Ten

The beginning of this scene shows us explicitly that Harrison wanted a distinction in tuning between the Roman West and the exotic Bithynian East. The music of Nicomedes' court was with the change out pitches, but here Harrison asks the players to use the original D-major bells in a scene that leads up to Nicomedes' successful seduction of Gaius. In the beginning of the scene, the Old Granddad trio underscores the narration and dialogue of the first part of the banquet. This is a

\[109\] Ibid
bubbling texture that firmly instills the idea of Roman West as the backdrop for Nicomedes’ arguments with his nationalists. In Figure 4, Nicomedes sings with a pitch collection that includes both the diatonic F# and C#, as well as the Eastern G#; he is at once a Bythinian and, regrettably, a subjugated outpost of Roman rule.

![Figure 4.4 – Young Caesar Scene 10](image)

In the recording of the 1971 performance, the tenor bells enter late and layer into the soprano bells and low keys. Whether this was a mistake on the part of the players or a musical choice by the composer, it is not notated in the score. For the 2007 score, the soprano bells part is played on marimba, the tenor bells are played on vibraphone, and the gender is played on harp. Harrison also cut down the ostinato to two measures from the original three. But in the 2017 version, the soprano bell part is doubled on the Bells I and Bells II part, while the Gendér plays the former tenor bells part. Eventually layering in, the harp and guzheng play the low keys part from the 1971 score. The reason for this is primarily acoustic, to balance the guzheng player. There remain some acoustic problems on the recording regarding the clarity of the low keys, but the ensemble balance is better than on the 1971 recording.
After the argument between Nicomedes and the Bithynian nationalists, Harrison adds a guiro and pails playing a syncopated rhythmic figure in time with the Old Granddad instruments. This is retained in the subsequent versions of the score. After Gaius has been convinced to take part in Nicomedes’ orgy, the scene proceeds to the “Whirling Dance,” where the bells drop out and the low keys play gong-like interjections in between a mesmeric violin-harp duet. These low sounds are transcribed for the tack piano’s left hand, a gong, cello I and cello II, and bass in the 2007 score; in the 2017 score, the new instrumentation is gong, bass drum, cello I, bass, and the original low keys. It is a complex sound that is not simply for harmonic support, and the expanded orchestration is another attempt at balancing the quiet low keys with louder instruments like violin, harp, and guitar.

After the dances “Whirling Dance” and “Acrobat” comes the infamous “Eroticon.” Though the Old Granddad instruments are not used in this section, the key is now F-major. This is a choice Harrison clearly made as a musical depiction of Gaius’s full embrace and submersion in Bithynia. The note F was special to the Old Granddad instruments (as one of the “change out” pitches) and had previously been used to depict Bithynia. Not only is the key indicative, but the instrumental writing happens on top of an organ cluster—the pitches C, D, F, G, B♭, and C. Because of the doubling, C is the pitch center of this collection; it is closely related to a C11 chord. The only pitches missing from a full white note cluster (a la Harrison’s teacher Henry Cowell) are the pitches A and E, which are important structural pitches to the Old Granddad instruments and the opera’s beginning and ending keys.
4.2.13. Scene Eleven

There is no use of Old Granddad in this scene.

4.2.14. Scene Twelve

Scene Twelve marks a return to the 7-11 bells (this time with a single G# in the key signature) and the court of Nicomedes. The king and his new consort are preparing for a tour of Bithynia while his political support is beginning to crumble; he is accused of being weak for his relationship to Gaius, who is himself mocked for his homosexual tryst. But the scene starts with a sound that depicts the joining of the couple — the bells play in a texture of repeating double-stops, almost entirely parallel fifths (and in a rhythm that is primarily eighth notes at 132 beats per minute). The low keys play only their gong interjections, but the volume created by the bells, both through rhythm and pitch content, is substantial. Given the octave transposition in the clef for the soprano bells, this scaling-pattern is also doubled at the octave in the bells. In the 1971 score, this music is played before the dialogue between bickering Roman financiers, as a reminder that even after the tender moments between the couple the plot still plays out in an exotic royal court and upon a world stage. After Nicomedes argues with the financiers, the metallophone orchestra is again heard in the same texture, but with different music. This music is
similar, both in texture and Harrison’s use of his “melodicle” compositional style, but it is not a repeat of the previous material.

In the 2017 version of the score, the music is marked with G#s and C♮s in the bells, a direct transcription from the 1971 score. In the 1971 score, the low keys play a role similar to the punctuating gong used in the rest of the score. As a holdover from the 2007 score, this is reinforced by a gong and low chord in the harp. Also from the 2007 score, celeste and a higher harp dyad are played at the ending of each bell phrase. The main difference between the 2007 and 2017 scores in this moment is the subtraction of the tack piano in the gong role.

4.2.15. **Scene Thirteen**

This scene chronicles the couple’s tour of Bithynia, with each stop deepening their relationship. They first stop at Hannibal’s grave and then the Temple of Jupiter, neither of which uses the sound of Harrison’s metallophone orchestra. Then comes the March to Mithra, wherein Gaius and Nicomedes witness what the libretto describes as the “sacred ceremonies of Mithra, God of the Sun.” This ritual is highlighted by the pipes and keys (with the change out pitches) which have characterized the royal court thus far, but are further colored by the use of Chinese jing cymbals and a high muffled drum. These timbres create an antique and ritualistic that which does not overshadow the Old Granddad writing or the melody played by the sheng. The March music uses only the tenor bells and bass/baritone
keys because the violin writing in for player one. The timbre of the violin lower in its range is quite close to the combination of tenor bells and sheng, providing a homogenous sound field. As in Scene Twelve, the writing for the bells is in parallel fifths. In this usage, the parallel dyads add to the antique sound of the tonal palette.

Additionally, this music is an example of Harrison’s use of gamelan texture and timbre, though he was still uninformed about that culture’s authentic practices. Harrison was still five years away from learning Javanese compositional techniques, but concepts of colotomy and rhythmic stratification are evident here. The melody is played by the sheng in primarily half notes, which is then subdivided by quarter notes in the tenor bells. The low keys mark the beginning of each phrase, instead of punctuating between phrases as before, as a gong might in a Javanese gamelan. Though Harrison did not yet understand the Javanese concept that all time flows to the gong at the end of the phrase, his writing here is aurally approximate to a texture reminiscent of that culture. The gong sounds from the pitch E, which establishes one of the only tonic-dominant relationships in the large-scale form of the opera. This scene precedes the final scene, and a pedal on the dominant is established through these gong sounds. This pitch center of E, and the use of G# from the change out keys, also establishes a sound quality close to E-major, which helps depict the rituals of Mithra as a joyous event for the couple. There is no more use of Old Granddad until Scene Fourteen.

In the 2017 score, there are no accidentals to indicate the use of either the D-diatonic keys or the change out pitches. The recording uses the D-diatonic set for the
same reasons as before. In both the 1971 score and the 2017 score, Harrison avoids writing for dyads that use the C/C# or the F/F#, instead opting for G♮s when necessarily paired with a B below it. This change follows the same process as in the Overture to Act Two. Tuning thirds across differing intonation systems is also notoriously difficult, especially for wind instruments. Though this change would have helped the sheng to sound more in tune for the 1971 premiere, it becomes even more important when the sheng is added to the piccolo and oboe in the 2017 reproduction. In this case, there are multiple wind instruments that need to tune with each other now as well.

4.2.16. Scene Fourteen

After a tender moment at the end of Scene Thirteen, in which Gaius and Nicomedes come to understand each other as Gaius asks to return to Rome, the curtain for scene fourteen opens to Gaius waiting at the coast of the Mediterranean Sea. The 1971 score has returned to the use of D-diatonic bells and gendérs, indicated through a note at each stave and by key signature. The first use of extended techniques is also found in the scene — the low keys are asked to play with “hard sticks on [the] edge [of each key].” Though marked fortissimo, this technique produces a bright, nasally sound that divides the rhythmic calls on cowbell and pails from the pitched material on the bells. An eighth-note figure in the soprano and tenor bells is again doubled at the octave. The figuration, which was previously used as underscoring in Scene Eight (although transposed up an octave
and a half here), now serves in an evocative role reminiscent of marine bells found along shipping routes. But this material soon decrescendos to be used as underscoring for the narration.

In the 1988, 2007, and 2017 scores, this eighth-note idea has been transformed to be used as the basis for a choral interlude, titled “Sailors’ Chorus.” Though the 1988 and 2007 versions used glockenspiel and vibraphone to create this texture, the Los Angeles production returned to the original pipes. The brilliance and the exotic character of the metallophones is also augmented with the addition of jing cymbals in measure 63. The frenetic part for the original bass and baritone keys was transcribed for flute, oboe, trumpet, tack piano, and marimba in the 1988/2007 scores; in 2017, only the flute, oboe, and trumpet are retained when the gender part is added back in. These winds are brassy and contribute to the character of the original extended technique. There is no indication to use this extended technique in the 2017 score, though, which might produce future performances to misinterpret the performance practice for this section.

As Gaius leaves Bithynia by boat at the end of the scene, Harrison has written a Barcarolle, a type of lilting song traditionally associated with Venetian gondoliers. A traditional Barcarolle is in a 6/8 meter, with accents on beats one and four accompanied by clearly defined “upbeats” on beats three and six. Harrison’s Barcarolle for Gaius, however, utilizes eighth notes in groups of four spread out over a 3/2 meter. The contour of each group of four notes is consistent with the “up-down” motion depicting a ship upon the waves from a traditional Barcarolle. The
Barcarolle also uses the change out 7-11 bells again (the keys do not utilize any pitches that require change out bars here). The writing for Old Granddad in the 1971 score again accompanies piri and flute, both playing a part reminiscent of naval horn calls.

This wistful quality from the 1971 wind instruments is amplified and completely changed in the chamber orchestration of the finale. The 2007 score orchestrates the bells for glockenspiel, marimba, and vibraphone, showing how bright and metallic Harrison wanted this voice to be. He originally wrote the keys part into tack piano and cello, then full low strings plus trombone and harp. The winds were transcribed for flute, oboe, and trumpet. In the 2017 version, the parts for bells are retained, but the bass and baritone keys part is reinforced first with trombone and then with low strings. The previous piri/flute transcription is retained from 2007, with the addition of a xiao. The key of A-minor is cemented by the use of C♮s in the bells, which are only found in the change out pitch set. The metaphor here is that Gaius is taking his love of the East, via its associated scale and played on the instruments of Old Granddad, back to Rome with him (at least in spirit). But in the original production, the sheer volume of the bells overwhelmed the winds and some of the power of the metaphor was lost. The newer production solves this balance issue. This newer orchestration is also much less pensive than the 1971 version. The constant reiteration of the E to A dominant relationship in the low voices colors a powerful melancholy in the key of A-minor to end the opera.
4.2.17. Conclusion

This opera gives an insight into Harrison’s thinking just as he is beginning to delve into the world of instrument making. He was still using many Eastern instruments from his Chinese ensemble and his Korean studies, in some cases more frequently than the Old Granddad instruments (the role of the piri, for example). By the end of this work, however, he is much more comfortable using the metallophones, even using alternate implements in the last scene. The various revisions of the opera provide a window into his mind, where Old Granddad occupied a musical role somewhere between keyboard percussion, harp, and low strings. He would become much more comfortable with and write music in which increasing responsibility is given to Old Granddad in the upcoming works, *La Koro Sutro* and *Suite for Violin and American Gamelan*. 
Chapter 5

La Koro Sutro

5.1. Background

After Young Caesar, the next work Harrison composed for his new instruments was an oratorio that had been brewing in his mind for almost a decade.\(^{110}\) The use of Old Granddad would be but one part of the pan-global epic that became La Koro Sutro. After his trip to Tokyo in 1961 as part of the East-West Music Encounter, Harrison had been mulling over a way to use a Mahayana Buddhist scripture called the Heart Sutra. He considered it “one of the great documents of humanity . . . It concentrates all of the paradoxical beauty of this whole area of philosophy into a very brief, sharp space . . . [it contains] psychological insight on the question of Nirvana.”\(^{111}\) This sutra, which is a written form of Buddhist scripture, distills the larger work “Perfection of Wisdom” from thousands of lines to just fourteen verses.\(^{112}\) This is where the title Heart Sutra comes from, as it is the “heart” of the larger work (a longer title for Heart Sutra is translated as “The


\(^{111}\) Ibid 81-82

Heart of the Perfection of Wisdom”). It is a meditation on the “impermanence of things . . . the truth that there is no ‘self’.”¹¹³ This view is a method to understand the true nature of the universe.

An essential part of this teaching is that there is no “other” — all beings are part of a single entity expressed in reality; another being’s suffering is my suffering. Harrison’s attraction to humanism met with this idea of a monistic universe in which every person, regardless of station, is merely a manifestation of the unity of reality. Because all beings are one, each individual has equal value “which places the Heart Sutra as one of the greatest religious testaments to humanism.”¹¹⁴ This work would become a monument to both his belief in humanism and his pacifism. It is the fourth work of Harrison’s to be categorized as “Peace Pieces.” While La Koro Sutro was written in 1972, the first three pieces were written or revised in 1968. The first “Peace Piece” is an invocation of the Metta Sutta (a Pali Buddhist discourse) in memoriam to Dr. Martin Luther King Jr. after his assassination. It is written for chorus, trombone, percussion, harps, reed organ, and string quintet. The second piece is a setting of Passages 22 by Robert Duncan for tenor, harps, strings, and 3 percussionists. The third piece is a revision of his work “Little Song on the Atom Bomb” from 1953, which uses Harrison’s own text about the growing nuclear dangers of the post-WWII world. It is written for voice, violin, harp, and drone strings. Harrison also considered his work “France 1917-Spain 1937” to be an early protest piece in the same vein as his “Peace Pieces.” It is a work for string quartet

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¹¹⁴ Ibid 80.
and percussion, written in protest of the Spanish Civil war and the rise of fascism in
Europe.\footnote{Leyland 81-82.}

Harrison was fluent in Esperanto, a language created in the late nineteenth
century as a method to combat the rising nationalism of the time. It had gained
further currency in the twentieth century and was endorsed by UNESCO. In his
\textit{Music Primer} from 1971, Harrison suggested that composers make versions of their
vocal compositions directly in Esperanto so as to “avoid the monstrosities that
might be done... in translations.”\footnote{Lou Harrison, \textit{Music Primer} (Lebanon, NH: Frog Peak Music, 1971), 22.} He considered this language to be more musical
that many languages, “which, like Topsy, just growed.”\footnote{Ibid} This is advice he himself
followed in 1969, when he commissioned an Esperanto translation of the original
Buddhist text from Bruce Kennedy.\footnote{Alves 307.} He began composing from this text in earnest
in 1971, in anticipation of the 1972 World Esperanto Conference to be held in
Portland, Oregon.

The chorus for the work was assembled by Vahé Aslanian, choir conductor at
Hartnell College. But because of the “deceptively challenging vocal parts [requiring]
a sensitivity to tuning and texture found in few other choral works,” the chorus for
the premiere had to be replaced by a professional one from Berkeley, under the
direction of Donald Cobb. Aslanian was later able to perform the work at Hartnell,
and it remains dedicated to him.\footnote{Ibid 311} The attendees at the Portland conference took a
trip to San Francisco State University for the premiere on August 11, 1972.\footnote{Leyland, 82.} It was
also performed in the summer of 1973 at the Cabrillo Festival with Carlos Chavez conducting.\textsuperscript{121}

In his Doctoral treatise, \textit{"La Koro Sutro by Lou Harrison: Historical Perspective, Analysis and Performance Considerations"}, Patrick Gardner summarizes the appeal that the work holds:

"Occidental chromaticism, oriental pentatonicism, Indian rhythmic and melodic organization, medieval, baroque and serial formal processes all combine to create a musical experience which is both immediately accessible to the audience and rich in intellectual stimuli for the conductor, historian or analyst."\textsuperscript{122}

Beyond its academic appeal, Harrison had created a truly powerful statement of peace that framed a period in which the civil rights struggle, domestic unrest, and the Vietnam war seemed to be tearing the world apart. The work also dramatically affected both older and younger generations. During their trip to Japan in 1993, Harrison, Colvig, and Eva Soltes met people from the generation that experienced World War II that were dramatically affected by the performances. It was quite abnormal for this generation to show emotion in public, and yet they approached the composer and his coterie weeping, asking “How did you know our childhood memories?”\textsuperscript{123} Indeed, the effect of the performance of \textit{La Koro Sutro} on this trip was one of the main reasons that Harrison and Colvig commissioned the first copy of Old Granddad from Richard Cooke. Along with the \textit{Suite for Violin and American Gamelan}, \textit{La Koro Sutro} remains one of the most frequently performed works that use the Old Granddad instruments.

\textsuperscript{121} Ibid 81
\textsuperscript{122} Gardner, 1.
\textsuperscript{123} Eva Soltes in discussion with the author, August 2018.
5.2. Musical Analysis

5.2.1. General Concepts

Harrison’s experience with Young Caesar showed him the value of composing for metal tubes and slabs. He and Colvig set about immediately constructing a set of instruments that could be played as a self-contained ensemble. They expanded the Soprano and Tenor Bells to four instruments, one pair for each register, and established the Bass and Baritone Keys as two separate instruments. They also constructed a set of “big bells” made of large gas canisters, sawed off and struck with a large piece of wood. Because the instruments of Old Granddad are the primary melodic instruments in La Koro Sutro, they all have a greatly expanded role and many more notes than Young Caesar. One can see Harrison starting to value them not as “ethnic” instruments, but as almost Western-music instruments: he does not include the “gangsa teknic” from Young Caesar and gives each of the instruments a much more nuanced set of musical lines and responsibilities.

The instrumentation for La Koro Sutro is for a mixed SATB chorus, harp, reed organ, and six percussionists. Gardner suggests “a chorus of 40 mature, trained voices, such as those found in the top group at a major university” at a minimum.124 This number is needed to compete with the Old Granddad instruments, especially during the movements “Kunsonoro kaj Gloro” and “Mantro kaj Kunsonoro,” where the volume of instrumental sound produced is “a major sonorous statement.”125 The

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124 Gardner, 197-198.
125 Ibid
percussionists need to play Old Granddad in addition to several other percussion instruments. A breakdown of their part assignments, with a few annotations for clarity, is found in Table 5.1.

<table>
<thead>
<tr>
<th>Percussion</th>
<th>Old Granddad Instruments</th>
<th>Other Instruments</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Soprano Bells [marked “High Bells (Saron)”] • Aluminum</td>
<td>Three large ranch triangles Two tambourines</td>
</tr>
<tr>
<td>2</td>
<td>Soprano Bells [marked “High Bells (Saron)”] • Steel</td>
<td>Jangles [Gentorak is used here often] Two Maracas Sleigh Bells Gentorak Two Muted Gongs</td>
</tr>
<tr>
<td>3</td>
<td>Tenor Bells [marked “High Bells (Saron)”] • Steel</td>
<td>Big Bells [gas canisters] Muted Bell on G [hand-mute the middle G of the steel Tenor Bells]</td>
</tr>
<tr>
<td>4</td>
<td>Tenor Bells [marked “High Bells (Saron)”] • Aluminum</td>
<td>Bass Drum [playing on both the head and the rim]</td>
</tr>
<tr>
<td>5</td>
<td>Baritone Keys [marked “Gender (medium)”]</td>
<td>Two Pails [metal trash cans] Lali [this is a Fijian wooden slit drum, though a temple block is often used]</td>
</tr>
<tr>
<td>6</td>
<td>Bass Keys [marked “Gender (low)”]</td>
<td>Two Deep Gongs [two differently-sized tam-tams are often used] Tam-Tam</td>
</tr>
</tbody>
</table>

Table 5.1 – Table of percussion assignments for *La Koro Sutro*
Some of the substitutions found above are common, such as temple block to play the lali part or the tam-tams substituting for the deep gongs. It should be noted that for modern percussionists, gongs generally imply a focused pitch via a raised central area called a “boss.” This is common for gongs of Indonesian and Thai origin. Unpitched gongs from China are usually referred to by other names, such as the tam-tam. Harrison’s intent in using both the indications “two deep gongs” and “tam-tam” is unclear with regard to whether they are pitched or not, though most recent performances (including those given by his contemporaries) tend to use tam-tams in both instances. The use of “jangles”, “sweet gentorak”, and “sleigh bells” is another area of possible confusion. There is meant to be a significant pitch difference between the sleigh bells and the other two instruments. The gentorak, which is an antiquated Balinese instrument,126 is often used for the “jangles” part in “Kunsonoro kaj Gloro.” The “jangles” and the “sweet gentorak” are likely interchangeable. Harrison constructed his own gentorak from flea market parts when he was unable to find a suitable Indonesian instrument in California and used both terms to describe his creation.

Bruce Kennedy’s translation is fourteen lines, divided up into seven sections called “paragrafoj” (“paragrafoj” is the plural of “paragrafo” in Esperanto). There is also an opening invocation, titled “Kunsonoro kaj Gloro,” and a closing invocation, titled “Mantro kaj Kunsonoro,” for a total of nine movements.127 Much of the vocal writing is unison and reminiscent of chant, Western or otherwise. Harrison found

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126 Gardner 114-115
127 Alves 308
chant to be international and "perdurable... [it] still stimulates [me] to hear & to make." Like the use of the pentatonic pitch collections and rhythmic cycles, he believed that chant was part of a universal musical language. In sections where Harrison didn’t use chant allusions, he used other vocal forms like the Conductus, avoiding the large-scale polyphony or dissonant clusters common in other choral works of the mid- to late-twentieth century.

These allusions to older styles of Western music and to other cultures music was just as important to him as form and tonal organization. He maintained an intellectual rigor in much of what he did thanks to his studies with Arnold Schoenberg. He thought about inversions and retrogrades in almost everything he did, including his artwork and calligraphy (what Harrison called his “putterings,” see Figure 5.1).

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This rigor found its way into his surface level writing, where there are numerous instances of palindromic melodic writing, to his global view of form among the movements. The large-scale harmonic plan which unifies the work is drawn from the D-major collection of the Old Granddad instruments. All but three of the movements are found in subsets of this collection. The work can be broken down into the introductory movement; paragrafoj one through three, as a major sub-group leading to the subdominant; paragrafoj four through six, as a second major sub-group leading to the dominant; the seventh paragrafo, as “deceptive” harmonic area before the finale; and the ending movement. The major motions to the subdominant, the dominant, and then a deceptive avoidance are the key components of the larger formal structure. A summary is found in Figure 5.2.
Much of Harrison’s ostinato writing in both the unpitched percussion and Old Granddad is based either in strict cycles that frequently cross bar lines, or conform to his method of “ictus control,” an idea from his *Music Primer* in which the composer controls the number and type of attacks (regardless of duration) for any given cycle of beats. 129 These icti could be increased or decreased as a way of “controlling attention and progress in a piece.” 130 The strict cycles, especially in the unpitched percussion, is most akin to the Medieval concept of *talea*, where an exact rhythmic idea is repeated after a cycle of beats, regardless of its relation to the

129 *Ibid* 17-18
meter. Gardner also draws a parallel in this case to the Indian concept of *tala*.

Throughout this work, Harrison also uses his method of “melodicle” composition much more than in *Young Caesar*. Melodicles can be defined as “short neume type figures of two to four notes which are combined in a sort of mosaic with a few other carefully chosen melodicles. Retrogrades, inversions and transpositions can all be used in the process of combination.”¹³¹ A much more thorough exploration of both melodicles and rhythmic motives will be shown below.

### 5.2.2. Kunsunoro kaj Gloro

The form of this movement is a palindrome ABCBA, where the A section is made of mostly percussion and the inner sections are for homophonic and homorhythmic voices.¹³² The first A section is mm 1-19, the first B section is mm 21-39, the C section is mm 41-50, the second B section is mm 53-68, and the final A section is mm 68-88. The A sections begin with a cluster of all the notes in the D-major pentatonic collection, plus a G#, in the reed organ. This sound is reminiscent of a Gagaku *sho* chord, with the added G# giving a brilliance to the sound that supports the metallic sounds happening above. These metallic sounds are the big bells (gas canisters), ranch triangles, tam-tams, and the gentorak (in addition to the bass drum in Percussion 4). The organ G# is also an extension of the cycle of fifths found in the cluster: D A E B F# (C#) G#.¹³³ Within the A section, the only use of Old Granddad is the five octaves of the pitch A sounding once each in measures 19, 39,

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¹³¹ Gardner 50
¹³² Ibid 129
¹³³ Ibid 130
and 51. These single attacks serve to punctuate the sections of the movement, as do the Lali parts leading into the B and C sections.134

5.2.3. 1a Paragrafo

This movement is the first feature of Old Granddad and is already more musically significant than anything written for it in Young Caesar. The introduction (mm 1-32) and postlude (mm 90-112) feature Old Granddad alone, and then use it in accompanying material for the vocal strophes (mm 35-59 and mm 66-90). It is written in a C# pentatonic with half steps, which is much like an Indonesian pelog scale or the Japanese in mode (a mode traditionally used to depict melancholy in solo koto music).135 As in most of Harrison’s music, there are only secundal, quintal, or octaval occurrences at the downbeats, with an avoidance of tertian harmony almost entirely.136 Harrison also composes with a jhala technique, in which the notes of the melody are alternated with a drone C#, creating a pedal tone effect (he called this “India’s answer to the Alberti Bass”137). This jhala, though, is in a “slow and deliberative tempo” unlike the virtuosic playing endemic to India. All of this happens over a 12-beat ostinato in the trash pails, which remains unchanged over the barline. The use of jhala, the quiet percussion ostinato, and the selected mode

134 Ibid 131
135 Alves 514
136 Gardner 147
combine to create a “haunting melody [that] sets up the opening mystery: that all of these aspects that make us human are in fact empty and illusory.”

The use of melodic composition style in the Old Granddad parts is an indication of the importance of these instruments to Harrison and how much nuance and musical depth he thought they were capable of. He used this compositional technique in virtually everything he had written since studying with Henry Cowell. In this paragraph, there are two main melodies: the bell writing (unison across all four sets of bells) from mm 33-35 (melodicle A) and from mm 36-38 (melodicle B). See Figure 5.3 below.

![Figure 5.3 – A and B melodicles in La Koro Sutro, “1a Paragrafo”](image)

The introduction and the postlude are comprised of freely ordered and modified melodicles, in very roughly retrograde order from each other. This is an example of how Harrison frequently skirted the line between free composition and strictly formal structure, a position he found necessary to produce compelling

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138 Alves 310
music. The two strophes use exact repetitions of each melodicle in the following order:

- Strophe 1 (mms35-59): B A B A B A
- Strophe 2 (mms66-90): A B A B B A A

These are almost exact retrogrades of each other, the differing final A melodicle changed to help the transition to the postlude. The intervening measures 59-65 offer another instance of free-melodicle writing. The freely varying melodic lines have so many different implications in relationship to the meter that an appropriate sense of nuanced phrasing on the part of the performer is a necessity. The fact that these lines must be played in unison by four players also compounds the necessity for nuance.

5.2.4. 2a Paragrafo

The second paragrafo includes more voice than Old Granddad. The voices are set in a homage to the 13th-century vocal works of Pérotin, notably the Conductus.\(^{139}\) It is the only movement in *La Koro Sutro* that is not in a strophic, palindromic, or rondo/ritornello form — its text is set freely, a musical and formal allusion to the content of the text, which states that “form is empty.”\(^{140}\) Under this text is an organ drone that is quite different in character from the opening *sho* imitation: a quintal chord built exclusively on the notes A, B, and E, emphasizing A.

\(^{139}\) Alves 310
\(^{140}\) Gardner 149
The paragrafo is composed of an A pentatonic collection akin the Korean “delightful” mode, and the organ keeps this tonality firmly in the background the entire time. Harrison occasionally uses a C# in the voice that breaks from the mode on the line “Same sento kaj percepto” which is translated to “The same is true of feeling and perception.” This is the first time in the text that emotions or subjectivity are discussed and here Harrison is using the same chromatic tone-painting techniques that were used by Pérotin to express high emotion.\textsuperscript{141}

The use of Old Granddad is spare in this movement, limited to interjections in all octaves of the instrument on the notes A, E, and D. This practice is also borrowed from the Korean “delightful” mode. The struck octaves also contribute forward movement toward and away from the climax in measure 77. This is done through a large-scale use of Harrison’s own “ictus control” — “These octaves appear progressively closer together as the piece proceeds to bar 77, and they appear progressively further apart as the conductus moves to the final cadence.”\textsuperscript{142} Though it is not composed for in an intricate or expansive way, the instruments of Old Granddad project a mass of sound that could be mistaken for the large beomjong bells in a Korean temple.

\textbf{5.2.5. 3a Paragrafo}

The third paragrafo is a highly chromatic setting of a part of the text that describes the imperfection of things, “neither tainted nor yet spotless, neither

\footnotesize\textsuperscript{141} Ibid 152
\footnotesize\textsuperscript{142} Ibid 150
lacking, nor completed."¹⁴³ This movement, centered on the pitch G, also serves as the subdominant pillar in the larger formal scheme of the work. Underneath this chromatic vocal writing is largely unpitched percussion and the bass and baritone keys. The keys, or “gendér” as described in the score," are the only pitched material besides the voices. The material written for Percussion 6 in the score, however, requires notes from both the baritone and bass keyed instruments; the other five players are needed on their unpitched percussion instruments, including Percussion 5 on the garbage pails. For this reason, the bass and baritone instruments are often placed close to each other in performance and Percussion 6 stretches to reach both instruments. This part also has an error in the score — all the writing for the two keys instruments should be on the note G (both high and low octaves) instead F. We can draw this conclusion through references to the bass writing in Heidi von Gunden’s The Music of Lou Harrison (page 214), Gardner’s thesis (157), and several recordings. The Bass and Baritone Key Gs also support the tonal centricity of the vocal writing.

Though they are pitched material, the bass/baritone notes blend into the ostinato percussion writing, creating “two contrasting planes” of sound for the listener to engage with.¹⁴⁴ The unpitched percussion parts are written in cycles of differing length, much like Harrison’s Young Caesar and his early percussion works. Percussion 1 (playing two tambourines) and Percussion 2 (playing two maracas) are in regular two-bar cycles. Percussion 3 plays a “muted bell on G,” which is just the middle G from the Tenor Bells played with one hand while lightly dampened.

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¹⁴³ Alves 310
¹⁴⁴ Gardner 158
with the other. This part plays a repeating cycle of six measures. Percussion 4 plays the bass drum in a cycle of seven measures. Percussion 5 plays the pails in a cycle of 5 measures. These overlapping cycles only completely line up in the same way once and give this paragrafo a nebulous, though motoric, underpinning that retains listener interest without distracting from the subject of the text.

5.2.6. 4a Paragrafo

The fourth paragrafo is the heart of the Heart Sutra, where we are asked to contemplate the idea that “if phenomena of our lives do not exist in the void, neither does suffering nor the attainment of nirvana itself.” This movement is the longest in La Koro Sutro, comprised of eight statements on the nature of emptiness. Each of these statements is divided by a short ritornello played by Old Granddad, which also plays the introduction and postlude. There are four main phrases which are used to constitute the introduction, ritornelli, and postlude (labelled A, B, C, and D below). A summary follows, wherein each verse (V) is numbered accordingly (V1, V2, etc.):

A A B B C D || V1 A V2 B V3 C V4 D V5 C V6 B V7 A V8 || B C D

\[145\] Alves 310
Table 5.2 – Complete ritornello statements in *La Koro Sutro*, “4a Paragrafo”

<table>
<thead>
<tr>
<th>Section</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
</tr>
</thead>
<tbody>
<tr>
<td>Complete Statement</td>
<td>mms. 5-11</td>
<td>mms. 19-25</td>
<td>mms. 33-37</td>
<td>mms. 38-42</td>
</tr>
</tbody>
</table>

The music contained between the beginning of verse one and the end of verse 8 constitute an arch form, framed by the introduction and postlude. This form “recalls the experiments with the rondo (or rondeau) form of Couperin or Rameau.”

This movement is in the pentatonic mode built on F#, though the bells use a C# pedal tone in their *jhala* technique (just like 1a Paragrafo). Harrison referred to the pitch collection of F# A B C# E as the “major-minor pentatonic” because it contains both the F# minor and A major triads within it. All of the vocal writing and use of Old Granddad happen over an eight-beat ostinato in Percussion 5 and 6, wherein Percussion 5 plays a pedal C# with the right hand, the left-hand alternates between F# and C#, and Percussion 6 plays the same F# and C# an octave lower.

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146 Gardner 165
147 Ibid 166
This meandering alternation between I and V in the mode of F# stays constant, even through the shifting meters caused by the writing for the vocal and bell parts. During each verse, the bells drop out, but the gendér part remains unchanged. In describing the ostinato of the bass and baritone parts as tala, Gardner notes that:

“The relationship of the tala and the bar line is reversed here from the relationship used in the first paragrafo, giving this movement an entirely different rhythmic character. The first paragrafo is barred in 4/4 exclusively and the tala, which is nineteen beats long, rearranges itself in relationship to that constant factor. Both the A and B phrases start on the downbeat consistently. The tala “floats” over the bar line, in other words. In this paragrafo the tala is [eight] beats long but the meter is continually changing. Thus one hears the melodies “floating” over the constant factor of the tala.”

This concept of “floating” in the repeating pattern has textual implications as well, implying the listener's changed relationship to the notion of impermanence and existence. This is the most subjective text in the work, referring to “sensation,” “perception,” various body parts, and the concept of growing old. In changing the

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148 Gardner 168
listener's perception of the relationship between ostinato and melody, Harrison has created a subtle but effective reflection of a complex philosophical subject.

5.2.7. 5a Paragrafo

This paragrafo is almost entirely vocal, similar in character to a responsorial chant.\textsuperscript{149} The only use of Old Granddad in this movement is to punctuate the beginnings and ends of phrases with octave B and F\# interjections on all instruments, much like the Korean \textit{beomjong} idea from the 2a Paragrafo. These interjections enforce the B minor hexatonic collection. The pitch F\# frames and is used during the playing of the “sweet gentorak” underneath the choir, while the B octaves are used primarily with the sleigh bells.

5.2.8. 6a Paragrafo

The sixth paragrafo connects with the third in its use of unpitched percussion and chromatic writing in the voices. However, in 3a Paragrafo, the collection is centered on G. Here it is centered on A, the structural dominant.\textsuperscript{150} This is textually significant because this movement is the only one to describe how the teachings of all the previous paragrafoj have affected other beings, that the “perfection of wisdom has awakened all Buddhas of all time.”\textsuperscript{151} This movement is in a rondo form A B A C A D A B A A, with an underlying motoric field played on unpitched

\textsuperscript{149} Ibid
\textsuperscript{150} Ibid 172
\textsuperscript{151} Alves 310
percussion in players 2, 4, and 6. Harrison referred to this form as a “folk rondo” or a French Rondeau in his Music Primer.  
152 Percussion 1 and 3 play the refrains on the “high bells” (usually the Steel Soprano and Aluminum Tenor Bells) with the Baritone Keys.

![Figure 5.5 – Refrain from La Koro Sutro, “6a Paragrafo”, mms.45-51.](image)

This baritone instrument is played with very hard mallets, dowels, or the butt-end of drumsticks in some cases. This is to create the articulation needed to play an intricate melodic line, like the writing at the end of Young Caesar. This refrain strongly reinforces the pitch A (the structural dominant) and is directly repeated, without alteration, every time. In most cases, the refrain enters cleanly after each episode. But in measure 16, the refrain elides with the vocal part by an entire measure, as the voice sings the same pitches as the beginning of the refrain. The paragrafo ends with a restatement of the refrain, even further enforcing the structural dominant just before the harmonically deceptive 7a Paragrafo.

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5.2.9. 7a Paragrafo

The wild diversion into F minor in this paragrafo is “as if the wisdom of the sutra has provided a new view of the world.” The key of F minor is a third above the tonic, a symmetrical reflection of 1a Paragrafo, which is a third below the tonic in B minor. The text of this movement summarizes all previous movements and implores the listener to heed the Heart Sutra’s advice. Its musical effect is found in its gentle harp undulations and quintal organ chord, rather than in a bombastic statement that might have been made with Old Granddad. While its orchestration may seem perfect with the advantage of hindsight, this is only due to a happy accident. When Harrison realized that he wanted to write this movement in F minor, William Colvig was off leading a hike with the Sierra Club. Rather than wait for Colvig to return and build new metallophones for him, Harrison simply composed for a different group of instruments. A short transition at the end of the movement leads back to the dominant A. Both the pitch material and the text, “By the Transcendental Wisdom has the mantram been delivered,” prepare one for the final paragrafo.

5.2.10. Mantro kaj Kunsonoro

The final “Mantram and Chime” movement is firmly in D, with hints of a D major tertian harmony and D pentatonic collections. The first section, up to measure thirty-six, features the Bass and Baritone Keys, as well as the harp, playing a nine-
beat cycle that forms the basis of a Chaconne. This formal idea is reinforced by Harrison asking the players to “damp at the end of each three-bar cycle.”

Figure 5.6 – Bass/Baritone ostinato from *La Koro Sutro*, “Mantro kaj Kunsonoro”, mms.4-6.

Above this, the bells play a repeating pattern in a cycle of ten beats that uses double stops in parallel fourth and fifths. This is the first time that Harrison asks the players to use double stops (and is only used sparingly in *Young Caesar*).

Figure 5.7 – Bell cycle from *La Koro Sutro*, “Mantro kaj Kunsonoro”, mms.4-7.

\[^{155}\text{Ibid}\]
The voices in section one state the text contrapuntally on A, F# and D, pointing toward a D major tonality. Tertian harmony is unusual in this piece and in much of Harrison’s compositions, but here he uses it to show “Western” music, in contrast with the quintal harmony found in pentatonic collections and music of the “East.” This quintal writing is also on display in the second major section, from measure thirty-seven to the end. “By juxtaposing the tertian and quintal systems, Harrison sets up both an exciting music contrast and a telling reaffirmation of the equality of the two systems.” This final section uses the same exclamatory bell texture from Kunsonoro kaj Gloro, heightening the text “Awake, all hail!” Words and music combine to proclaim the joyous freedom from human suffering through realizations of Avalokiteshvara.

This final exclamation uses ranch triangles, gas tanks, the bass drum, and the Baritone and Bass Keys. The harp continues to support the low Old Granddad instruments and the organ plays the same sho chord from Kunsonoro kaj Gloro. The sung chord (comprised of the pitches E, A, and D) is supported by a rapid arpeggiation in Percussion 2, playing the High Bells (usually the Aluminum Soprano Bells). This is the most virtuosic writing for any instrument of Old Granddad to date — it is sixteen measures of arpeggiated sixteenth notes at a marked tempo of ♩=80 beats per minute. Dr. Patrick Gardner states that, “The [instrumental] parts are not difficult and, once again, musicality and a willingness to adapt to stylistic
requirements are of more importance than technical virtuosity.”¹⁵⁸ While this is true for most of this work and Young Caesar, this spot for Percussion 2 is the exception.

5.3. Conclusion

Patrick Gardner, who knew Harrison personally and performed this work with his consent and under his supervision, believes that the gamelan should be in full view of the audience and likely in front of the chorus: “Traditional gamelan music normally appears as part of a colorful spectacle which incorporates puppetry, dance and music. If one is to present fully the oriental side of the syncretic experience, this element of concert presentation should be considered.”¹⁵⁹ This is unlike Young Caesar, which asks the players to serve in a pit orchestra. The method of visual presentation that Harrison himself espoused, as well as the increasingly difficult and nuanced music he was writing for Old Granddad, show a composer ready to use the instrument in a centrally important musical way. His did this with his next composition: Suite for Violin and American Gamelan.

¹⁵⁸ Gardner 198-199
¹⁵⁹ Gardner 203
Chapter 6

Suite for Violin and American Gamelan

6.1. Background

As part of the 1972 concert that premiered La Koro Sutro at San Francisco State University, Harrison asked several friends to help fill out the rest of the concert. This included works performed by a trio from his Chinese-music ensemble comprised of William Colvig, Richard Dee, and himself. Instead of filling it with other works of his own, Harrison asked if Dee would compose a piece on an Esperanto text that might complement La Koro Sutro. Though initially quite hesitant, Dee ended up composing a violin melody to accompany The Four Patrons of the Palaestra, an Esperanto poem written by Harrison.\textsuperscript{160} There was still not quite enough to fill the concert, however, and so Harrison asked Dee to cooperatively compose a piece with him. Though Harrison had composed works with other composers before (most notable Double Music with John Cage in 1941), this was to be a new process of writing. Double Music was a percussion quartet in which each

\textsuperscript{160} Bill Alves and Brett Campbell, Lou Harrison: American Musical Maverick (Bloomington, IN: Indiana University Press, 2017), 311-312.
composer wrote for two of the members; Cage and Harrison agreed on the length of the piece and some structural guidelines. Harrison’s collaboration with Dee yielded a chaconne in which they alternated variations over a predetermined ground bass. This composition was much more expansive than Dee’s violin and text work. The Chaconne would later be absorbed into the larger *Suite for Violin and American Gamelan*.

The San Francisco Chamber Music Society later offered Harrison a commission through its Norman Fromm Composer’s Award. Harrison wanted to use the instruments of Old Granddad again and asked Dee to expand on their collaboration. The *Suite* would be a collection of different styles and would be cooperatively written in a few different ways. The first movement, “Threnody,” was written by Harrison alone. The second movement, “Estampie,” was written in the same manner as the previous Chaconne, where Harrison and Dee alternately composed sections. Within the “Estampie,” Harrison wrote the phrase endings, traditionally called *ouvert* and *clos*. The third movement, “Air,” is in the style of a slow, lyrical Baroque work. Dee wrote this movement alone and borrowed heavily from his previous setting of Harrison’s *The Four Patrons of the Palaestra*. Next came a set of three Jahlas. Harrison initially wanted this section to be a sort of “suite within a suite” mosaic of different styles, but he and Dee settled on the three Jahlas. The first was composed by both men, with Dee writing the violin part and Harrison writing the Old Granddad accompaniment. The second was composed by Dee alone.

161 Ibid 312
The third was written by Harrison alone, for only the instruments of Old Granddad with no violin. The final movement of the Suite is the previously composed Chaconne.\textsuperscript{163}

The score credits both Harrison and Dee as composers, though it is often marketed and rented as a work by Harrison alone (which was much to Harrison’s frustration). On numerous occasions, the composers refused to say which sections belonged to which composer. Only after Harrison’s death did Dee feel comfortable disclosing who did what.\textsuperscript{164} This collaboration was likely a necessity for Harrison, who was in a state of alcoholic despair after his mother’s death in early 1974, and too emotionally overwhelmed to take on large-scale tasks during his grief.\textsuperscript{165} The original Chaconne was first performed on October 29, 1972. The larger work was premiered on December 9, 1974 with Lauren Jakey as violin soloist.\textsuperscript{166} Part of the suite was performed again at the seminally important August 16, 1975 concert at the summer session of the Center for World Music in Berkeley, CA. After his “Intonation in World Music” course, Harrison encouraged a performance of new American Gamelan music by some of his students and conference attendees, notably Barbara Benary, David Doty, and Daniel Schmidt.\textsuperscript{167} Many of these people became

\begin{flushright}
\begin{footnotesize}
\textsuperscript{163} Alves 312-313
\textsuperscript{165} Alves 320
\end{footnotesize}
\end{flushright}
luminaries in the field of American Gamelan and new gamelan composition. For his part, Harrison contributed the third Jahla from the Suite, titled “Slow and Solo Jahla” in the concert program (see Figure 6.1).

**Figure 6.1 – Program from concert “Music for An American Gamelan,” August 16, 1975**

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168 For more information, see Jay Arms “Gamelan As A World Citizen: American Experimental Music and the Internationalization of Indonesian Arts” (PhD dissertation, University of California Santa Cruz).

This concert would prove to be the wellspring for the burgeoning American Gamelan movement and the end of Harrison’s use of Old Granddad in any significant way. As a part of the summer session, he met the composer Pak Cokro and began his intense study of Javanese music. He also observed and worked with the instruments of the Kyai Hudan Mas gamelan. After that summer, he set about building a set of instruments modeled on Kyai Hudan Mas, which became the gamelan Si Betty. It was on these instruments that Harrison would compose and teach for the rest of his life.

6.2. Musical Analysis

6.2.1. General Considerations

This work uses Old Granddad in a variety of ways that Harrison already experimented with in both Young Caesar and La Koro Sutro. In many ways, the Suite for Violin and American Gamelan represents the culmination of Harrison’s writing for these instruments. It is also the most ambitious, as there are no other instruments used besides the violin and Old Granddad. Young Caesar was an opera that made liberal use of a small battery of instruments from around the world; La Koro Sutro used organ and several percussion instruments to accompany a choir. The Suite for Violin and American Gamelan is for only 7 players, who must play in a delicate chamber music environment. Heidi Von Gunden summarizes Old
Granddad’s uses in the *Suite* as “a drone, in ostinati textures, doubling the violin melody, part of a chaconne, making percussive strikes on its wood rack, performing *jhala* in counterpoint to the violin’s melody, and as a solo section for *saron* melody with *gender* punctuation.” Harrison again uses only the D-diatonic instruments, though he and Dee favor the relative minor (B-minor) and the modes built on C# and F#. Their increased reliance on more distant and complex key relationships show a comfort with the instruments that wasn’t there in the heavily D-pentatonic writing from the early *Young Caesar* sketches.

### 6.2.2. Threnody

This opening movement is a melancholic rhapsody for mostly violin solo with interjections from the Old Granddad instruments. The title “Threnody” is likely a nod to the award namesake, a prize awarded in memory of Norman Fromm. The movement begins with a stepwise descent motive from the Bass and Baritone keys, which repeats in several places. This stepwise movement down to the tonal center of C# is also expanded upon with the entire collection of metallophones in mms61-67. We see the return of “gangsa teknic” from *Young Caesar*, which instructs the players to muffle the previous tone as the new note is struck.

Much of the writing for Old Granddad in the rest of the movement are gong-like punctuations, usually single pitches doubled or quadrupled at the octave on all

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170 Von Gunden 218-219  
171 Ibid 218
metallophones. These function in much the same manner as the writing for Old Granddad in La Koro Sutro, paragrafoj 2a and 5a. These also echo the Korean temple block interjections seen in much of Harrison’s writing, especially in the recitative of Young Caesar.

6.2.3. Estampie

The second movement is the most virtuosic section of the Suite. It is in the form of a medieval dance in seven large parts, with Harrison and Dee alternating composition for each section. Harrison was especially interested in this form since his youth and continued to use it throughout his life. Each part is divided into two sections; each of the two sections repeat the same material but with different endings. The structure for the piece can be summarized as:

\[A1 \ A2\ B1 \ B2\ C1 \ C2\ D1 \ D2\ E1 \ E2\ F1 \ F2\ G1 \ G2\]

At the end of each section is either an ouvert or a clos ending, which Harrison composed before the pair set about writing the rest of the piece. There is only one eight-measure ouvert in the piece, used to conclude A1, B1, C1, etc; there is only one eleven-measure clos in the piece, used to conclude A2, B2, C2, etc. The table below summarizes the section lengths and ouvert/clos for the movement.
<table>
<thead>
<tr>
<th>Section</th>
<th>Length</th>
<th>Sub-Section</th>
<th>Length</th>
</tr>
</thead>
<tbody>
<tr>
<td>A1</td>
<td>mms.1-36</td>
<td>Ouvert</td>
<td>mms.28-36</td>
</tr>
<tr>
<td>A2</td>
<td>mms.36-74</td>
<td>Clos</td>
<td>mms.63-74</td>
</tr>
<tr>
<td>B1</td>
<td>mms.75-94</td>
<td>Ouvert</td>
<td>mms.86-94</td>
</tr>
<tr>
<td>B2</td>
<td>mms.95-117</td>
<td>Clos</td>
<td>mms.106-117</td>
</tr>
<tr>
<td>C1</td>
<td>mms.118-141</td>
<td>Ouvert</td>
<td>mms.133-141</td>
</tr>
<tr>
<td>C2</td>
<td>mms.142-171</td>
<td>Clos</td>
<td>mms.160-171</td>
</tr>
<tr>
<td>D1</td>
<td>mms.172-199</td>
<td>Ouvert</td>
<td>mms.191-199</td>
</tr>
<tr>
<td>D2</td>
<td>mms.200-233</td>
<td>Clos</td>
<td>mms.222-233</td>
</tr>
<tr>
<td>E1</td>
<td>mms.234-263</td>
<td>Ouvert</td>
<td>mms.255-263</td>
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<tr>
<td>E2</td>
<td>mms.264-300</td>
<td>Clos</td>
<td>mms.289-300</td>
</tr>
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<td>F1</td>
<td>mms.301-330</td>
<td>Ouvert</td>
<td>mms.322-330</td>
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<tr>
<td>F2</td>
<td>mms.331-364</td>
<td>Clos</td>
<td>mms.352-364</td>
</tr>
<tr>
<td>G1</td>
<td>mms.365-383</td>
<td>Ouvert</td>
<td>mms.375-383</td>
</tr>
<tr>
<td>G2</td>
<td>mms.384-407</td>
<td>Clos</td>
<td>mms.396-407</td>
</tr>
</tbody>
</table>

Table 6.1 – *Suite for Violin and American Gamelan, II. Estampie; formal structure*
The entire movement is centered around the pitch F# and makes heavy use of a quarter note ostinato figure in the Baritone Keys, played by Player 4 (who is asked to move to the different instrument from the Tenor Bells, creating a situation with two players on one instrument). The Bass Keys and Player 5 on the Baritone Keys also play quarter note figures that outline the tonality of the movement; they further provide rhythmic drive by striking the frame of the instrument (a technique also used in *La Koro Sutro*). During the D1 and D2 sections, the Bass and Baritone Keys play only rhythms on the frame, leaving Player 4 to continue the quarter note ostinato on the keys. In this section, players 1-3 perform a quasi-obbligato figure on the Soprano and Tenor Bells. In E1 and E2, Players 5 and 6 resume their normal roles and Players 1 and 3 drop out. Player 2 stops momentarily but resumes the obbligato role in E2 alone. In F1 and F2, Players 1 and 3 layer in a nine-beat ostinato on top of Players 4 and 6. During the F1 *ouvert*, Player 5 re-enters to reinforce Player 6’s part. Player 2 enters at F2 playing the same repeating pattern as Players 1 and 3.

The final sections G1 and G2 ask Players 5 and 6 to stop the sound of their instruments from ringing and resume playing them muted, creating a much shorter, percussive sound. The parts are in quintal counterpoint with each other and still contain heavy use of the rim strike. Players 1-3 play an obbligato line under the violin, but with the use of “gangsa teknic” again (notated in the score at “g.t.”). This obbligato line is not complete, instead only outlining the beginning of G1, its *ouvert*, the beginning of G2, and its *clos*. 
6.2.4. Air

The third movement was written by Richard Dee and borrows significant amount of material from his setting of Harrison's *The Four Patrons of the Palaestra*. It is a slow and through-composed work built on a melodicle comprised of the B-D minor third and gentle stepwise motion in the violin part. This melodic material is manipulated in several ways (at different rhythmic levels as in mm.38 or harmonized in parallel fourths as in mm.31), though never in a predictable pattern. Underneath this lyrical melody, Players 1-5 in the Old Granddad ensemble play a four-beat ostinato that strongly emphasizes B-minor, with an added E. This quintal harmonic field makes the movement, though it was composed by Dee, sound very much like Harrison's writing. The ornamentation is also reminiscent of Harrison's violin writing.

6.2.5. Jahlas One Through Three

The Jahlas are here discussed as a set, though in many recordings they are all on separate tracks. The score denotes “Jahla 1” as movement “IIII” and the Chaconne as movement “V,” which is an indication from the composers that they do not consider Jahla’s 2 and 3 to be stand-alone movements. The roles of each instrument vary within this set of Jahlas; the violin melody is sometimes dominant, but in other
it acts as a decorative line above the Old Granddad body-melody, somewhat like the concept of a *balungan* from Javanese gamelan.\(^{172}\)

“Jahla 1” was composed jointly: Richard Dee composed the violin part and Harrison the Old Granddad parts. It is an ABA form with a short codetta. The jhala technique for the movement is built on a pedal C#, even when there is a slight modulation in the violin part at measure 36. The codetta features a short ending flourish for the violin starting in measure 80, but a simplified part for the Old Granddad instruments. For the entire movement, Players 5-6 are tacet and Players 1-4 play a complex jhala in unison. Jhala technique requires players to mostly keep one hand on the pedal tone, asking each player’s right hand to execute two-, three-, and four-note groupings, as well as grace note figures, at the relatively brisk pace of Quarter Note=136bpm. This is some of the most technically demanding writing in the entire *Suite*, made more difficult by playing in unison with three other players.

“Jahla 2” was composed by Dee alone and is the shortest part of the *Suite*, as well as the only movement to be set in the home key of Old Granddad, D-major (it also utilizes a D pedal tone). Players 5-6 play only rim strikes during the movement and Players 1-4 execute an obbligato line to the violin. The movement begins with only Player 1 executing the obbligato part through measure 15. At this point, Players 2-4 enter as well and play a refrain from mms.16-34. This refrain is broken down into two nearly identical nine-measure segments. Player 1 again accompanies the violin from mms.34-41. In measure 42, the other Bells enter again on the refrain

\(^{172}\) Ibid 219
material. There is a short ending utilizing Indian reductive techniques that reinforces the main syncopated motive from the refrain. This movement, though it is marked at 168bpm, is slightly easier to execute than the previous Jahla due to its use of repetition and relatively idiomatic writing for the Bells.

"Jahla 3" was composed by Harrison alone and is the first instance of Harrison writing a self-contained piece for only the instruments of Old Granddad. The closest he had come before was the extended refrain material from La Koro Sutro's "4a Paragrafo." It again utilizes a C# pedal tone in Players 1-4 and a very simple ABA form. Like the Javanese music he would shortly start studying, Harrison composed gong-like punctuations for Players 5-6 at the end of each melodic phrase. The Javanese call this concept the "cradle of time" (though they normally expand upon it with many layers of colotomic gong playing) and it appears as though Harrison had an intuitive understanding of how it might sound, even though he had not yet developed an academic understanding of the subject. It was this work that Harrison extracted for the 1975 performance at the Center for World Music in Berkeley (under the title "Solo and Slow Jahla"), likely in part because it was Old Granddad alone and also because it was the most similar to the music being played by Pak Cokro and the players of Kyai Hudan Mas.

6.2.6. Chaconne

The Suite concludes with the "Chaconne," the first piece that Harrison and Dee had worked on together for the 1972 performance. This piece included a nine-
beat ground bass played by Players 5 and 6. Harrison composed the ostinato and the first melody, a simple violin line in quintal counterpoint with the bass, ending in measure 15. Richard Dee composed the next segment of the violin melody (mms.16-34), which does not cleanly end with a repetition of the Chaconne bass. Harrison resumed his writing of the melody in measure 35, which was a two-measure lead in to the next section beginning in measures 37. Dee composed the virtuosic final melody from measure 64 to the end. This included a return to Harrison’s principal melody starting in measure 82, though re-orchestrated into octaves and with much richer textures in the accompaniment.173

At this point in their relationship Dee was not as experienced in composition, and so Harrison wrote most of the parts for Old Granddad. The parts for the Bass and Baritone Keys were not significantly more challenging than anything else that had been written before, but the bells all included an extended section of double-stop writing in parallel fourths from mms.48-54. The return of the principal melody at measure 82 also includes octaval double-stop writing for the bells, a rare in Harrison’s writing. Finally, it is the first time that Harrison is grouping the Bell instruments based on the metal they were created from, pairing Steel Soprano and Tenor Bells, Aluminum Soprano and Tenor Bells. The entire movement includes these two instrument pairs in counterpoint with each other, signifying Harrison’s deeper understanding of the tonal differences between the metals.

173 Alves 312
6.2.7. Conclusion

The *Suite for Violin and American Gamelan* showed a composer at fully in control of the set of instruments he built for a very specific use, in this case exploring modal just-intonation systems. The technical virtuosity required of the players, especially in the “Estampie” and “Jahla 1” movements, are significant. As Harrison and his friends were not trained percussionists, this was doubly impressive. This piece is frequently programmed alongside *La Koro Sutro* due to their relationship in Harrison’s repertoire. That they are both performed with relative frequency, despite the scarcity of the Old Granddad instruments and the expense required to rent and perform on them, is a testament to Harrison’s and Dee’s abilities. At this point in his career, Harrison stopped writing for Old Granddad almost entirely and began to explore the vast world of Javanese gamelan.
There is one stand-alone solo and several fragments of film music composed by Harrison which include single instruments from the Old Granddad set, usually a single set of Tenor Bells. But after the 1974 premiere of the *Suite for Violin and American Gamelan*, Harrison abruptly turned to the study of Javanese music and began work on his *Elegiac Symphony*. The *Solo to Anthony Cirone* contains perhaps Harrison’s most complex harmonic ideas for Old Granddad instruments, extensively exploring diatonic Just Intonation systems and the implications of “wolf intervals.” Harrison’s music for the films *Discovering the Art of Korea* and *Scattered Remains* also shows how he perceived Tenor Bells as a peer among his arsenal of instruments. Finally, the chapter will conclude with a discussion of contemporary trends in the use of Old Granddad, as the instruments have been put into service in a composer’s collective at the Massachusetts Institute of Technology.
7.1. *Solo to Anthony Cirone*

*Solo to Anthony Cirone* (1972), a piece for a single set of Tenor Bells, was dedicated to percussionist Anthony Cirone, Harrison’s colleague at San Jose State University. Cirone was also a percussionist with the San Francisco Symphony, with which Harrison had enjoyed a lengthy relationship. Cirone led the University’s percussion ensemble in performing several works of Harrison’s, including the 1969 premiere of the massive *Orpheus* for percussion orchestra. Cirone subsequently approached Harrison about commissioning a piece for his percussion ensemble; at the same time, the San Jose State organ professor Philip Simpson also requested a piece. Harrison satisfied both of their requests with his work *Concerto for Organ with Percussion Orchestra.*

The solo that Harrison wrote for Cirone is a meditation on the possibilities of the Just Intonation scheme of the Old Granddad instruments. Every degree of separation from Old Granddad’s D-major tonal area includes the addition of some dissonance in the interval content of the mode. In *Solo to Anthony Cirone,* the B-minor mode eventually modulates to a tonal center of E. In D-major Just Intonation, the distance between E and B is not a simple ratio and is thus not heard as consonant. This interval is sometimes referred to as an “imperfect fifth” or an “imperfect fourth,” but has become colloquially known as a “wolf interval” due to the howling nature of the overtones beating dissonantly against each other. Harrison repeatedly uses this interval in the climax of the *Solo,* creating tension and... 

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174 Alves 314
resolution through interval consonance and dissonance. He makes a note in the score that the Tenor Bells must be in Just Intonation to effect the “narrow escape” in the climax.

This piece, despite being unpublished and only available in the composer’s own handwritten score, is one of the most frequently performed works for Old Granddad. Several prominent percussionists have played the piece including William Winant (who was a friend of Harrison’s and recorded the piece), Garry Kvistad (of the Nexus Percussion Group), Keith Aleo (faculty at Interlochen), and Joseph Gramley (Professor at the University of Michigan).

7.2. **Film Music**

Lou Harrison had a difficult relationship with film. He admired film composition and the way some of his fellow composers contributed to the artform, but he himself had a difficult time working within the constraints of the creative process of filmmakers. His first experience with film music occurred in 1968, when he collaborated with James Broughton, a counter-cultural and experimental filmmaker. Broughton’s film *Nuptiae* utilized music for a battery of instruments, including the gong-like Philippine *kulintang*. Harrison created a tintinnabulous score that precisely synchronized points of the film with the music. After submitting his work to Broughton, the film, and its sound track, were edited, creating cross-

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fades and hard cuts that destroyed Harrison’s sense of pacing. Because of this experience, Harrison vowed to write only “wallpaper music” from then on.\textsuperscript{176}

His next film project was part of the National Museum of Korea’s 1979 touring exhibition of historic Korean artifacts.\textsuperscript{177} This hour-long documentary film gave Harrison another opportunity to write for film, though it would suffer a similar fate as \textit{Nuptiae}. The dialog required nearly constant underscoring (an unobtrusive music that supports the narration) and Harrison diligently worked to create an authentic Korean experience from among his own eclectic collection of instruments. He used his troubadour harp, the Sheng, Chinese tam-tams and gongs, and a set of Tenor Bells. He would also write exposed parts for the \textit{banghyang}, the Korean metallophone that had initially inspired Harrison and Colvig to create Old Granddad. But in his excitement, he forgot his experiences with Broughton in 1968; at the 1979 film premiere, he discovered that the filmmakers had edited the film, destroying many of Harrison’s musical ideas.\textsuperscript{178}

Harrison’s last use of Old Granddad was in James Broughton’s 1987 film \textit{Scattered Remains}. This time, Harrison set about writing music that could be faded and cut at almost any point without losing its musical integrity, what he deemed “wallpaper music.” Bill Alves calls this film score “possibly the closest Harrison ever got to minimalism.”\textsuperscript{179} It contains an undulating ostinato created by harpsichord and unpitched percussion, with a sinewy melody for Tenor Bells layered over the top. There are no beginnings and no major cadential points, which allowed

\begin{footnotes}
\item[176] Alves 297-298
\item[177] Alves 345
\item[178] Ibid 346
\item[179] Ibid 385
\end{footnotes}
Broughton to edit as he saw fit. Harrison later orchestrated this music and called it *Air for the Poet* (1987).

Dislocated fragments of the scores for these works exist in the Harrison archives, and Alves has transcribed some of the music from *Scattered Remains* for Tenor Bells, harpsichord, and percussion, but little of Harrison’s film music remains. The films themselves show how Harrison envisioned multiple functions for the Tenor Bells: texturally evocative of several world cultures; and also capable of functioning melodically, independent of cultural context. The *kulintang* used in Broughton’s *Nuptiae* sound like Javanese bonang and are used in a similar manner as the Tenor Bells in *Discovering the Art of Korea* — recurring chime patterns in an ostinato context. Harrison created this second film five years after his last major work for Old Granddad, so one may assume that he knew the melodic potential for the Tenor Bells and decided to write for them texturally anyway. In *Scattered Remains*, Harrison features the Tenor Bells as the melodic voice. The harpsichord, which might have been the lead player in the hands of any other composer, is relegated to a percussive-motoric role. That Harrison featured the Tenor Bells in these films, as well as in the *Solo to Anthony Cirone*, shows the esteem with which he held these instruments, even as he had moved on to other forms and styles of music.

### 7.3. Old Granddad #3

The set of instruments which Richard Cooke designed for his own use are now owned by Dr. John Pennington, formerly of Fort Lewis College and now at
Augustana University. While at Fort Lewis College, Pennington and the mallet and percussion ensemble recorded Harrison's *Suite for Violin and American Gamelan*. After moving the instruments to their new home at Augustana University in Sioux Falls, South Dakota, Pennington recorded a new work for the Old Granddad instruments, harmonium, guitar, and solo voice called *Gitanjali*. The work is based on original text and translation by Rabindranath Tagore. The first performance and recording were made with soloist Cyprian Consiglio and the Augustana University Percussion and American Gamelan Ensemble.

### 7.4. MIT Old Granddad Project

Old Granddad #4 was sold by the Boston Modern Orchestra Project to Jody Diamond after it completed its recording of Harrison's *La Koro Sutro* and *Suite for Violin and American Gamelan*. Diamond had hoped that the group would commission new works for the instruments after the recording was finished. This never materialized, and Diamond purchased them to seek out composers and produce new works. She also wanted to keep an Old Granddad set on the East Coast for the Harrison centennial celebrations in 2017 (all other copies exist on the West Coast or in Montana). The instruments were kept in storage until an acceptable space could be found. While working on a production of Harrison's *Concerto for Piano and Javanese Gamelan* with composer Evan Ziporyn and his gamelan players from ensemble “Galak Tika,” both Old Granddad and Harrison's Javanese set of
instruments (named Si Betty) were offered a temporary residence at the Massachusetts Institute of Technology.

Ziporyn was intensely interested in the instruments and shared Diamond’s desire to see new works composed. While Si Betty eventually moved to Bucknell College, Old Granddad #4 remains at MIT where it is the focus of a small composers’ collective dedicated to creating new works. There have been several new works written by composers like Ziporyn and Jody Diamond. Diamond’s work is titled *Kenong* and is based on a work she wrote for the Javanese tuned gongs of the same name. In the original work, a single player plays ten of the tuned gongs as a solo. In the work for Old Granddad, Diamond writes for five players to each play two notes from a single set of Tenor Bells.

The group commissioned Balinese composer Dewa Alit to write a piece for the metallophone orchestra. Alit had already worked with the players from MIT’s “Galak Tika” ensemble and was given access to the Harrison instruments. After seeing and playing the instruments, he agreed to write *Ameriki* in a very compressed span of time. In an email with the composer, he describes the experience of composing for Old Granddad to be very different from writing for gamelan. He specifically wrote *Ameriki* to take advantage of the different sound effect. This difference was a challenge for him, but not more so than composing for any other Western instrument with which he was not immediately familiar. Although the tuning was designed by Harrison, Alit found no problems incorporating instruments from other tuning schemes (flute and piano). His advice for future composers –
“They should see the instruments and find the potential by themselves, so they won’t be limited by other people, including myself.”

Evan Ziporyn himself has found working with the instruments to be “a deeply rewarding project, which [he feels] is only starting.” Despite the large logistical hurdle of moving a set of large and unwieldy instruments, the compositional process was engaging:

“For me, compositionally, the interesting thing was the subtle process (still ongoing) of getting inside that one immovable, unimpeachable scale. One oscillates between feeling like it’s an impediment (fairly limited harmonic and melodic palette) or a gateway (accepting it, and gradually finding subtle, new forms of expression). My own piece, short as it is, is basically about trying to find that moment, where it opens up to something...I don't know, new, magical, personal.”

But the result was worth the effort. The audience found the first performance to be captivating: the instruments “very magical” and the music “meditative and contemplative.” It has inspired other people within the MIT music community to begin composing for Old Granddad.

7.5. Conclusion

Several patterns have emerged from the spare use of the Old Granddad instruments after Harrison’s initial three compositions. After composing for the 

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180 Dewa Ali, e-mail message to author, December 18, 2018.
181 Evan Ziporyn, e-mail message to author, December 28, 2018.
182 Ibid
183 Ibid
complete group of instruments, Harrison preferred to use only a single metallophone after that in his film music. He favored the Tenor Bells, which is an instrument that Jody Diamond also selected in her work *Kenong*. Though more recent works have featured other compositional techniques (Diamond used hocket and process-oriented techniques in *Kenong*, for example), Harrison used the bells in a melodic role rather than a motoric one. As the composers of the MIT Old Granddad Project have discovered, the addition of more instruments and added virtuosity yields muddy textures. Articulation is problematic because of the length of the resonance of each note. It now seems clear that Harrison’s *jhala* technique, used throughout the major works for Old Granddad, was a method to control clarity among an ensemble of the larger performing forces. In any case, the effort to revive Old Granddad is just beginning.
The construction history of the Old Granddad instruments, as well as how they’ve been used in the repertoire outlined thus far, show us a path forward for new compositions. As with any frequently performed piece of music, the repeated performances of the works for Old Granddad have created of a performance practice since their premieres in the early 1970’s. This practice is a pastiche of composer-and instrument-builder design, years of modification by Harrison and Colvig, and, subsequently, other performers working on their own. It is important to understand what changes have been made to this performance practice and how others have interpreted Harrison’s music in an effort to provide the best possible path going forward. This includes notes for future composers on limitations and possibilities, as well as notes for performers in their quest to produce accurate and clear interpretations of existing works.
8.1. Implements

The mallets used to play the Bells from Old Granddad have evolved over time — Colvig’s initial instruction manual described wooden discs wrapped in bicycle inner tube, but Richard Cooke distributed a set of rollerblade wheels on the end of dowels for his mallets. Cooke also distributed Javanese style mallets with his Bass keys, though these would have been largely unavailable to Harrison and Colvig in the early 1970s. Most recent performances on the Bells have used cord-wrapped vibraphone mallets. These mallets have developed over time to produce the most fundamental tone and minimum contact noise for metal idiophones. For the Trinity Church performance during the Harrison Centennial celebrations, the Rutgers Percussion Group used just such a set of implements.\textsuperscript{184} It is a commonly understood part of the percussionist’s job that they will choose the correct implements to achieve the desired effect in the performance space. The prospective composer should write the notes, rhythms, and articulations desired and leave problems of implement selection and clarity to the performer (with the exception of extended techniques or special effects).

Each set of bells produced a crystalline, ringing sound with a significant decay time. For the works already in existence, the performer should seek to produce as clear a pitch as possible while eliminating contact noise. If too hard a beater is used, there will be a significant number of overtones from this contact noise; too soft of a beater and the pipes or bars will be slightly dampened when struck.

\textsuperscript{184} Joe Tompkins in discussion with author, July 2018.
For specific or unusual sounds on Old Granddad’s pipes and keys, the prospective composer should avoid writing for implements that are of a harder material than the steel and aluminum of the instrument. This rule can be broken at very soft dynamic levels. In the case of loud playing, plastic or wood chopsticks can be substituted. The use of alternative implements (like glockenspiel or xylophone mallets, triangle beaters, brushes for example) is strongly encouraged, but with the above caveats. A beater is determined “too soft” only when the clarity of the composer’s intent is hindered. To understand the quality of sound produced on each instrument, this document includes a library of sound files that were taken from field recordings of Old Granddad #4. Each pitch is played in isolation with the implements originally supplied by Richard Cooke.

Audio samples of the Bass Keys are also included in this document, though the Javanese-style gong beaters slightly muffle the bars when struck due to the large contact surface area of the mallet face. To eliminate the contact surface area, a possible future solution might include the use of yarn-wrapped tam-tam mallets or even an Alan Abel type Bass Drum mallet, which has a weighted steel handle and a small felt-covered head. In any case, a great deal of mass is required to activate the Keys fully; this translates into heavy and often unwieldy mallets. Additionally, the playing ambitus of the Bass Keys can be six feet or more, making quick movement with heavy implements even more difficult. When writing for general sounds, the prospective composer should follow Harrison’s lead and write for relatively slow rhythms on the Bass Keys. The Baritone Keys have less of an issue in this area: their mallets are lighter and easier to play with and the physical ambitus is generally
under four feet. In either case, slower rhythms on lower instruments results in greater clarity during performance and follows some of the colotomic principles of Javanese gamelan (see Section 8.3).

### 8.2. Personnel

“For many, gamelan provided a corrective for the faults they found in mainstream American musics [sic]... Gamelan music’s arguably communal approach to music making doubtlessly attracted some who may have felt disenfranchised by a perception that Western art music excluded all but the most gifted musicians.”\(^{185}\)

One of Old Granddad’s greatest assets is that the intonation system allows for complex interval relationships and interesting music within a simple modal language. Complexity is not necessarily a virtue in this setting. This was a hallmark of Harrison’s compositional style on other instruments as well. Many neo-Minimalist and post-modernist composers such as Peter Garland or John Luther Adams have also exploited these tendencies in their own works for other instruments. Drawing lessons from *Young Caesar’s* various iterations will help the prospective composer navigate the difficulties of combining wind instruments from different cultural traditions with Old Granddad, especially with regard to writing in tertian harmony (see Section 4.2.15).

A great loss from *Young Caesar’s* initial failure was that Old Granddad was no longer viewed as a collection of disparate instruments, to be drawn from at will and

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combined with other instruments (like the sheng or the suling). Old Granddad was used as a complete set for Harrison’s other works, though he tried to resurrect the use of individual instruments briefly, most notably with the Tenor Bells in his *Solo to Anthony Cirone*. This was fleeting, however, as he was already moving on from Old Granddad, beginning to compose his *Elegiac Symphony* and his Javanese-style works.

One of the most innovative elements of Old Granddad’s creation was the use of slab keys for the Bass and Baritone notes. Previously, only deep Javanese gongs had been used to fill this musical role. These gongs were, and remain today, prohibitively expensive. Harrison and Colvig’s innovation was crucial for the burgeoning American Gamelan movement, notably the instruments of builder Daniel Schmidt. Richard Cooke’s innovations on Old Granddad #4’s Bass Keys have made them much louder and richer-sounding than previous iterations. Extracting instruments from the Old Granddad family, the Bass and Baritone Keys in particular, could prove a fruitful area for future composition within a mixed instrumentation setting.

Samuel Z. Solomon recommends to “write for people, not sounds.” This is good advice for concert percussion and Harrison followed it well in his orchestration of *La Koro Sutro*, where he had many of the Old Granddad players double on concert percussion instruments at certain moments. This advice holds true in other ways as well, as in Jody Diamond’s recent composition for the MIT Old Granddad composer’s project in which she has several players playing on one set of

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186 Solomon 24
tenor bells. The melodic interplay and hocketing are representative of her background in Javanese music, but they also resemble the intimately cooperative repertoire of groups like So Percussion or Third Coast Percussion.  

8.3. Colotomy and Rhythmic Notation

The organizational principle of Javanese music is that of rhythmic stratification based on register, or colotomy. Harrison understood this intuitively in his writing before he ever understood it academically in his studies with gamelan experts. “In gamelan music it is a general principle that the larger and lower in pitch the instrument, the more infrequent are the notes (or beats) played on that instrument... The music that you hear is made up of many layers of melody all overlapping and interlocking to form one whole.”  

This is also fundamental to the writing for the Bass Keys in Old Granddad; in addition to massive implements, the struck bars take a while to fully blossom and expose their fundamental pitch. Intricate rhythms on lower instruments would be difficult to hear and lack clarity unless a very articulate implement is selected. This use of harder implements may have compromised tone quality in other ways — less fundamental pitch, more prevalent undesirable overtones, and lower volume, to name a few. Despite his experiments with harder implements in Young Caesar Act 2 Scene 14 (see Section 4.2.16), Harrison later tended to write for the Bass Keys as if they were deep pitched

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187 As an example, the piece Extremes by Jason Treuting, in which four players play on a single prepared bass drum.
188 Jennifer Lindsay, Javanese Gamelan: Traditional Orchestra of Indonesia (Singapore: Oxford University Press, 1992), 47-48.
gongs or a low string instrument. His later transcriptions for Western instruments confirm this technique.

When notating rhythmic values, avoid notation that specifically proscribes duration. This helps aid in “rhythmic readability.” Additionally, articulation markings have mixed practical use. Solomon summarizes best practices:

> “Although real control over the different articulations is not always possible or practical, either because of the nature of a given instrument or the context of a passage, articulation and phrasing markings are still helpful. .. Percussionists realize these notations through dynamic phrasing, mallet choice, and variations in muting or beating spot.”

Muffling and dampening are two different technical concepts: muffling is the act of applying some sort of preparation to the instrument to shorten its duration; dampening is the act of stopping a sound after playing it. Harrison uses dampening when he asks for “gangsa teknic,” or through special notation (as found in the Suite for Violin and American Gamelan, “Estampie,” measure 365). He makes no use of a muffling technique, a possibility which might be exploited by composers in the future.

### 8.4. Technique and Execution

A discussion of proper techniques of execution for percussion instruments is beyond the scope of this document. However, there are a few concepts that are paramount for performers and composers alike. The performer must strive to

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189 Solomon 71
190 Ibid
execute a vertical stroke path on each note, where the head of the mallet begins and ends above the player's wrist. The primary motivator for the implement should be gravity, which will produce the optimal sound on all instruments. There are several mitigating factors when writing for these instruments (as with all percussion instruments): the number of surfaces to be struck and the distances between them; the weight of the implement(s); the desired dynamic level; the endurance of the player and how the music is written to respect or exploit that endurance; whether or not double strokes are required; and the physical balance required to execute the upper body motions.\textsuperscript{191} In general, composers should limit themselves to the following tempos for each technique, when applied to a single surface:

\textsuperscript{191} Ibid 48-49
<table>
<thead>
<tr>
<th>Technique</th>
<th>Speed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hand to hand sixteenth notes while holding two mallets</td>
<td>144bpm</td>
</tr>
<tr>
<td>Hand to hand sixteenth notes while holding four mallets</td>
<td>120bpm</td>
</tr>
<tr>
<td>Double strokes with sticks</td>
<td>200bpm</td>
</tr>
<tr>
<td>Double strokes with hard plastic, rubber or wood mallets</td>
<td>170bpm</td>
</tr>
<tr>
<td>Soft plastic, rubber, or wood mallets</td>
<td>120bpm (same as hand to hand speed)</td>
</tr>
<tr>
<td>Hands and Fingers</td>
<td>Assume moderately slower than 120bpm, depending on the player</td>
</tr>
</tbody>
</table>

**Table 8.1 – Tempos for specific playing techniques**

When combining some of these techniques, assume that the tempo decreases, as in “Jahla 2” from *Suite*, in which the Bells must combine double strokes and hand to hand strokes in its Jhala technique.

The ambitus of each instrument is also a concern, especially with the Bass and Baritone instruments. But shifting from the lower manual to the upper manual on the Tenor Bells is also difficult. Assuming a beating spot near the center of each pipe, there is at least a two-foot distance between notes front to back on the lower
end of the instrument. “A composer can take what is known about accuracy problems with large leaps and runs that quickly span large distances on piano and apply that fourfold to keyboard percussion instruments.” The composer should multiply this again for pipes, as striking them can produce odd rebound angles due to the curved surfaces of the Bells.

8.5. Future Concerns

Several techniques, both standard and extended, as well as several musical attributes, have yet to be explored in the extant repertoire for Old Granddad. Some of these attributes include extremes in articulations or more subtle dynamic nuances. Future repertoire might try to achieve as wide a dynamic spectrum as possible on the Bells and, to a lesser extent, the Baritone Keys. The Bass Keys have a smaller dynamic range, owing to the large mass that must be used to excite each pitch and the air contained in its corresponding resonator. To augment the upper extremes of the dynamic spectrum, one might use the oxygen tanks. These tanks have been included with every iteration of Old Granddad built but have never been used outside of La Koro Sutro. Their sonic brilliance and impact might be used in the same manner as a concert bass drum and crash cymbals are used in Western classical music, for example.

There are several standard percussion techniques and innumerable extended techniques that could be explored in the future. These include: rolling, dead strokes,
using brushes or other alternative implements, bowing, glissandi, playing on the nodal points, various instrumental preparations, using cluster techniques, or spatializing the instruments in any number of ways.
Laurel (2019) by Dr. Shane Monds

To test and apply the knowledge of this document, composer Shane Monds wrote a piece for Old Granddad. Though he had access to this document and sound files, Monds did not have access to the instruments. The resulting piece, titled *Laurel*, uses the full Old Granddad ensemble, plus the oxygen tanks and bass drum from *La Koro Sutro*. It is attached in Appendix 1 and described below.

9.1. Conception and Background

Shane Monds spent four months in India doing a documentary and musicology project on changing aesthetics, trends, and reception history in North Indian plucked instrument forms in the Fall of 2018 and lived with a scientist named Mandar Phatak. Mr. Phatak is a cell biologist and an accomplished professional vocalist with an interest in music cognition research. The two met at a conference where Mr. Phatak was discussing experiments in finding the tonic note in a pentatonic scale when the tonal background (in this case, a drone) is shifting. Depending on the drone, the same collection of pitches can be heard with several different tonic notes. In Western music, an example of this would be a C-major
pentatonic collection (pitches C D E G A), which might also be heard as an E-minor pentatonic collection (pitches E G A C D) depending on the background context.

Phatak's interest in pentatonicism was serendipitous for Laurel. Many nights of discussion between he and Monds culminated in the formation of a system that played on pentatonicism within a changing framework, while also referring to specific ragas. In Hindustani music, the theory of modal organization is called moorcchana. Vishnu Bhatkande (1860-1936), an eminent musicologist and guru of Indian classical music, sought to organize the many different ragas by creating a simplified taxonomy for theoretical or educational purposes. Though ragas typically contain melodic contours, tendency tones, and ornamentation, each collection of pitches can also be expressed in a global way, in ascending order and without any additional musical or cultural information; this is called thaat. Each of the ten thaat theorized by Bhatkande is also a pentatonic superset. Within the ten thaat (plus two additional modes), it is possible to contain Old Granddad’s D-major pentatonic collection inside modes that start on each of the twelve chromatic pitches. In short, this is a way to make Old Granddad (with its fixed pitch set) a modulatory instrument. The way Monds chose to realize this modulation was through the addition of an electronic component – a tape part consisting of modified samples of Old Granddad itself. In Indian music, the drone (or tanpura) stays static while the raga is played over it. In Laurel, the Old Granddad instruments play a static set of pitches with a shifting tape ostinato that helps it achieve the other modalities (including filling in necessary pitches).
9.2. **Formal Structures**

There are ten *thaat* in use, as well as two more rotated iterations of the pitch set to complete the full chromatic set. These twelve modes are arranged in a circle of fifths progression that starts on an A-centric raga called “durga” (which is in Kalyan thaat) and finishes on a D raga called “bhoop” (which is in Bilawal thaat). The Indian raga names, as well as their “tonic” pitches and close Western correlates are presented (in the order in which they appear in the piece) in Figure 9.1. The construction of each *thaat* is found in Figure 9.2.
**Figure 9.1 – Procession of ragas throughout Laurel**

<table>
<thead>
<tr>
<th>Tonic note: A</th>
<th>Raga: Durga</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Thaat (parent mode): Kalyan (Lydian)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Tonic note: E</th>
<th>Raga: Megh</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Thaat (parent mode): Khamaj (Mixolydian)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Tonic note: B</th>
<th>Raga: Bhrampalasi</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Thaat (parent mode): Kafi (Dorian)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Tonic note: F</th>
<th>Raga: Malkaus</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Thaat (parent mode): Bhairavi/Asavari*</td>
</tr>
<tr>
<td></td>
<td>(Phrygian/Aeolian)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Tonic note: G</th>
<th>Raga: Komal Rishab-Asavari</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Thaat (parent mode): Bhairavi (Phrygian)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Tonic note: G</th>
<th>Raga: Gujari Todi - koral mishad**</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Thaat (parent mode): none **</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Tonic note: D</th>
<th>Raga: Miyavi Todi</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Thaat (parent mode): Todi</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Tonic note: B</th>
<th>Raga: Purviya Dharmashree</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Thaat (parent mode): Poorvi</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Tonic note: F</th>
<th>Raga: Purviya</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Thaat (parent mode): Marwa</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Tonic note: C</th>
<th>Raga: Yaman</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Thaat (parent mode): Kalyan (Lydian)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Tonic note: G</th>
<th>Raga: Shantara</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Thaat (parent mode): Kalyan (Lydian)</td>
</tr>
</tbody>
</table>

used through a transition only

<table>
<thead>
<tr>
<th>Tonic note: D</th>
<th>Raga: Bhoom</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Thaat (parent mode): Kalyan/Bilawal*</td>
</tr>
<tr>
<td></td>
<td>(Lydian/toriani)</td>
</tr>
</tbody>
</table>

* Malkaus and Bhoom are two ragas that can be a subset in two different thaat and are classified according to V. Bhatkhande’s taxonomy
** This transposition with G as tonic falls onto a parent scale not listed in either Hindustani theory or Western theory but aligns with the raga, Gujari Todi with a flattened seventh (rather than Gujari Todi’s typical natural seventh). Hence, a "new" raga: Gujari Todi - koral mishad
Ten Thaats of North Indian (Hindustani) Classical Music

Rotated so tonic = C

Bilawal - Ionion

Kalyan - Lydian

Khamaj - Mixolydian

Bhairav - “Double harmonic major mode”

Pritvi - no Western equivalent

Marwa - no Western equivalent

Kafi - Dorian

Asavari - Aeolian (natural minor)

Bhairavi - Phrygian

Tooli - no Western equivalent

Each thaat transposed so to have pentatonic collection: D, E, F, A, B (or enharmonic equivalents) present

Figure 9.2 – Thaat containing Old Granddad pitches
The piece is similar to an Indian genre called *raga-malika*, which means “a link-chain of *ragas.*” In a modern *raga-malika*, a player will shift through many different ragas in one evening-long piece as a show of their creativity. In the early twentieth century, this chaining could take place across several evenings and was a way for performers to keep the audience’s attention over the span of several days. Though the similarity to the *raga-malika* in Monds’s piece *Laurel* is evident, this was merely a coincidence that occurred after the initial conception of the modal and mathematical possibilities set out by Monds and Phatak.

*Laurel* is approximately thirty minutes long and is in eleven parts, with each part divided into two phases. Each part capitalizes on a different raga from the above progression, though the G modality (*shankara*) is not given its own section due to its aural similarity to *bhoop*. It is used as a transition from *yaman* to *bhoop*. Within each part, there are two phases. The first phase presents the tape part in a stable drone that cements the current pitch centricity. The second phase is unstable, use microtonal elements to shift to the next centricity. The eleven parts can be further grouped into two ‘movements’: parts one through seven contain a frenetic introduction and a lead up to the core melody of the piece in part seven, using different methods of masking and clouding fragments of the melody throughout; the second movement is a gradual rhythmic acceleration through the finale.

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194 Ibid 33-35
Part one begins as soft as possible and as fast as possible – a “cloud” that gradually slows down into its second phase. Part two introduces a melodic fragment that will form the core of a rondo. Its primary technique is an asynchronous canon, wherein the players may start at a time of their choosing and play at a speed of their choosing. This also dissolves into another cloud. Part three is a sparse duet between the Bass and Baritone Keys over the raga Megh. Part four uses the melody from Part two in strict three-part canon, where the voices move seven beats apart from each other. There is a use of interstitial notes (F#) in this movement that establishes a quasi-pedal tone. These F#s gradually become C#s, which establishes the tonality for part five. Part five is another asynchronous cloud using a fixed rhythmic cell. Part six is a sudden explosion of the melodic materials from part one, but this time at fortissimo and over the G# drone. This is the mode unstable modality in the piece and is used in juxtaposition with the original melodic elements. Part six phase two ends on an F# tremolo leading into a simple unison statement of the primary melody in part seven.

The melody in part seven is only shown in its complete form at this moment. Previously, it has only been played in fragments or in the asynchronous clouds. After this stark statement of the melody, the tape drone plays solo for thirty seconds in phase two. This is followed by a Baritone Keys solo in part eight. The second phase of part eight introduces recurring upbeats on G. This is the first time that G has been heard in the piece in any prominent way. The upbeats begin the rhythmic acceleration to the end of the piece. Part nine is centered around a syncopated and driving melody in the Bells. This leads to faster rhythms in part ten and an eventual
virtuosic solo in part 11 on the Soprano Bells. This final solo over *bhoop* uses the jhala technique that Harrison also favored. The piece is primarily notated in cells and boxes, like some of the works of Lutoslawski, Riley, or Wolff.

### 9.3. Use of Microtonality

The electronic component for *Laurel* is a tape part that is derived from samples of Old Granddad #4. Monds used digital manipulation to modify these pitches to work in a microtonal environment. Much of his work uses 7-limit intonation, especially the concept of a seventh undertone. This undertone idea creates a step that is a ratio of 8/7 from the first pitch (modern equal temperament uses a ratio of 9/8). This step is 31.1 cents sharp from its nearest pitch. For example, the use of this system starting on the pitch A would produce a B+31.3 cents. This B can also be conceived of as 1/6 of a tone higher than a normal B. If another step is produced above that, it would be a C#+62.6 (2/6 of a tone). If a third step is produced, it would be D#+93.9 (3/6 of a tone). This leaves only a slight comma (6.1 cents) to complete the semitone.

Shane Monds has created a progression where each of these pitches becomes a new temporary harmonic root: A to B+31.3, to C#+62.6, to D#+93.9. The final comma is covered by slow digital glissando to the new tonic E. Above this foundational bass, there is a voice B from the bass B+31.3 to the highest voice. This pitch is then gradually altered through glissando until it arrives on a true B above
the final note in the bass. This combination of E in the bass and B in the top voice is the new open-fifth drone for part two.

**Figure 9.3 – Drone progression from *Laurel*, electronic component**

This process repeats in each of the phase two transitions to new tonal centers and is gradual enough to appear smooth and organic. Within this microtonal concept, there is also a similarity to “shepherd tones,” wherein audio is digitally altered to produce an auditory illusion of continuous and gradual movement.

### 9.4. Conclusion

With any instrument comes a restriction of some kind; in this case, the restriction is the explicit definition of pitches as defined by mathematical ratios. For a composer fluent in the use of microtones, restriction to pentatonic and diatonic contexts may have proved limiting. But it was by happy accident that Monds was
living with a scientist studying pentatonic collections, while studying raga and \textit{moorcchana}. Further, given the progression that was used to modulate the \textit{thaats}, the “tonic” notes were related in a $3/2$ ratio, or a 3-limit system. This meant that the \textit{thaats} moved by 3-limit motion, the instrument was constructed in a 5-limit system, and the tape part was in a 7-limit system. The piece ended up being written in 11 parts, which is the next prime number (and the next possible -limit system, according to Harry Partch). There is also a large-scale motion from V to I from the start of the piece to the end. All these mathematical coincidences became an attractive subject for Monds to take on.

This document proved useful through its quantitative information, especially tables and graphics, that relayed specific pitch information that could be compared with Indian \textit{thaat} and modified to be used microtonally in the electronic component. Monds thought the audio files were especially useful to construct the electronics because, “to create a modulating piece with a single set of instruments, you need to have a congruous set of sounds that allows [you] to ‘interfere with the psyche of the audience’s tonal pitch perception.’”\textsuperscript{195} If it were a solo flute playing a fixed pentatonic collection and a microtonally-modulating tape of a piano, the flute would always seem paramount and the tape part would always seem detached from it. By using homogeneous sound types, the modulation seems organic and a natural outgrowth of the instruments themselves. As Dr. Monds said, “It’s always attractive

\textsuperscript{195} Dr. Shane Monds, in discussion with the author. February 2019.
to take something and make it more fully what it already is, in order to blow up what it has been."\textsuperscript{196}
"Every time I came in to see him, I was inspired about how open things were and how being a composer allowed you the opportunity to think about everything in the world... the definition of what I was able to get into a piece of music grew much larger." – composer David Lang, on studying with Harrison at Stanford University in 1974-75

Lou Harrison is sometimes disparaged as a composer who exiled himself from the modernist musical world in which he was destined to be a part, only looking backward in time or across the Pacific Ocean for musical materials. But, as Peter Garland puts it, “stepping out of, and beyond modernism has been one of the most important and radical acts any composer this century has taken.” Harrison used disparate musical resources from the ancient classical world, from China and Indonesia, from India and Persia, and fused them with his own personal experiences. His early work led him to expand the world’s musical palette beyond strictly pitched materials to ‘noise instruments’ like tin cans and brake drums. In the middle of his life, when many composers might be resting on their well-earned status, he dove head-first into the thorny world of microtonality and just intonation. In the end, he managed to create a body of work that respected and revered music from many world traditions, without ever seeming to short-shrift any of them. Old Granddad, however, remains an oddity. It is largely unknown to the musical world.

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outside of its role as a curiosity akin to Harry Partch’s Cloud Chamber Bowls or Diamond Marimba. Indeed, most general history texts refer to Old Granddad and Harrison’s later Javanese-inspired instruments almost interchangeably, despite their culturally and musically significant differences.

The preceding chapters have been devoted to a detailed discussion of Harrison’s life experiences leading up the creation of Old Granddad, his personal and musical influences, as well as a thorough description of the instruments and their tuning. All the materials used for construction were readily available in Central California in the 1960s. All the information about tuning and temperament was available, if not ancient at the time that Harrison and Colvig utilized it. These varied sources came together to create something greater than the sum of their parts. It is my hope that this information should be valuable to the reader as a statement of Lou Harrison’s compositional output, and also enough to begin the construction of new instruments.

The making of the Old Granddad instruments and the narrative surrounding the creation, rejection, and revision of *Young Caesar* paint a picture of a composer with a map of the world drawn on his face, newly invested in the place he grew up, and finally in possession of some measure of personal peace. The capricious experimentation he and William Colvig undertook became a lesson for their colleagues, who carried the flame for American Gamelan for the rest of their lives. The history of the revision of this work show an artist convinced of the righteousness of his cause. *La Koro Sutro* stands as a monument to humanitarian
cooperation among cultures. It brought Old Granddad out of the opera pit and into
the spotlight and remains as a truly unique spectacle in choral literature. The *Suite
for Violin and American Gamelan* showed how an instrument of such sonic power
could be used for gentle chamber music and pointed toward his better-known
innovative pairings with Javanese gamelan. Harrison created such a cohesive work
out of such disparate musical sources that it is still being emulated by contemporary
composers.

Ultimately, it is my wish that this document spur creation. New instruments
mean new opportunities to see *Young Caesar* performed as an expression of mid-
twentieth century counterculture; to see the infrequently performed *La Koro Sutro*
as a modern choral masterwork; to experience the sublime dialogue in the *Suite
for Violin and American Gamelan*; or, ultimately, to compose new works. It is my
hope that my analysis of the composition and orchestration techniques in Harrison's
works for Old Granddad have shown how this creation might occur (as evinced in
Shane Monds's *Laurel*), as well as provide the resources necessary to shine a light on
a path forward to a new repertoire for these instruments.

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198 Patrick Grant Gardner, “La Koro Sutro: Historical Perspective, Analysis and Performance
Considerations” (PhD dissertation, University of Texas at Austin, 1981), 238-239.
Primary Resources

Alit, Dewa. E-mail message to author. December 18, 2018.


Lowenstein, Marc. Discussion with author. August 2018.


**Secondary Resources**


Chacko, Rachel E. *Beyond the myth of East-West hybridity: An analysis of Lou Harrison’s works for gamelan and Western instruments.* Ph.D., University of Colorado at Boulder, 2010.


http://latitudes.nu/the-influence-of-gamelan-on-western-modern-music/ 
(accessed on 2 December, 2017).

Gardner, Patrick Grant. La Koro Sutro: Historical Perspective, Analysis and 


Keislar, Douglas et al. “Six American Composers on Nonstandard Tunings.”
Perspectives of New Music 29, no. 1 (1991): 176-211.

Kostelanetz, Richard. “A Conversation, in Eleven-Minus-One Parts, with Lou 

Lindsay, Jennifer. Javanese Gamelan, Traditional Orchestra of Indonesia. Singapore: 

16-27.


Miller, Leta E. “The Art of Noise: John Cage, Lou Harrison, and the West Coast 

Miller, Leta E. and Fredric Lieberman. Composing a World: Lou Harrison, Musical 

Miller, Leta E. and Fredric Lieberman. Lou Harrison. Urbana, IL: University of Illinois 


Miller, Leta E. “Lou Harrison and the Aesthetics of Revision, Alteration, and Self- 

Miller, Leta E. “Method and Madness in Lou Harrison’s Rapunzel.” Journal of 


Swed, Mark. “This 'Young Caesar' has finally conquered.” *The Los Angeles Times*, June 15, 2017.


**Pedagogical Resources**


Appendix A: *Laurel* (2019) by Dr. Shane Monds

SHANE MONDS

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**LAUREL**

for percussion octet, "Old Granddad," American Gamelan
with electronic fixed media

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FULL SCORE

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2019
NOTES ON THIS WORK:
This work was written in December and January 2019 during a residency in Mumbai, India. I was fortunate to have been living with an Indian classical vocalist, percussionist, and research scientist, Mandependency, Phatak. Over the course of many discussions, we discussed particular ragas and their nature in frequently being aspects of the panatonic collection. Depending on one’s tonal frame of reference, that panatonic set could be framed in a number of ways. In fact, prior to this work, Mandependency Phatak had already created a music cognition experiment demonstrating this principle.

When asked to write for the “American Gamelan—Old Granddad,” I was immediately drawn to this discussion. The overall framework of this piece exploits the simple panatonic card at times distinct collection of Lou Harrison’s gamelan. Audio samples of the gamelan were used in creating a fixed media audio that extends the appearance of chromaticism in the gamelan. The fixed media creates a drone-like ostinato throughout over different open fifths successions. In each “Phase” of the piece, the second half of the phrase slowly “modulates” via a specific monotonous progression. This is a very direct, sequential, monotonous progression that carries the drone pitches to the next “stable” set, a perfect fifth away from the previous phase. The new drone becomes the new “tonic” for the next phase and gives a new frame of reference for the instruments above. This progression is indicated only for the first instance from Phase 1 to Phase 2, but continues in the same manner (although transposed) in each phase.

The title Luridr is a reference to the garland that adorns the head. Each leaf occupies a different place along the garland, and although is the “same” as all the other leaves, it gives a slightly different appearance based on simple biological variation and placement along the garland. Similarly, each of the phases uses the same note of the gamelan, but its placement against the external framework (the fixed media drone) gives it a different impression.

A complete explanation of this work is given in the dissertation by Brady Spitz: Lou Harrison’s “Old Granddad”: A Composer’s Guide for which this piece was composed.

PERFORMANCE NOTES:
Each phase is comprised of two halves: the first over a stable set of pitches, and the second half over the “progression” to the next set of drone pitches. When performing, the conductor should use a clock or leave a clock on the playback control of the fixed media that can be seen by the conductor. Each figure in the score either an indefinite number of repeats—where the conductor will signal the duration on the next figure. On these, there is a specific number of repeats where the number given (x or Nx) indicates the number of times the item is to be played.

The music tanks are to lie with sticks and should never be too loud.

The bass drum is frequently instructed to be played lightly with hand, either with a resonant stroke by the middle and ring finger, or with a flat non-resonant stroke of the palm—the latter, indicated with an “X” in a nothograph.
for Brady Spitz

with special thanks to Mundar Phanak
LAUREL

for percussion octet, "Old Grankiad," American Gamean with electronic fixed media

SHANE MORIN
(2019)

 Phase 1

Phase 1, part 2: fixed media transcription (see performance notes for details)

Phase 2

Phase 2 (continued)

Modulation in fixed media pitches to same as phase one, transposed down a perfect fifth and continues similarly for each section except the final phase. See initial performance notes for full description.

1) Phrase 1 repeats are indefinite in number so as to fill the given duration. Players may gradually increase the two segments outlined. In a full version from one group to the next.
*) In the second half of Phase 4, the two soprano bells may play either C5 or F5, gradually substituting all F5 to C5s.
LAUREL | 12

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(FIXED MEDIA MODULATION PROCESS)
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Appendix B: *Ameriki* (2018) by Dewa Alit

Below is a facsimile of the first ten pages of the score to *Ameriki*. To preserve composer’s prerogative and intellectual property, the remaining sixty-seven pages have been omitted.
Appendix C: *Kenong (1990, trans. 2018)*
by Jody Diamond

KENONG by Jody Diamond (What’s App Version, August 2018)
Summary of process:
1. Enter one at a time, no pulse, listening a few times to each new cluster

2. When all are in, leader signals change to pulse. Due to long resonance, probably not too fast

3. Using pulse, and Ziporyn Distribution of right and left hands, make the following divisions: 2, 3, 4, 6, 12. Listen to each before moving on.

4. Continuing pulse, drop out one by one.

5. Last note play for a while.

6. Re-enter one by one, using Ziporyn Rhythmic Formula of beat plus one and a half.

7. Continue until all notes have been added. Listen.

8. Leader switches to full pulse, others continue ZRF. One by one, switch to full pulse.

9. In contrast to #2 above played softly, when all return to full pulse, gradually increase to maximum volume. At signal from leader, stop; let last cluster ring. Leader may give visual signal for end; if preferred, leader may drop penultimate note as signal.
This piece has been transcribed for the pitches of the Tenor Bells as a part of the MIT Old Granddad Project (see Chapter 7.4)