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THE EVOLUTION OF HARRY PARTCH'S MONOPHONY

by

RICHARD M. KASSEL

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Ann W. Myers — Executive Officer

Joel Lester

David Olan

Ben Johnston

Carol Oja

Bruce Saylor

THE CITY UNIVERSITY OF NEW YORK

FOREWORD

I wish to thank:

Professor Danlee Mitchell, president of the Harry Partch Foundation and longtime associate of the composer's, for permission to quote from various Partch writings. His cooperation and interest have been a great boon to me and others interested in Partch research;

Professor Ben Johnston, also an associate of the composer's, who has generously shared his memories, information, and insight with me for a decade, and who served on the defense committee although he is not a member of the CUNY faculty;

Professors Joel Lester and David Olan, readers of the essay and composition portions of this dissertation, respectively, for their patience and efforts, and their participation on the defense committee;

Professors Carol Oja, Bruce Saylor, and Barbara R. Hanning (chair), who also participated on the defense committee and offered fresh viewpoints and careful readings during the final stages of this process;

Those who kept me fed, housed, and able to pursue this degree by employing me over the years, notably the City College, CUNY, RILM Abstracts of Music, and The Town Hall Foundation, Inc.;

My family, friends, and colleagues, who offered moral support, wisdom, laughter, empathy, and just plain love to me when I needed it (which was often);

And those who have in any way made this work easier through their research or their direct assistance to me. Some of these people are mentioned in the essay, others are not; but I am grateful to all.

Two thoughts:

I began my doctoral studies in 1982, and became "ABD" in 1986. Except for two years off, I have been enrolled at CUNY the entire time. I produced a first draft in 1989; several more were to follow before my readers and I felt it was time to defend. To say that the dissertation portion of my doctoral studies was a struggle is to state the obvious; but most of my reasons for the slow progress were not much different than for others: making a living in an high-priced city, being associated with a university with extremely limited (and shrinking) resources, and a more than average number of personal crises. It was never a question of ability.

Here it is, then, signed, sealed, and delivered. If you are struggling to complete a degree or something else important to you, take heart - - it will happen when you can focus on the task at hand, put off worrying about the great unknown (i.e., the future), and defy your demons and enemies, real or imagined. Love your work, and you'll have an easier time loving yourself, and therefore getting finished.

A second thought:

Dedications are a tricky business at best. My first composition teacher warned me that they have a way of getting old in a hurry, and he certainly got that

right. But I would be untrue to myself if I did not admit that the loss of family and friends through death has left many sad places in my life, and it is at crossroads such as this that one reflects upon them with even greater sorrow than usual. If I tried to list them all, I would miss one or two by accident, and never forgive myself for the omissions; I hope their souls will be content with their names in my memory and their lives in my heart.

One of these individuals deserve a special, long overdue mention. Laurence R. Singer went to school with me for six years prior to college. When I met him I was an unhappy piano student who had grown up on classical music and was only just beginning to appreciate mainstream rock. Stuck out in a New York suburb like me, Larry encouraged me to become more involved with music. We formed a band, during whose short existence it became clear that I couldn't hear nor play the most basic chord progressions without Larry's tough training methods. At a birthday party, he hired his guitar teacher to play; while most of the participants ignored him, Larry and I listened and watched his fingers fly over the strings. We endured school orchestra together (he was a decent violinist, I a walking viola joke); worse, we had to suffer through the social inadequacies of a single-sex school together.

But I have dedicated this essay to him for a more direct reason. Larry opened more musical doors for me than anyone before or since. Whether it was early Grateful Dead, John Coltrane, gamelan music, Art Blakey, the Godz, Roland Kirk, or the Mothers of Invention, Larry seemed to know them, and he was always eager to share his discoveries. Among them, if I recall correctly, was some guy with a weird scale and odd instruments he built himself, producing music and sounds unlike any I had ever heard. For that moment of discovering Harry Partch, I owe an incalculable debt to my friend.

Larry was very emotional and expressive; it was not always easy to negotiate the intense combination of love, anger, and laughter that he offered. Soon after we graduated and went off to different colleges, Larry became ill. A few summers later, he got in touch with me, and we spent a small amount of time together at his house. The changes in him were shocking; he could only play music for a few minutes before his vulnerable nervous system took over. At least we still had the pleasure of listening to Stevie Wonder. I lost touch with him again; it was by reading an alumni magazine a few years later that I learned he had died in his twenties, on my birthday.

I have honored Larry's memory anonymously elsewhere, but here I can thank him openly for teaching me to listen to any music, regardless of how others' (or even my own) prejudices might try to limit my explorations. Since high school, I have acquired any further musical literacy I have by continuing to listen, impulsively at times, methodically at others, to whatever I wanted to. It is this experience that brought me closer to Partch, and a series of "signs from heaven" that convinced me to write a doctoral essay that shed a bit more light an extraordinary musician who has alternately bemused or frightened too many academics. The degree to which I have been successful I owe to Larry. This one's for you, Mr. Singer.

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ONE: An Introduction to Monophony

A. Background

Harry Partch (1901-74), composer, instrument builder, and iconoclast, was one of the most original and influential musicians in twentieth-century America. Over a period of fifty years, he created a body of work that challenged not only the prevailing aesthetic of the "serious" musical mainstream but its tuning system. Rejecting the principle of equal temperament taken for granted in European (and therefore American) musical culture, Partch developed and implemented an alternative system based on the ancient principle of just intonation, in which tuning is based on the division of strings into equal parts and the relationships between these parts. Years of research and experiment (ca. 1923-47) resulted in a theory Partch called "Monophony."[1] Monophony is built on the idea of derivation from a fundamental pitch, which Partch labeled 1/1 (the unison ratio in just intonation). Instead of producing tetrachords and scales as the ancient Greek and Renaissance theorists had, Partch devised hexads (six-note consonant "Tonalities"[2] based on the odd-numbered ratios 1/1, 3/1, 5/1, 7/1, 9/1, and 11/1, as well as their inversions[3]) as

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[1] All references to Partch's tuning system are capitalized (Monophony), to distinguish them from a "monophonic" texture.

[2] All references to Partch's hexadic system are capitalized (Tonalities), to distinguish them from equally tempered major and minor "tonalities."

[3] The individual ratio components of hexadic Tonalities are called "Identities" (always capitalized) by Partch and labeled by their numerator or denominator, depending on the Tonality type being cited.

the bases of his system. In turn, each ratio within a hexad could itself act as a fundamental, producing a potentially infinite lattice of hexads. In order to build or adapt instruments for the "Monophonic music" he was already composing by 1930, and conceding the limitations of mortality, Partch decided upon a 43-tone gamut that contained fourteen complete Tonalities and fourteen others with at least the basic triad (1/1, 5/1, 3/1 or its inversion) present.

While Partch was composing and adding new instruments, he was also pursuing another element important to Monophonic music: the expression of meaning through a clear presentation of the text and the avoidance of modern, vibrato-laden singing, which he associated with European music and its domination of American music. Partch's preferred vocal style, which he called intoning, was a kind of speech-song not unlike Schoenberg's Sprechstimme, but used in a less extreme manner. Partch first applied this technique to classically poetic texts; but in the mid-1930's he saw that he could help free American music from its inherited European past by applying speech-song to the vernacular, natural speech of American people. He would find both types of application useful throughout his compositional career.

An explication of Monophonic theory, its historical background, and its relationship to non-just systems formed the central portion of Partch's treatise, published in 1949 as *Genesis of a Music* (Partch 1949; hereafter *Genesis*). From then on until his death, Partch concentrated on composition, instrument building, and performance; his Monophonic theory, designed to provide a solid basis for his

creative work, received little further attention.

Why did Partch need to go outside the mainstream so definitively? One answer:

> Before I was twenty, I had tentatively rejected both the intonational system of modern Europe and its concert system, although I did not realize either the ultimate scope or the consequences of that rejection. In 1919, as I recall, I had virtually given up on both music schools and private teachers . . . When I was twenty-one I finally found, in a library, the key for which I had been searching, the Helmholtz-Ellis *On the Sensations of Tone*, and I began to take wing. (Partch 1974, vi-vii)

From that day in 1923, Partch proceeded slowly. By 1925 he had written a string quartet in just intonation; two years later, he had begun work on a draft of a treatise entitled *Exposition of Monophony* (Partch 1928/33; hereafter *Exposition*). He designed the first Monophonic instrument (the Adapted Viola)[4] in 1930, the year he composed his first Monophonic music. *Exposition* went through several more drafts and title changes; progress on it was aided considerably by research Partch did at the British Museum (now Library) in 1934-35, but was hindered enormously by his nomadic lifestyle during the Great Depression. In the 1940's, Partch returned to composition, instrument building, and work on the treatise; settling down in Madison, Wisconsin for a few years (1944-47), he was able to complete *Genesis* in 1947, with its publication by the University of Wisconsin Press coming two

[4]A photograph of the Adapted Viola appears in Partch 1974, 199.

years later (Partch 1949). The mixed reception was due in part to the untraditional and therefore "difficult" approach to temperament taken, given most people's unfamiliarity with ratios as pitch determinants; the relative obscurity of Partch and his music at the time was another contributing factor.

During the 1950's and 1960's, Partch's reputation grew considerably for several reasons. During this period, he shifted his compositional efforts from mostly smaller-scale song-like works to more ambitious theatrical pieces, combining varying degrees of music, drama, and movement, and with his growing number of instruments always included as part of the setting. The success and notoriety of these works was reinforced by the release of a number of films by Madeline Tourtelot featuring Partch's music. Several recordings of Partch's music were issued, at first exclusively by the composer on a mail-order basis, later by commercial labels. All these factors led to considerable attention in the press and belated recognition in some musical circles. Finally, the long out-of-print *Genesis* was expanded and issued in a second edition by Da Capo Press (Partch 1974), only a few months before Partch's death.

There have been many difficulties in promoting the Partch legacy: the existence of only one instrumentarium (now located in downstate New York); the limited number of recordings in print, and the need for modern or

even first recordings of several works; and the tablature-type scores, none of which are in print.[5] To date, most writings on Partch that deal with the theory at all have tended to focus on the "immensity" of the 43-tone gamut. Some writers have explained the Monophonic system in paraphrases of Partch's treatise or on their own terms (Augustine 1979; Johnston 1966, 1967; Mandelbaum, 1961; Rasch n.d.; Woodbury 1967). Others include discussion of Monophony in conjunction with studies on individual works (Cameron 1982; Gilmore 1992; Hackbarth 1979; Nicholl 1982). In *Genesis*, Partch himself offers testimonials on his predecessors' work on intonation, but Monophony itself is described more as a *fait accompli* than as the result of more than two decades' struggle; the process by which Partch developed Monophony is only hinted at.

B. Goals of This Essay

This essay describes the approximately twenty-five-year process by which Harry Partch developed Monophony for his own compositional use. The primary focus is on the period between 1927 and 1933, during which Partch wrote several drafts of the unpublished *Exposition* and composed his first Monophonic music. Through a collation and interpretation of direct

[5] This situation will be improved by the issue of a transcription and facsimile edition of Partch's *Barstow* (1941-68), edited by the present author, in the COPAM-MUSA series published by A-R (Richard Crawford, editor-in-chief). At least one European publisher is considering issuing Partch scores.

and indirect references from these and other manuscripts and resources, Partch's career as a theorist will be reconstructed. The essay also covers events of the 1930's that influenced the less theoretical, more aesthetic aspects of Monophony. Partch's theory took final shape in the 1940's, at the same time as his renewed compositional vigor, breaking a silence lasting from 1933 until 1941.[6]

The controversies surrounding the man and his aesthetics, the arguments for and against the validity of Monophony, the diametrically opposed evaluations of his music, the historical role Partch played and continues to play in twentieth-century music, his relationships with contemporaries who are considered fellow members of the "American experimental tradition" - - all these remain for present and future discussion. At the moment, there remains a pressing need to present, as completely as possible, the essential elements of the history, so that future discussion will be more firmly based. This essay is therefore not primarily a critique of Partch the composer, his sources, his advocates, or his critics.

C. Just Intonation and Monophony

Partch defines just intonation as follows:

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[6] This is the "official" dating of Partch's "silent" period; in my view, the musical journal "Bitter Music" (1935-36) should be considered a legitimate work, despite its unusual origins, non-public performance mode, and reliance on the equally tempered piano (see Chapter Six).

> a system in which interval-and scale-building is based on the criterion of the ear and consequently a system and procedure limited to small-number ratios; the initial interval in Just Intonation is 2/1,[7] and stemming from this are the wealth of musical intervals inherent in small-number tonal relationships. (Partch 1974, 71)

This definition focuses on the ratio aspect of just intonation, the numerical expression of the relationship between two pitches tuned on "the criterion of the ear;" that is, "the term 'just intonation' refers to the consistent use of harmonic intervals tuned so pure that they do not beat" (Lindley 1980, 9/755). The ratios correspond to the frequency numbers of pitches; they can be demonstrated on the monochord by the comparison of different string lengths, as well as aligned with the constituent partials (overtones) of a given pitch.[8] "Small-number" refers to the size of the integer factors making up the ratios, thereby indicating relatively simple frequency relationships; these are the essence of Partch's system of just intonation.

1/1, then, represents both the unison (a pitch) and the relationship between two pitches (an interval), in this case identical. 2/1, the "initial interval" of just intonation, represents the "octave," a term Partch avoided because of its associations with keyboard distances. As with 1/1, 2/1 represents a pitch and an interval. 2/1 may also be interpreted as a factor of 2; thus, any ratio can be

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[7] Throughout this essay, ratios will be expressed with a slash (2/1) as Partch did, rather than with a colon (2:1).

[8] On the monochord, a string is divided by successively higher integers, and the resulting string lengths are compared; so, when a string is divided by 2 (in half), the ratio of the open string to the half-length string (2/1) represents the interval between the two tones sounded as a result of the procedure. In the overtone series, the partial numbers are used to determine the ratios (and therefore intervals) involved. So a fundamental C (partial 1) and the C immediately above it (partial 2) are an octave apart.

reexpressed through multiplication or division by 2/1 without a change in pitch class; in equal temperament this concept is called "octave equivalence." It is convenient to express all ratios within the octave between 1/1 and 2/1, that is, in "scale order."

In practical terms, just or "pure" intonation has traditionally taken two forms. One is Pythagorean tuning, in which a cycle of twelve untempered "perfect" fifths (3/2's) results in a comma (difference) of 23.5 cts. (where 100 cents equals a tempered semitone) between the initial 1/1 (e.g., C) and the final 531441/524288 (B-sharp). This kind of tuning, advocated from antiquity well into the Renaissance in Chinese, European, and, later, Arab theory, is associated with the music of the Middle Ages.

The second "pure" tuning, as defined by Barbour, is "a system based on the octave (2/1), the pure fifth (3/2) and the pure major third (5/4)" (Barbour 1953, x). Beginning in the Renaissance, theorists adjusted the Pythagorean scale to allow for the more consonant major thirds necessitated by the harmonic practice of the period, rather than the Pythagorean major third (81/64). Designed for an essentially twelve-note scale and, eventually, the keyboard that embodied it, these tunings permitted certain just or pure triads as well as other out-of-tune ones. As the need for more "well-tuned" triads and scales developed in Baroque music, the concept of temperament eventually came to dominate, first in the form of meantone systems and later as equal temperament.

Partch recognizes a "third stream" of just intonation: open-ended systems

which require the adapting or building of instruments that will provide as many just intervals as possible, rather than forcing just intonation into an established but limited framework such as the twelve-note chromatic keyboard. While theorists had speculated on expanded scales for centuries, most of the serious attempts before Partch at building instruments to accommodate such scales took place in Great Britain in the 19th and early 20th centuries. Some of these keyboard instruments were based on expanded equal temperament (e.g., 53 notes to the octave, or "53-equal"), but other used various just tunings as their basis.[9]

All of these systems involve a mere fraction of the just-intonation fabric, for much as ratios can be infinitely multiplied, so too is just intonation an unlimited system. Recognizing this, Partch gradually developed a system based on the expansion from "unity," or the fundamental 1/1, which serves as the starting point for any pitch gamut evolved by multiplying small-number ratios systematically. (Partch calls any such system Monophonic.) The larger the odd-numbered ratio factor, the more complex the potential gamut and the more extensive the degree of consonance; Partch's chosen ratio factor, or "limit," is 11. Such an approach allows for more consonant harmonic possibilities than the Pythagorean system and greater flexibility than the various 12-tone chromatic systems; the primary loss by comparison with equal temperament is the latter's ability to transpose readily within a limited gamut.

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[9] For descriptions and photographs of some of these instruments, see Partch 1974, 391-395, 440-447. Partch saw many of them (and met one of their inventors) during his 1934-35 sojourn in England.

In order to build an intrinsically compatible instrumentarium (including several fixed-pitch types) to play his music, Partch limited his "official" gamut to 43 tones to the 2/1. Those who later wrote about Partch's work would often emphasize this detail to the exclusion of more important information about the theory, the instruments, or the music itself; Partch later referred to the 43-tone scale as "the one-half truth of the one-fourth factor" (Partch 1991, 197). The choice of 43 tones was simply a consequence of a particular application of Monophonic theory, and had no further musical relevance; indeed, the number of tones in the Monophonic scale went through several adjustments during the early years of the theory's development.

Partch developed his "revolutionary" intonation theory in an evolutionary way. While he based this theory from the outset on just intonation (ca. 1923), and Monophony was conceptually in place by about 1928, his descriptions of the system reveal changes of perspective over time. Most striking is how an early emphasis on the overtone (and its inversion, the phantom "undertone") series gave way to a focus on the derivation of the system from 1/1 and its harmonic potential. Within the treatise there are also comments regarding the place of Monophony in musical theory at large as well as touches of Partch's personal philosophy.

But before the history of Monophony is explored, the early years of Partch's life and the important influences at the time must be discussed.

TWO: Biography to 1923: The Helmholtz Factor

This chapter draws from published and unpublished materials on Partch's life, leading up to his discovery of Helmholtz and Ellis's major work on musical acoustics. The biographical sketch is meant to provide context for Partch's search for alternatives to the musical norm; it is in no way intended to be exhaustive. The chapter concludes with a discussion of Helmholtz and Ellis, and those ideas from their book which were to prove vital to Partch's musical development.

A. Sources for Biographical Information

Both editions of *Genesis* contain details about Partch's life and the influences on his work (Partch 1949; Partch 1974); the second edition, published only a few months before his death, includes chronological listings of his compositions, major performances, recordings, films, and instruments, along with bibliographical information on his writings, sources, and writings about him (Partch 1974, 468-99). But, as the second edition's subtitle, "an account of a creative work, its roots and its fulfillments," implies, *Genesis* emphasizes Partch's artistic achievement over his life story (ibid., [iii]).

Other autobiographical materials include a *Current Biography* article for which Partch supplied information (Partch 1965, 316-18); remarks recorded for Stephen Pouliot's film *The Dreamer That Remains: A Portrait of Harry Partch*

(1972-73), later transcribed and published (Partch 1973, 107-16); a March 1974 interview conducted by Vivian Perlis for her "American Music Series" oral music history project (Perlis, 1974); and several Partch writings, some previously unpublished, that were collected and published as *Bitter Music: Collected Journals, Essays, Introductions, and Librettos* (Partch 1991; hereafter *Bitter Music*). The editor of this last collection, Thomas McGeary, is a musicologist who helped organize and curate the Harry Partch Archive at the University of Illinois, Urbana-Champaign during the 1980s.

McGeary has made access to biographical information on Partch easier than before. First, his introductory essay to *Bitter Music* includes a biographical survey (Partch 1991, xv-xxiii). Second, McGeary is the author of *The Music of Harry Partch*, "a descriptive catalog" which opens with a detailed "biographical outline" (McGeary 1991, 1-16). This reference work will also help those who wish to locate Partch manuscripts or copies at the Urbana-Champaign archive or elsewhere.

Less detailed biographical surveys may be found in standard reference works, notably those written by Paul Earls for three *New Grove* dictionaries. Another valuable source of information on Partch is Ben Johnston, who worked with Partch in California and later arranged artistic residencies for him in Urbana-Champaign, where Johnston taught. Among Johnston's writings on Partch are two biographical articles and a published interview (Johnston 1974, 1978; Zimmermann 1976). Daniel Augustine's dissertation on twentieth-century American theories of

music devotes a section to Partch (Augustine 1979, 225-97). Its biographical section is based wholly on secondary sources and perpetrates errors found therein; in any case, it has been made mostly superfluous by the two McGeary items. Finally, the Partch Archive at Urbana-Champaign houses many taped interviews with those who knew Partch and, in many cases, collaborated with him, as well as correspondence and other papers.

B. Biography to 1923

Harry Partch's parents, Virgil Franklin Partch (1860-1919) and Jennie Childers Partch (1863-1920), were Presbyterian missionaries who served in China during the years 1888-93 and 1895-1900. Disillusioned, they returned to the USA during the Boxer Rebellion with their children Paul and Irene. Eventually the Partchs ended up in Oakland, California, where Harry Partch (full name) was born on June 24, 1901. The family moved to the U.S. Territory of Arizona in 1904, where Virgil had been assigned by the Immigration Service, for whom he now worked. For the next fifteen years, the Partchs followed Virgil's postings, homesteading throughout Arizona until 1913, when they settled in Albuquerque, New Mexico.[10] During this period, Jennie worked as a reporter, was outspoken as an advocate of women's suffrage, and took a bachelor's degree in social science in

[10] The Immigration Service mistakenly believed that the mostly Cantonese Chinese immigrants in its jurisdiction would benefit from Virgil's background, although his knowledge of Chinese was limited to the Mandarin dialect.

1917. Harry Partch later wrote of his

> recollections of my mother visiting jails, complaining loudly about their condition, and occasionally bringing a prostitute home to spend the night. My father would bring hobos home also, but he insisted that they work. I do not recall that my mother ever demanded that the prostitutes work. (Partch 1974, x)

In later years, Partch reflected on what he felt was an unusually wide range of exposure to music in his youth. According to the preface to the second edition of *Genesis* (ibid., vii-ix), he heard Mandarin Chinese songs and Christian hymns sung by his parents, and believed he might have had contact with Yaqui Indian music. He learned to play on several mail-order instruments, and took harmony and piano lessons, eventually playing well enough to perform Chopin (whose music he loved) at home. In Albuquerque, Partch worked as a pianist at silent movie houses, playing the popular music of the day (including *Hearts and Flowers*). From 1915 on, Partch began to compose; the most discussed of his early efforts was a 1916 tragic melodrama with piano accompaniment, known variously as *Death on the Desert* (McGeary 1991, 2) or *Sandstorm on the Desert* (Perlis 1974, B8).

A similar eclecticism is evident in other aspects of Partch's early life. His earliest literary experiences involved reading Greek mythology and contemplating picture books in Chinese from his parents' library (including illustrations of the execution of missionaries by the local population). He developed a strong distaste for religion and politics, attributable in part to his parents' obsessions with those subjects and, one suspects, the hypocrisy of their emotional inexpressivity (ibid.,

B3-4). He was affected more positively by the empathetic attitude of his parents towards the economically less fortunate; this early exposure to life's harsher realities helped prepare him for the struggles and the people he would encounter during his own nomadic existence.

Shortly after his father's death in 1919, Harry graduated from Albuquerque High School. According to his yearbook, his club activities included journalism, oratory, chorus, and Spanish; his appearance in the senior play *The Amazons* "as the passionate Frenchman was a scream throughout" (McGeary 1991, 3). Less happy school memories found their way into his 1935-36 journal, "Bitter Music":[11]

> Time flashes back twenty years or more. I am standing grimly with my back against a wall - - unmoving from terror - - while a group of my schoolmates - - always groups - - pummels me and taunts me with "Sister!" (Partch 1991, 38)

His father's death having removed the last reason to remain in New Mexico, Harry and his mother moved to southern California in late 1919. A year later, she was struck and killed by a Los Angeles trolley. During the first years of his return to California, Partch enrolled twice at the School of Music, University of Southern California; neither tenure was long in duration, for

> [by] 1919, as I recall, I had virtually given up on both music schools and private teachers, and had begun to ransack public libraries, doing suggested exercises and writing music free from the infantilisms and inanities of professors as I had experienced them. (Partch 1974, vii)

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[11] In this essay, the journal written by Partch in the 1930's is referred to as "Bitter Music," while the recently published collection of writings that includes this journal is called *Bitter Music*.

Partch also worked as a proofreader and a piano teacher, and at some point accepted a commission as a sailor.[12]

By the spring of 1923, Partch was working for the State Printing Office in Sacramento; it was in that city's public library that he discovered the Alexander J. Ellis translation of Hermann L.F. Helmholtz's *On The Sensations Of Tone as a Physiological Basis for the Theory of Music* (hereafter *On the Sensations*), which Partch later credited as "the key for which I had been searching . . . Under this new impetus, doubts and ideas achieved some small resolution, and I began to take wing" (Partch 1974, vii). This encounter inspired Partch to pursue more systematically the question of musical intonation and other theoretical and aesthetic assumptions about music.

C. The Helmholtz-Ellis Effect

On the Sensations deepened Partch's understanding of musical acoustics and thereby helped determine the nature of Monophony and its music. The spark that set Partch's brain on fire in 1923 was Helmholtz's (and Ellis's) preference for just intonation to either Pythagorean intonation or 12-equal temperament, as expounded in the discussion of "the system of

[12] While McGeary (1991, 3) suggests that Partch's visit to Kaneohe Bay, Hawaii in early 1922 took place "probably during time spent as a common seaman," Partch thought that he had "been through that ship-out as an apprentice seaman" in the late 1920's, shortly before his New Orleans sojourn (Perlis 1974, D1-2).

keys" (Helmholtz 1954, 310-30);[13] Partch's acceptance of Helmholtz's viewpoint would lead directly to the development of Monophony.

The subject matter in *On the Sensations* of interest to Partch went far beyond the question of tuning, however. In addition to its detailed consideration of the history of and acoustic principles behind intonation, *On the Sensations* discusses music history, consonance and dissonance, intervals, pentatonic and diatonic scales from the ancient Greeks forward, major and minor scales, and melodic progression and resolution. Ellis contributed "numerous additional notes and a new additional appendix" (number XX, Helmholtz 1954, 430-556) to the 1885 edition; these include further explorations of the history of intonation (illustrated by numerous tables), a system for the comparison of pitch (the logarithmic division of an octave into 1200 "cents", ibid., 446ff.)[14], and an expansion of Helmholtz's discussion of experimental keyboard instruments, including his own "harmonical designed to exhibit the effects of Just Intonation"; this must have suggested to Partch that he build his own instruments.

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[13] As the number and derivation of pitches varies from scale to scale in this essay, two methods of identifying scale types are used. An integer followed by a hyphen and the word "equal" represents any logarithmically derived "equal" division of the octave (e.g., "12-equal" represents the standard chromatic scale). Just, Pythagorean, and other "untempered" scales are designated by the number of tones per octave (e.g., "43-tone") regardless of the method of scalar derivation.

[14] In this essay, "cents" is often abbreviated to "cts".

D. Terminology

In *Genesis*, Partch defines just intonation as follows:

> a system in which interval- and scale-building is based on the criterion of the ear and consequently . . . limited to small-number ratios; the initial interval in just intonation is 2/1, [from which stems] the wealth of musical intervals inherent in small-number tonal relationships. (Partch 1974, 71)

As stated previously, the (perfect) octave, a melodic or harmonic interval associated with equal temperament, will be referred to as 2/1, its just equivalent in ratio notation. To Partch, the octave was "a keyboard distance, but not an interval, or pitch distance" (Partch 1974, 72) - - for example, when he discussed his Chromelodeons, harmoniums adapted to the Monophonic system (ibid., 207 ff.)

In his discussion of "the sensation of sound in general" that opens *On the Sensations*, Helmholtz explains how the periodicity of a sound wave's pattern is necessary for the perception of pitch, measurable by "the number of vibrations completed in a given time," or frequency. The "higher" the pitch, the greater its "pitch number," or frequency, i.e., the shorter its vibrational period. Helmholtz then states a basic principle for deriving intervallic, "small-number" ratios:

> A musical tone which is a perfect octave higher than another makes exactly twice as many vibrations in a given time as the latter . . . Two musical tones stand in the relation of a so-called fifth when the higher tone makes three vibrations in the same time as the lower makes two . . . When two musical tones form a fourth, the higher makes four vibrations while the lower makes three (Helmholtz 1954, 13-14).[15]

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[15] 2/1, 3/2, and 4/3, in Monophonic terminology.

Helmholtz calls any interval derived by such small-number ratios "perfect," according to Ellis's translation; he and later Partch adopt the alternatives "pure" or "just" to avoid confusion with the standard 12-equal system of classifying consonant and dissonant intervals.

Helmholtz proceeds to derive thirds and sixths, completing the group of "consonant intervals which lie within the compass of an octave," where "consonance" indicates a lack or near absence of "beating" when two tones are sounded simultaneously. In passing, Helmholtz mentions Pythagoras's work with ratios and the ancient Greek use of a monochord to measure string lengths (ibid., 14-15), a procedure also described at the start of the theoretical section of *Genesis* (Partch 1974, 79-81). This division of a string correlates with the division of a fundamental pitch into its sounding components, or partials; these primary determinants of pitch and timbre are based on the rational relationships known as the "overtone series."

From the start, Helmholtz equates the idea of ratio as pitch designation (2/1, 3/2, 4/3, etc.) with ratio as interval, the distance between the partials of the overtone series (½, 2/3, 3/4, etc.; Helmholtz 1954, 15). Partch first accepted this equivalence:

> It is not important whether one chooses to say that musical intervals have their source in the ratios of simple numbers . . . or that their source is the overtone series . . . The result is the same . . . Just intonation is any system of tuning with intervals exactly the same as the intervals of the overtone series. (ca. 1928-30, in Partch 1928/33, [ii]-1)

However, by the time he completed *Genesis* in 1947, Partch regarded tone or pitch as "number" - - i.e., a ratio - - and that, in addition, the ratio of one pitch's frequency to another is a precisely measurable relationship, necessary and sufficient to define an interval in Monophony, without the need for the overtone series as corroboration (Partch 1974, 88-89). As subsequent chapters of this essay will demonstrate, ratios are the sole elemental basis for the final Monophonic system.

E. Just-Intonation Scales

First, Helmholtz evolves a just C-major scale from the overtone series. He begins with the tonic triad (i.e., partials 4:5:6):

(letters)	C	E	G
(ratios)	1/1	5/4	3/2

Then he adds the G-major and F-major (i.e., dominant and subdominant) triads to yield a scale, a procedure credited by Partch to Ptolemy, the ancient Alexandrian mathematician (ibid., 164-67). Thus, in addition to their roles in the C-major scale, the pitches F, A, and C may be heard as a major triad whose root (1/1) is F, third (5/4) is A, and fifth (3/2) is C; so too with G, B, and D (1/1, 5/4, and 3/2 respectively). This ambiguity of meaning provides the basis for modulation. The scale pitches are given below as ratios, equal-temperament letters, and as partials in the overtone series (Helmholtz 1954, 15):

(ratios)	1/1	9/8	5/4	4/3	3/2	5/3	15/8	2/1
(equal temperament)								
	C	D	E	F	G	A	B	C
(partials)	24	27	30	32	36	40	45	48
or:	3		15	1	9	5		3

The partials chosen by Ellis to represent the major scale are based on the need to include all ratio factors in the calculation and by the requirement that a scale's steps be consecutive. A scale built on the fundamental (first partial) of an overtone series does not fulfill the definition, as it lacks the fourth step, 4/3 (except as the inversion of 3/2) and the sixth step, 5/3. Therefore the lowest common multiple of the scale ratios' denominators (1, 2, 3, 4, 8 = 24) becomes the "tonic" partial of the just C-major scale; this partial is reducible to the third partial by octave equivalence (24/1 = 24/16 = 3/2). The remaining partials are the products of each ratio and 24.[16]

In order to demonstrate the effects of consonance, Helmholtz derives a pitch gamut comprising fourteen ratios, all of whose factors are integers less than 10 (ibid., 1954, 187):[17]

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[16] The notion that a "natural" major scale begins on the "fifth" rather than on the fundamental of an overtone series would seem to support those who discredit any theory citing the overtone series as the source for the major scale (not to mention the more troublesome minor scale).

[17] This is Helmholtz's equivalent for Partch's "x-limit," where x is the highest prime-numbered factor shared among a set of small-number ratios. Helmholtz does not discuss rational limits per se in *On the Sensations*; by contrast, Partch, in *Genesis of a Music*, surveys the history of limits, from the 3-limit of the ancient Chinese and Pythagorean theorists to Partch's personal "breakthrough" to the 11-limit in the twentieth century.

C	D	D+	Eb-	Eb	E	E+	F
1/1	9/8	8/7	7/6	6/5	5/4	9/7	4/3

Gb-	G	Ab	A	Bb-	Bb	C
7/5	3/2	8/5	5/3	7/4	9/5	2/1

The source of this expansion of the just C-major scale is the addition of 6/5 (Eb), 8/5 (Ab) and 9/5 (Bb), while 15/8 (B), a "compound" ratio resulting from the product of 5/4 and 3/2, has been eliminated. Also new are several "septimal" ratios (i.e., those with a factor of 7) not normally associated with the Western chromatic scale - - in order of increasing size, 8/7, 7/6, 9/7, 7/5, and 7/4.[18]

Both Ellis and Partch reject the tritone as a scale step; unavailable as a small-number ratio, it was indeed considered a "diabolic," logarithmically derived feature of equal temperament. Helmholtz offers a "false" (augmented) fourth, or tritone (45/32) and its inversion, the diminished fifth (64/45; Helmholtz 1954, 332-333, 455). By definition, Monophony had no use for such "large-number" ratios; when Partch wanted to fill in the large gap between 4/3 and 3/2 (perfect fourth and fifth), he used the septimal ratios 7/5 and 10/7. These appear in the earliest Monophonic scale of 29 tones indicated on the Adapted Viola (ca. 1929-30), as well as in the final 43-tone scale (ca. 1934-35).

F. The Development of Musical Style

[18] The plus and minus signs are Helmholtz's notation. Despite his support for just intonation, he remains resolutely conservative on the presence of septimal ratios in music: "The scales of modern music cannot possibly accept tones determined by the number 7" (Helmholtz 1954, 228).

Helmholtz briefly describes the three "chief phases of the development of musical art":

> 1. The Homophonic or Unison Music of the ancients, to which also belongs the existing music of Oriental and Asiatic nations.
> 2. The Polyphonic Music of the middle ages, with several parts, but without regard to any independent musical significance of the harmonies, extending from the tenth to the seventeenth century, when it passes into
> 3. Harmonic or Modern Music, characterised by the independent significance attributed to the harmonies as such. Its sources date back from [*sic*] the sixteenth century. (Ibid., 236-37)[19]

Writing with the perspective of the 1870's, Helmholtz expounds further on the homophonic period:

> One part music is the original form of music with all people. It still exists among the Chinese, Indians, Arabs, Turks, and modern Greeks, notwithstanding the greatly developed systems of music possessed by some of these nations . . . One part music, considered independently and unaccompanied by words, is too poor in forms and changes, to develop any of the greater and richer forms of art. Hence purely instrumental music at this stage is necessarily limited to short dances or marches. We really find no more among nations that have no harmonic music . . . Extensive works of art, in homophonic music, are only possible in connection with poetry. (Ibid., 237-38) [20]

Helmholtz's Eurocentric view of the "one part" homophonic period runs counter to Partch's interpretation of the later Monophonic aesthetic of the "one voice":

> Throughout history the Monophonic concept has been consistently manifested through one medium: the individual's spoken words, which are more certainly the juice of a given identity than anything else in the tonal world. Of all the tonal ingredients a creative man can put into his music, his

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[19] Unless otherwise indicated, all emphases are those of the author of the quotation.

[20] Helmholtz seemingly is unaware of or chooses to ignore the highly developed heterophony of several Middle Eastern and Far Eastern cultures.

> voice is at once the most dramatically potent and the most intimate. His voice does not necessarily mean his own voice and it certainly does not mean the specialized idiosyncrasy known as "serious" singing. It means his conception as expressed by the human voice and it means one voice. The instant when other voices are added to that one voice is an instant of metamorphosis. Thereafter his identity is not that of the inner self alone but the identity of a group. The drama and the intimacy of the individual are superseded by a different esthetic or sociological quality. (Partch 1974, 7)

G. Just Intonation in Theory and Practice

Helmholtz summarizes his arguments against "tempered intonation" in the sixteenth chapter of *On the Sensations*, "The System of Keys." He begins with an account of one of the predecessors of equal temperament:

> In the Pythagorean system, which maintained its predominance over theory to the time of Zarlino in the sixteenth century, tuning proceeded by ascending Fifths [i.e., 3/2], thus: C -- G -- D -- A -- E -- B -- F# -- C# -- G# -- D# -- A# -- E# -- B# . . . The tone B# is higher than the Octave of C by the small interval 74/73.[21] (Helmholtz 1954, 312)

All homophonic music and polyphonic vocal music (i.e., before the prominence of triadic consonance) could be performed using the Pythagorean system (especially in a cappella performances). Singers, string players, and other performers on unfixed-pitched instruments could alter pitches according to their context, i.e., when temporary "leading tones" were introduced by accidentals. However, music for instruments of fixed pitch that required "remote" modulations to keys a number of accidentals "away" from the tonic proved difficult:

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[21] More precisely, 531441/524288, the Pythagorean comma, ca. 23.5 cts.

> But for practice on instruments with fixed tones, the distinction between degrees of tone which lie so near to each other [i.e., enharmonically related pitches] was inconvenient, and attempts were made to fuse them together. This led to many imperfect attempts, in which individual intervals were more or less altered in order to keep the rest true, producing the so-called unequal temperaments [i.e., meantone temperaments]. (Ibid., 312-13)

The need for such temperaments arose from the needs of what Helmholtz calls "the European tonal system" that developed during the harmonic period of music (after 1600), the "fundamental principle" of which is

> that the whole mass of tones and the connection of harmonies must stand in a close and always distinctly perceptible relationship to some arbitrarily selected tonic, and that the mass of tone which forms the whole composition, must be developed from this tonic, and must finally return to it . . . It is evident that this is merely an esthetical principle, not a natural law. The correctness of this principle cannot be established a priori. It must be tested by its results. (Ibid., 249)

While Helmholtz felt that this principle has its origins in the ancient world of homophonic music, the harmonic period was the one during which pressure was exerted on composers to modulate in ever more expressive ways (i.e., to increasingly remote keys). The need for as many well-tuned major and minor keys on keyboard instruments as possible necessitated some sort of compromise in intonation.

Helmholtz is mostly silent on meantone temperaments, which, according to Ellis, "prevailed all over the Continent and in England for centuries." Ellis defines meantone temperaments as those built on just major thirds (5/4, 386.3 cts), resulting in most fifths being "less-than-perfect" (ca. 696.6 cts, compared to 3/2, ca. 701.95

cts). Noting the too-large "wolf" fifth located between G# and Eb (737.7 cts, where C is the fundamental), both Ellis and Partch refer to attempts to rectify the problem of modulation to remote keys (ibid., 433-35; Partch 1974, 409-12). But Partch then has a field day with the result of these efforts:

> European musicians had great fun modulating a ring-around-the-rosy from one "key" to another until they had used every one of the twelve tones of the temperament as a "tonic," and got back to where they started, but the four "major" triads and the four "minor" triads that were not "in tune" and were not intended to be - - with their bruited "howling of wolves" - - soured the rosy. Thereupon, one or a group of gentlemen, whose pictures hang above the pianos of nearly every music studio in America, came along and showed how, by using a new system of tuning, musicians could have triads without the obnoxious contrast, all equally bad and equally good . . . with this tuning the musician could rosy around all day long with completely satisfying, undeviating monotony - - from the standpoint of intonation. (Partch 1974, 411)

As Helmholtz points out, the above-mentioned "new system of tuning," equal temperament, resolves the problem of the Pythagorean comma by distributing it evenly among all twelve fifths of the Pythagorean circle. All the resulting "perfect fifths" are 700 cts, or less than two cents smaller than the just fifth; the resulting decrease in beating leads to a more consonant-sounding interval. According to Helmholtz,

> their imperfection is really not worth speaking of, and is scarcely perceptible in chords. The fault rather lies in the Thirds, and this error is . . . the old Pythagorean error of forming the Thirds by means of an ascending series of four Fifths . . . The natural relation of the major Third to the tonic, both melodically and harmonically, depends on the ratio 5/4 of the pitch numbers. Any other Third is only a more or less unsatisfactory [i.e., less consonant] substitute for the natural major Third. (Helmholtz 1954, 315)

Helmholtz cites the effect of beats and combinatorial tones on the harmoniousness of triads as a central reason for preferring just intonation to equal temperament. He acknowledges that instrumental music, especially in rapid passages, tends to mask equal temperament's imperfections; a similar result occurs in the piano by virtue of its rapid decay as well as the manner of regulation. On the other hand, the sustained tone of the organ serves to emphasize the negative aspects of equal temperament, especially in the mixture stops, where "an awful din must ensue" (ibid., 323).

By contrast, Partch is far less benignly disposed toward equal temperament's "imperfections;" he blames the "7-White/5-Black" keyboard design for a "tyranny" of intonational habit. Partch also criticizes Helmholtz's views on the relationship between "harmoniousness" and beating partials. First, Helmholtz:

> When two musical tones are sounded at the same time, their united sound is generally disturbed by the beats of the upper partials, so that a greater or less part of the whole mass of sound is broken up into pulses of tone, and the joint effort is rough. This relation is called Dissonance. But there are certain determinate ratios between pitch numbers, for which this rule suffers an exception, and either no beats at all are formed, or at least such as have so little intensity that they produce no unpleasant disturbance of the united sound. These exceptional cases are called Consonances. (Ibid., 194)

Now, Partch:

> Helmholtz . . . tended to ascribe comparative consonance to those intervals which generated the fewest beating partials. This was a conscious effort by Helmholtz to put consonance and dissonance on a physiological basis rather than the psychological basis [expressed in Leonard Euler's] idea of a conscious feeling for orderly as opposed to disorderly relations of tone . . . No practical musician and tuner

> will belittle the significance of beating partials; yet the fact is that after Helmholtz's day consonance and dissonance were expressible in exactly the same terms as they were before - - namely, small-number proportions = comparative consonance. (Partch 1974, 144)

Helmholtz speculates on the ensemble problems of singing and string quartet playing in tempered intonation; in the process, he imagines the effect of habit on aural experience and the inhibition of performers' natural instincts:

> Modern musicians who, with rare exceptions, have never heard any music executed except in equal temperament, mostly make light of the inexactness of tempered intonation. (Helmholtz 1954, 320)

> But if the best players . . . are able to overcome the defects of their school and of the tempered system, it would certainly wonderfully smooth the path of [less-skilled] performers in their attempts to attain a perfect ensemble if they had been accustomed from the first to play the scales by natural intervals. (Ibid., 325)

In 1864, a year after the publication of the first edition of *On the Sensations*, Helmholtz visited London, where he worked with members of the Society of Tonic Sol-faists, an a cappella singing movement based on the "movable doh" principle. The rise and decline of this movement symbolizes the fortunes of nineteenth-century England's entrenched resistance to equal temperament. In an appendix devoted largely to his experiences with the Tonic Sol-faists, Helmholtz declares:

> The [just] intervals which have been theoretically determined . . . are really natural for uncorrupted ears; that moreover the deviations of tempered intonation are really perceptible and unpleasant to uncorrupted ears; and . . . notwithstanding the delicate distinctions in particular intervals, correct singing by natural intervals is much easier than singing in tempered intonation. (Ibid., 428)

Helmholtz then challenges his opponents in a sarcastic tone not unlike Partch's

typical mode of defense:

> Musicians have contested, in a very dogmatic manner, the correctness of the propositions here advanced. I do not doubt for a moment that many of these antagonists of mine really perform very good music, because their ear forces them to play better than they intended, better than would really be the case if they actually carried out the regulations of the school, and played exactly in Pythagorean or tempered intonation. On the other hand, it is generally possible to convince oneself from their very writings that these writers have never taken the trouble to make a methodical comparison of just and tempered intonation. I can only once more invite them to hear, before uttering judgments, founded on an imperfect school-theory, concerning matters which are not within their own personal experience. (Ibid.)

Or, as Partch puts it,

> Equal Temperament is a current habit, as is also the scope for modulation that it allows. Composers can "think" only in Equal Temperament for just one reason: because it is all they have got to think in. (Partch 1974, 194)

H. Partch Takes His Cue

On the Sensations provided Partch with a wealth of information and ideas concerning the physical nature of tone, its constituents, and its apprehension by the ear; the evolution of modes, scales, harmony, and tonality; the production of tone by voice and other instruments; and the state of just intonation research in the late 1800s. While Partch found more detailed information about subjects such as the history of musical tuning in other sources, Helmholtz and Ellis provided Partch with the essential knowledge to pursue his own path.

From his earliest days as a Monophonic composer, Harry Partch took

Helmholtz's "invitation" to skeptics as a model; throughout his career, he would present "demonstrations" of the Monophonic system and the compositions he wrote using it. To Partch, the aim of his demonstrations was to prove "that the ability of the human ear is vastly underestimated" (ibid., 437n); his greatest hope was to reach the ears of the amateur listener who would come to his demonstrations relatively free of aural and intellectual bias. Yet his theoretical and aesthetic writings seem directed more towards the professional musician, for whom strong argument and language had to be devised in order to overcome inevitable prejudices resulting from conventional approaches to music and music education. In short, Partch dreamed of reaching everyone.

On a more general level, Partch's inspiration for nearly five decades can be summarized as follows:

> The accuracy of Just Intonation has not proved "practicable" for a single reason: the lack of significant music for instruments conceived for Just Intonation and incapable of anything else . . . Equal Temperament has proved "practicable" simply because the music written for its instruments is significant. (Ibid., 192)

> Music systems are made valid - - and workable - - by significant music . . . But to produce significant music in Just Intonation we must have instruments, and instruments are no small problem. (Ibid., 194)

Despite that, Partch made it his life's work to devise a system, build instruments to make this system "workable," and to write "significant music" for it and them. The difficulties were immense; all of his efforts were "no small problem." But despite that, he was to remain remarkably faithful to his ideal.

In 1927, Partch began converting the ideas of Helmholtz, Ellis, and others into a treatise on Monophony. This in turn served as the theoretical grounding for Partch's first experiment with instrument building, the Adapted Viola. By 1930, he had begun to turn theory into practice, with the composition of *The Long-Departed Lover*; by 1933, he had completed the fifth draft of his treatise. The development of Partch's thinking during these years is the subject of the next three chapters.

THREE: The Development of Monophony (to 1928)

> The full subtitle for the first edition of *Genesis* reads:
>
> MONOPHONY: the relation of its music to historic and contemporary trends; its philosophy, concepts, and principles; its relation to historic and proposed intonations; and its application to musical instruments (Partch 1949, iii)

Partch's emphasis on the theoretical aspects of his work to this point (1947) reflects the fact that virtually all of Monophonic theory was in place by this time, while the bulk of Partch's larger works were yet to come. By the second edition, the new subtitle reflected the change: "An account of a creative work, its roots and its fulfillments" (Partch 1974, iii). It is time to explore those Monophonic "roots."

A. After Helmholtz (to 1930)

Despite Partch's ongoing investigation of just intonation and other issues raised by *On the Sensations*, he continued to use the 12-equal tempered scale in his compositions in the 1920's; these included two movements of a piano concerto, songs, piano pieces, and a symphonic poem from 1924-25.[22]

Partch's only known compositional experiment with just intonation during the 1920's was a string quartet (probably scored for violin, cello and two violas), written sometime between 1925 and 1927. In this work, Partch composed using

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[22] Partch apparently submitted this work to a Los Angeles Symphony competition, without success.

"small-number ratios" to designate pitches; in other words, he was writing his first work based on the rational relationships between numbers (and therefore pitches). To facilitate playing the work, Partch devised paper coverings for the fingerboards to indicate the locations of the desired "ratio pitches."[23]

During the latter part of the 1920's, Partch lived primarily in the greater San Francisco Bay area. In addition to proofreading, he played viola in community orchestras, ushered for traveling opera companies, picked fruit, and stood on endless breadlines. He expanded his musical horizons by attending Cantonese "music hall" performances in the clubs of San Francisco's Chinatown (Partch 1974, viii).[24] Although ignorant of the Cantonese language, Partch was sympathetic towards this musical style, which contained a prevalence of heterophonic and intimate textures, pentatonic scales, and a direct simplicity of expression.[25]

In around 1926 or 1927, Partch began writing a treatise in which he proposed the use of just intonation for composition, instead of the standard equal temperament; the first draft of this treatise was completed in 1928. At the same

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[23] During the winter of 1927-28, this quartet was sent to Howard Hanson for possible inclusion on one of Hanson's new-music concerts, along with the fingerboard coverings. Hanson did not program the work, now lost along with its paper fingerboards (Perlis 1974, B-8).

[24] More accurately, these were performances of Cantonese opera excerpts in the music clubs that served the local Chinese community as primary social and cultural centers. For a survey of the Cantonese music scene in San Francisco, see Ronald William Riddle, *Chinatown's Music: A History and Ethnography of Music and Music-Drama in San Francisco's Chinese Community* (Ph.D. thesis, University of Illinois at Urbana-Champaign, 1976), in particular Chapter 5, "Chinese Theater: Regrowth and Survival (1907-1945)."

[25] For Partch's general impression of the music of "present-day Cantonese music-theater," see Partch 1974, 13-14.

time, Partch saw

> that it was necessary to devise instruments of my own . . . I did not find it a fearful step. Until his death in 1919, my father had always maintained a small woodshop; I was familiar with common tools. (Ibid., xi)

Rather than building an instrument from scratch, however, Partch chose to pursue the path opened by his experimental string quartet; he would adapt a string instrument to just intonation, and find a more permanent solution to his paper fingerboard coverings. Having found the violin too small for experimentation and the cello too large for easy and practical transport, he settled on the viola and began working on a redesigned fingerboard.

In 1929, Partch began his "long" depression - - a nomadic, soul-enervating period that coincided with and outlasted the more general "Great" Depression; Partch declared his to have ended around 1943 (Perlis 1974, D2). The only memorable event in his career in 1929 was the publication of a song for voice and piano/ukelele, *My Heart Keeps Beating Time*, with music by one "Paul Pirate," an early "hobo moniker"[26] of the composer's. The published words, by Larry Yoell, are of the cowboy-loves-his-horse variety; the music, pleasant and historically interesting, is nevertheless unable to prevent Yoell's bathetic clichés from banishing

[26] These nicknames allowed hoboes their dignity through anonymity, and could also serve as identification in correspondence and graffiti; the latter use is alive and well, as a visit to any American urban setting can testify.

the song to a well-deserved obscurity.[27] Although the song received performances, Partch received no royalties.

By February, 1930, Partch had moved to New Orleans, where he worked as a proofreader for the *Times-Picayune*. There he sought and received assistance from a violin maker, Edwin Bentin, who found a way to attach Partch's modified cello fingerboard to the body of a viola. The completed Adapted Viola (which Partch first called the "monophone") has the range of a tenor violin (i.e., one octave lower than the standard violin).[28]

> It was also in New Orleans in 1930 that Partch engaged in
>
> a kind of adolescent auto-da-fé - - the burning of fourteen years of my music in a big iron stove . . . I can still relive the great surge of exhilaration that uplifted me on that occasion. But it is a curious fact that I destroyed nothing truly valuable to me. As late as 1960 I was still pulling out bits of ideas from that pot-bellied stove, ideas sorted away in memory - - that mysterious structure of cells and spirit. (Partch 1974, x).

As Partch admitted, the burning also helped get rid of "a lot of music" and "a lot of unhappiness . . . both economic and romantic" (Perlis 1974, D1). While this characteristically melodramatic step may be regretted by scholars, it was not rashly undertaken by Partch, but the result of "a long process," and never regretted. This auto-da-fé symbolized his irrevocable break with the inherited traditions of Western

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[27] San Francisco: Lloyd Campbell Publications, Inc., 1929; McGeary 1991, 68-69. Another version, with tongue-in-cheek text concerning hobo life, is found in "Bitter Music" (Partch 1991, 78-80). It is unknown which set of lyrics came first; Yoell's text may have been substituted at the insistence of the publisher, or have been the subject of a "Bitter Music" parody.

[28] A full description and photograph may be found in Partch 1974, 198-202.

art music.

In December, 1930, Partch celebrated this breakthrough by completing the first of his works, *The Long-Departed Lover*, for Adapted Viola and "intoning voice" (speech intonation or speech-song, akin to Sprechstimme). This is a setting of an English translation of a lyric by the eighth-century Chinese poet, Li Po.[29] With this work, Partch began nearly forty-five years of research into Monophonic theory, composing in just intonation, adapting and/or building of appropriate instruments, and a virtually unassailable belief in the correctness of his approach, whatever the consequences.

B. A Treatise is Born

In the "Author's Preface" to the first edition of *Genesis*, Harry Partch indicates that his work on Monophony had "undergone many evolutions" since 1928, "when a first draft on Monophonic principles was completed;" no other dates are given (Partch 1949, xiii; Partch 1974, xix). In the "Preface to the Second Edition," he states that *Genesis* drafts were written in 1927, 1930, 1934, 1940, 1944, 1945, and 1947 (Partch 1974, vii).[30] All early drafts of *Genesis* were thought lost until the early 1980's, when a draft of *Exposition of Monophony* (hereafter

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[29] All seventeen of Partch's Li Po settings use Shigeyoshi Obata's English translation, *The Works of Li Po, the Chinese Poet* (New York: Dutton, 1928).

[30] An outline sketch of this Preface gives the dates 1927-28, 1930, 1934-35, 1940-41, 1944, 1945-46 and 1947, thus making the information more specific. A copy of this sketch is held by the New York [NY] office of Composers Recordings, Inc. Even this list is incomplete.

Exposition) surfaced in papers inherited by Jonathan Glasier, a composer and publisher whose family was long friendly to Partch:

> In a packet of letters, newspaper clippings, and magazine articles saved by Harry Partch's first patron, Bertha (Knisley) Driscoll, and given to Jonathan Glasier by her surviving husband, Harold Driscoll, there was an unopened package postmarked August 10, 1933. The fifty-year-old package has a first [*sic*] draft of Partch's ideas, titled *Exposition of Monophony*, a 50-page document. (Glasier 1983, 6)[31]

In handwritten marginalia on the manuscript of *Exposition*, Partch lists another series of dates (presumably of completion) for drafts of this treatise (Partch 1933, [ii]):[32]

1928 (San Francisco: #1)
1930 (New Orleans; #2)
1931 (San Francisco; #3)
1932 (Visalia, CA; #4)
1933 (Los Angeles; #5)

What Glasier possesses then is the 1933 final draft of *Exposition*, to which Partch appended "two notarized pages from the 1928 draft."[33] Glasier has published excerpts of this draft in his journal *Interval* (Glasier 1983, 6-7; Glasier 1984, 8-9).

Exposition's Foreword reads, in part:

> This work is an attempt to found the theory of music definitely on the origin of intervals. It is an exposition of the so-far-accepted in the

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[31] The typescript is actually 51 pages long, with additional charts; a copy is held in the Harry Partch Archive at the University of Illinois, Urbana-Champaign.

[32] The five drafts mentioned here would have preceded the "third draft" (1934-35) mentioned in Partch 1974, vii.

[33] The survival of this draft stems from Partch's having sent this copy in 1933 by registered mail from Gloucester (MA) to Bertha McCord Knisely in Los Angeles in order to secure copyright, then a legal method.

> light of that origin and a disclosure of a further small part of its universe. (Partch 1928/33, [ii])

The exposition proper, which lacks a table of contents, is divided as follows (chapters are underlined):

> The 11 Diatonic Intervals
> The Overtone Series
> The Undertone Series
> The Six Tonalities
> The Phenomenon of Resolution
>
> The 37 Monophonic Intervals
> The 11 Limit
> The 12 Tonalities
>
> History of the 37
>
> Classification of Intervals
>
> Notation and Instruments
> The Staff
> Adapted Viola
> Ratio Keyboard
>
> The Spoken Word In Song
>
> Review

Despite its brevity (two typescript pages), the closing "Review" manages to summarize ten years of Monophonic development. The explicit and implicit information contained therein serves as the primary source for my interpretation of this period of development of Monophony, unless stated otherwise. In order to make the early evolution of Monophony (as exemplified by *Exposition*) more readily apparent, I will concentrate on the drafts completed in 1928, 1931, and 1932 (first,

third, and fourth).[34]

It should be remembered that Partch's initial goal was to develop an intonation theory that 1) could be justified on the grounds of theoretical precedent and his own experimentation, and 2) could serve as the basis for compositions written for instruments built on, or adapted to, just intonation. It was only in later years that Partch's interest in aesthetic matters became primary, as the Monophonic framework fell into place and enough instruments had been built for Partch to compose ensemble works. He refers to historical intonational theory and the issues that arise from it for other theorists, ancient and modern; but the solutions he found were meant for his justly tuned music only, as an alternative to (but not a replacement) for equal temperament or any other intonational system and its music.

C. First Draft (1928)

To open the "Review," Partch writes of his 1923 encounter with a book

> the name of which I have forgotten, on the relation of the physics of sound to musical theory, and containing a discussion of the merits of just intonation and of equal temperament. (Ibid., 50)

As the "Review" reports next, Partch's research finally bore fruit in the first draft of *Exposition* after a five-year "period of gestation." Its primary components:

> It made the 11th overtone the limit of the source of its intervals, presented the theory of resolutions here included, and contained a similar classification of intervals. (Ibid., 50)

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[34] All page-number references are by necessity to the surviving 1933 (fifth) draft.

This statement confirms directly or indirectly that several basic tenets of Partch's Monophonic system of just intonation were present in this 1928 draft. Partch had rejected equal temperament and returned to the ancient system of just intonation; he was already using ratios to represent particular pitches or intervals, rather than letter names (for pitch) and modified ordinal numbers (for interval). The following are essential Monophonic principles already in place:

1. Expansion of Consonance. Since the medieval recognition of the "imperfect consonance" (thirds and sixths), the ratios used in theoretical explanations of diatonic intervals and chords had been contained within the 5-limit. In practice, this meant using ratios with factors limited to the odd integers 1, 3, and 5, their octave (or 2/1) equivalents, and "compound" integers, products of two digits 5 or smaller, as numerator or denominator. A widely-known exemplar of this idea is Gioseffo Zarlino's concept of the "senario" (i.e., 6-limit) in determining consonance, where 6 is treated as the octave equivalent of 3; Partch later described Zarlino "as the first forthright Monophonist" (ibid., 378-79).

Partch credits Marin Mersenne with expanding the definition of consonance to a 7-limit, an idea corroborated by Tartini but met historically with as much disdain as support (ibid., 91-93). Partch himself extended the definition of consonance further, by including ratios of the 9- and 11-limits. The centuries-old concept of a limit is central to Partch's Monophonic scale.[35]

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[35] In a diagram of the "chronology of the recognition of intervals," Partch calls himself the first to treat intervals with ratios of the 9- and 11-limit as consonant, while acknowledging ancient Chinese and Greek

2. Theory of Resolutions. Partch's discussion of "the phenomenon of resolutions" is modeled on Helmholtz's "laws of the progression of parts," as follows (all emphases are Helmholtz's):

> The musical connection between two consecutive notes may be effected
>
> 1. By the relation of their compound tones. This is either [a] direct [relationship], when the two consecutive tones form a perfectly consonant interval, in which case . . . one of the clearly perceptible partial tones of the first note is identical with one of the second. (Helmholtz 1954, 350)

The first part of this law provides for motion by perfect intervals and major and minor thirds and sixths. The overtone series comes into play: if two different tones share a lower-numbered (and therefore strong) partial, then the motion between them will be smooth or "direct," with the shared partial acting as a "common tone."

> . . . [or an] indirect [relationship between compound tones], of the second degree only. This occurs in the regular progression of the scale, proceeding by Tones or Semitones. (Ibid., 351)

To Helmholtz, such scalar progressions are akin to "the Hexachord of Guido of Arezzo, which was the normal scale for singers throughout the Middle Ages, [and] ended at the sixth" (ibid.). The familiar and "regular progression of the scale" influences perception to the degree that any motion by tone or semitone sounds valid, even if "indirect" (i.e., without the tones sharing a lower-numbered partial). Finally,

> 2. Tones may be connected by their approximation in pitch. This

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thinkers for recognizing such ratios as "scale materials." For a summary of the history of the recognition of consonance through number, see Partch 1974, 90-94.

> relation has been considered previously with reference to the leading note. The same holds good for the intercalated [interpolated] tones in chromatic passages. For example, if in C major, [C# is interpolated between C and D], this C# . . . has no relation with the tonic C, and also no harmonic or modulational significance. It . . . only serves to render its discontinuous progression [i.e., C to D] more like the gliding motion of natural speech, or weeping or howling. The Greeks carried this subdivision still further . . . by splitting up a Semitone into two parts in their enharmonic system. (Ibid., 352)

Helmholtz explains the phenomenon of the "leading note" in "modern music" thus:

> The tone B_1 in the major scale of C has the most distant relationship of all the tones to the tonic C . . . But when a singer has to perform the [ascending] passage F - B_1 - c, he conceives the interval F - c, which he can easily execute, but does not force his voice up sufficiently high to reach c at first, and thus strikes B_1 along the way. Thus B_1 assumes the appearance of a preparation for c . . . Hence it has been said that B_1 leads to c; or that B_1 is the leading note to c . . . The relation of Db_1 in descending passages of the mode of the minor Sixth of C . . . is perfectly similar to the effect of B_1 in the ascending scale of C major. It really forms a kind of descending leading note. (Ibid., 285-86)

In the *Exposition*'s reworking of Helmholtz's "laws of progression of parts," Partch assigns three laws to "the phenomenon of resolution":

> a) The attraction a triad tone exerts is in inverse proportion to its ratio to 1 (Partch 1928/33, 15)

In other words, the further removed from the tonic (1/1) a tone's ratio is numerically, the weaker that tone's "magnetic pull" is on other tones (ratios) and the weaker its potential as a goal of resolution for a so-called "departure note" or "satellite."[36] For example:

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[36] Partch uses the metaphors of "magnet" and "satellite" during the *Exposition* period; he would drop this terminology by the time of *Genesis*, even if the concept remained the same.

> The urge in 9/8 for resolution to 1 . . . is greater than the urge of 5/3 to [resolve to] 3/2, practically the same distance away, even tho [sic] 5/3 is a simpler departure tone. (Ibid.)

In C major, for example, a melodic D has more "urge" to resolve downwards to C than A has to G, because D (9/8) is closer to C (1/1) than A (5/3) is to G (3/2).

> b) The urge to resolution in a departure tone is in proportion to its simplicity. (Ibid., 15-16)

Thus, the closer to 1/1 a tone's ratio is numerically, the greater its urge to resolve. But Partch's own example intentionally exposes a contradiction:

> 4/3 has greater urge than 15/8 [to resolve], as 4/3 is simpler than 15/8. However, the resolution [4/3 to 5/4, or F to E] is no stronger [than 15/8 to 2/1, or B to C]. (Ibid., 16)

Here is Partch's theoretical quandary: in C major, a melodic F (4/3) should have a stronger urge to resolve downwards to E (5/4) than B (15/8) has to resolve upwards to C (1/1), as 4/3 is "simpler" than 15/8. But harmonically speaking, he equates the effect of resolving 4/3 to 5/4 (i.e., the 4 - 3 suspension resolution) with 15/8 to 2/1 (the 7 - 8 leading tone resolution, 2/1 being the octave equivalent of 1/1). To resolve the inconsistency in applying the first two laws, Partch adds a third:

> c) The urge in a departure tone [to resolve] is also in proportion to its proximity. (Ibid.)

In other words, Partch reinterprets Helmholtz's law of "pitch approximation." He continues:

> The urge of 4/3 to [go] to 5/4 is certainly greater than 4/3 [going] to 3/2. Also the urge [of] 8/5 [going] to 3/2 is greater than . . . 5/3

> [going] to 3/2. (Ibid.)

That is, in C major, a melodic F (4/3) has a stronger need to resolve downwards to E (5/4) than upwards to G (3/2); similarly, Ab (8/5) has a stronger need to resolve downwards to G than A natural (5/3) has.

Partch closes the discussion by mentioning the dominant-seventh resolution, discussed a few pages earlier (ibid., 14), in which "only a synthesis of the three laws can satisfactorily explain the phenomenon" of the similar effect of the two resolutions:

> 4/3 to 5/4 and 15/8 to [2/1] have the same resolution interval but they are probably equally powerful because the former has the strongest departure note [4/3, closest numerically to 1/1] moving to the weakest triad tone [5/4, the major third], while the latter has a weaker departure tone [15/8, furthest numerically from 1/1] moving to the strongest triad tone [1/1]. (Ibid.)

3. Classification of Intervals. In *Genesis*, Partch defines an interval as

> a pitch relation between two musical sounds, a ratio. Interval, ratio, tone [pitch], are virtually synonymous; a ratio is at one and the same time the representative of a tone and of an interval, and a tone always implies a ratio or interval. (Partch 1974, 71)

Monophonic ratios are thus used to indicate pitch or interval, depending on their context. Partch's view of the classification of intervals seems related to another of Helmholtz's principles:

> In every consonant interval those upper partials form a dissonance, which coincide in one of the adjacent consonant intervals, and in this sense we can say, that every consonance is disturbed by the proximity of the consonances next adjoining it in the scale, and that the resulting disturbance is the greater . . . the smaller the number which expresses the ratio of the pitch numbers. (Helmholtz 1954,

186-87)

In other words, the smaller the ratio is numerically, the greater "disturbance" or influence it has over its neighbors. For support, Helmholtz offers a table giving "a general view of this influence of the different consonances on each other" (ibid., 187). In this table, 11 small-number ratios within the 9-limit (including the 7-limit ratios) are listed in scalar order, with statistics culminating in a measurement of their "intensity of influence." This concept depends entirely on a tonal context, with 1/1 (the fundamental) sounding implicitly; it is based on "a measure of the relative strength of the beats resulting from the mistuning of the corresponding interval" (ibid.).

While Partch would later declare that "it is preferable to ignore partials as a source of musical materials" (Partch 1974, 87), he certainly considers the "intensity of influence" principle when classifying intervals. Partch does not credit either of his predecessors directly in the *Exposition*; instead, he offers a somewhat poetic reinterpretation of the data and presents an alternative to the standard terminology (e.g., perfect, major, minor). Although the earliest stages of Partch's system of the classification of intervals remain obscure, it is probable that his system was in place by the third draft (1931).

Partch also borrows Helmholtz's "somewhat arbitrary law for the dependence of roughness [the relative amount of consonance or dissonance in an interval] upon a number of beats" (Helmholtz 1954, 192). Helmholtz uses a violin

to compare the number of beats per second between the tonic and any other pitch within an octave, and graphs the results (ibid., 193, 333).[37] According to Helmholtz, degrees of roughness are relative, based on the absence or presence of beats; thus, intervals of the perfect unison, octave, and just fifth have "zero roughness," etc. Ellis extrapolates a "tabular expression" of Helmholtz's diagrams, which Partch would have found helpful for its inclusion of just and equally tempered intervals (ibid., 332-33).

4. Consonance and Dissonance. Even at this early stage of Monophony's development, Partch's intonational individuality is apparent on the question of chordal consonance. Helmholtz, who hears the seventh partial (or 7/4) as relatively harmonious, still maintains the triad as the limit of a consonant chord (ibid., 211-12). Due to the effect of combination tones, Helmholtz believes "that all consonant tetrads must be either major or minor triads to which the octave of one of the tones has been added" (ibid., 222). Ellis, exhibiting greater faith in expanded consonance, allows for a consonant triad comprising the sixth, seventh, and ninth partials or 6:7:9 (i.e., a 9-limit triad; ibid., 213n).

In the aforementioned "tabular expression" of intervallic roughness, Helmholtz hears 9/8 as rougher than a tempered major second; when inverted,

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[37] In addition to the law's intrinsic value, Partch must have noticed Helmholtz's graphic presentation -- white-line-against-black-field diagrams, resembling cardiograms or seismic records and full of "prominences," "valleys," and "depressions" (ibid., 193, 333). Helmholtz's diagrams seem to anticipate Dayton C. Miller's "Phonodeik" recordings of harmonic curves, reproduced in *Genesis* (Partch 1974, 141). Both served as models for Partch's representations of his system of intervallic classification.

however, the reverse is the case - - the tempered minor seventh is considered rougher than 16/9! He also considers the tempered tritone less rough than 45/32 (ibid., 332-33). Partch prefers all just ratios to their tempered equivalents by (Monophonic) definition, especially 9/8; in the case of 45/32, neither the just interval nor its tempered equivalent are consonant.

Another sign of Partch's individuality involves chordal consonance. While conceding that consonance is relative, he recognizes a special property in certain ratios above the 5-limit: an ability to imply their fundamental (i.e., root or 1/1). According to this theory, a chord can be represented by more than its traditional triadic components (Partch 1974, 124). As an example, here is a Monophonic "version" of the usual dissonant G dominant-seventh chord (Partch 1928/33, 14-16):

	3/2	15/8	9/8	4/3
	"G"	"B"	"D"	"F"
[Interval above "G":]	1/1	5/4	3/2	16/9

By contrast, Helmholtz goes to some trouble to describe seventh chords that grow less dissonant as they approach 7/4, the seventh partial (Helmholtz 1954, 342-50). An example:

	3/2	15/8	9/8	21/16
	"G"	"B"	"D"	"E/F"
[Interval above "G":]	1/1	5/4	3/2	7/4

Helmholtz does not even include septimal ratios in his graphic representation of roughness (ibid., 331-33). Partch and Ellis, on the other hand, would consider Helmholtz's example of a seventh chord unquestionably consonant, since 21/16 is the 7/4 above 3/2 ("G").[38]

5. The First Monophonic Instrument: Scales and the Fundamental. At the same time that Partch was completing the first draft of *Exposition*, he had begun another crucial project:

> Only one instrument has been adapted to Monophony thus far. It has a viola body and an elongated fingerboard permitting greater accuracy in making the stops . . . Intervals are indicated on the fingerboard by tiny brads and marks. The lowest string, making the same vibrations per second as the cello G, is chosen as fundamental. The four strings are tuned in the ratios 1 - 3/2 - 9/4 - 27/8,[39] a 2/1 below those of the violin. The instrument is held between the knees when played. (Partch 1928/ 33, 40)
>
> The fingerboard of the viola was begun in Santa Rosa, Cal[ifornia] in June, 1928, and attached by Edw[in] Bentin in New Orleans in April, 1930. There are 29 indications for ratios within the 2/1 (octave), corresponding to my 1928 theory of the more essential tones. The other ratios were comparative to these. (Ibid., 37)

Appendix I includes a list of the 29 ratios Partch marked on the fretless viola fingerboard. If, as is likely, this gamut was Partch's earliest Monophonic scale, then it would appear that his "1928 theory of the more essential tones" has a few

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[38] Many years later, he referred to this question in an interview: "I remember one time, it was just a lark, but I spent I think about three months on the dominant-seventh chord, and I thought, well, this is the end, I'll never touch this sort of nonsense again. I don't think I ever did, with any kind of [harmonic] resolution. (Perlis 1974, B11)

[39] Within the 2/1, 1/1 - 3/2 - 9/8 - 27/16, or, in equal temperament, G - D - A - E.

anomalies, namely the omission of 9/8 and 27/16 (and their inversions) from the ratios indicated on the fingerboard, although both are present as open strings on the Viola. 9/8 is especially crucial to Monophony, not only as the just major second of the diatonic scale but as the "9 Odentity" [9-limit component] of the consonant hexad that constitutes the "Overtonality" or "Otonality" (major key) built on 1/1. 9/8 also serves in its own right as one of the basic "1-Odentities" (fundamentals) in Monophony. This evidence suggests that, in 1928, Partch had not yet established the 11-limit consonant hexad as the structural basis for Monophony's pitch gamut.[40] In keeping with his experiments in the 1920's, Partch produced a just 11-tone scale, that is, without the "tritone" (ibid., 5):

1/1	16/15	9/8	6/5	5/4	4/3	3/2
C	Db	D	Eb	E	F	G
8/5	5/3	16/9	15/8	2/1 [= 1/1]		
Ab	A	Bb	B	C		

Most of the ratios found in Partch's 11-tone scale fall within two long-recognized small-number limits: intervals of the 3-limit, the perfect fifth and fourth (3/2, 4/3); and intervals of the 5-limit, the major and minor thirds and sixths (5/4, 8/5, 5/3, 6/5). The other ratios in the scale are compound ratios, the products of two 3- or 5-limit

[40] This would support the idea that Partch's lost 1920's string quartet attempted to impose just intonation onto a traditional polyphonic or homophonic texture built on a scale, and that he had yet to settle upon a system of just intonation derived from a single fundamental (i.e., Monophony).

factors:

a. 16/15 (Db), from 8/5 x 4/3 (i.e., minor sixth + perfect fourth);

b. 9/8 (D), from 3/2 x 3/2 (perfect fifth + perfect fifth);

c. 16/9 (Bb), from 4/3 x 4/3 (perfect fourth + perfect fourth); and

d. 15/8 (B) from 3/2 x 5/4 (perfect fifth + major third).

In a footnote to Helmholtz's discussion of the just C-major scale, Ellis describes having "contrived a specially-tuned harmonium, called an Harmonical," which he tunes as follows (ibid., 17n):

C	"D"	D	Eb	E	F	G
1/1	10/9	9/8	6/5	5/4	4/3	3/2
	Ab	A	"Bb"	Bb	B	C
	8/5	5/3	7/4	9/5	15/8	2/1

Partch's diatonic just scale is identical to the Ellis Harmonical scale except in two instances: Partch replaces "D" (10/9) with Db (16/15), and a single Bb (16/9) replaces both "Bb" and Bb (7/4 and 9/5).

The main reason behind Partch's alteration of Ellis's scale involves the Monophonic principle of absolute scalar symmetry, where "each ratio has its complement ('inversion') at the corresponding point from the opposite end of the scale" (Partch 1974, 115). In other words, 1/1 is the axis of symmetry for each pair of complementary ratios. In all of Partch's Monophonic scales, therefore, the pattern

of intervals between ratios are identical whether read from bottom to top (1/1 to 2/1) or top to bottom (2/1 to 1/1). So 16/15 and 15/8 are the same distance from 1/1, 9/8, and 16/9 are the same distance from 1/1, and so on. Partch's emphasis on the mathematical would eventually allow him to dispense with the overtone (and "undertone") series and create his own rationale for Monophonic intonation.[41]

A question naturally arises as to why Partch used G instead of C as his fundamental. In *Exposition*, he demonstrates uncertainty about the issue. C serves as the standard for most of the *Exposition* text, but G is used for the overtone series and system of notation "charts used in [the] oral exposition of Monophony in Pasadena and Los Angeles demonstrations, February-June, 1933" (Partch 1928/33, 49). Further evidence of Partch's indecision regarding the choice between C and G can be found in *Exposition*'s discussion of the Adapted Viola:

> The G fundamental will probably be changed with the development of instruments for ensemble. The [ratio] keyboard . . . must have its fundamental as middle tone with three or four 2/1's extending above and below. Therefore, to give a median range of pitch, middle C would seem a better fundamental. (Ibid., 40)

Yet a 1932 design for a "ratio keyboard fabric" retains G as the 1/1 (Partch 1932, 14-17). Furthermore, one of Partch's earliest extant manuscripts, contemporaneous

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[41] In *Genesis*, Partch builds a 13-tone scale on the 5-limit, also including multiples and without a tritone (Partch 1974, 114-15). The resulting scale replicates the 11-tone scale of *Exposition*, adding 10/9 and 9/5. By contrast, Ellis's Harmonical scale includes 10/9 and 9/5 but not 16/15 or 16/9 (Helmholtz 1954, 17). Another inconsistency is Ellis's inclusion of 7/4, but not its inversion 8/7. Clearly, Partch's axiom of scalar symmetry around an axis is not held by Ellis, whose main priority was to include the seventh partial in the Harmonical scale, thereby extending consonance one step beyond the 5-limit.

with the ratio keyboard fabric, is a version of his Li Po setting *A Dream*,[42] in which the voice and Viola parts are notated in ratios, and the vocal range, ranging from 5/3 (lowest octave) to 9/5 (third octave), is also notated on the standard staff as E_1 up to F^2. And, in the score the Viola's lowest string is labeled decisively: "I = The fundamental string - (1 - Cello G)" (McGeary 1991, 81).[43]

Common sense would suggest that Partch may have preferred G (196 Hz) because of his own baritone vocal range, the full resonance of the G string on the Adapted Viola, or the convenient placement of this pitch on the bass clef's staff. Whatever the reason, the choice of G seems definitive by 1933.

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[42] McGeary 1991, 81 (HP-2013), dated San Francisco, February 29, 1932.

[43] This is further supported by *Exposition*'s instructions for "string family adaptation" to just intonation, which charts the "proportions of string length measured from nut for stops;" the tunings for the cello (later altered to "string family") retain G as the Monophonic fundamental (Partch 1928/33, 41): 4/3 (C) - fund. (G) - 3/2 (D) - 9/8 (A).

FOUR: Monophony: Stage II (to 1929-31)

In late 1930, while he was working on a third draft of *Exposition*, Partch completed his earliest extant Monophonic composition. From then until 1933, when he completed the fifth draft, Partch's first practical experiences with Monophonic composition, notation, and public performance were accompanied by theoretical considerations of interval classification, the role of overtones and undertones in the support of just intonation, and the Monophonic concepts of Otonality, Utonality, and the consonant hexad.

A. Developments in Notation (to 1930); The First Composition

The notation of justly tuned music became an important issue for Partch. From the beginning, he sought to balance the need for accuracy against the desire to make the performance of his music less arcane and therefore more likely. Especially difficult were instruments of flexible pitch, and it is precisely for that type that Partch wrote his first Monophonic music in the early 1930's. As instruments of set pitch came into his instrumentarium, he was able to devise notational systems based on the notion of tablature - - pluck this string or hit that block, rather than play that pitch. But during the period leading up to the publication of *Genesis* and beyond, Partch had to experiment constantly with notation.

In the first edition of *Genesis*, Partch discusses an early attempt at notating

justly tuned pitches, devised probably before 1930:

> The first notation consisted solely of numbers, from 1 to 29, for certain of the Monophonic ratios [i.e., those marked on the Adapted Viola fingerboard], deviations from these being lettered 1a, 1b, 1c, etc. (Partch 1949, 221)

The "deviations" mentioned involve approximating ratios not found in the basic 29-tone gamut. The letters a, b, and c represent deviations of about 16, 8, and 4 cents respectively, and may be used in combination with each other. The letters are placed either to the left or right of the "pitch number" to indicate flattening or sharpening, respectively (Partch 1928/33, 32). This system "was soon abandoned because it tended to obliterate the meaning of ratios" (Partch 1949, 221). No Partch manuscripts using this notation survive; Example One presents the opening of *The Long-Departed Lover* as it would have appeared in this notation:

Example One: Partch, *The Long-Departed Lover* for Intoning Voice and Adapted Viola (1930), opening

Intoning Voice: hyphen [-] = repeat previous pitch.
Adapted Viola: [2] = play in octave above fundamental 2/1 (11z196).
Play on II (9/8) string throughout. O = stop string.

Voice	[rest]		Fair	one,	when	you	were
			15	-	-	-	-
Viola [2]	8	15	-	O			

here,	I	filled	the	house	with	flo-	wers.	[rest]
-	-	19	-	-	-	10	8	
[O]							8	9 8

[rest]	Fair	one,	now	you	are	gone - - on-		ly
	15	-	19	18	17	a12	13	12
19	15	O			17	a12	13	O

an	emp-	ty	couch	is	left.
-	[12]	-	11	9	- *etc.*
[0]					9 *etc.*

Number System and Equivalent Ratio (as used above):

[1]	8	9	10	11	a12	12	13	15
1/1	7/6	6/5	11/9	5/4	14/11	9/7	4/3	7/5
	17	18	19					
	16/11	3/2	14/9	(2/1)				

One of the two notarized pages from the 1928 draft of *Exposition* included in the 1933 draft describes Partch's next attempt at a notational system (Partch 1928/33, following 18). This involves a single five-line staff, supplemented by a complex diacritical system of curved stems and slashes to replace the earlier "letter deviation" system. While this method also proved unsatisfactory at the time, Partch would return to it in the early 1930's. The opening of *The Long-Departed Lover*, taken from Partch's manuscript, has been published.[44]

In around 1931, Partch began notating pitches with their ratios. The ratios are placed within the usual vertical and horizontal parameters, for simultaneity and synchronization, respectively. As with earlier systems, deviations are indicated by a, b, and c, and no rhythmic notation is employed. Performers are thus encouraged to intone in a speech-like rather than metrical manner; the resulting quasi-recitative is characteristic of Partch's early Monophonic works.

In the first stage of this notational system, only the Adapted Viola part uses ratios, while the voice part is written on the conventional five-line staff (with additional ratio indications). In a later stage, both instrument and voice parts use ratios; two examples have been published.[45]

In the *Exposition* "Review," Partch writes that, in 1929,

> I had composed many songs for voice and piano, with none of which

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[44] McGeary 1991, 75, 77, following 128 (Illustration 4). Both editions of *Genesis* ignore this developmental stage.

[45] McGeary 1991, 75, 77, following 128 (Illustration 2); Partch 1974, 202.

> I was wholly satisfied. Then came the determination to allow the spoken words of lyrics to govern the melody and rhythm of the music . . . The completion of the [Adapted Viola] was the needed incentive. (Partch 1928/33, 50)

The Long-Departed Lover is the first of many works featuring an intoning voice part. Although he disparaged Arnold Schoenberg as the twentieth-century "apotheosis of Abstraction[46] and John [*sic*] Sebastian Bach," Partch's idea of the intoning voice is similar to Schoenberg's Sprechstimme; Partch admired *Pierrot Lunaire* particularly for its vocal technique (Partch 1974, 40-41).[47]

Partch's setting of *The Long-Departed Lover* is light and uncomplicated in texture. The Adapted Viola provides brief interludes between the intoned portions and consistently ends each of its phrases by cuing the first pitch of the ensuing vocal phrase. When the two parts are heard together, the Viola is doubling the vocal part. The melody and rhythm of the music are governed by the words.

The Long-Departed Lover was completed in New Orleans in December, 1930, and was the first of seventeen settings of lyrics by the eighth-century Chinese poet

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[46] *Genesis* contains several references to Partch's aesthetic dichotomy, pitting Abstraction (non-verbal formalism, transcendent mass expression, instrumental and mood-setting vocal music) against Corporeality (word or dance connections, emotionally tactile self-expression, narrativity).

[47] Henry Cowell's New Music Society presented performances of *Pierrot Lunaire* twice in San Francisco: its local premiere in 1930, and a partial performance conducted by Schoenberg in 1935 (Mead 1981, 148, 312). The soprano was Rudolphine Radil, with whom Partch performed in his first California lecture-demonstrations in 1932. However, he was in New Orleans during the first performance, and in Europe during the second. I know of no earlier reference by Partch to *Pierrot Lunaire* than *Genesis* 1947; the question as to when he might have heard the work remains open, although he refers to "the execution of *Pierrot Lunaire*, under Schönberg's [*sic*] direction" (Partch 1974, 40).

Li Po, composed between 1930 and 1933.[48] As the settings were composed during a period of almost continuous experimentation with notational methodology, Partch's numerous copies of varying combinations of Li Po songs reflect the fluidity of the situation.[49]

Partch's experience of actual composition and performance in just intonation, especially with the Li Po songs, would in turn have an immediate impact on Monophonic theory as well as his approach to text-setting. While continuing to emphasize the 29-tone scale as late as 1930 (Mayfield 1930, 5), *The Long-Departed Lover* uses pitches not found in that scale: 16/15, 9/8, 14/11, 21/16, and 15/8. Having exceeded the limits of the "original" Monophonic scale from the outset, Partch would continue to experiment with the extent and components of the Monophonic gamut until around 1935.

The second draft of *Exposition* was completed in New Orleans a few months before the composition of *The Long-Departed Lover*. The second draft is described in the Review only as "a more thoro [sic] explanation of [his] ideas;" but it retains importance as the *Exposition* draft completed just before Partch's Monophonic compositional efforts hit full stride, after his return to California in 1931.

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[48] For detailed studies of this cycle, see Cameron 1982 and Gilmore 1992.

[49] McGeary 1991, 75ff., describes the somewhat haphazard groupings of Partch's Li Po manuscripts and their notational systems. In all, McGeary counts six "versions," using five distinct notational methods, dating from ca. 1930 to 1962.

B. Interval Classification

As he worked on Monophonic theory, Partch was contemplating ways of presenting his theory of interval classification. Although "a similar system of classification" was already found in the first draft (Partch 1928/33, 50), evidence points to its development having continued until 1930-31, contemporary with the evolution of Monophony towards a 37-tone gamut. The culmination of its development is described briefly in *Exposition*:

> The 37 intervals fall naturally into four classes [which] of necessity are named arbitrarily . . . The names should indicate the four types of interval reaction. (Partch 1928/33, 33, 35)

"Interval reaction" is not defined further, but seems to express the relative stability of pitches in relation to their fundamental and their strength as magnets. Partch believed that these intervals produce a particular psychological effect on the listener. The four "types" are named and delineated in the following chart, with their equally-tempered equivalents (which Partch acknowledged) listed alongside (ibid., 35):

Example Two: Monophonic Interval Classification System (*Exposition*)

Classification	Ratios	Equivalents in 12-Equal Temperament
Intervals of POWER	1/1, 4/3, 3/2, 2/1	perfect consonances
Intervals of SUSPENSE[50]	between 4/3 and 3/2	augmented fourths or diminished fifths (tritones)
EMOTIONAL Intervals	ca. 6/5, 5/4, 8/5, 5/3	imperfect consonances
Intervals of APPROACH	ca. 16/15, 10/9, 9/8, 16/9 9/5, 15/8	seconds, sevenths

In *Exposition*, Partch presents his classification system both in a horizontal graph covering a single octave (ibid., 34) and a "table of relationships" (ibid., 36). The left-most column of the table lists a Monophonic "fabric," or scale. Each ratio in this scale in turn becomes a scalar fundamental (1/1), to the right of which a set of twenty-four ratios (excluding 2/1) and their groupings into the four interval types are presented. The idea of transforming a scale into a set of fundamentals for further evolution of scales anticipates Partch's concept of the Tonality Diamond (Partch 1974, 110-111, 158-161).

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[50] Partch (1928/33, 35) first labeled these intervals "Psychic;" "Suspense" seems tame by comparison. Perhaps "Psychic" had too many personal connotations, in light of Partch's interest in numerology, a history of psychological problems, and a mystical, almost Yeatsian vision of "another path - - that of Man, the bright adventurer, the magic-maker" (Partch 1973, 116).

Two curiosities emerge upon closer examination. First, many of the ratios are indicated using Partch's "old" system of approximation (a, b, c) rather than with mathematical precision. Second, while the scale found in the horizontal graph has 37 ratios, the primary (left vertical) scale of the table has 41. There may well have been an earlier table involving only 37 ratios; it is quite probable that the extant graph and table come from different drafts of *Exposition*. But, whatever remained to be delineated, Partch's approach to interval classification was certainly in place by 1931.[51]

C. Overtones and Undertones

> According to the Review, the third draft of the *Exposition*
>
> admitted undertones as the source of intervals. This was hastened thru [sic] reading[52] Henry Cowell's *New Musical Resources*, published in 1930 (Partch 1928/ 33, 51).

In *New Musical Resources*, Cowell reiterates the commonly held view positing a direct relationship between the overtone series and major tonality (Cowell 1930/69, 7-9), but then insists upon a similar relationship between an "undertone series" and minor tonality (ibid., 21-24). While this second idea was not original with Cowell

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[51] This principle would later be conveyed in the form of the visually and nominally compelling "One-Footed Bride, a graph of comparative consonance" (Partch 1974, 155). It is possible that Helmholtz's dissonance graph (Helmholtz 1954, 333) was an inspiration for Partch's diagram. Nonetheless, the "Bride" carries no new information on her person; if Partch's interval classification system led to any further developments after 1931, it was in the compositional arena, not the theoretical one.

[52] Partch's original wording ("This was the result of reading . . .") had been changed by 1933.

(see next paragraph), he thought he had found indisputable proof for it in the research of one Nicolas A. Garbusov in Moscow, who "demonstrated" to Cowell that, in a room where music was being played, the resonating bodies in the room (instruments, objects in the room) would generate undertones from the same sound source that produced overtones (ibid., 21-23).

A theory of undertones, a series of audible pitches generated, like the overtone series, from a fundamental but in a descending direction, was first proposed by Jean-Philippe Rameau, who tried to generate the source of the minor triad in a manner parallel to the generation of the major triad.[53] The subject of debate during more than the last two centuries, its most vociferous advocate was Hugo Riemann, who credited Gioseffo Zarlino for its theoretical basis (Shirlaw 1917, 35-36). But the possibility of hearing the undertone series was already in great doubt by the time Cowell wrote *New Musical Resources* and it is unlikely that anyone would try to rationalize the minor triad through undertones at this point.[54]

What were the views of the scientist from whom Partch had drawn so much? Helmholtz mentions undertones briefly, but he views them more as resonance enhancers than as scale generators (Helmholtz 1954, 44-45). He interprets the

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[53] First advocated in Rameau, *Génération harmonique* (1737). There is a lengthy section on this treatise in Partch's indispensable source for historical theory, Shirlaw 1917 (155ff.).

[54] In Cowell 1930/69, Joscelyn Godwin writes: "This theory [of undertones] is fallacious, and Cowell's very explanation of it is self-contradictory . . . If the original sounding body does not produce the undertones, but 'it is difficult to avoid them in resonation' [ibid., 22], how could Garbusov's instrument produce them 'without the aid of resonators' [ibid.]? . . . It is possible that Garbusov's instrument was connected in some way with 'difference tones,' and that it was insufficiently explained to Cowell in Russia" (ibid., 150). Cowell visited the USSR in 1929.

"modern minor mode" as a post-1600 fusing of the medieval Dorian, Aeolian, and Phrygian modes, and its harmonic rationale as an ambiguous by-product of "false combinatorial tones" (ibid., 248, 294-95).[55]

During the early 1930's, however, Partch considered both overtone and undertone series to be generative sources for scales, although not always in the order of the partials themselves. As a demonstration, he expresses the 11-tone diatonic scale in both series of ratios (Partch 1928/33, 8):

C	Db	D	Eb	E	F
Overtone:					
1/1	16/15	9/8	6/5	5/4	4/3
Undertone:					
½	8/15	9/16	3/5	5/8	2/3

G	Ab	A	Bb	B	C
Overtone:					
3/2	8/5	5/3	16/9	15/8	2/1
Undertone:					
3/4	4/5	5/6	8/9	15/16	1/1

According to Partch,

> It is clear that the two sets of ratios that are the symbols for these tones differ only in that the undertone ratios are a 2/1 below the overtone ratios . . . The very fact that a ratio must have two numbers is proof that it is a potential dual identity [i.e., can serve as a component in at least two sets of ratios, one overtonal, one undertonal, and thereby participate in a modulation] . . . The germ of this theory was discovered . . . by Giuseppe [*sic*] Zarlino . . . who

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[55] Partch virtually ignores this rationale for minor (Partch 1974, 389); Shirlaw gives it greater attention (Shirlaw 1917, 373-75).

> expounded the polarity of major and minor [meaning] that the major is naturally an ascending scale, and that the minor naturally descends with intervals the exact reverse. (Ibid., 8-9)

While Zarlino writes about intervallic inversion as well as the classification of intervals, harmonies, and modes into "major" and "minor," he never refers to "scale," despite Partch's claim. Later, in *Genesis*, Partch elaborates on Zarlino, "the first forthright Monophonist," concerning the "senario," the Harmonical and Arithmetical Proportions, and simple and composite ratios; but he also credits "major and minor scales" to Zarlino's theory (Partch 1974, 378). The original source of Partch's error is unclear;[56] but the issue is ultimately semantic, since it does not figure in the final rationale of Monophonic theory.

Limiting himself to ratios found in the 11-tone scale, Partch first derives three major and three minor diatonic scales, presented in ratios. The major scales are built on the overtone series (Partch 1928/33, 10-11):

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[56] Because of the lack of a bibliography or footnotes in *Exposition*, it is impossible to discover the source of Partch's attribution of "scale" to Zarlino; the principal source for *Exposition* (Helmholtz 1954) barely mentions Zarlino and never in this context. For information on the history of music theory in *Genesis*, Partch drew heavily upon Shirlaw 1917 for much of the material on Zarlino. Although Partch's summary of the relevant pages (Shirlaw 1917, 35-46) is accurate, Shirlaw never associates "scale" with Zarlino. Joel Lester (private communication) has suggested that Partch's misapplication may have come from Hugo Riemann; the *Genesis* bibliography lists the 1887 English translation of Riemann's *Die Natur der Harmonik* (1882). While possibly true, there are obstacles to proof: Shirlaw, who challenges Riemann at great length, does not criticize him on this particular item; Riemann is not credited with any Zarlino material in *Genesis*, although Partch refers to Riemann's "truly Zarlinean conception of 'minor'" (Partch 1974, 390); and, finally, the complete absence of Riemann from *Exposition*.

Major:	Tonic	2nd	3rd	4th	5th	6th	7th	Oct
	1/1	9/8	5/4	4/3	3/2	5/3	15/8	2/1
=	C	D	E	F	G	A	B	C
	4/3	3/2	5/3	16/9	1/1	9/8	5/4	4/3
=	F	G	A	Bb	C	D	E	F
	8/5	16/9	1/1	16/15	6/5	4/3	3/2	8/5
=	Ab	Bb	C	Db	Eb	F	G	Ab

Still limiting himself to notes in the 11-note scale, Partch next derives three minor scales in a direction downwards from 1/1. Understanding this type of derivation requires the acceptance of unorthodox ideas associated with the "undertonal" form of the minor tonality:

1. Minor scales are derived and presented in descending order, even though scales are conventionally heard as ascending from a tonic;

2. If the fundamental of a minor scale were to be considered its tonic, the resulting ascending scale would be perceived as the modern Phrygian mode, rather than any of the minor modes; and

3. In any "undertonally derived" scale, the fundamental is heard as the fifth step of an ascending minor scale, not its tonic. The next new pitch (or partial) in order of derivation is heard as that scale's tonic, that is, as the root of its "tonic chord" (with the fundamental as its fifth).[57]

Here are Partch's "downwardly derived" minor scales (ibid., 10-11):

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[57] Compare with Partch's views on "Rameau the Inconstant" (Partch 1974, 385-86).

Minor:	5th	4th	3rd	2nd	Tonic	7th	6th	5th
	2/1	16/9	8/5	3/2	4/3	6/5	16/15	1/1
=	C	Bb	Ab	G	F	Eb	Db	C
	3/2	4/3	6/5	9/8	1/1	16/9	8/5	3/2
=	G	F	Eb	D	C	Bb	Ab	G
	5/4	9/8	1/1	15/8	5/3	3/2	4/3	5/4
=	E	D	C	B	A	G	F	E

Already in the 1930's, Partch acknowledges the difficulties inherent in Zarlino's concept of "the polarity of major and minor":

> It was [Zarlino's theory] that the major is naturally an ascending scale, and that the minor naturally descends with intervals the exact reverse . . . taken from their source in the overtone or undertone series. . . It is rather an arbitrary grouping, and quite variable. It is preferable to think of the 11 tones [of the just chromatic scale] as a single body susceptible of many groupings [i.e., a Monophonic source set]. The arrangement of the intervals does not matter so long as the triad tones are retained, C - E - G for major, and C - Ab - F for minor . . . [This discovery] is completely corroborated in that the 1 - 3 - 5 identities [i.e., partials] of the overtone series form the major triad [through octave equivalence], and the 1 - 1/3 - 1/5 of the undertone series the minor. (Ibid., 9-13)

Following Zarlino's approach, Partch gives consonant relationships between pitches priority over scalar considerations; in effect, the theoretical goal of Partch's Monophony is to attain Zarlino's "perfect harmony."[58]

> The very fact that a ratio must have two numbers is proof that it is a potential dual identity. It is not meant that a tone can be considered an overtone and undertone at once; rather, that a tone at once has the

[58] Partch's reasoning may be compared with the discussion of Zarlino in Shirlaw 1917, 44-50.

> possibility of both. The mind must work in diametric directions to comprehend this; for overtones up, for undertones down. (Ibid., 9)[59]

This last caveat offers a clue to Partch's later response to Monophony's demand for "diametrical comprehension." He defines "ratio" as

> a relationship, or interval, expressing the vibrations per second, or cycles, of the two tones concerned . . . a ratio represents a tone and an interval at one and the same time; in its capacity as the symbol of a tone it is the over number that is nominally representative (in the upward manner), but since the over number exists only in relation to the under number, the ratio acquits its second function, as representative of an interval; [e.g.,] 3/2 represents D in the key of G [1/1] - - upward from G; it is thus simultaneously a representative of a tone and an implicit relationship to a "keynote" - - or unity. (Partch 1974, 73)

Partch would eventually come to agree with the mathematician Max Meyer on the question of ratios. He cites Meyer's book[60] as authoritative, despite the latter's stand against "extended just intonation" (of which Monophony is one type) and in favor of 24-equal temperament:

> Of ratios [Meyer] says: "No other terms are safe from ambiguity;" therefore, "the musician who abhors numbers . . . abhors the way leading toward an understanding of musicianship, an understanding of the psychology of music." In surveying musical theory, "our whole endeavor is directed toward deriving the history of music from the 'preference,' so to speak, for smaller number symbols [i.e., small-number ratios], other conditions permitting a choice" . . . [Meyer] scoffs at the idea that the ear can like any unusual interval merely through habituation, and gibes at the "mythology" of overtones. (Ibid., 427)

Meyer's studies of the physiology of listening (reported in *An Introduction to the*

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[59] Partch has moved here beyond the "physical" (that which is observable in nature) to the "metaphysical" (that which must be intuited, even imagined).

[60] Max F. Meyer, *The Musician's Arithmetic* (University of Missouri Studies IV/1, 1929).

Mechanics of the Inner Ear, 1907) influenced Partch's decision to rely on mathematics to determine pitch and to reject any other received notions about its basis.[61]

Sometime between the 1933 draft of *Exposition* and the last two drafts of *Genesis* (1946-47), then, Partch conceded that the undertone series could not justify the minor mode.[62] In order to maintain consistency, he had to eliminate not only the undertone series but also the overtone series from any defense of Monophony. In a *Genesis* survey of "equal temperaments" and attempts to rationalize them, he writes rather sardonically:

> In this brief examination of contemporaries we are also very conscious of their repeated use of the word overtone, their evident desire to tie our everyday scale to something a little beyond us, to one of the phenomena of nature . . . The genesis of twelve-tone Equal Temperament has nothing to do with overtones . . . Even in the light of the long years and great labor that man has expended in striving for beauty in intonation, we must say . . . that twelve-tone Equal Temperament was an unfoldment of genius. We also know that it was attended by an evil genius,[63] but the treasure nevertheless survives. And now, at 11:55 by the clock, would-be resuscitators are rushing to the bedside with transfusions of overtones, apparently assuming that a critical illness exists. (Ibid., 423)

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[61] Partch's footnote here reads: "[a]cknowledgement is here made of the salutary effect of Meyer's argument on the presentation of material in this book" (Partch 1974, 427). One may infer that Meyer's *The Musician's Arithmetic* had considerable impact on Partch's reliance on overtone-undertone rationalization. and the "hallucinations" of undertones as sources of tonality, calling the ordinarily considered "dominant" in the Utonality [minor] 1-5-3 triad the "worst chosen keynote."

[62] Partch likely did not dismiss his overtone-undertone rationalization of Monophony completely until after 1940 (see Chapter Seven).

[63] Is Partch hinting that the *diabolus in musica*, in the form of the 12-equal tritone, is at work here?

D. Otonality and Utonality: The Hexad

Having put aside the "natural" rationalization of Monophony found in *Exposition*, Partch builds his defense instead upon the aforementioned "potential dual identity" of the ratio in *Genesis*. The concept states that the tonal meaning of any ratio depends on whether its "over number" (numerator) or "under number" (denominator) either 1) indicates the tonality to which the ratio belongs, or 2) designates a "correlative" or individual ratio's "location" within the tonality. In Monophonic theory, the tonality of a related group of ratios is determined by their sharing of a lowest common factor, or Numerary Nexus,[64] within whatever numerical limit has been established. (This shared factor may be present in either its lowest form or as an octave equivalent.) These groups of related ratios are classified in one of two ways: either as an

Otonality, or Overtonality, the Monophonic equivalent of 12-equal major tonality. The denominators form the Numerary Nexus, or common factor. The 11-limit set of Odentities (Otonal Identities, or the individual components or "correlatives") can also be derived by the Harmonical Proportion of ancient Greek theory and be transposed to begin on any ratio acting as a fundamental (1-Odentity); or as an

Utonality, or Undertonality, the Monophonic equivalent of 12-equal minor

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[64] It is unclear when the term "Nexus," not found in *Exposition*, entered Monophonic theory. In the 1946 (penultimate) draft of *Genesis*, Partch calls the lowest common factor the "Ordinal Nexus;" only in the 1947 final draft does he refer to "Numerary Nexus." To my knowledge, Partch never explained this last-minute change; perhaps a desire for alliteration sufficed.

tonality. The numerators form the Numerary Nexus. The 11-limit set of Udentities (Utonal Identities, or the individual components) can also be derived by the Arithmetical Proportion of ancient Greek theory and be transposed to begin on any ratio acting as a fundamental (1-Udentity).[65]

Using a spirited if odd metaphor, Partch underscores the fact that both Otonality and Utonality result from

> an immutable faculty of ratios, which in turn represent an immutable faculty of the human ear . . . The important fact is the immanence of Utonality in ratios, that Utonality can create an aural sensation quite as definite as the visual sensation of a new moon. The casual hearer of the one and the casual observer of the other are moved only by effect, and that effect is in no way changed by the name given to it. The one significant aspect of Utonality is that willy-nilly it is coexistent with Otonality in a Monophonic system of Just Intonation. (Partch 1974, 88-89)

For Partch, the relationships between ratios (as heard by the ear) are sufficient to underpin a justly tuned system such as Monophony, and inversion of these ratios creates "willy-nilly" a "coexistent" set of ratios. Both Otonality and Utonality are "immanent" in the ratios; no manipulation of external factors (e.g., overtones) is necessary to produce the just "equivalents" of major and minor. But what is the "aural sensation quite as definite as the visual sensation of a new moon"? If it's meant to be taken seriously, the image requires considerable metaphysical juggling: a new moon is dark and empty, yet the beginning of light (waxing) - - the opposite of a full moon, which is light, yet the beginning of darkness (waning).

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[65] In *Exposition*, Partch favors the terms "overtone" and "undertone" to refer to Odentities and Udentities; but there is one occurrence of the term "identity" (Partch 1928/33, 20-21).

Mathematically speaking, Otonality and Utonality are "opposites," but what is the aural result? According to Partch, it is what "the casual hearer" is moved by: that effect [that] is in no way changed by the name given to it." In other words, perception is finally the necessary and sufficient proof of the Monophonic system.

With its inclusion of such basic Monophonic concepts as Otonality and Utonality, the 1931 draft of *Exposition* must have considered another basic principle: the consonant hexad based on the 11-Limit. Using the overtone and undertone series, Partch introduces the notion of a Monophonic "tonality." This is neither a diatonic scale nor even a full-fledged key, but a series of six tones or ratios derived from a single fundamental and governed by a Numerary Nexus in either the numerator or denominator. These six tones (or Identities) are by definition consonant with their 1-Identity (whose function lies somewhere between modal final and scalar tonic) as well as among themselves. A Monophonic hexad contains no more or less than all the "odd-numbered components" (Identities) of a given tonality up through the 11-limit; examples of both types follow:

I. 1/1-Otonal hexad[66]. Like a "key signature," the initial ratio indicates the fundamental, or Prime Unity (i.e., 1/1). Since the Numerary Nexus of any Otonality corresponds (through octave equivalence) to the fundamental's denominator, the

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[66] The six ratios of this hexad serve as the Prime Unities for both Otonal and Utonal versions of the "Ptolemaic Sequence," an ancient Greek scale given the name "Intense Diatonic." Partch calls this "one of the world's fundamentally beautiful tonal sequences . . . the scale of widest distribution and widest popularity in the West . . . In one of its present-day prostituted forms it is any 'major' scale on the piano" (Partch 1974, 164-67).

Numerary Nexus of the following Otonality is 1; Odentities are indicated in the numerator; 12-equal temperament equivalents are placed underneath (ET):

Odentity:					
1	3	5	7	9	11
1/1	3/2	5/4	7/4	9/8	11/8
(or)					
8/8	12/8	10/8	14/8	9/8	11/8
Cents:*					
0	702.0	386.3	968.8	203.9	551.3 [67]
Equal Temperament					
G	D	B	"F"	A	"C/C#"
Cents Difference:**					
0	+2.0	-13.7	-31.2	+3.9	48.7

*0 cts = 1200 cts
** cts difference between just ratio and nearest 12-equal pitch.

The second line of ratios demonstrates that the denominators of the first line (1, 2, 4, and 8) are simply octave (2/1) equivalents of the Numerary Nexus as well as each other. They can thus be represented by their lowest common multiple, in this case 8 (2^3, sounding three octaves [2/1's] above 1/1).

Because of the layout of the Otonal hexad, the numerically-based ordering of Odentities (1-3-5-7-9-11) differs from the chordally-based ordering, for, in any Otonality, the 3-Odentity yields the hexad's just perfect fifth (slightly sharper than the 12-equal equivalent), while the 5-Odentity produces the just major third (flatter

[67] Partch 1974, 461-63 (Appendix I) comprises a table of the "Cents Values of Intervals, Including the 340 Intervals Narrower than a 2/1 Found in the Monophonic Fabric." All values are rounded to the nearest tenth of a cent. The cents values for the final 43-tone Monophonic scale are also listed separately (ibid., 133).

than the 12-equal equivalent). Continuing the analogy with 12-equal temperament, the just 7-, 9-, and 11-Odentities will be most likely interpreted as a flat minor seventh, a slightly sharp major second, and a pitch almost exactly halfway between a perfect fourth and tritone, respectively. To clarify the chordal aspect of the hexad, it is now rearranged into "closed position," which results in:

[Lowest]	1/1	5/4	3/2	7/4	9/8	11/8	[Highest]
Cts:	0	386.3	702.0	968.8	203.9	551.3	
Equal:	G	"B"	D	"F"	A	"C/C#"	

Finally, here is the 1/1-Otonal hexad in "scalar order":

[Lowest]	1/1	9/8	5/4	11/8	3/2	7/4	[Highest]
Cts:	0	203.9	386.3	551/3	702.0	968.8	
Equal:	G	A	"B"	"C/C#"	D	"F"	

II. 1/1-Utonal hexad. Just as the "phantom" undertone series is an inversion of the overtone series, Monophony's "minor" or Utonalities invert the pattern of Otonality by having their Numerary Nexus in the numerator and their Identities ("Udentities") in the denominator. The following Utonality has a Prime Unity (1-Udentity) of 1/1 and a Numerary Nexus of 1; it is shown first in the order "downwardly derived" from its fundamental:

Udentity:	1	3	5	7	9	11
	1/1 (or) 16/16	4/3 16/12	8/5 16/10	8/7 16/14	16/9 16/9	16/11 16/11
Cts:	0	498.0	813.7	231.2	996.1	648.7
Equal:	G	C	Eb	"A"	F	"C#/D"
Cents Difference:	0	-2.0	+13.7	+31.2	-3.9	+48.7

In 1/1-Utonality, the lowest common multiple of the Numerary Nexus is 16. Since this hexad is downwardly derived from its Prime Unity, Utonality must incorporate the idea of "downward octave equivalence." For example, the 3-Udentity, 2/3 (the actual ratio resulting from the downward derivation), must be interpreted as its octave equivalent, 4/3.

Unlike Otonalities, a Utonal Prime Unity will not be perceived as the tonic. In Utonalities, the 1-Udentity is heard as an slightly flattened perfect fifth, the 3-Udentity as the tonic (and "root" of its hexad), and the 5-Udentity as a somewhat sharp minor third. For clarification, the 1/1-Utonal hexad is now presented in a reordering into ascending closed position; the "transposition" interprets how the chord will be perceived aurally:

[Lowest]	4/3	8/5	1/1	16/11	16/9	8/7	[Highest]
[transposed]	1/1	6/5	3/2	12/11	4/3	12/7	
Cts:	0	315.7	702.0	150.7	498.1	933.2	
Equal:	C	Eb	G	"D/Db"	F	"A"	

The nature of the Utonal hexad is further confounded by the 7-, 9-, and 11-Udentities, which will most likely be interpreted as a sharp major sixth, an almost perfect fourth, and a pitch halfway between a minor and a major second, respectively. As a result, there is no apparent "seventh" to reinforce the basic triad; nor does the major sixth belong to the equivalent natural or harmonic minors.

In order to understand Monophony fully, one should not treat Utonality as a "pseudo-minor," but rather as a different path for compositional exploration. Similarly, Otonality should be perceived on its own terms, not as a "substitute" for major. It is perfectly logical for Partch to have jettisoned the terminology of 12-equal temperament, for the "functional harmonic theory" supporting the major/minor scalar system does not apply to Monophony or its hexadic system.[68] Partch could now justify Otonalities and Utonalities as "implicit in small-number ratios," rather than deriving them from overtone and undertone series or from other possibly dubious precedents (Partch 1974, 75). In addition, he could call on the Harmonical and Arithmetical Proportions to lend validity to Monophony (ibid.,

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[68] In *Genesis*, Partch dispenses with the problem of "the perception of the minor root" in Utonality through an analogy with an upside-down map (Partch 1974, 111-12). But he has every right to do so; for while the derivation of "minor" from "major" and related issues remain the property of theoretical warring factions everywhere, one need only accept Monophony on its own terms, as it were; the "problem" of Utonality then becomes nothing but a red herring. Utonality is not minor; there is no need to prove otherwise.

88-90).[69] He was thus able to "save" Monophony by isolating its rationale from Cowell's invalid undertone theory (and the overtone theory as well). By the time of *Genesis*, Partch could confidently state that, in Monophony, ratios would be the sole basis for tuning, numerical relationships the sole determinant of interval and harmony, and the ear the ultimate judge and confirmation of the Monophonic system.[70]

E. The Principles of Song

As already mentioned at the beginning of this chapter, the third draft is the first to include a discussion of the "principles of song" that Partch had been considering since 1929. In *Exposition*'s chapter "The Spoken Word In Song," two simple but often ignored principles of text setting are given: that melody is to be determined by the inflection of speech, and that the text's rhythm would determine the music's rhythm. Only at "psychological points" would melodies be "introduced without words with preaccepted meanings, to be sung in pure vowels and other

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[69] The Harmonical Proportion (the successive subdivision of a string into equal parts) produces the equivalent of Otonality, and was mentioned earlier. The Arithmetical proportion involves dividing the string into equal parts, but now the ratios are determined beginning at the highest pitch (1/x), continuing through 2/x, 3/x . . . x/x, where x = the number of parts the string has been divided into (and x/x is the whole string). The resulting descent mirrors the harmonic proportion in the opposite direction.

[70] Throughout *Genesis*, Partch raises the question of the ear's capacity to perceive subtle distinctions in intonation; he recalls an experiment he conducted involving "audience participation," i.e., perception, which supported his views (Partch 1974, 192-93).

syllables. These [were to] conform to a notated rhythm" (ibid., 44).[71] Partch was well aware of the lack of originality in his thinking on this subject at this point in his career. He is both freer and more specific in crediting his influences here than anywhere else in the *Exposition*: ancient Greek and Chinese dramatic declamation, the "troubadours of France," Peri, Schütz, Gluck, Wagner, and Wolf (ibid., 44-47). To demonstrate the principle of pitch inflection, Partch includes the product of a 1931 "experiment in using the spoken inflection of another person as the basis of a song." This is a transcription of a recitation of *My Lord Is My Shepherd* by a San Francisco cantor, Reuben Rinder (ibid., 46-47).[72] This small but significant step in Partch's development anticipates the transcriptions of speech and song in the hobo journal "Bitter Music" (1935-36) and the so-called "Americana" works of the early 1940's. By early 1932, he had expanded this "experiment" into a setting of the 23rd Psalm for voice and Adapted Viola (McGeary 1991, 66-67).

F. Monophony's Public Performance Debut

Sometime between April and August, 1931, Partch returned to California, where he was to remain until the summer of 1933 (McGeary 1991, 4-5). Early in 1932, Partch began giving demonstration-concerts of the Monophonic system and

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[71] "There was no conscious influence [on these conclusions] except, possibly, the knowledge that the ancient Greeks had used some such manner of song" (Partch 1928/33, 50).

[72] See Appendix III for a partial reproduction of Partch's score. The notational system used for the transcription in *Exposition* dates from 1932 and is described in Chapter Five.

music. With some resignation, he had decided to limit his public performances to accompanying others on the Adapted Viola. Here the composer reflects on this aspect of his career:

> The severity of the whole Christian démarche [the post-Gregorian era], cutting off the people and the language of the people from a music appropriate to their daily emotions, their place, and their time, had its inevitable reaction in the pleasant and romantic art of the troubadours, trouvères, minnesingers, and meistersingers, of the eleventh to sixteenth centuries . . . Here was a rebirth of the spirit of Greek epic chant . . . The point is that minstrel poet and minstrel composer and minstrel performer were generally one and the same. It must occur to many . . . that because this is no longer true today, we may have lost an important value. (Partch 1974, 19-20)

Partch's first collaborator was the Oakland singer Rudolphine Radil, who had been introduced to Partch by Henry Cowell, soon after the two composers met in 1931. Their first public recital took place at Rudolph Schaeffer's San Francisco studio on February 9, 1932, possibly after a week's postponement.[73] Several local newspapers noted the event; one advertisement called it "the first public demonstration of Monophony and tone declamation (new-old systems of musical and poetic [thought])." The program opened with Partch presenting an "exposition with monophone . . . an instrument designed to produce accurately 55 tones within the octave." He was then joined by Radil in performances of two scenes from Shakespeare, including a "dialogue from *The Merchant Of Venice*" (now lost), seven Li Po songs, and the two Psalms. Writing for the *San Francisco Chronicle* of

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[73] The pair gave a private concert in San Francisco on 29 November 1931 (Gilmore 1992, 57).

February 10, 1932, Alexander Fried summarizes the "public relations" material on Partch and then comments on the demonstration:

> The effect was, for a moderate time, interesting. Tone declamation, or "monophony" as it is sometimes called by its inventor, does not threaten to put conventional music out of business. It did not even prove itself a superior substitute to the ordinary recitation of sonorous poetry. But it may very well have possibilities as a distinctive means of musical expression.

FIVE: Monophony: Stage III (1932-33)

With the first public Monophonic demonstration under his belt, Harry Partch continued to compose, primarily settings of Li Po; revise his treatise, revealing an uncertainty about the number of tones per Monophonic octave; and experiment with notational systems. He built a prototype for a Monophonic keyboard instrument, and gave further lecture-recitals about his system and of his music for intoning voice and Adapted Viola.

A. The 37-Tone Scale and its History of Intervals

By the third draft (1931), many of the essential tenets of Partch's Monophony were already part of *Exposition*; the last two drafts mostly provided additional support material for the theory. The fourth draft was completed in Visalia, California on August 24, 1932. According to the Review, "the 1932 draft contained a history of intervals." As Partch acknowledges, this is drawn primarily from two sources: Ellis's addenda to Helmholtz, especially Appendix XX, sections D and K, which focus on musical intervals and non-harmonic scales (Helmholtz 1954, 451-57, 514-27); and the otherwise obscure "David Binning Munro's *Modes of Ancient Greek Music*, in which several scales of the cithara after Ptolemy, Egyptian scientist of the second century B.C., are given in exact ratios" (Partch 1928/33, 27). Neither Munro nor his book are found in Partch's writings after *Exposition*.

As the chapter called "History Of The 37" in the 1933 draft seems likely to have been based on a similar one in the previous draft, it may be concluded that, by 1932, Partch favored a 37-tone scale over the 29-tone scale found on the Adapted Viola. The following incorporates the two scales; note that the 37-tone scale (like its predecessor) is symmetrical around 1/1:

[1/1]	49/48	[33/32]	22/21	[21/20]	16/15	[15/14]
[12/11]	11/10	[10/9]	9/8	[8/7]	[7/6]	[6/5]
[11/9]	[5/4]	14/11	[9/7]	[4/3]	[11/8]	[7/5]
			-- axis --			
[10/7]	[16/11]	[3/2]	[14/9]	11/7	[8/5]	[18/11]
[5/3]	[12/7]	[7/4]	16/9	[9/5]	20/11	[11/6]
[28/15]	15/8	[40/21]	21/11	[64/33]	96/49	[2/1]

Ratios belonging to the 37-tone scales are underlined;
Ratios belonging to the 29-tone scale are bracketed; and
Ratios belonging to both are underlined and bracketed.

Of the original 29 ratios, 21/20, 15/14, 28/15, and 40/21 have been eliminated. Twelve new ratios have been added, which may be accounted for by one of two reasons:

1) the completion of the "twelve Tonalities," that is, the six Otonalities (Overtone Tonalities) and six Utonalities (Undertone Tonalities) that Partch now

considered essential to Monophony and that are depicted in the *Exposition* table called "the twelve Tonalities within the One [i.e., derived from 1/1]" (Partch 1928/ 33, 22). Ratios in this category include 9/8 and 16/9, the major second and minor seventh of the 11-tone just scale, whose unexpected absence on the Adapted Viola fingerboard (see Chapter Three) is now rectified; and

2) the filling in of the relatively large "ratio gaps" between 1/1 and 12/11 and their inversions, 11/6 and 2/1. These include 16/15 and 15/8, the "leading tones" above and below the fundamental 1/1. By the time Partch settled on a 43-tone Monophonic scale (1935), he had eliminated four ratios of this 37-tone system (see Appendix I).

The intervals contained in the "History of the 37" are organized by Identity number - - 1, 3, 5, 7, 9, and 11 - - followed by "intervals the result of two [ratios] within [the] 11[-limit]" (ibid., 27-31). Each interval is presented both as a ratio and its equivalent in cents; in some cases, Partch uses approximations for the ratios (with a maximum error of four cents).

In addition, each interval is accompanied by a brief description of its reputed historical and/or geographical origin. Most of these are drawn from Ellis, who in turn depended on the "reports" of authorities such as the Dutch scholar J.P.N. Land (Helmholtz 1954, 515-17). Partch's choices of attribution include well-known sources (Chinese, Arabic, Greek, and Indian theories), the "wood harmonicon of West Africa" (belonging to the "balafong" family), the string

tambours of "Bagdad" and "Khurasan," and a mysterious "certain Highland bagpipe." In only one case, 21/11, does its origin remain "unidentified."[74]

Despite the historical bases delineated and supported by graphs outlining the acceptance of all 37 tones as valid, Partch's allegiance to this scale was by no means steadfast at the time. For example, a notice for Partch's 1932 New Music Society concert refers to

> the result of Partch's investigation . . . a system built from a single vibration and its overtone series, making available 55 ratios of that series within the octave. Such a system parallels the human voice, which glides from one sound to another. (Nathan 1932)

While no table of or theoretical rationale for this 55-note scale by Partch has yet come to my attention, Nathan's comment undoubtedly reflects the composer's actual practice at this time. The 55-tone scale would have included ratios used in the Li Po settings but not found either marked on the Viola fingerboard or within the 37-tone system.[75] During this period, Partch was at his most free in exploring the infinite possibilities of just intonation, using only instruments (voice and Viola) able to produce pitches without being hampered by structural limitations.

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[74] Partch presents an extended, more readable summary of this and related information in the first chapter of *Genesis*, "From Emperor Chun to the Vacant Lot" (Partch 1974, 3-47).

[75] In her study, Janet Garcia Cameron tabulates "all the ratios Partch used . . . not included in the 'Monophonic fabric,'" and details his practice of using "inexact ratios" resulting from "adding a plus or minus to a ratio" in the Adapted Viola part. While her essay and transcriptions provide a "general explanation of Partch's notation," she offers no hypothesis concerning the 55-tone scale (Cameron 1982, 13-18).

B. Notation (1932)

As demonstrated by a 1932 version of the Li Po song *A Dream*, Partch's use of ratio notation had continued.[76] Later that year, however, Partch temporarily abandoned this method for a system of five pairs of staff lines, with spaces between the pairs to be filled in by a single leger line. Each "ten-line/four-space staff" covers one 2/1; as with ratio notation, an Arabic numeral to the left of the staff indicates register, while a Roman numeral indicates the desired Adapted Viola string.[77] In this system, accidentals are wedge-shaped marks, equivalent to the c accidental (i.e., about 4 cts) found in earlier Partch systems. Used singly or in combination, the wedge-mark indicates sharpening (when the mark is located above the note, wedge pointed upwards) or flattening (when the mark is below the note, wedge pointed downwards; Partch 1928/33, 37).

> Some years later, Partch would write that this notational system
>
> satisfied the [essential] graphic quality completely . . . [but] the area the eye was obliged to cover defeated the object - - easy reading through a completely graphic notation. (Partch 1949, 221)

According to the fifth (1933) draft of *Exposition*, this staff was designed for the 37-tone scale; but there is in fact room for a 39-tone scale, without additional accidentals. That Partch was already contemplating using a slightly larger scale is confirmed by the forementioned interpolated table demonstrating the string fingering

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[76] A microfilm copy of this manuscript is held at the Lauriston C. Marshall Collection of the Partch Archive at the University of Illinois (reel 3).

[77] An example of this notation may be found in McGeary 1991, following 128 (no. 3).

necessary to play 39 Monophonic ratios per 2/1; the date of this chart, originally intended for cello, is uncertain (Partch 1928/33, 41). This 39-tone scale alters[78] the 37-tone scale by eliminating 11/10 and 20/11 while adding 21/16, 15/11, 22/15, and 22/15.[79]

C. The Model Ratio Keyboard: Further Experimentation with Scales

According to the Review, Partch designed a "ratio keyboard" in April, 1932, with the help of Mildred Couper, a friend and "composer in quarter-tones" (ibid., 51). Partch completed a model of it (without action or sound) later that year. The model ratio keyboard was never attached to a sound-producing mechanism, and is no longer extant. However, three different designs for it are in the collection of Jonathan Glasier, having come to him in the same envelope that held the *Exposition* draft (see Chapter Four). Glasier has published the second of these designs, dated September 8, 1932, along with Partch's comments on it (Partch 1932).

This design calls for an extent of six octaves, with its keyboard curved in an arc towards the player for ease of playing, much like a carousel organ; the keys are

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[78] McGeary 1991, 5, suggests a precise date and probable location (Pasadena, December 28, 1932) for this event; he refers to this as the "experimental Ptolemy organ" and "Chromatic Organ." However, these terms refer properly only to the related but nonetheless distinct experiment known as the Ptolemy, discussed in Chapter Six.

[79] Gilmore 1992, 50-52, discusses sketches for the last three Li Po songs (written in Gloucester, Massachusetts in 1933). In two cases, the voice parts show Partch using equally-tempered subdivisions of the conventional chromatic scale which, however, are not found in the fair copies. Gilmore views these as a "shorthand" subject to later "fine tuning: fixing precise interval relationships within a harmonic, and even structural context" (ibid., 51).

circular in shape and aligned in five rows. The placement of pitches is designed to fit the natural "five-finger patterns of the hand," with the intention of making scales of anywhere from 7 to 20 tones degrees relatively easy to play. A reproduction of the design is found in Appendix II.

While the design calls for the same 39-tone scale found in the "string family adaptation" chart (ibid., 41), Partch was apparently still unsure of the final Monophonic gamut. He discusses a 41-tone option, which reinstates 11/10 and 20/11, ratios found in the 37-tone but not the 39-tone scale (see Appendix I):

> The same four more complex ratios are represented by keys, while four ratios, 12/11 - 11/10 and 20/11 - 11/6, because they are approximate and surrounded by very small intervals, are allotted only two keys. A pedal may be devised to allow one key to play either of two ratios. (Ibid., 42)

Partch uses the term "complex" to refer to those intervals, inevitably the product of two 11-limit ratios, which fill in remaining gaps in the Monophonic gamut: the areas a semitone above or below the fundamental (i.e., between 11/6 and 12/11) and the tritone axis (between 4/3 and 3/2). What Partch meant by "approximate" is less obvious; he also uses the term in his "general description" of the ratio keyboard design. While both 11/10 and 20/11 require several accidentals in Partch's notational systems, they are by no means unique in this; and, while they are absent from the string family adaptation chart, so are 32/27 and 27/16. So one may conclude that Partch's definition of "approximate" is itself approximate, more the result of uncertainty concerning the feasibility of performing Monophonic music

accurately than any particular aspect of Monophony's development.

Partch's shift from a 39-tone to a 41-tone scale most likely took place in 1932, during the construction of the model ratio keyboard. Support is found in *Exposition* with the table of relationships discussed in Chapter Four (Partch 1928/33, 36) which incorporates a 41-tone "fabric" (scale) with at least two changes but with no ratios not found in a previous Monophonic scale; classification of the corresponding intervals, with the term "psychic intervals" changed to "suspense intervals;" and restoration of the diacritical accidentals a, b, and c, with their placement either before or after ratios, depending on their function (to flatten or sharpen, respectively), and the possibility of multiple applications.

The presence of two of Partch's handwriting styles in the table supports the hypothesis that this table was initially planned as far back as the first draft of *Exposition* (1927-28), "corrected" over the years, and included in the final *Exposition* draft more as a record of Monophony's evolution than as an up-to-date status report.

By the fourth and fifth drafts, Partch had gone beyond a concern with diatonicism to focus on extended consonance. The emergence of the hexad as the primary construct of Otonality and Utonality meant that Monophony would have to incorporate all six Identities of all twelve "primary" Tonalities. With this shift of attention to the vertical axis, Partch's previous emphasis on the linear aspects of the scale gives way to an insistence on as much 11-limit hexadic completeness as

feasible - - leading to greater modulatory freedom and thus greater expressivity. The "final" 43-tone Monophonic scale incorporates sixteen "secondary" Tonalities: two more "complete" Tonalities, making a total of fourteen such Tonalities; and fourteen "partial" Tonalities, requiring at least the presence of their 1-, 3-, and 5-Identities within the Monophonic gamut. While mortality and practicality eventually forced Partch to limit the breadth of his exploration, his system was designed to allow anyone to explore infinitely the idea of extended consonance - - in practical terms, to use ratios outside the 43-tone scale where necessary and appropriate.

D. Color Analogy

Partch's discussion of the model ratio keyboard introduces a system of color analogy to represent the six Identities of a Tonality, up through the 11- limit. For centuries, many individuals have discussed the experience of synaesthesia, often drawing up color analogies for keys. Helmholtz, for example, discusses an analogy between the prismatic breakdown of white light into the color spectrum and the analysis of "compound musical tones," that is, a single pitch, into its constituent partials (Helmholtz 1954, 64). Partch, however, has made

> no attempt to draw a true color analogy . . . The keys [of the model ratio design] are colored for only one reason - - to break the expanse of white so that the eye may quickly single out one of them. This was deemed necessary even [though] the ratios are painted on the keys. (Partch 1932, 16-17)

Partch thereby reinforces the visual indication of a given pitch's Identity within Otonal and/or Utonal hexads by marking keys with the color designated to symbolize that particular Identity. Given the multiple senses possible in Monophony, a key might have as many as six colors marked upon it, since pitches such as 1/1 may function as Identities in more than one hexad and therefore act as common tones during "modulation" between Tonalities. That the analogy was still in flux in 1932-33 is shown by the considerable difference in color choices between the 1932 design and the 1933 description of the model in the *Exposition* (Partch 1928/33, 42-43):

	1932:	1933:
1-Identity	Black	White
3-Identity	Red	Red
5-Identity	Blue	Yellow
7-Identity	Yellow	Blue-Green
9-Identity	Orange	Blue
11-Identity	Violet	Violet
+/- 1-Identity*	not shown	Black
"Complex Ratios"**	not shown	Gray

*"Those ratios approaching the [1-Identity] from both directions that are the result of two ratios within [the 11-limit]." (Ibid.)

**Four so-called "approximate" ratios (12/11, 11/10; 20/11, 11/6) allotted only two keys (see above).

E. A Summary of an Exposition

In early 1933, Partch performed with Calista Rogers, a Brooklyn-born soprano and Bach specialist who opened her Pasadena home to an informal recital series. The second and fourth events of the series, given on February 17 and April

28, were devoted to Partch demonstrations; the latter event was given "in response to many requests," according to the printed announcement. The two demonstrations were almost certainly identical in content, and very similar to earlier Partch demonstrations: his "exposition of Monophony," with musical examples, followed by performances of Monophonic works for voice and Adapted Viola. In the February 17 announcement, Monophony is described as "a system of music making available as many as fifty-seven [*sic*] tones within the octave in just intonation."[80] In the April 28 announcement, Monophony is "back" to 37 tones. The only other 1933 demonstration mentioned "was made for the high school music teachers of the city of Los Angeles" (ibid., 51).

Partch finally completed the extant typescript of *Exposition* on June 8, 1933, in Los Angeles. The Review describes the final draft of *Exposition* as a rewriting, with

> thoughtful criticism by [his patron] Bertha McCord Knisely . . . It is principally a condensation of the [fourth draft]. It contains new details, the history is more authoritative and complete, but the fundamental ideas are unaltered. (Ibid.)

The rediscovery of the fifth draft of *Exposition* has made it possible to examine far more closely the development of Monophonic theory during its first and most significant decade of evolution, beginning in 1923. While Monophony continued to develop after 1933, the evidence for its second decade of growth is less

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[80] This apparent misprint may be an unintentional conflation of 37 and 55, suggesting further uncertainty in Partch's thinking.

substantial and more indirect: reports on Partch's research in England in 1934-35; a few articles written by or about him in the 1930's and early 1940's; "Bitter Music;" his letter of application to the Guggenheim Foundation in 1940, containing an author's preface and a table of contents for a revised Monophonic treatise named *Patterns Of Music* (now lost); his return to Monophonic composition in 1941, after an eight-year hiatus; and other ideas incorporated into the first edition of *Genesis*.

For all intents and purposes, however, Partch had already formulated most of the basic principles of Monophony by 1933:

1) the use of a fundamental pitch (or ratio) to generate other pitches (or ratios);

2) the use of just intonation to determine true consonance and dissonance, with the consequence of requiring more than twelve tones per 2/1;

3) the development of tonal hierarchical relationships for the grouping of pitches, according to their numerators or denominators; and

4) a notational system (for intoning voice and Adapted Viola).

On the other hand, Partch had yet to tackle a number of important theoretical and practical areas of concern by the completion of *Exposition* in 1933:

1) a more versatile technique for Monophonic composition;

2) instruments for which such music could be written, and the acoustic and sonic principles on which they would be based; and

3) the training of performers and, eventually, maintaining of larger

ensembles, to perform the music.

Aesthetic issues, which Partch had seemed not yet ready to contemplate in depth, became more pressing as his confidence in Monophony grew. The "principles of song" were still embryonic and had only been subjected to one test, the setting of traditional lyric poetry. In a larger sense, he needed to decide what of the past to reject, what to accept, what to alter - - and how to replace what he would refer to as the Abstract aesthetic (i.e., mainstream European tradition), which he saw as the cause of modern music's downfall. His solutions, gradually formulated during the 1930's and 1940's and expressed in *Genesis*, are centered on the concept of the Corporeal aesthetic, an intuitive, communal, emotional, visceral, and ritualistic experience of participation, to be accomplished through music and whatever other means were required.

SIX: Monophonic Hiatus: 1933-40

The next phase of Harry Partch's life was a period of restless activity. It included work with the music of Native Americans, a first visit to the eastern USA, an eventful journey to Europe, and a return to a depressed America. He continued to refine the Monophonic system while pursuing a more thorough consideration of his compositional aesthetics and philosophical attitudes. Finally, he went through rigorous and tortuous challenges to his intellectual, psychological, and physical mettle - - in short, a thorough test of his professional and personal endurance.

A. Partch as Ethnomusicologist (1933)

Shortly before his departure for the eastern United States in the summer of 1933, Partch had an opportunity to study Native American music closely. This evoked for him his childhood in the southwestern United States which, at that time, consisted of small towns, desert, and Indian reservations. In the introduction to the 1974 edition of *Genesis*, he remembers that

> Yaqui Indians, very timid and aloof, were all about us in the declining years of the Old West. I recall watching through a telescope so-called 'bad men' holed up in some nearby rocks, and I fear that my five-year-old sympathies were all for the hunted. Later, when I heard the Yaqui Spring Ritual on a record, the sounds seemed amazingly familiar to me. (Partch 1974, ix)

Partch's Native American research took place at the Southwest Museum in Los Angeles, where he was temporarily employed as a transcriber. The position

most likely resulted from his work with Calista Rogers, who had performed with him earlier in the year. The January, 1934 issue of the Museum's bulletin, *The Masterkey*, reports that

> For some time during the spring and early summer of 1933, Miss Eleanor Hague and Mr. Harry Partch worked on the Museum's collection of Spanish California and Indian song records. These were made some thirty or forty years ago by Dr. Charles F. Lummis, from the singing of local people of Spanish inheritance and from Indians of neighboring tribes.[81]

Lummis (1859-1928), one of the first important North American ethnologists and founder of the Southwest Museum, had made a large number of wax cylinder recordings early in the century which were now part of the Museum's Lummis Collection. *The Masterkey* article continues:

> Mr. Partch is peculiarly well qualified for such a task, on account of the research which he has carried on in musical intervals of smaller scope than the ordinary diatonic intervals. Indian tunes are replete with such intervals, and with his knowledge Mr. Partch could analyze the melodies according to the number of vibrations per second on any pitch.[82]

This was not the first time that transcriptions had been made from the Lummis cylinders; Arthur Farwell (1872-1954), founder of the Wa-Wan Press and an "Indianist" composer, came to southern California in 1904-05 at Lummis's behest to work on these recordings. Farwell apparently concentrated on Spanish songs, for

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[81] "Some California Songs. I," *The Masterkey* VIII/1 (January, 1934), 15. Eleanor Hague, who also performed with Rogers, was an ethnologist who is best known today for her text translations for *Canciones de mi padre* (1946), collected by Luisa Espinel, upon which Espinel's niece Linda Ronstadt drew for material.

[82] Ibid.

only a few transcriptions by him of Native American melodies are extant.[83]

The history of Partch's transcriptions is rather obscure after his departure for the East Coast. They were never published in *The Masterkey*. In 1953, Frederick Hodge, retired director of the Museum, found the transcriptions at his home and returned them to the Museum. They apparently lay hidden until the late 1980's, when they were rediscovered by John Koegel with the help of former Museum librarian Richard Buchen.[84]

Partch's twelve-page manuscript, which includes a brief introduction and commentary by him, contains transcriptions of twenty-four songs and dances on the Lummis cylinders. Like most transcribers of this music, Partch carefully indicates the changing meters found in several pieces. Five of the songs are set apart, however, in that they are presented by Partch both in equal temperament and in just intonation. Here is his introduction to this group:

> In analyzing the five California Indian melodies attached I have the feeling that there is a constant striving for very simple intervals . . . [that is,] those possible in our major and minor diatonic scales. Those places where the voice wavers, slides up or down to a tone, or rises under excitation do not alter that feeling since at no time . . . is there a deliberate use and repetition of a more complex interval . . . Notating the melodies for the tempered scale also is perhaps justifiable since its falsity is no doubt less than the element of human

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[83] Farwell's most famous piano piece, *Navajo War Dance #2*, is based on an Indian melody drawn from secondhand sources.

[84] Koegel has produced an index to all cassette tape copies of cylinders made by Lummis in 1904 and 1905, including those transcribed by Partch (private MS, 1990).

fallibility mentioned.[85]

For the five transcriptions in just intonation, Partch revived the eighteen-line- per-octave staff developed at the time of the third draft of *Exposition* (1931).[86] The manuscript's key for transcription shows 41 tones to the octave, much as Partch had proposed for his model ratio keyboard (Partch 1933, 42). As the diatonic nature of the melodies means that they require no more than eight tones per octave, Partch's use of the expanded staff may be seen as a demonstration of the notational system he was then considering:

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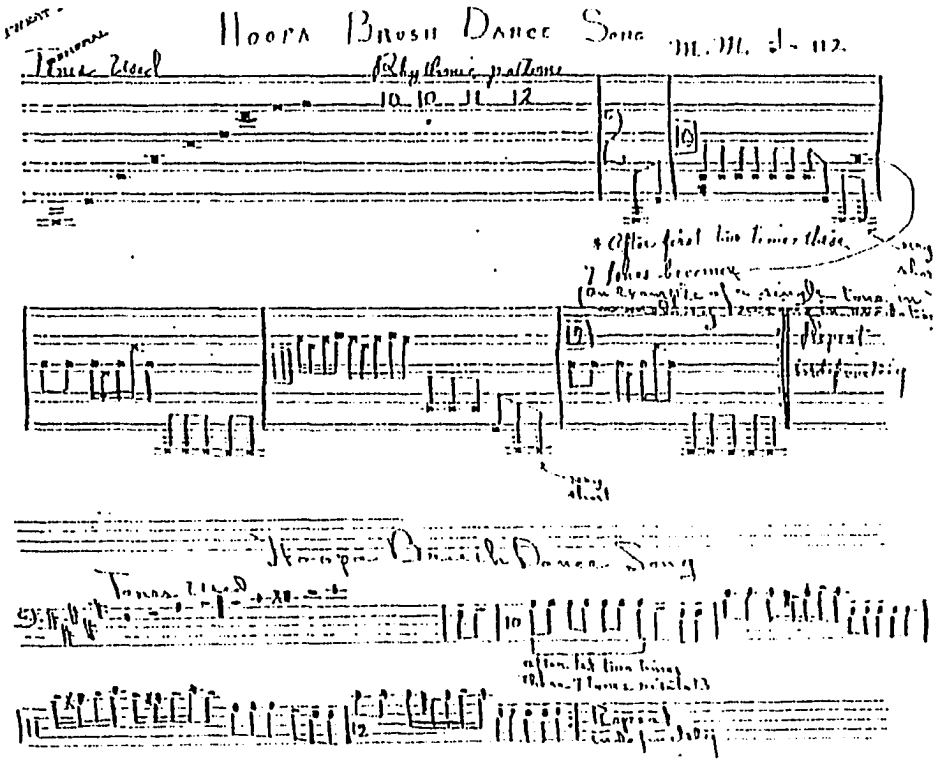
[85] Partch MS, Charles F. Lummis Collection, Braun Research Library, Southwest Museum (Los Angeles, CA), [1].

[86] See Chapter Five.

Example Three: Comparison of just intonation and equal temperament transcriptions of a Native American melody (Partch 1933)



Previous transcribers of Native American music, such as Theodore Baker, John Comfort Fillmore, Frances Densmore and Natalie Curtis, generally believed that Native American singers were instinctively aiming for the notes of the tempered diatonic scale, even if their so-called "lack of training" made this difficult to achieve consistently.[87] Partch's approach was similar to that of his predecessors, with one crucial difference: his belief that the pitches chosen by the singers were attempts to sing in just intonation, the ultimate in "natural scale systems," which he in turn represented in Monophonic ratios. For Partch, this served to confirm his belief in tuning by ratio, even if irrelevant to the Native American. Pace *The Masterkey*, he did not believe, however, that Indian songs were "replete" with microtonal intervals (Partch 1933, 1; Kassel 1991, 11).

Partch's transcribing work was only the second time he had attempted to notate what others had sung, rather than compose, in just intonation, the first being his rendering of Reuben Rinder's chanting of *The Lord Is My Shepherd*. In terms of his compositional activity, the unaccompanied monophonic textures of the Native American songs exhibited the direct presentation of text and melody that Partch's music had striven for (and would continue to do in the future). Indeed, he acknowledged borrowing two of the Lummis cylinder melodies: a Cahuilla "Bird Dance Song" (*The Bewitched*, 1955), and an Isleta "Cancion de los Muchachos"

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[87] Exceptions were Benjamin Gilman, who used an early phonographing device to reveal the untempered intervals often sung by vocalists, and Helen Heffron Roberts, whose study of California Indian music contains transcriptions filled with microtonal (mostly quarter-tone) intervals.

(*Cloud Chamber Music*, 1950).[88]

B. Massachusetts and New York (1933-34)

By August 1933, Partch had arrived in Gloucester, Massachusetts, where he composed the last three of his seventeen Li Po settings. He also mailed the surviving draft of *Exposition* to Bertha McCord Knisely. Inserted into the same envelope was a key to a new notational system, "adopted August, 1933." This is a return to the standard five-line staff, along with the "wedged-shaped mark" system of accidentals found in the 1932 draft of *Exposition*. Unlike the previous notation, a single staff could accommodate two octaves (2/1's). An important development - - the expansion of the Monophonic gamut to 43 tones per octave - - is contained within the August 1933 key. The ratios 32/27 and 27/16 have been added to the 41-tone system; this is not, however, the final set of 43 tones that Partch would eventually settle on.

By September, Partch was in New York, where he began to copy out the Li Po songs, two Psalms, and "a scene from Shakespeare" in the five-line notation. Only the first portion of this manuscript, containing eleven Li Po songs, survives;[89] it is questionable whether he never completed this project. Partch must have realized the difficulty of his five-line staff system, for he not only indicated the interval

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[88] For a fuller account of Partch's work at the Southwest Museum and its implications for his composition, see Kassel 1991.

[89] Marshall Collection, Partch Archives (University of Illinois at Urbana-Champaign), microfilm reel 3.

between pitches in the voice part in ratios, but later added the ratio indications for the pitches themselves, in both the intoning voice and Adapted Viola parts. Short samples of both this and the previous notational system can be found in the first edition of *Genesis*, with Partch's caveat that "it is obvious that it would take months, if not years, to acquire facility in reading these notations" (Partch 1949, 222). When he resumed Monophonic composing in 1941, he would once again use ratio notation for vocal and Adapted Viola parts, while "tablatures" particular to each new Partch instrument were developed.

In New York, Partch began a campaign to win foundation support for a journey to Europe to do further research. He contacted many leading figures in the music scene; the most helpful to him was Otto Luening, who was then at the University of Arizona, Tucson. Letters from Partch to Luening during 1933-34 provide evidence of Partch's activities.[90]

Partch had previously submitted an unsuccessful application to the John Simon Guggenheim Memorial Foundation from California in October, 1932, trying to win support to do research in the Far East and Europe. Now in New York, and having sought advice and gathered additional referees, Partch submitted another application to the Guggenheim Foundation in 1933. With it, he provided a two-page "resume of Exposition of Monophony (a system of music, instruments,

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[90] Partch folder, Otto Luening Collection, Music Division, New York Public Library, Lincoln Center, New York.

and notation having 37 tones to [the] octave)."[91] This "resume" covers all the main aspects of the 1933 draft, including the ratio keyboard. There is confirmation that songs based on his text-setting principles "were begun in 12-tone temperament with piano accompaniment," but abandoned. Partch mentions for the first time his proposed setting of William Butler Yeats' translation of Sophocles' "King Oedipus." Complete presentations of Monophony and its music are promised for New York; according to the "resume," there was a presentation at the Town Hall Club on February 11, 1934.[92]

Although Partch once again failed to win a Guggenheim grant, the Foundation's secretary general, Henry Allen Moe, was able to convince the Carnegie Corporation of New York to award a grant to him. Partch was told simply to apply for it, and received a letter of notification on June 27, 1934 at a farm in East Chatham, New York, where he was working for room and board.[93]

The grant was given to do a year's worth of research in Europe; according to a "six months' report on projects to be executed under Carnegie grant for the year 1934-35," submitted on February 5, 1935, Partch had previously proposed that he would

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[91] Written in late 1933 or early 1934. Partch file, Moldenhauer Collection, Houghton Library, Harvard University, Cambridge, Massachusetts.

[92] I have yet to find independent confirmation of this event.

[93] Partch, "Bitter Music," typescript dated November 22, 1940, Marshall Collection, Partch Archives (University of Illinois), microfilm reel 1. Included in Partch 1991, 22ff. All subsequent references to "Bitter Music" are to the 1991 publication.

1) build a keyboard instrument, adapt a guitar, and possibly a double bass, in order to perform music in his Monophonic system;

2) do historical research at the British Museum and in the vicinity of London, especially to examine extant experimental keyboard instruments, with the intention of completing his treatise; and

3) seek William Butler Yeats' permission to set the poet's *King Oedipus* translation.[94]

Partch had already written Yeats (in a letter dated October 27, 1933), who responded in January, 1934. According to an entry in "Bitter Music," Yeats wrote:

> I give you permission with pleasure (to set *King Oedipus*) subject, in case of performance or publication, to the usual business arrangements . . . What you say in your letter is exceedingly interesting and has, so far as I can understand your methods, my complete sympathy. (Ibid., 23)

A subsequent letter from Yeats stated that he couldn't help much in music, for he had "made no attempts to carry out my theories (setting spoken words to music)" since the passing of a friend (Florence Farr) who had assisted him.

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[94] Submitted to the Institute of International Education (New York, NY); copy in Partch file, Luening Collection, Music Division, New York Public Library.

C. European Sojourn (1934-35)[95]

Partch obtained a visa and left for England on September 22. After arriving in London, he spent several weeks working at the British Museum; in November, he traveled to Dublin. He met Yeats and nervously performed *Psalm 137* ("By the waters of Babylon . . . ") for him. Partch recalled Yeats' reaction: "I don't care for your voice, but a play done entirely in this way, with this wonderful instrument [Adapted Viola], might be really sensational . . . I am interested, but I must say, my letters didn't show it. You are one of those young men with ideas, the development of which it is impossible to foretell, just as I was thirty years ago" (ibid., 25- 26).[96] Partch remained in Dublin for ten days; among his activities were performances at the Abbey and Gates theaters and, in a specially arranged session, an opportunity to hear and transcribe the recitations of Abbey Theatre actors doing portions of *King Oedipus* (Yeats read the choruses).

Partch continued to make progress on instruments. By the time the "six-months' report" was submitted in January, 1935, he had finally found an organ builder willing to build the Ptolemy, a reed organ or harmonium tuned in just intonation; completion was expected in March, 1935. Partch had already adapted a

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[95] The principal source for information on Partch's 1934-35 European journey, in addition to the "six-months' report," is "Bitter Music." Although the journal primarily focuses on his first months of wandering after returning to the United States in 1935, a lengthy entry for June 24, 1935, written at a California work relief camp, recalls with bittersweet nostalgia his recent trip overseas (Partch 1991, 22-36).

[96] A somewhat more critical comment on Partch can be found in a letter to Margot Ruddock, published in *Ah, Sweet Dancer* (London: Macmillan, 1970, 27-28). After a description of Partch's approach, Yeats comments that "[we] cannot however use him in our work at present, he is on his way to Spain to perfect his discovery; it is still, I think, immature. He is very young, and very simple."

guitar to play in just intonation while still in New York, during the summer of 1934. According to the report, his current plan was to have

> the vocalist [sounding the Adapted Guitar] while she sings, providing accent and variety . . . The purpose of the Guitar is to provide a percussion capable of intonation and to increase the variety of sound in the new music, without increasing the number of performers.

Partch compared this performance approach to ancient Greek epic chant and Southern mountain folk balladry. On the other hand, Partch admitted that he would be accompanying the singer-guitarist as well, on the Adapted Viola. This is the first significant evidence of his desire for an expanded ensemble, moving beyond the ideal of a self-accompanied "troubadour."

Partch's library and field research in Great Britain had also borne fruit. He was hard at work on a much expanded version of his treatise, now entitled *Monophony is Expounded*; he expected completion in March. The treatise would trace the history of intonation and the historical role of various theorists and experimenters in the field; a history of the evolution of intonation, featuring examples of exotic and Partch notations; descriptions of experimental instruments, especially keyboards; and a study of form exemplified through "pseudo-spoken words," and its development from ancient times up through the "Italian renascence."

While back in London after his visit with Yeats, Partch spoke to a number of individuals, the best-known being Arnold Dolmetsch, whom Partch found to be empathetic. After a vacation trip to Rapallo (where he apparently met Ezra Pound) and Malta, Partch returned to England, where he met two individuals in particular

who would receive attention in the first edition of *Genesis*: Wilfrid Perrett and Kathleen Schlesinger.

The obscure Perrett, a linguist who read German at the University of London, parlayed an interest in just intonation into a treatise, *Some Questions of Musical Theory* (hereafter *Questions*). *Questions* summarizes Greek and subsequent acoustic and modal theory, and rejects atonality in favor of a tonality where the seventh partial (7/4) is consonant. Perrett had a justly tuned organ built which he named the Olympion, in tribute to a Greek harpist (Olympus) who discovered the septimal ratio in the seventh century B.C. and was banished for his troubles. Perrett also developed a notation where differently shaped note-heads replace accidentals (Perrett, 15-16) rather than indicating different metric subdivisions, as in Henry Cowell's proposed notation in *New Musical Resources* (Cowell 1930, 45ff).

Perrett's tonal system evolved over the years. His 1926 plans for the Olympion proposes fourteen notes, adding black keys to the spaces between E-F and B-C (Perrett, 14ff). All notes in this first system are found in Partch's Monophonic system. By the time Partch met Perrett in 1935, the Olympion had five more keys (colored russet brown), located above and to the right of the black keys (Partch 1974, 443-47). Here is the Olympion's asymmetrical scale; white keys are underlined, black keys plain, and russet brown keys in quotation marks. Pitches not found in Partch's final 43-tone Monophonic system marked with an asterisk:

1/1	21/20	"35/32"*	9/8	7/6	"6/5"	5/4	21/16
4/3	7/5	"35/24"*	3/2	63/40*	"8/5"	5/3	7/4
"9/5"	15/8	63/32*	2/1				

As Partch points out, the Olympion's black and russet-brown keys provide true 7/4's (above 1/1, 9/8, 6/5, 5/4, 4/3, 3/2, 8/5, 5/3, 9/5) or 6/5's (above 1/1, 35/32, 7/6, 21/16, 4/3, 35/24, 3/2, 7/4).

Later, in *Genesis*, Partch criticized Perrett's reliance on overtones and undertones, rather than small-number ratios, as the basis of "major" and "minor" tonalities, the same approach he had considered while writing *Exposition* (ibid., 446). Nevertheless, Partch was otherwise highly complimentary towards Perrett, who was after all the only builder of a non-tempered keyboard instrument whom Partch had met up to that time. The Olympion's keyboard design (three separate but integrated levels) probably influenced the design of a subsequent Partch keyboard instrument, the so-called Old Chromelodeon II (ibid., 216-19).[97] Partch may also have paid Perrett tribute in his 1946 composition, *Two Studies On Ancient Greek Scales*; the first study is based on Olympion's Pentatonic, a scale discussed by Perrett (Perrett, 45) and duly credited by Partch (Partch 1974, 177, 470).

Kathleen Schlesinger (1862-1953) was an investigator of ancient Greek music and instruments; her book, *The Greek Aulos*, speculated in Greek musical

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[97] Partch 1949, 197 has a photograph of the Old Chromelodeon II keyboard.

theory.[98] Based on measurements of instruments depicted on Greek vases, she claimed that ratios involving the 13-limit were part of the Greek system of diatonic *harmoniai*, which she based on the Arithmetical Proportion; her research was later discredited. However, Partch acknowledges her contributions to his work in *Genesis* by including a lengthy discussion of her ideas (ibid., 447-456).

By 1947, Partch called his choice of the 11-limit a "purely personal and arbitrary" decision based primarily on practical matters (ibid., 123); but he expressed his views about going past the 11-limit rather differently in *Exposition*, before meeting Schlesinger:

> Considering that the intervals of 13 are not by present judgment especially consonant with the simpler ratios, and that there might be a question as to the ability of the ear to accept the 50 and more tones within the 2/1 they would allow, 11 is an inevitable choice. (Partch 1928/33, 19)

While Schlesinger's theoretical ideas played only a supporting role in Partch's adoption of the 11-limit of consonance, her research into the Greek kithara had greater impact on Partch, who would build a series of instruments based on that stringed instrument beginning in 1938 (Partch 1974, 456; Partch 1991, 31-32).

By March 1935, Partch's justly tuned reed organ was completed. The Ptolemy had a typewriter-like keyboard which provided nearly four complete 2/1's in a 43-tone system. It is quite possible that the Ptolemy's tuning was now based on the "definitive" 43 tones that became the standard for Partch's subsequent

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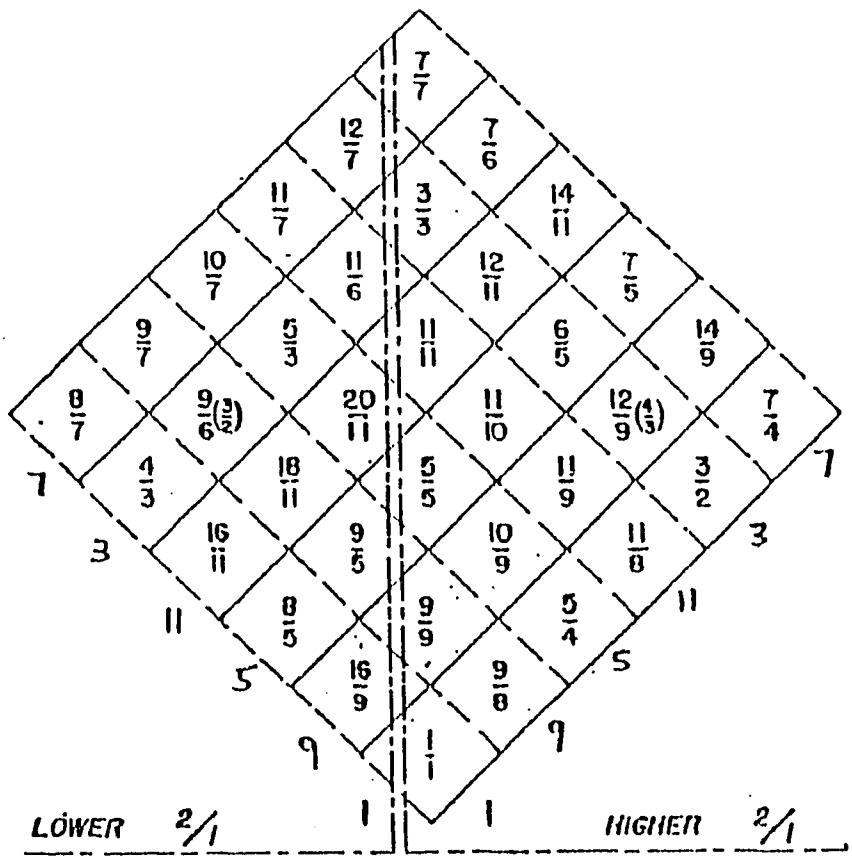
[98] London: Methuen, 1939. Much of this book's material was originally published in *Musical Standard* 27-28 (1926).

instrument-building and composition.[99] More important theoretically was the incorporation of the first realization of the Expanded Tonality Diamond, here as a keyboard design. A diagram of the Ptolemy keyboard diamond appears below (Partch 1949, 207):[100]

[99] Partch, Genesis 1949, 206 has a diagram of "one 2/1 of the Ptolemy keyboard proper," with keys marked with the final 43-note scale. However, there is no corroborating evidence contemporaneous with the Ptolemy's design and construction (i.e., 1934-35) to confirm that the final gamut was in place Partch's first composition using the definitive 43-tone system dates from 1941.

[100] In 1940, Partch built a new model of the Ptolemy keyboard, comprising three diamond-shaped keyboards in addition to the typewriter-like one; a photograph of this model follows Partch 1949. 196.

Example Four: Expanded Tonality Diamond[101]



KEY:

To read Otonalities, read lower left to upper right. The Identities appear in scale order | 1 - 9 - 5 - 11 - 3 - 7 | rather than hexad order.

To read Utonalities, read lower right to upper left. The Identities appear in reverse scale order | 1 - 9 - 5 - 11 - 3 - 7 | rather than hexad order.

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[101] As the Diamond is Partch's most widely known and discussed theoretical concept, my description here will be brief. For the composer's most thorough explanation of the Diamond, see Partch 1974, 109-180.

Partch's Expanded Tonality Diamond is based on principles outlined in *Exposition*: the axiomatic 11-limit hexad, the role of "overtones" and "undertones," "the twelve Tonalities within the One," and the potential for the multiple interpretation of a ratio.[102] As Example Four demonstrates, the Diamond is an interlocking graph of the six primary Otonalities (formerly Overtonalities) and six primary Utonalities (formerly Undertonalities). Read from two directions, it reveals how each ratio belongs to at least two primary hexads, and thus may serve as a pivot tone for modulation. In an article published in England, Partch explains further:

> The diamond keys are a substantiation of mathematics as the basis of musical materials, which tempered scale theorists are prone to deny. Among other things, they show that undertones, as the explanation of minor tonality, are intrinsically present in a logical system such as Monophony. This is entirely apart from the question of the existence of undertones in sound phenomena. (Partch 1935, 765; emphasis mine)

By 1935, Partch had come to understand the problems with using undertones as a rationale for minor (as he had in *Exposition*), and was now publicizing a change of view on the question. Elsewhere in the article, he consciously or unconsciously altered his past slightly to suit his present needs by claiming that his two California singers (Radil and Rogers) had sung in the 43-tone, rather than the 37-tone system he was actually using in 1932-33 (ibid., 765).

In the article, Partch refers to being "at work on settings of four chapters of the *Song Of Solomon*" as well as *King Oedipus*, the latter scored for

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[102] In addition to Partch 1928/33, see Chapters Four and Five for more detailed explanation.

> Adapted Viola, Ptolemy, Adapted Guitar, and cymbals. *King Oedipus* is in no sense opera. It is drama always, heightened throughout, and eventually purged, by music. (Ibid.)

This echoes Partch's "six-months' report," except that there the proposed work was to be scored for four voices (one intoned, the rest spoken), Ptolemy, and three adapted stringed instruments: Viola, Guitar, and Bass; the last was never built. In addition to *Song Of Solomon*, Partch proposed a "Sapphic trilogy" based on the translations of Arthur Weigall, accompanied by Ptolemy and Adapted Guitar. While Partch's setting of *King Oedipus* eventually saw the light of day, the other settings were to remain tantalizing dreams, except for fragments found in "Bitter Music."

D. Harry the Hobo (1935-36): "Bitter Music"

Partch left England for the United States on March 30, 1935, after shipping the Ptolemy to Los Angeles: "I say goodbye to ginger beer, yellow primroses, general civility, unfailing courtesy from the powers that be. I do not want to go" (Partch 1991, 34). From Portland, Maine, he went to New York; his arrival in April, 1935 was followed by an unsuccessful meeting at the Carnegie Corporation, where no one "understood" his six-months' report. He traveled westwards, arriving in Los Angeles at month's end. He "freed" the Ptolemy from customs and shipped it to Mildred Couper in Santa Barbara for safekeeping, and sent a copy of his treatise to a friend in London, hoping to find a publisher there.

Partch contemplated returning to Los Angeles to try once more to "promote my seemingly revolutionary ideas in music, [having] never thought of my work as revolutionary, but only as evolutionary" (ibid., 6). He chose instead to become a hobo, at different times holding down jobs, working in relief camps, spending an occasional night in jail, riding the rails, or walking and sleeping under the stars. Thus began the period he called his "own personal Great Depression," lasting from 1935 to 1943. Much of this period was unproductive for him compositionally; instead, he concentrated on writing, collaborating on two Works Progress Administration travel guides,[103] contributing articles on music to a local newspaper, and continuing to revise his treatise. Partch also continued experimenting with instruments, adapting guitars, beginning work on his version of the kithara, and trying to salvage the Ptolemy, whose failure would eventually lead him to adapt rather than newly build a Monophonic keyboard instrument. The most remarkable product of the early years of Partch's "Great Depression," however, was "Bitter Music."

> My return [from Europe] was to a jobless America . . . I found it easy, during those particular years, to get just one kind of job - - dishwasher and flunky. And if my personal history between 1935 and 1943 were to be frozen in space, it would appear as a finely detailed mosaic made up of an incredible number of dirty dishes, nameless faces in WPA jobs, and almost nameless faces in hobo jungles and fruit harvests . . . I took my blankets out under the stars beside the American River (the river of gold!), carried my notebook,

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[103] The first is *California: A Guide to the Golden State*, Federal Writers Project (New York: Hastings House, 1939). While individual articles do not have author credits, Partch is listed as an expert on northern California. The second guide is on Arizona; Partch's participation is uncredited.

> kept a journal, and made sketches. I called the journal Bitter Music . . . and I even had a contract for its publication. During the Depression, it might have had a chance, but with war in Europe, the contract was cancelled and I destroyed the effort. (Partch 1974, 323)

The above-mentioned journal originated during Partch's first period of post-European wandering (1935-36) in the USA. A preface was added in 1940, when Partch apparently recopied the manuscript for possible publication.[104] Otto Luening refers to the journal as if it were a composition in his foreword to the first edition of *Genesis* (Partch 1949, vii; cut from Partch 1974). Yet Partch believed that he had "destroyed the effort," and a major literary-musical work from relatively early in Partch's career appeared lost forever.[105]

That "Bitter Music" has survived is due entirely to Lauriston C. Marshall (1902-1979). Marshall, a physicist at the University of California at Berkeley from 1937 to 1954, began his association with Partch in 1949, when the composer was living in Gualala (north of San Francisco); they jointly held a pair of Guggenheim grants in 1950-52.[106] An unplanned result of the collaboration:

> While administering the Guggenheim Foundation grants, Marshall

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[104] According to Ludlow 1994, 21, the intended publisher was Caxton Printers, Ltd, whose editor, John E. Ludlow, had responded enthusiastically to the manuscript. But "the proprietor of Caxton's eventually decided against publishing the book."

[105] "I did so without regret, because it had given me a large and already faintly delineated canvas for the collection of ideas that I later called *The Wayward* [1941-55], of which *U.S. Highball* [1941] is a part" (Partch 1974, 323).

[106] McGeary, "The Lauriston C. Marshall Collection," ii-iii. While ostensibly for the purpose of developing electronic means of producing accurate microtones, the grants were in truth designed to provide Partch with sustenance.

> established in his office a repository for documentation of Partch's work. As a precaution, Marshall had all Partch's compositions and journals microfilmed, thus preserving several otherwise lost compositions and journals.[107]

The collection includes scores (1932-50), correspondence, documentation, and sound recordings. The collection also includes two journals, including "Bitter Music."[108]

"Bitter Music" opens with a preface, dated November 22, 1940, which describes it as "a diary of eight months spent in transient shelters and camps, hobo jungles, basement rooms, and on the open road." Entries, which he wrote "on the day indicated or the day following," begin on June 12, 1935 and end on February 1, 1936. The journal text is filled with references to drawings and musical examples, found at the back of the journal. The notation of the music was completed in southern California in January, 1936.[109]

According to the 1940 preface, the music itself resulted almost entirely when Partch

> notated the music of the spoken words in a rough way without

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[107] Ibid., ii.

[108] Partch wrote Marshall in February, 1950 and asked for the return of the journal's typescript (Partch 1991, 465); but the microfilms survived and were bequeathed to the Partch Archive at the University of Illinois. Whatever the ethical questions concerning the preservation of material Partch believed lost or wanted destroyed (the case of Franz Kafka comes to mind), the value of the materials preserved in the Marshall collection to Partch research is inestimable.

[109] As the microfilmed text was typed in 1940, it is likely that the musical examples were removed from the original 1935-36 journal and gathered, to be reincorporated within the text itself when published; the pagination was never reconciled. As for the illustrations, Partch "sketched the original pencil drawings - - used as suggestions for the present illustrations - - on the scenes described" (ibid., 5-7).

> instruments, in most cases, very soon after the words were actually spoken . . . Musical notes are given roughly as the words of critical passages were or might have been spoken, and a piano accompaniment occasionally added. The accompaniment is designed to heighten and to reconstruct the original impression or emotion, which is now secondhand to all concerned . . . To reproduce the original effect the words should be spoken quickly, on the tones indicated. They should never be sung. (Ibid., 5-6)

This is the most significant expounding of Partch's "principles of song" since *Exposition*, where he seizes upon the "tonality" of human speech in order to delineate two Monophonic principles of vocal music: "the line of the spoken inflection determines the melody for the words;" and, "the rhythm of the words is the intrinsic rhythm of the music" (Partch 1928/33, 44).

In the journal itself, Partch announces that he seeks

> a new and great music of the people - - not just for this country but regardless of country . . . I work with words because they are the commonest medium of creative expression. And words are music [i.e.,] spoken words . . . [Furthermore,] music is not a desire - - it is an omnipresent condition. Tones, like the colors of the sky, mountains, trees, and the body, are inescapable, and not all music is man-made. Some respond - - some don't. Much of that which is man-made we ignore, such as the music of speech. Well, I'm not ignoring it. (Partch 1991, 12-13)

This is the first time that Partch connects the Monophonic principle of "speech-music" with "a new and great music of the people," i.e., national self-expression; this concept would be fully realized in the "Americana" works of the early 1940's.

By an ironic twist of fate, "Bitter Music" contains virtually all of the composer's extant music in 12-equal temperament; for

> the book is designed to be read at the piano, and the fragmentary music, on passages requiring emphasis and intensification of mood, occurs much as the incidental music might occur in a talking picture [sic]. The fragments are in no sense "performers' music;" they are readers' music. If the reader . . . does play the piano, even poorly, the musical passages may be something of an excursion into an art form as old as history, but one which . . . is all but lost. It is an individual form - - the expression of one individual to another. (Ibid., 6)

This is an early and unexpectedly personal embodiment of the principle of the "One Voice," a Monophonic ideal described by Partch in *Genesis*:

> Throughout history the Monophonic concept has been consistently manifested through one medium: the individual's spoken words . . . Of all the tonal ingredients a creative man can put into his music, his voice is at once the most dramatically potent and the most intimate. His voice does not necessarily mean his own voice and it certainly does not mean the specialized idiosyncrasy known as "serious" singing. It means his conception as expressed by the human voice and it means one voice. The instant when other voices are added to that one voice is an instant of metamorphosis. Thereafter his identity is not that of the inner self alone but the identity of a group. The drama and the intimacy of the individual are superseded by a different esthetic or sociological quality. (Partch 1974, 7)

The combination of the Monophonic ideal of the One Voice and the use of 12-equal temperament gives "Bitter Music" a hybrid quality unique in Partch's output. But the idea of a genuine musical diary for public consumption is certainly unusual for any composer.

The frame for the narrative is Partch's wandering. There are descriptions of his experiences in work camps (set up during Franklin Roosevelt's first presidential term), his life on the road, and individuals encountered there. There is nostalgia, especially for the European sojourn; social commentary, mostly angry but with

occasional reference to happier circumstances; and homespun philosophy. There are excerpts of Partch's correspondence,[110] and quotations from Lao-tze, Ogden Nash, Sappho, Isadora Duncan, and others. Threaded throughout the text are Partch's reactions to the non-stop obscenity and vulgarity in the work camps, the humor that served as relief, and the ironic social circumstances, such as the clear-cut class distinctions between workers. One also finds the camaraderie and implicit homoeroticism that emerged in some of Partch's relationships, which he describes in a discreet, sometimes sentimental, and ultimately bittersweet manner.

"Bitter Music" also reveals Partch's personal state during a period in which he was transforming from a charming and naive darling of the cognoscenti into an increasingly embittered iconoclast. As he wrote heatedly to a friend in September, 1935:

> I will never jolt the leaders of music with my [treatise] - - but I will jolt them into it, eventually, by branding them as the idiots they are. I have been gentle and persuasive all too long. The time has come for combustion and contempt. (Partch 1991, 75)

This did not mean that Partch instantly dropped all social graces - - only that he would henceforth ration them more carefully.

E. The Music of "Bitter Music"

The musical examples in "Bitter Music" fall into four categories: pieces

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[110] A 1935 letter from a fellow hobo, Pablo, serves as the text for Partch's *The Letter* (1943).

composed by Partch prior to the keeping of the journal; music borrowed from various sources; transcribed "speech-music;" and set-pieces derived from "speech-music."

1. Pre-1935 Pieces. There are two pieces which were composed (or at least mentioned) by Partch prior to the journal's inception. The earliest is *My Heart Keeps Beating Time*, the sole surviving song from Partch's 1929 burst of creativity using 12-equal temperament (see Chapter Three). The version of this song published in 1929 falls into the cowboy-song genre.[111] The version in "Bitter Music," however, has an ironic text about hobo life. The music is popular in style and wistful, with the F-major tonality colored by the genteel chromaticism of an earlier generation; unexpectedly, the final piano chord is F minor.

The other "pre-journal" work, mentioned earlier in connection with the European sojourn, is a setting of a well-known excerpt from the *Song of Solomon*, beginning with "The voice of my beloved! Behold, he cometh leaping upon the mountains . . . " (ibid., 52-57). [112] Partch's setting alternates between two textures: the text itself, with the voice part doubled at the 15th, interrupted by brief interjections on the piano; and solo piano interludes, all in 5/16 meter, aggressively accented with hocketing between hands. This setting uses the speech-song style of the Li Po songs; the piano interludes add a percussive and repetitive quality which

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[111] The published version is included in the "American Popular Songs" series of microfilms (catalogue *ZB-768), Music Division, Lincoln Center, New York Public Library.

[112] Chapter 2:8-17, King James version.

foreshadows Partch's introduction of percussion as a sonority in the 1940's.

2. Borrowings. "Bitter Music" contains quotations of other music. The journal's first musical example is a straightforward harmonization (in G major) of one verse of the spiritual folk song, *All My Sins Are Taken Away*. Four more verses, each with the refrain "All my sins are taken away," are spread throughout the journal. Some verses repeat the initial setting; others feature a harmonically distorted setting, with flattened second, third, and fifth scale steps, and an unexpected C-minor chord to support the melodic final G. The final verse and the refrain lead directly into the drinking song "Adieu, kind friends, adieu . . . I can no longer stay with yieu [sic];" and the voice part is in G major, accompanied by a vamp in G minor (ibid., 130-31). This suggests an unsteady barroom atmosphere, where Partch might have heard the song sung (if he did at all). The use of *All My Sins Are Taken Away* as a refrain in "Bitter Music" helps to explain the journal's original title, "'Cause All Our Sins Are Taken Away" (ibid., 465). More importantly, this is the first example in Partch's music of a structural device he would use in later works and with greater sophistication.

Other musical quotations in the journal include the spiritual *Standing in the Need of Prayer*, the tragic ballad *Jenny Lee* ("Get along, poor boy, get along"), Stephen Foster's *Oh Susanna*, and the refrain of the popular Depression song, Harry McClintock's *Hallelujah, I'm a Bum*.

3. Speech-Music Conversation. The third and fourth categories fall into the

realm of speech-song. The third, with by far the greatest number of examples, comprises the conversational fragments that Partch transcribed during his 1935-36 journey. Some appear in their unadorned state; to others, he has added light piano accompaniment in the form of octave doublings, parallel lines or pedal points. Some piano additions serve as introductions or interjections, often "commenting" on the text. Some speech-music fragments have been rhythmicized; others are free of durational and metric indications. There is a considerable variety of accents captured in these fragments, both American and those drawn from Partch's memories of his European sojourn.

The isolation of hitchhiking and sleeping under the stars inspired Partch alternatively to reverie or whimsy. These fall into the category of self-transcriptions, in the manner of most of Partch's 1930-33 works. Two such "reveries" later found their way into Partch's 1960 theater work, *Revelation in the Courthouse Park* (ibid., 66-67, 81).[113] There are humorous inventions, such as a speech by the "Junior Association of Anemones of the great city of Saint Francis," satirizing San Franciscans' historic disdain for any shortening of their city's name (ibid., 92-94). Finally, there is the day when Partch could not stop a distorted version of the opening melody of Chopin's F#-major nocturne (opus 15, no. 2) from going around his head (ibid., 96).

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[113] In this adaptation of Euripides's *Bacchae*, Partch uses a line from the first reverie ("And in the briefest moment, they are away") for the Mom/Agave character; the entire second reverie is sung by the Chorus: "Why wander? Why tire yourself uselessly? Stop and reflect. Rest. There is nothing but eternity - - infinity . . ."

4. Set Pieces. The two works in the final "Bitter Music" group, while not officially a part of the Partch canon, demonstrate how the original notion of speech-music had evolved into small-scaled but full-fledged set pieces. The first piece is contained in an entry dated between November 15 and 23, 1935 (ibid., 101-08). While hitchhiking, Partch was picked up by a Filipino who extolled the virtues of Christianity during the ride. The composer notated the Filipino's speech, and later added other elements to it: a piano accompaniment, mostly pedal points in the bass register; a hymn (*Rock of Ages*) and hymn-like interjections; narration, without pitch or rhythmic indications; and a quote from Ibsen's *The Wild Duck*. The finale begins with the Filipino's "Jesus wash all your sins away." The piano suddenly provides harmonic support along with a pedal point D, in preparation for the climactic "May God bless you, my brother!" The final musical gesture is again taken from *Rock Of Ages*: ". . . could not atone - - Thou must save and thou alone;" the piece concludes in a gently ambiguous D major.

Under normal circumstances, Partch would have ignored the proselytizing. But "the sweet music from the throat of the Filipino" not only encouraged Partch to look beneath the surface to find a good man, but served as inspiration for a piece that experiments with a mixture of mood, texts, tonal centers, and styles of delivery. The collage technique of placing seemingly unrelated thoughts one after (or on top of) another was to operate in different ways in later Partch works, including *Barstow, U.S. Highball, The Bewitched, Revelation in the Courthouse Park*, and

Delusion of the Fury.

The second set piece is an even more remarkable collage. Partch, now living in a basement in Los Angeles, was being visited by a syphilitic friend from Arizona on December 7, 1935 (ibid., 112-128). The speech-music, which alternates between Partch's sober voice and his friend's freely-associative delirious ramblings, blends poetic and musical fragments, quotation (including the "Marcia funebre" from Beethoven's *Eroica*), narrative, commentary, and outrage into a phantasmagoria which suggests madness. The piano accompaniments range from unaccompanied textures to parallel doublings, drones, interjections, and ostinatos. The latter is featured in Partch's setting of a quotation "from *Wilderness Song* by Everett Ruess, who disappeared in the desert in 1934" (ibid., 6, 117-18):

> Say that I starved, that I was cold and weary,
> That I was burned and blinded by the desert suns...
> but that I kept my dream.
> Always I shall be one who loves the wilderness,
> Swaggers and softly creeps between the mountain peaks.

The tragic-romantic spirit of Partch's outlook is captured perfectly by Ruess's "desert song." Indeed, the entire setting of a "visit from a friend" is a powerful realization of the idea of speech-music collage; its variety and intensity provide a remarkable musical climax to "Bitter Music."

F. The Significance of "Bitter Music"

Although temporarily deprived of just intonation, Partch used the period

immediately after his European sojourn to create a narrative work which raised the question of what constituted "American" musical art. This last issue was to bear intellectual fruit some years later in *Genesis*, in the chapter entitled "American Musical Tendencies" (Partch 1974, 48-63). Here Partch converts the comparison of European vs. American musical art into the analogy of the Abstract vs. the Corporeal: a struggle between an academic, formalist, concert-hall mentality and an intimate music designed "to disclose a manner of impressing the intangible beauty of tone into the vital power of the spoken word, without impairing either" (ibid., 61). "Bitter Music" does not attempt to speak in such philosophical terms; the concept of the Corporeal does not seem to have entered Partch's thinking until at least 1941. But the combination of a heightened sensitivity to spoken sound and the visceral experience of life on the road created (or reinforced) for him a strong spiritual connection between the external world (natural or man-made) and the internal experience of that world (his or others'). Monophony was increasing in its breadth.

The numerous vignettes (and the few larger-scale scenes) in "Bitter Music" reveal the increasing artistic and personal conflicts within its author. For one, how could Partch express the earthy reality of American life as he knew it while using just intonation, with its inherent subtleties, complexities, and logistical difficulties? Certainly his choice of equal temperament in 1935-36 would have been difficult for Partch to justify in later years; this renders "Bitter Music" partially inadequate to his long-term concerns. His first Monophonic solutions to the problem are found in the

"Americana" works, beginning with *Barstow* (1941).

Another problem involved Partch's determination to survive in an ignorant and disillusioning world, a special challenge given his sensitive, easily depressed nature and his sexual preference. It is remarkable that, in the United States of the late 1930's, Partch was trying to publish a journal that discussed the homosexual experience, albeit somewhat rhapsodically and with no more than a hint of social commentary. His courage then was both sure and innocent; perhaps his desire to suppress "Bitter Music" in the late 1940's was in part a seasoned response to the prejudices of the era. Later works would once more deal with homosexual themes as well as explore Partch's deeply ambivalent feelings towards women.

Partch endured by relentlessly pursuing his truths, throwing "barbs and broadsides" at those who couldn't or didn't comprehend his work, and using his savage wit as a defense against the inevitable disappointments and hardships of an "alternative" life. But he would always remain open to anyone willing to lend him an honest ear. As the last entry in the journal (San Bernardino, February 1, 1936) states:

> Do you passersby know what is in my soul?
> Rain, rain, rain, my swift darlings,
> and bitter music.

SEVEN: Monophony Concluded (1940-49)

A. The Treatise, Compositions, and Other Writings

As indicated in Chapter Six, Partch's "own personal Great Depression" lasted until 1943; he completed no Monophonic compositions between 1933 and 1941, although he typed up "Bitter Music" for possible publication (1940). Partch continued to revise his treatise, which underwent further title changes: by 1934 or 1935, *Monophony is Expounded* had become *Trails of Music* (Partch 1991, 22). This in turn was transformed into *Patterns of Music* by 1940. A letter that year to Henry Allen Moe at the Guggenheim Foundation accompanied a rather lyrical preface (Partch 1991, 159-61) and table of contents to this treatise, the manuscript of which is now lost.[114] The preface is full of analogies between an artist's sensitivity to color values, a poet's manipulation of language, and a composer's (potential) wish to make "less poor the pathetically impoverished language of tone." *Patterns Of Music* sets out to show

> how the bonds of the composer might be, and are being, burst . . . It is not a new trail in itself. It is only a survey - - - but a survey of all trails, both old and projected, and of one particular new trail. (Ibid., 161)

He also refers to the treatise's having been begun in 1926, a year earlier than usually given.

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[114] Letter from Big Sur, California to New York City, dated December 13, 1940. John Simon Guggenheim Memorial Foundation Collection, Partch Archive, University of Illinois, folder 2, v.

The table of contents to *Patterns of Music* lists an introduction, a history of intonation, a study of diatonic and Monophonic systems of intervals, a survey of "contributors to Just Intonation," a discussion of notation and instruments (including non-Partch keyboards), and an expanded discussion of "spoken words in song." A comparison of the *Patterns Of Music* table of contents with that of *Exposition* indicates that Partch's theory is probably still in transition. The 43-tone scale is in place, probably in its final form;[115] the overtone and undertone rationales remain. Of Partch's instruments, only the Adapted Viola and Ptolemy seem to be discussed, although the Adapted Guitar, Kithara, and perhaps another keyboard instrument were in progress by this time.

Some significant developments are, however, indicated by the table of contents. There is now mention of twenty-four Tonalities, divided into Primary and Secondary. Although not defined here, the Primary Tonalities must be those, previously discussed in *Exposition*, whose entire 11-limit consonant hexad are found within the basic Monophonic gamut. Secondary Tonalities are those with at least their 5-limit triad plus one other note of the hexad available in the gamut.[116] Entirely novel for Monophonic theory are discussions of "modulatory resources," "harmonic music," and "auxiliary tones and minor tonality." Confident of his theoretical

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[115] Appendix IV shows the derivation of the 43-tone scale through application of the 11-limit hexadic system.

[116] This concept was already being discussed in Partch 1935. By 1946, he had expanded the number of Tonalities to twenty-eight, allowing simple 5-limit triads to stand for a Tonality without further reinforcement of the hexad.

system, Partch has begun to consider precompositional issues in his writings. The discussions of intonation (historic and modern), "contributors to Just Intonation," and keyboard instruments reflect Partch's research in Britain. Notation is more fully discussed, and the philosophical concept of the Abstract is considered in the context of "spoken words in song." The list of "settings" reveals no new works nor plans since 1935; "Bitter Music" is not mentioned.

In 1941, Partch contributed four short articles on music to the Carmel (CA) *Pine Cone*, where he was working as a proofreader: "Bach and Temperament;" "W.B. Yeats" (his visit to the poet in 1934); "The Kithara" (a progress report on building an instrument following Schlesinger's models); and "*Barstow*" (Partch 1991, 162-73, 201-03). "Bach and Temperament" holds Bach partly responsible for the general acceptance of the "falsity" of equal temperament; the article is an early and relatively gentle example of the kind of polemic that would flow from Partch's pen in later years.

The last of these articles, "*Barstow*," signals a new period for the composer, in which the lessons of "Bitter Music" were beginning to yield results. Partch relates how in 1940 he noted down some hitchhikers' inscriptions "on one of the white highway railings just outside the Mojave Desert junction of Barstow, California." Partch then set eight such texts for baritone voice and Adapted Guitar, his first Monophonic work since 1933. The realistic, slangy vernacular of the texts inspired a more direct, vigorous music than the wine-suffused *Lyrics of Li Po* ten years

earlier. The vocal writing alternates between "intoning" (speech-song) and singing; the accompaniment is idiomatically triadic and drone-oriented. Partch wrote other "Americana" works in the next few years, notably *U.S. Highball*, based on his own 1941 journey "riding the rails" from San Francisco to Chicago (Partch 1974, 320-24).[117]

As Partch's instrumentarium grew, so did the orchestration of these pieces; as volunteer performers appeared, the dream of public performances became a reality, most notably at New York's Carnegie Chamber Music Hall (now Weill Recital Hall) in 1944. During this period he was still composing short works on "poetic" texts that mostly recalled the darker Li Po songs.[118] Some of these were later combined with newer works to form a collection called *Intrusions* in 1949-50, including *Cloud Chamber Music*, which used an Indian melody Partch had transcribed back in 1933 at the Southwest Museum (see Chapter Six). Another project must have been occupying Partch: the setting of Yeats's *King Oedipus*, which he would not complete until 1951. This work in turn ushered in the period in which Partch concentrated on theatrical works that embodied his beloved but elusive concept of Corporeality.

Partch also continued to experiment with instruments: a series of Adapted

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[117] Other works in this group include the aforementioned *The Letter* and *San Francisco*, a setting of newsboys' cries on a foggy Bay Area morning. These four works were eventually gathered into a collection, *The Wayward*, to which Partch added a fifth piece, *Ulysses at the Edge of the World*, in 1955.

[118] These include a group known as *December, 1942*; *Dark Brother*, a setting of a Thomas Wolfe text; two excerpts from James Joyce's *Finnegan's Wake*; and a somewhat hysterical parody, *Yankee Doodle Fantasy*.

Guitars; the reinterpretation of the Greek kithara; and the ill-fated Ptolemy keyboard. The Ptolemy maintained its hold on Partch, even after he abandoned the original English-built instrument in 1935; he produced a new Ptolemy keyboard model in 1940. He soon gave up on this as well, and began to develop an alternative to the Ptolemy, an adapted reed organ known as the Chromelodeon, begun in 1941 in Chicago.

B. The State of Monophony in the 1940's

While the 1940's was a more productive decade than the last for Partch, little evidence of the theoretical work he was doing survives until the revision process of his treatise was complete. In 1943, Partch was awarded a long-sought Guggenheim fellowship, which was renewed in 1944. This allowed him to work further on his treatise; he was also able to pursue a research grant at the University of Wisconsin, which he received in 1944, and moved to Madison later that year. Here he met Livia Appel, who served as the treatise's editor at the University of Wisconsin Press and whom he thanked "for her help in putting the manuscript into publishable form and especially for her very genuine desire that it should be a significant book" (Partch 1949, xv).

Genesis, completed in 1947 and published two years later, presents the definitive expression of Partch's theory after 1933.[119] Parts II and III of *Genesis*

[119] A typescript of the penultimate draft of Partch 1949, completed in 1946, is held in the Music Division, New York Public Library, Lincoln Center. While there are some differences between this draft and the

present Partch's most complete explanation of Monophony (Partch 1949 & 1974, 67-194). Part IV is an encapsulated history of intonational theory and practice (Partch 1949, 235-331; Partch 1974, 361-457), part I a history of Corporeal music and its struggles with the musically Abstract, especially in the USA (Partch 1949 & 1974, 3-63). A chapter found only in the first edition discusses "experiments in notation" (Partch 1949, 219-231).[120]

What follows is a summary of the principal elements of Monophony as it had evolved by the 1940's:[121]

Where tonal consonance is concerned, purity of interval is essential, and takes precedence over the convenience of universal modulation. Thus, consonances built on the principle of simple-number ratios are the basis for harmonic and melodic consonance (Partch 1974, 86-87).

The Monophonic principle involves a Tonality of up to six ratios related either through their numerator (Otonality, akin to major) or denominator (Utonality, akin to minor). The resulting hexads, based on the 11-limit, add three additional, if less powerful, consonances to the usual triad. The ordering, in condensed form (but not in scale order), is as follows:

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final version, they have no bearing on Monophonic theory, which was fully in place by 1946.

[120] In Partch 1974, 195-357, this chapter was replaced by three: two survey Partch's expanded instrumentarium; one provides "backgrounds" of six major works, all but one (*U.S. Highball*) written after 1947.

[121] For a chronological chart of the evolution of Monophony, see Appendix V.

Otonality

reduced:					
1/1	3/2	5/4	7/4	9/8	11/8
unreduced:					
1/1	3/1	5/1	7/1	9/1	11/1
equal temperament:					
"tonic"	"5th"	"3rd"	"b7th"	"2nd"	"#4th"

This group of ratios, with its "numerary nexus" (shared number) in the denominator, can also be inverted, producing the numerary nexus 1 in the numerator:

Utonality

reduced:					
1/1	4/3	8/5	8/7	16/9	16/11
unreduced:					
1/1	1/3	1/5	1/7	1/9	1/11
equal temperament:					
"5th"	"tonic"	"3rd"	"6th"	"4th"	"b2nd"

The seeming "downward derivation" of Utonality, maligned elsewhere by Partch, is made redundant by his putting aside the overtone and undertone series as rationales for scales. His turn to the "immutable faculties" of ratio and the human ear for explanation is supported by important borrowings from ancient Greek theorists:

> The historic Arithmetical Proportion, the division of a string into a given number of exactly equal parts (not equal intervals), is the ancient source of Utonality, thus corresponding to Utonality as the ancient Harmonical Proportion does to Otonality [where] the string

> is divided into successive parts of ½, 1/3, 1/4, 1/5, 1/6, 1/7, 1/8, etc., and the resulting proportions create the "major chord" (and a good deal more) and correspond to a series of partials. (Partch 1974, 90, 89).

Twelve Primary Tonalities result from using each of the twelve ratios that make up the 1/1-Otonal and 1/1-Utonal hexads (i.e., where 1/1 is the 1-Identity) as 1-Identities in turn; a total of 29 ratios make up the resulting Expanded Tonality Diamond (see Chapter Six).

The final form of the 43-note scale chosen by Partch incorporates the same 29 basic 11-limit ratios that make up the Expanded Tonality Diamond; these were already a part of the 1933 37-note system as well as the diamond-shaped section of the Ptolemy's keyboard. Of the eight so-called "multiple-number" ratios of the 37-note scale (i.e., the result of multiplying two simple ratios to permit expansion of consonance), four ratios located just below or above the fundamental 1/1 survived: 33/32, 16/15, 15/8, and 64/33. The remaining "new" ratios were chosen to fill up gaps (in the interest of a more even, quasi-chromatic scale) and to continue the process of harmonic expansion (see Appendix I). Having completed the 43-tone scale, Partch was able to increase the number of Tonalities to twenty- eight. The 1-Identities of these new Tonalities are among the twenty-nine ratios in the Expanded Tonality Diamond not already serving in this capacity. The result is two new complete hexads (for a total of fourteen) and fourteen Tonalities with at least the 1-5-3 triad complete within the Monophonic 43-tone octave.

One other transformation in the composer's thinking is complete. In the

earliest known manifestation of Monophony (the twenty-nine pitches chosen for the Adapted Viola in 1928), the idea of justly tuned scales seems the most prominent concept; the hexad principle has not yet appeared. The 1940 *Patterns Of Music* table of contents divides the discussion evenly between the Tonality (hexad) principle and diatonic (including tempered) scales. By the time of Partch 1949, the discussion focuses primarily on Monophonic Tonality, with scales relegated to either a historic role (e.g., the incidence of various Greek scales within the Monophonic system) or, in the case of tempered scales, to the "inexorable accident" of their appearance within the Monophonic system.[122]

Even with the 43-tone system now in place, Partch would continue to use pitches and Tonalities outside the system, most often in the form of fleeting passages in string parts. Partch never forgot that his personal system was but a portion of the potentially infinite world of just intonation.

C. Instruments, Voice, and Notation after 1941

Partch had experimented with a number of approaches to notation in the early years: systems using numbers alone, numbers plus five-line staves, straightforward presentation of ratios, two-line staves, and five-line staves; the only consistency was the use of lower-case letters to mark rather inexact deviations.

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[122] To Partch, the tempered scale is "the basic ingredient of this 'chaos,' otherwise known as twentieth-century music, which has accepted temperament (and therefore intonational falsehood) all too easily" (Partch 1974, 406).

There are no surviving Monophonic manuscripts between the *Lyrics of Li Po* copy of 1933 and the first version of *Barstow* for voice and Adapted Guitar (1941); this was followed by three short works for the same combination, grouped under the title *December, 1942*. By this time, Partch had returned to the ratio notation for use in Adapted Guitar and Adapted Viola parts.

The long-sought solution to building a fixed-pitch keyboard instrument changed Partch's overall thinking on notation. He had given up the Ptolemy concept in the late 1930's in exchange for the idea of the "chromatic organ," an adaptation of a conventional reed organ. He first experimented with "an old melodeon" in Chicago after his 1941 *U.S. Highball* journey; in 1942, still in Chicago, he began to adapt the "Chromolodian" (later, Chromelodeon) from a conventional "five-octave" harmonium, or pump organ.

For notation, Partch chose to take advantage of the familiar analogy between standard notation and keyboard playing, thus sparing his keyboard performers from having to learn a new set of psychophysiological mechanics (such as would have been necessary for a Ptolemy performer). He reasoned correctly that performers could habituate themselves to unexpected sounds coming from retuned reeds associated with the traditional "7-White/ 5-Black" keyboard arrangement. Thus the graphic or rational principles of Partch's earlier attempts at notation had given way to a mechanistic approach: play this physical key or block, rather than this pitch or note (Partch 1974, 215-216).

With the Chromelodeon's notational method, percussion-type tablature had been introduced to Monophony; all instruments subsequently built or adapted by Partch utilize this approach. For example, parts for the Kithara, a vertically-strung multiple lyre, are notated on a conventional five-line staff by color or number (indicating which group of six strings, or hexad, is to be plucked) and by staff space (indicating the specific note in the hexad played); no staff lines are used. Ratios are necessary only when the moveable "Pyrex rods or tubes" found on two of the twelve hexads are used to create glissandos (Partch 1974, 230-31). These criteria also apply to the Surrogate Kithara (a horizontally-strung double lyre), built after the first edition of *Genesis* was published.[123] Later string instruments such as the Harmonic Canons use string numbers, a reminiscence of his earliest notation system, since the Canons' eighty-eight strings are retuned according to the needs of an individual piece (ibid., 240-41). Partch's Koto (or psaltery, a gift from Lou Harrison) utilizes the same principle, with added ratios to indicate the pitch to be produced by the depressing of strings to the left of the moveable bridges, in the traditional manner (ibid., 251-53).

The first Partch percussion instrument, the Diamond Marimba, was built in 1946 in Madison, Wisconsin; it was first used in the *Intrusions*. The pitch organization and shape for this instrument is based on the Expanded Tonality Diamond, which in turn derives from the Ptolemy keyboard. The pitches on the

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[123] However, the Surrogate Kithara is clearly a descendant of the 1946 Double Canon, an instrument mentioned and pictured in Partch 1949, 100-01, but totally ignored in Partch 1974.

Diamond Marimba, however, are arranged so that, when the mallets are played idiomatically in diagonal sweeps, hexad arpeggios are produced, rather than the scales of the Expanded Tonality Diamond. The grid-like notation uses the conventional staff (staff and leger lines only) to represent row position, while adding the numbers 1-6 over and under the note heads to indicate a specific block's location within a row. Except for the usual vertical analogy, however, the element of pitch is not significant in this notational system (ibid., 260-66). The upward front-to-back slant of the Diamond Marimba layout makes the downward Otonal and upward Utonal arpeggios more idiomatic, as downward sweeps are far easier for the player. To permit idiomatic performance of upward Otonal and downward Utonal arpeggios, Partch later built the beautiful Quadrangularis Reversum, which includes an additional "alto register" (ibid., 267-72).

This same tablature principle is applied to Partch's later percussion instruments, whether built of dark woods, bamboo, glass (in the form of light bulbs, Pyrex carboys, or liquor bottles), metal, or gourds.; in some cases, the relatively small number of pitches in an instrument requires only numbers or the five-line staff for notation. In a few cases, note head shape was a determinant of choice of pitch, in a manner reminiscent of, but otherwise unrelated to, Cowell's proposals for rhythmic notation in *New Musical Resources* (Cowell 1930, 45ff.).

The notation of vocal parts, which had been subjected to the same reconsiderations as the Adapted Viola during the Li Po era, now went through two

more changes. With the fixed-pitch Chromelodeon available to him from 1941 on, Partch would indicate vocal pitches by writing a part in Chromelodeon notation, which the singer would presumably learn from using the instrument. This notation was used in the 1943 *Barstow* manuscript; with a few exceptions (most notably the 1944 *Yankee Doodle Fantasy*, where the soprano's part is notated conventionally), this method prevailed through at least 1950. This includes the recopying of the *Lyrics of Li Po* in 1949; the voice part is given in both Chromelodeon notation and in conventional notation, as a guide. Only *A Dream* is given in ratio as well as Chromelodeon notations, while *A Midnight Farewell* uses an inconsistent combination of all three types.

By the time Partch revised *Barstow* in 1954, he had abandoned the Chromelodeon vocal notation and was content to approximate pitch by the use of conventional notation. He would, at times, indicate more precise pitch requirements through the use of ratios; in other places, notes that were traditionally considered enharmonically equivalent would occur in close proximity in a vocal part, implying a difference in pitch. This general notational procedure is found in the *Summer 1955* collection, which includes the rewriting of works dating as far back as 1931 as well as new compositions. Partch continued its use until his death, and defended singers against accusations of out-of-tune-ness; the culprit, for Partch, was the piano, rather than the singers' instincts (ibid., 256-57).

D. Conclusion

From the late 1920's on, Harry Partch made several efforts to write a treatise concerning the nature of musical pitch and his personal preference for the tuning system known as just intonation. At first, he worked with a limited number of sources (most importantly Helmholtz and Ellis' *On the Sensations*) and presented his ideas in connection with public demonstrations on his Adapted Viola; the result of this first phase was *Exposition* in 1933.

Over the next several years, there was further research, especially in England in 1934-35; further experimentation with new instruments; and several more drafts of the treatise. Like Partch's lifestyle, the title of the treatise was in constant flux; it might have stayed that way (and the treatise unfinished) except for some good tidings of fortune.

"Bitter Music," while an apparent detour from Monophonic research, provided a much-needed laboratory for Partch's experiments with speech-song. While self-transcription had sufficed for his lyrically moody Li Po songs, "Bitter Music's" transcriptions of American vernacular speech, with its particular rhythms and pitches, forced Partch to go outside his own personality; his new alertness to "the music of the people" not only led to the "Americana" works, but gave him greater range of expression when he began to compose his stage works, beginning with the long-gestating *Oedipus* (1951).

In 1949, *Genesis* was published, more than two decades after Partch began

his explorations. It is in this form (Partch 1949)[124] that his theory has become known, explained, vilified, and defended. After 1949, Partch did not elaborate on Monophonic theory, "the one-half truth of the one-fourth factor" (Partch 1991, 197), in his writings. There are a few writings on precompositional topics, notably "The Rhythmic Motivations of *Castor and Pollux* and *Even Wild Horses*" (1952; Partch 1991, 221-227) and *A Quarter-Saw Section of Motivations and Intonations*, a lecture with taped examples (Partch 1967). *And on the Seventh Day Petals Fell in Petaluma*, in light of its original role as "verses" (studies) for *Delusion of the Fury*, can serve as a basis for studying Partch's compositional process. For Harry Partch's theoretical work, however, the endpoint is 1947, the beginning some twenty years before.

This essay has traced the development of Monophonic theory during that period, based on surviving evidence and inference. *Exposition* and "Bitter Music" are examined in detail for the first time; many other documents have been incorporated. The essay reveals how Partch's approach towards explaining his system grew more sophisticated, his breadth of theoretical association wider. It establishes the shift in emphasis from scale to hexad in Monophony, paralleling an increased use of harmony in his music. It demonstrates the fluidity of the Monophonic pitch gamut, which settled at 43 tones per octave after several changes, and even then was open to expansion to meet compositional needs.

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[124] Also Partch 1974, a reprint with additional non-theoretical material.

Harry Partch began his search for an alternative to equal temperament in the early 1920's; his ear and compositional impulses demanded nothing less. Just intonation, the system of ancient Greece, provided the solution. In creating Monophonic theory, Partch was providing a secure anchor for his composing and instrument building while working in an unusual tonal world. During the period of development (1923-50), the *Lyrics of Li Po*, the "Americana" works, and *Intrusions* were Partch's principal works; most were short, closely bound to their texts, intimate in expression. In the larger theatrical works that followed, the duration of pieces increased, the formal structures were freer, the emotional range widened, as Corporeality moved from the intimate concept of the One Voice to a communal, highly visceral performance mode. In these works, the strength Partch had built into Monophony repaid him in varied opportunities for modulation and other prolongation devices, the result of his challenge to the "distortions" of equal temperament. Sometimes the unfamiliarity of the notation of and concepts behind Partch's music has hindered those who might otherwise have studied Partch's music. Thanks to Ben Johnston's transcription method, this may no longer be necessary.[125]

Partch took on centuries of what he considered to be acoustic delusion and compositional obfuscation. He did not wish to destroy the past, but to offer a new, rejuvenating approach to creating music. He sought understanding and support, but

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[125] Johnston's method is designed for all justly tuned music, and he composes with it. I have used his system to transcribe Partch's *Barstow* for inclusion in the COPAM-MUSA series to be published by A-R Editions.

not imitators. His perseverance, manifest throughout his career, is a testimony to a courageous, thoughtful, radical mind, poised to triumph over threat, fear, or indifference. His music continues to elicit strong response from performers, audiences, and recording companies; his theories and instruments have served as models for a plethora of musicians[126] and an increasing number of writings. Harry Partch's legacy thrives, and will continue to do so.

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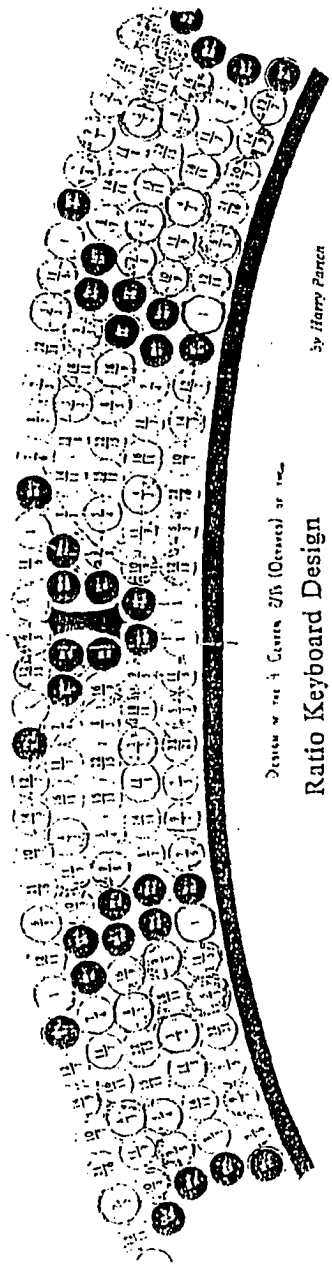
[126] "Partch's effect on other composers . . . has been profound and unabating, as is evident in the works of composers experimenting with just [and other] intonation[s], in mixed-media works since the [1950's and] 1960's, and in the percussive motor-rhythmic music of the [second group of] minimalists" (Earls/Kassel 1986). Composers in the first group include Lou Harrison, Ben Johnston, La Monte Young, James Tenney, Ezra Sims, Easley Blackwood, and Michael Harrison; in the second, those involved with the Happenings movement, Fluxus, the ONCE group, and much contemporary dance, theater, and performance art; and, in the last, Steve Reich, Phillip Glass, John Adams, and California-based composers associated with the journals *1/1* and *Interval*. Finally, there are the large number of musicians and artists who have built their own instruments for composition, performance, or as sound sculpture, whether modeled on Partch's example or not. These include Lou Harrison and William Colvig, Other Music, Music for Homemade Instruments, Gamelan Son of Lion, the Baschet brothers, and the many contributers to the journal *Experimental Musical Instruments*.

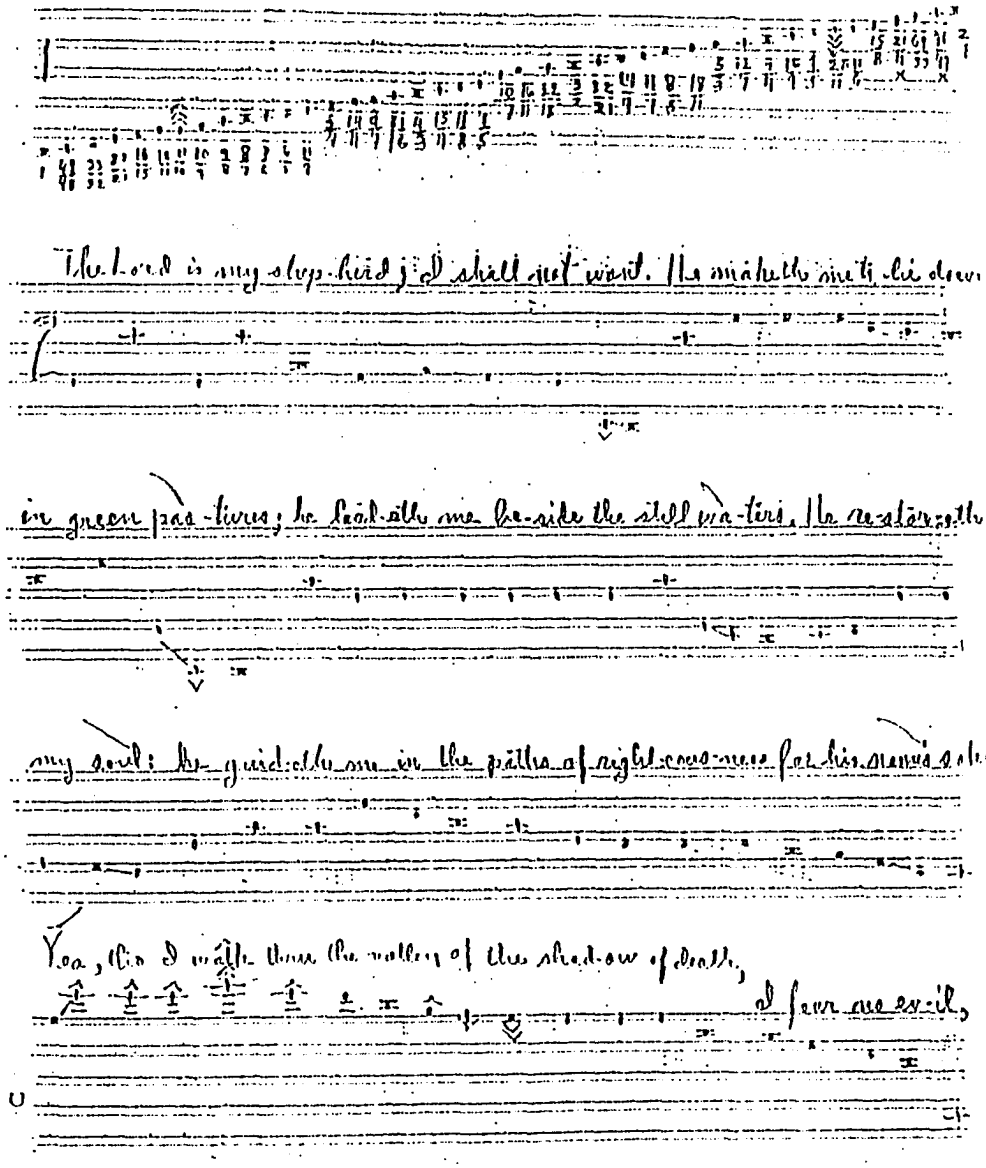
APPENDIX I: Three Monophonic Scales

#1: Adapted Viola (29: 1928-30)	#2: *Exposition...* (37/1931-32)	#3: *Genesis...* (43/1940's)
1/1	1/1	1/1
		81/80
	49/48	
33/32	33/32	33/32
	22/21	
21/20		21/20
	16/15	16/15
15/14		
12/11	12/11	12/11
	11/10	11/10
10/9	10/9	10/9
	9/8	9/8
8/7	8/7	8/7
7/6	7/6	7/6
		32/27
6/5	6/5	6/5
11/9	11/9	11/9
5/4	5/4	5/4
	14/11	14/11
9/7	9/7	9/7
		21/16
4/3	4/3	4/3
		27/20
11/8	11/8	11/8
7/5	7/5	7/5
----------Inversional Axis of Symmetry----------		
10/7	10/7	10/7
16/11	16/11	16/11
		40/27
3/2	3/2	3/2
		32/21
14/9	14/9	14/9
	11/7	11/7
8/5	8/5	8/5
18/11	18/11	18/11
5/3	5/3	5/3
		27/16
12/7	12/7	12/7
7/4	7/4	7/4
	16/9	16/9
9/5	9/5	9/5
	20/11	20/11
11/6	11/6	11/6
28/15		
	15/8	15/8
40/21		40/21
	21/11	
64/33	64/33	64/33
	96/49	
		160/81
2/1	2/1	2/1

APPENDIX II: Model Ratio Keyboard (1932)



APPENDIX III: Patch, Transcription of *The Lord Is My Shepherd*, recited by Reuben Rinder (Original notation, 1932)



APPENDIX IV: Derivation of 43-tone Monophonic scale using 11-limit hexads (Partch 1974, 159-161)

Interval Relationship (Upward):

1/1	3/2	5/4	7/4	9/8	11/8

PRIMARY OTONALITIES (based on Expanded Tonality Diamond)::

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

SECONDARY TONALITIES (bracketed pitches are not in Expanded Tonality Diamond):

3/2	9/8	[15/8]	[21/16]	[27/16]	[33/32]
6/5	9/5	3/2	[21/20]	[27/20]	
9/5	[27/20]	9/8		[81/80]	
[16/15]	8/5	4/3		6/5	
[32/21]	8/7	[40/21]	4/3	12/7	
[32/27]	16/9	[40/27]		4/3	
7/5	21/20	7/4			
[27/20]	[81/80]	[27/16]			
[64/33]	16/11			12/11	4/3
[160/81]	[40/27]			10/9	

APPENDIX V: Monophonic Developments. 1928-1950
Brackets indicate a lost work or abortive project.

Year	I. Theory	II. Instruments	III. Compositions
1928	Treatise: *Exposition* Interval Classification Resolutions 11-limit 29-tone scale Diatonic Tonalities	Experiments with cello, viola	[string quartet]
1929			*While My Heart Keeps Beating Time*
1930		Adapted Viola	*Lyrics of Li Po* begun
1931	Overtones Undertones Hexadic Tonalities Intoning Voice		Psalms "Potion Scene" from *Romeo and Juliet*
1932	History of Intervals 37-tone scale Experiments with 39, 41, 55 tones	[Ratio Keyboard]	
1933	Last version of *Exposition* Experiments with 43 tones		*Lyrics of Li Po* completed
1934		Adapted Guitar I	
1935	Treatise: *Monophony Is Expounded* Mathematical Rationales 24 Hexadic Tonalities 43-tone scale	Ptolemy I	"Bitter Music" (to 1936) *Oedipus* (to 1951) [Song of Solomon] [Sappho settings]
1936	Vernacular Speech-Song		
1938		Kithara I	

1940	Treatise: *Patterns of* Music History of Intonations Proposed Intonation Systems Just Keyboards Abstraction Critique Precompositional Concepts	[Ptolemy II]	["Bitter Music" prepared for publication]
1941		Chromelodeon (Old I)	*Barstow*
1942	First Ensemble Works		*Dark Brother* *December, 1942*
1943			*US Highball* *San Francisco* *The Letter* ["Mad Scene" from *King Lear*]
1944			*Yankee Doodle Fantasy* Two Excerpts from *Finnegan's Wake*
1945		Chromelodeon I Adapted Guitar II	[*I'm very happy to be able to tell you . . .*]
1946	Overtone/Undertone No Longer Used "American Musical Tendencies" Corporeality	Harmonic Canon I Diamond Marimba Chromelodeon (Old II)	*Two Studies on Greek Scales* (Intrusions 1-2)
1947-1949	Treatise: *Genesis* (completion and publication)		
1949-1950		Bass Marimba Cloud-Chamber Bowls Spoils of War Chromelodeon II	Intrusions 3-11 *Sonata Dementia**

*later incorporated into *Plectra and Percussion Dances*

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