

REFLECTIONS OF A FOOL: A MODERN BALLET
DERIVED FROM ELECTRONIC SOUND SOURCES

by _____

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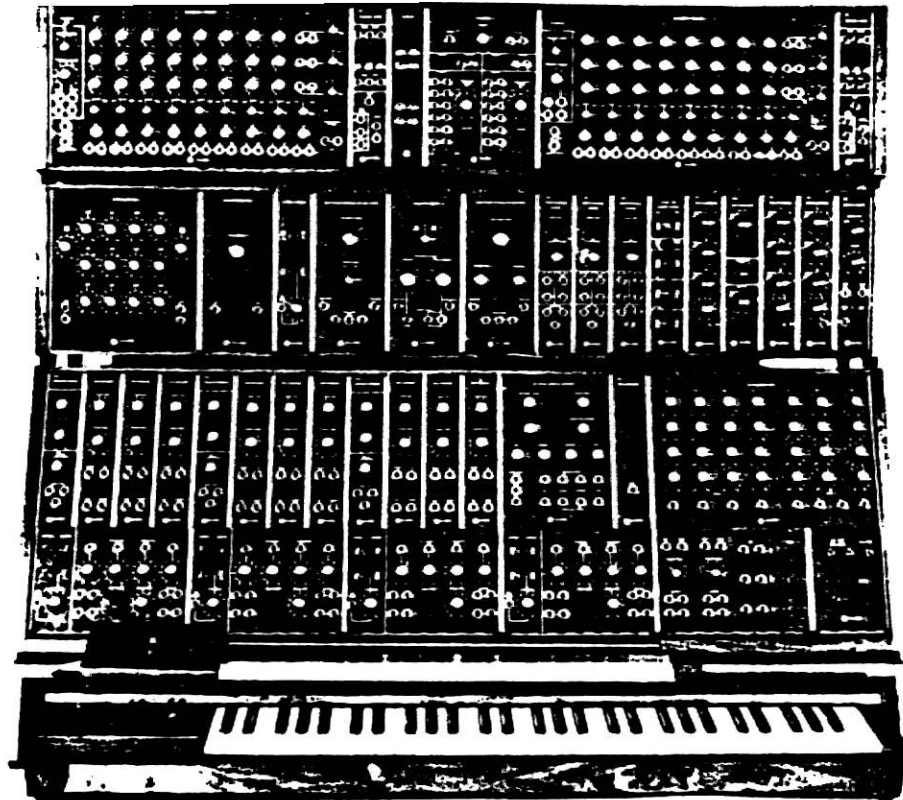
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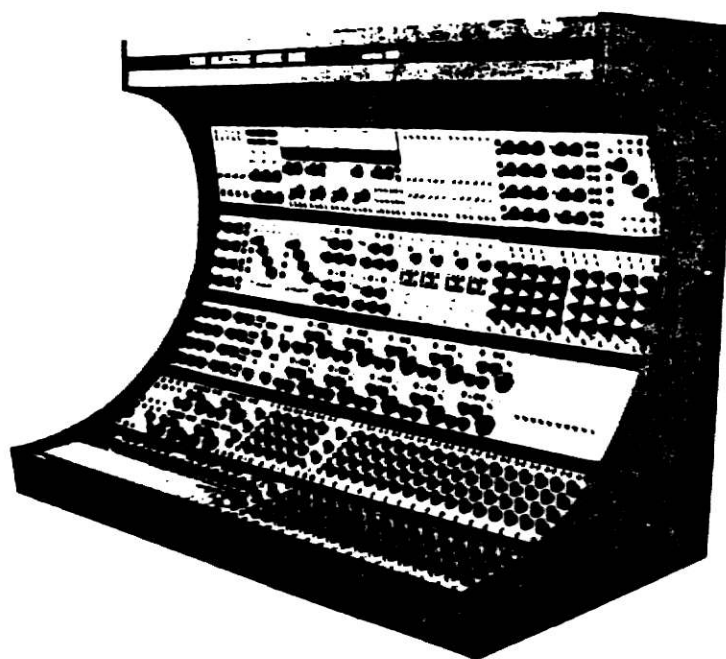
- I. Figure:
 - 1. Moog Synthesizer, IIIc.
 - 2. Buchla Electric Music Box, Model 200.
- II. ARP 2500 Analog Synthesizer.
- III. Block Diagram of ARP 2500 Patch.
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figure 1

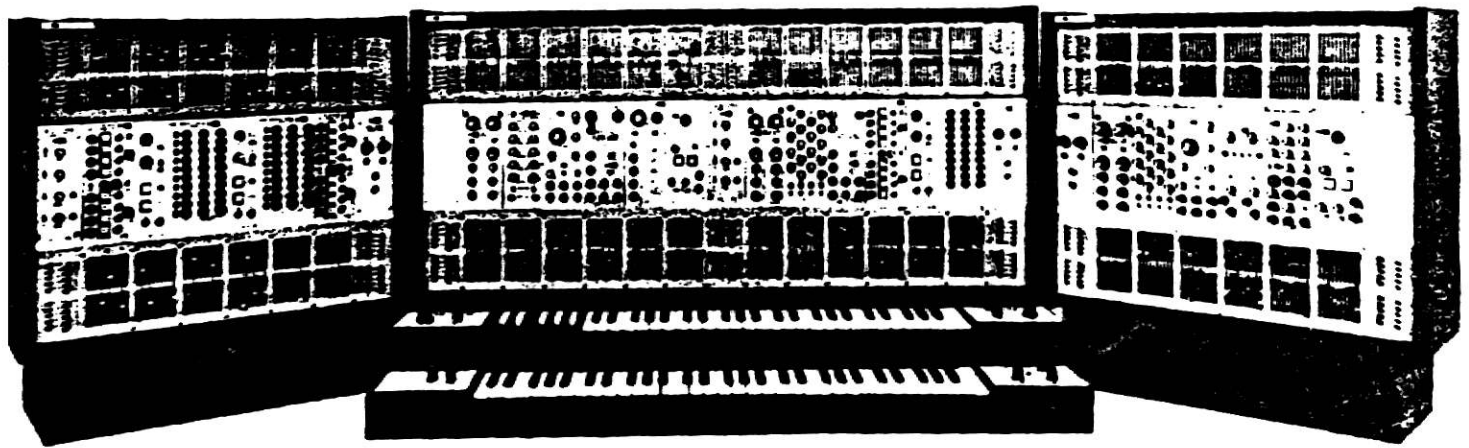


Moog Music Inc. Synthesizer III, with two Sequencers on the right and left of the top row.

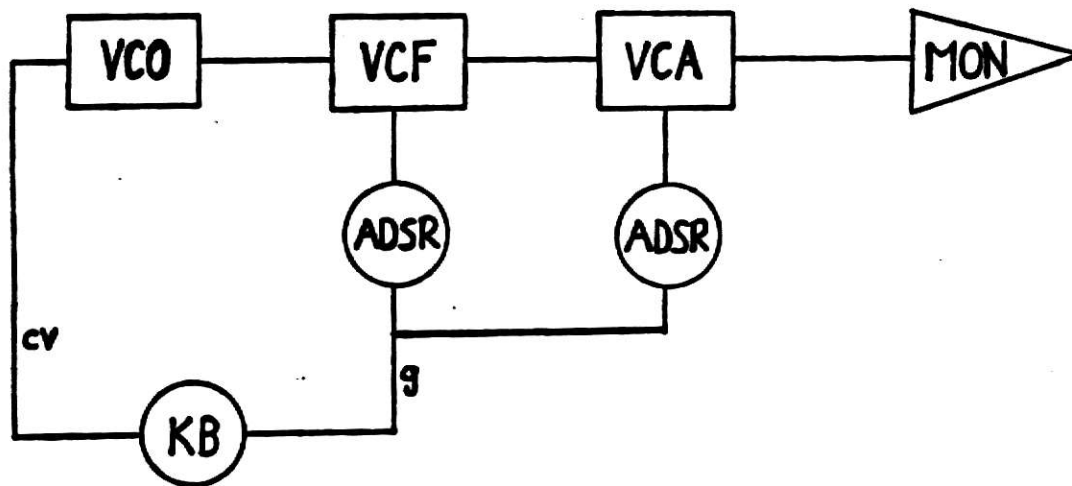
figure 2



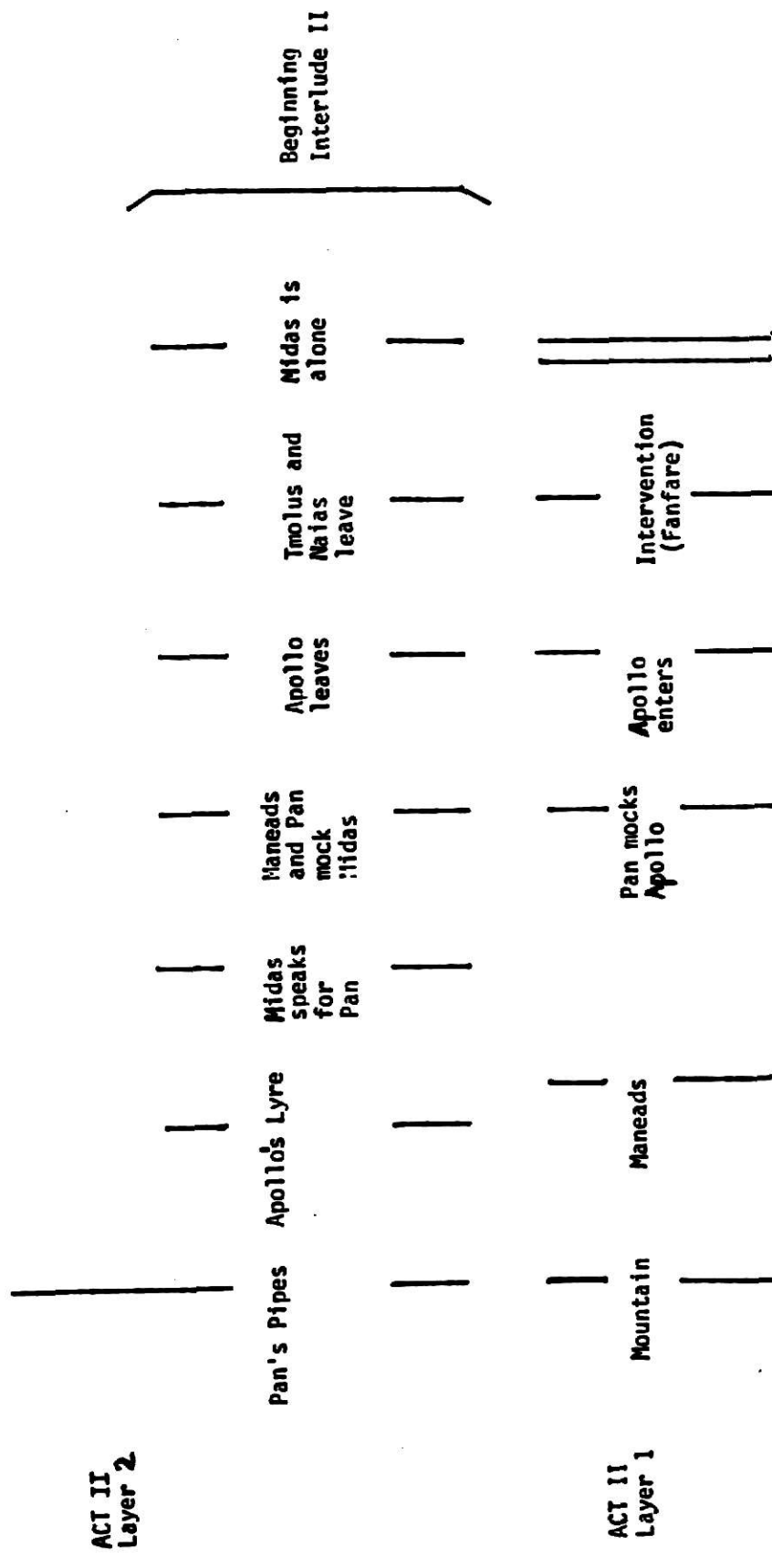
The Electric Music Box, model 200 (studio system), manufactured by Buchla Associates.



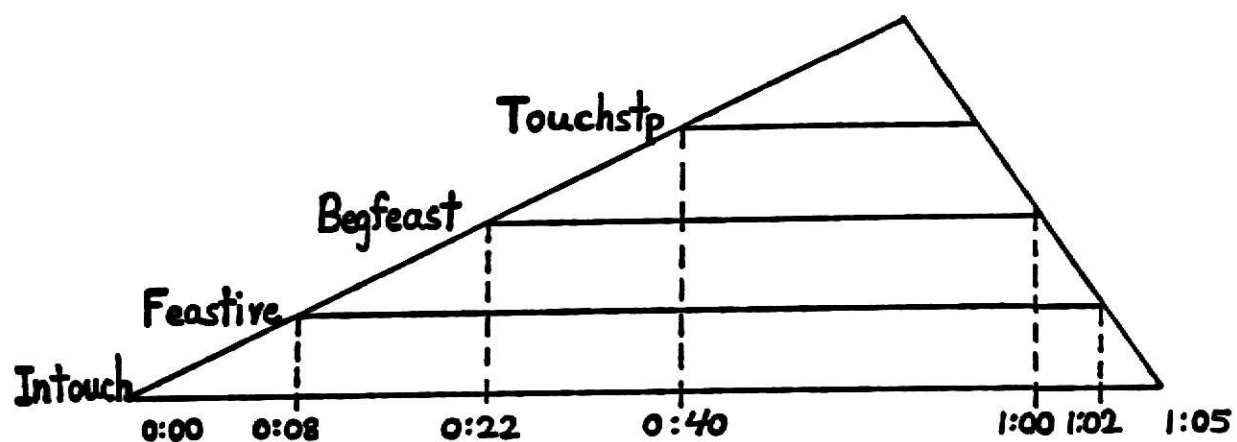
The ARP 2500 Electronic Music Synthesizer.



ARP Patch: Block diagram of a simple patch on the ARP 2500 Analog Synthesizer.



Act II: Formal outline revealing two layers of material. The primary layer begins Act II after the transitional section 'The River, Pactolus' and repeats with the beginning of 'The Contest'. At this point the second layer begins. As the primary layer fades, the second layer completes Act II.



Introduction: Formal outline revealing an Arch shape resulting from the textual combination of overlapping voices.

CHAPTER I

History of Electronic Music

Section 1: Early Electronic Instruments

Reflections of a Fool was conceived as a work which would explore the world of pure synthesized sound, the world of electronic music. The electronic medium enables the composer to simultaneously become creator and performer, allowing him to control many facets of a work. Similar to the manner through which an artist molds a sculpture to achieve the desired result, the composer shapes sound through its numerous qualities. Qualities such as timbre, frequency, amplitude, duration and spatial manipulation act independently and in combination to produce an evolving musical form within a stable or fluctuating texture. To bring into focus the vast spectrum of sound and its infinite possibilities, it is necessary to study the evolution of electronic music.

In the first half of the twentieth century, the framework for the establishment of electronic music began to take shape. During this time, the word 'electronic' was widely employed and applied toward a large number of concepts and their devices. Conventional musical instruments, modified by electronic circuits producing an

altered tone quality, rightly fall into an instrumental category known as hybrid. Pure electrophones utilize waveforms derived from rapidly alternating electrical currents, resulting in sound generators or oscillators. Oscillators produce frequencies which, used individually and in multiples, allow the performer or composer to control and manipulate sound in a variety of ways. Pure electronic instruments such as the Ondes Martenot, Theremin and Trautonium, invented in the third decade of the twentieth century, were monophonic, employing one or two oscillators.

"One of the first electronic instruments to attract public attention was the Theremin, invented about 1924 by the Russian scientist whose name it bears. This instrument uses a radio-frequency beat system of tone generation based on the interference between the outputs of two oscillators...The Ondes Martenot operates on a similar principle, as does the Trautonium."¹

The novachord allowed the use of many oscillators, each of which produced individual notes and made possible the performance of polyphonic music.

"The novachord, a single-manual instrument that also resembles the spinet in form, employs a purely electronic tone-generating system. Twelve vacuum-tube oscillators operate at the frequencies of the highest octave of the instrument."²

1 Edwin M. Pipin, "Electronic Instruments," in Harvard Dictionary of Music, (2nd ed., edited by Willi Apel, 1981), p. 284.

2 Pipin, "Electronic Instruments," in Harvard Dictionary of Music, p. 284.

The Hammond electric organ, while not employing oscillators, produces sound through signals derived from motor driven rotary generators. "The oscillations of the tone generator produce an electronic signal which is then modified by the stops and foot pedal."³ Hybrid and pure electronic instruments attempted to create and explore sound sources. They are representative of the early evolution of electronic music and form the foundation on which the technique of sound manipulation, through electronic devices, could grow and flourish.

Electronic music follows a close, parallel course with the rapidly advancing technology of the last half of the twentieth century. The invention of magnetic tape, during World War II, enabled the composer to shape sound to his own aesthetic specifications. In France, the compositional technique of musique concrete (recording acoustical sounds and consequently changing those sounds through various technical means) established a precedent through which a composer could skillfully work with the pliable tape medium. Other techniques, such as the mutation of acoustical sound material, could also be applied with special signal processing devices. Finally, an environment conducive to creating this new music was established in the forming of electronic music studios.

3 Article "Electric Organs," in Musical Instruments of the World (edited by Ruth Midgley, 1976), p. 258.

After World War II, what are commonly known as 'classic' tape studios were started in major artistic centers of the world.

Section 2: The Electronic Music Studio

In the Electronic Music Studio, special musical parameters(loudness, pitch, tone quality), previously subserviant to harmonic and melodic control, could be raised to a higher level of awareness. The existing technology, between World War II and the nineteen sixties, made possible the isolation and analysis of individual parameters. Varying degrees of loudness(amplitude), pitch(frequency) and tone quality(timbre) could be produced by sine oscillators, white noise generators and pulse generators.

"The usual list of sound generators for the production of electronic music includes sine, triangular, square, sawtooth and pulse⁴ wave-form generators and a white noise source."

Amplitude and frequency could be modified through ring and amplitude modulators, frequency shifters and amplitude filters. Timbre, determined by its harmonic series and the emphasis placed on the fundamental and its overtones, could be manually altered by filters which attenuate certain frequencies of the sound spectrum.

4 Gustav Ciamaga, "The Tape Studio," in The Development and Practice of Electronic Music (edited by Jon H. Appleton and Ronald C. Perera, New Jersey: Prentice-Hall, 1975), p. 74.

Equalizers could boost or attenuate separate bands of frequencies. The resultant sounds could be enhanced by reverberation units creating an acoustically acceptable sound. The signal processing and modifying devices could be manually operated through a keyboard or potentiometers(pots) where the key or rotary dials could open or close the signal path. Units, such as the gate and amplitude modulator, could open or close the signal path in response to control voltages rather than a key or pot. A pulse generator could also be used to furnish repetitive control voltages. After sound is created and molded into an acceptable shape, it is then subject to mixing and tape recording procedures.

The mixer could receive eight and send up to four signals. The individual signals could be attenuated or boosted with pots and sliders. Having final control over the resultant combination, composers could record up to four possible mixes on four separate tracts. The final mix was output through an amplifier, with monophonic or stereophonic capabilities, to the loudspeaker system. To create the desired result, devices could be linked together by means of a patch board. "The patch panel consists of an array or field of jack-receptacles representing the inputs and outputs of the equipment found in the studio"⁵ The patch board made possible the

5 Ciamaga, "The Tape Studio," in The Development and Practice of Electronic Music, p. 88.

connecting of a sound source to any modifying device and the transfer of their resultant sound, by way of the mixer, equalizer or reverberation unit, to the recording equipment. Alternative methods of organizing the interaction of numerous devices, available in the electronic music studio, were made possible by the advent of transistorized circuitry.

In the seventh decade of the twentieth century, the voltage-controlled synthesizer evolved due to the invention of a minute electronic device able to control current flow, the transistor.

"The development of the first voltage-controlled synthesizers by Robert Moog in New York, Donald Buchla in California, and Paul Ketoff in Rome was made possible by the availability of semiconductors and an industry-wide shift to a transistor technology in the early '60s."⁶

Modules could now generate audio signals and transform sound more efficiently in a smaller compact space.

Devices, designed to manipulate incoming currents, were designated as control units. The current created by voltage generators and flowing through voltage controllers was termed the signal path. "A signal path is a coherent route from a generator to a terminating point, which may pass through various modules, each of which processes the signal in some specific way."⁷ Separate modules,

6 Joel Chadabe, "The Voltage-controlled Synthesizer," in The Development and Practice of Electronic Music (edited by Jon H. Appleton and Ronald C. Perera, New Jersey: Prentice-Hall, 1975), p. 167.

7 Chadabe, "The Voltage-controlled Synthesizer," in The Development and Practice of Electronic Music, p. 140.

predesigned as voltage generators or controllers, were placed within the same casing. By internally connecting the individual units signal paths could be established. Many synthesizers were assembled in the nineteen sixties and seventies, each maintaining its own system of patching and network of integrated modules. Studio models include the Moog 55, the Moog IIIc(Plate I, figure 1), the Buchla 'Electric Music Box' series 200(Plate I, figure 2), the CEMS System from the New York State Electronic Music Studio in Albany, the SYNTHI 100 from the Electronic Music Studio of London and the ARP 2500(Plate II). An ARP 2500 voltage-controlled analog synthesizer, located in the Kansas State University Electronic Studio, was utilized in the work, Reflections of a Fool. To help explain the operation of a synthesizer, the ARP 2500 will be used as a model.

Section 3: Analog Synthesis

The modules of the ARP 2500 are as follows: White Noise(W/N), Pink Noise(P/N) and Random Voltage Generator; Dual Voltage Control Oscillator(VCO)--Low Frequency Oscillator(LFO); Low Pass(1/p) Voltage Control Filter(VCF) and Voltage Control Amplifier(VCA); Dual Envelope Generator with Attack, Decay, Sustain and Release(ADSR) and a Delay option; Four individual Envelope Generators(two with Delay option); Ring Modulator(RM)

with VCA; l/p, Band Pass(b/p), High Pass(h/p) and Band Reject(Notch) VCF; Dual Sample and Hold(S/H) with Random Voltage option; Mix-Sequencer(Seq); Clocked Sequential Control(Seq) with three, ten step Sequencers; Keyboard Controllers which provide for the addition of Portamento and Tuning options--the ARP supports two Keyboards(KB), one black and the other white. Above and below the modules is a patch system, consisting of several buss lines and sliding switches, with which audio and control paths can be interconnected. Plate IV, figure 1 shows a block diagram of a simple patch(audio path shape--rectangular, control path--circular and destination of final mix--triangular). The audio path is established and an initial sound is produced(VCO). The sound flows through the VCF and VCA on its way to the Monitor(Mon). The KB sends a control voltage(cv), when a key is depressed, to initiate sound produced by the VCO. Depressing a key can also open a gate(g) through which the Envelope Generators(ADSR) shape sound modified by the VCF and VCA. An initial sound has been generated and modified through an audio path and its resulting shape controlled by the KB and ADSR. Through 'subtractive synthesis' a sound can be filtered and shaped to create an altered timbre.

"When a tone is produced by being generated on an oscillator and processed through a filter, it is said to be produced by subtractive synthesis. Most

tones in electronic music are produced in this manner."⁸

The synthesizer made possible the molding of sound through compact modules conveniently paced side by side within the same cabinet.

"The principles of electronic music really haven't changed much-just the equipment. All a synthesizer is-in the broadest sense-is a self-contained electronic music studio. All of the various oscillators, filters, amplifiers and what not are contained within a single package."⁹

Sound is transmitted through voltage-control. Factors expressing quantities of voltage, resulting from an alternating current, are expressed analogously in musical terminology(Hertz, cycles per second-Frequency; Decibels-Amplitude). The term 'analog' became associated with the theory and practice of 'subtractive synthesis'.

Section 4: Digital Synthesis

In the second half of the twentieth century the development of the integrated circuit board(chip) allowed for the increased control, within a limited space, of analog devices through Digital to Analog(DAC) and Analog to Digital(ADC) Converters. The conversion of numeric

⁸ Hubert S. Howe, Jr., Electronic Music Synthesis (New York: W. W. Norton, 1975), pp. 85-86.

⁹ Delton T. Horn, Electronic Music Synthesizers (Pennsylvania: Tab Books, Inc., 1980) p. 15.

information to an analog voltage or vice versa could be accomplished through the input and output(I/O) of converters to the Central Processing Unit(CPU) of the digital computer.

"It can be seen that the special I/O devices known as DAC and ADC are very important for interfacing the computer with the sound world. The ADC accepts an analog voltage and outputs binary numbers to the computer. The DAC accepts binary numbers from the computer and outputs an analog voltage."¹⁰

The development of the digital synthesis system further advanced the speed and accuracy through which sound could be created and controlled. One such digital synthesis system is located in the Kansas State University Electronic Lab(The Crumar General Development System).

The General Development System(GDS) consists of a keyboard, the computer terminal, the Z-80 microcomputer and two eight inch disk drives. The computer scans the keyboard by way of an open channel inputting, through the keyboard, directions to the computer to do certain operations(I/O to the screen, printer, disk drive and keyboard itself). Through various commands, the CPU is directed to access areas in Random Access(RAM) and Read Only(ROM) Memory. The areas of memory can be either the basic program area, the residential operation system(CP/M-Control Program for Microprocessors) or any peripheral board which has been added to the system. The

¹⁰ Hanley Jackson, Synthesis (Kansas: L&M Publishers Inc., 1982), pp. 102 and 104.

peripheral boards plug into a mother board, located within a housing unit, which includes the main CPU/Memory.

"A special integrated circuit board containing thirty-two digital oscillators is integral to the system. The wave form of these oscillators may be either sine or triangle as needed. A single channel DAC is used to give a monophonic sound output. Other special circuit boards are used to interface the control mechanisms of the keyboard console."¹¹

The GDS can access sixty four thousand bytes(64k) of Random Access Memory(RAM). These memory positions can be recalled with complete accuracy at the instant the command is given. Precise information, contained within the memory positions, can be stored and accessed quickly utilizing formatted disks. Through use of the thirty-two digital oscillators, sine and triangle waveforms can be combined in a method known as 'additive synthesis'.

"If a multitude of sine wave oscillators are available, you can use what is known as 'additive synthesis'. Instead of filtering out the harmonics you don't want, you add in the ones you do want."¹²

The composer is in complete control of programming his voices and can decide how best to combine and manipulate predesigned timbres.

"Computer instrument design consists of linking together unit generators, a process conceptually similar to 'patching' in an analog studio. A particular linkage is called an 'instrument'.

11 Jackson, Synthesis, p. 128.

12 Delton T. Horn, Electronic Music Synthesizers (Pennsylvania: Tab Books Inc., 1980), p. 22.

Various 'instruments' are combined into a user's 'orchestra'. In addition to an orchestra design, the user must also provide the data that 'plays' the instruments. This data, which is called the 'score', triggers the instruments and provides them with information by which they control various musical parameters"¹³

Digital information can be immediately stored, recalled and shaped according to the knowledge and capabilities of the programmer. The rapid growth of the electronic medium, throughout the twentieth century, has and continues to effect all areas of life. It should be studied and understood in order to realize the full impact it has had on our world. The more knowledge is accumulated in the subject area of electronic sound synthesis the better the composer can understand the increased control of his craft he has achieved due to its development.

13 John E. Rogers, "The Uses of Digital Computers in Electronic Music Generation," in The Development and Practice of Electronic Music (edited by Jon H. Appleton and Ronald C. Perera, New Jersey: Prentice-Hall, 1975), p. 227.

Chapter II

Twentieth Century Music and Modern Ballet

Section 1: The Compositional Process

Through the study and working knowledge of 'analog' and 'digital' synthesis, tools are acquired which aid in the compositional process providing the composer with a means to explore the world of twentieth century music. The compositional process is derived from an ordered sequence of steps outlined below:

1. The conceptualization of a work, accompanied by research and analysis of subject material.
2. The decision-making phase, describing in prose the structure and style of the work.
3. The precompositional working out of musically conceived ideas.
4. An informal sketch musically outlining the shape and content of the work.
5. Completed pencil sketch, inclusive of total musical material.
6. Transference of sketch to ink score, arranging voices accordingly.
7. Writing out of parts.
8. Organizing a performance.
9. Actual performance.

When composing voice or acoustical sound material, steps 1-9 are unavoidable, especially if the composer hopes to hear the completed work. The interpretation of a score by the performing soloist or ensemble may or may not be that which the composer intended. The detailed, descriptive score becomes an imperative link between composer and performer.

The development of 'analog' and 'digital' synthesis provided the composer with an alternative to the descriptive score. The electronic music studio allowed the composer to become creator and performer. The detailed score was no longer necessary for the interpretive process. The composer could now realize his music exactly as he had first intended. Steps 6-9 could be condensed to one in which the final pencil sketch is realized on tape. A large amount of flexibility in the realization of original sound material became available to the composer through the electronic studio. Due to this flexibility, improvisational techniques and new notation were no longer a handicap. The serious composer could now explore and shape new music as never before possible.

The commercial availability and decreasing price ranges of the computer-interfaced digital synthesizer and its software has allowed the amateur musician to enter the domain of the composer. Popular music was suddenly

invaded by the amateur artist, who, through professional guidance, exploited the electronic sound world. The serious popular artist was unfortunately associated with this commercial development. When the public hears and talks of composing within the electronic medium, the music of the popular artist is immediately envisioned. Meanwhile, the serious composer struggles to change this popular misconception.

The professional performer-arranger is another participant in the creation of electronically conceived sound material. Through performance he uses his craft to arrange and bring pre-composed scores to the public. Within the performance he will often include original material. In this manner, the field of composition is entered by the performer. Through the electronic studio, the composer is also able to enter the domain of the performer. The composer considers the performance to be an inseparable part of the compositional process. The performance, throughout the history of Western Music, has been the final goal for which the composition was created. The technology of the twentieth century has given the composer the opportunity to hear and control the performance of his own works. In an age which denies the serious, contemporary composer the support to achieve such performances, the electronic studio is a welcome development.

Through the electronic studio, varying styles of music have been exploited, rearranged and composed. Twentieth century music is no exception. It has passed through the electronic studio emerging transformed into a variety of shapes. The serious composer can now freely create and interpret his own works in the style which was initially intended. He has acquired a foothold within a new frontier. Perhaps with the passing of time a more aware public will grow weary of electronic clichés within a commercial world. It is the shared responsibility of the professional artist and composer to provide an alternative to the commercial exploitation of the electronic medium through the study and promotion of serious twentieth century music created in the electronic studio.

Section 2: Modern Dance and the Ballet

The development of the electronic studio and its influence upon the creation of twentieth century music is analogous to the development of modern dance, in the United States, and its influence upon classical ballet. Ballet, in America, began with the establishment of dancing companies associated, in the nineteen thirties, with The American Ballet. Directed by the Russian emigrant, George Balanchine, the companies grew to form, in 1948, The New York City Ballet. Traditional classical

ballet, featuring the 'dance-drama' through which performers utilized grand dramatic movements to convey a story, and an abstract modern style, developed by Balanchine to complement twentieth century music, were equally part of The New York City Ballet's repertoire.

"Stravinsky's recent music, however, has often served Balanchine for his other favourite form in which the old open, straightforward bravura style is changed into a very personal manner with turned-in feet, bent arms and legs, unexpected quirks, twists and bends of the body, and rhythms that sink or rise in a surprising way. First seen to illustrate the theme of The Four Temperaments (to commissioned music by Hindemith in 1946), this style has subsequently been turned by Balanchine into a way of setting abstract dances to contemporary music."¹

An alternative to traditional ballet, modern dance, developed through Martha Graham, a student of the Denishawn School which inspired dance as an individualistic art.

"What makes Martha Graham pre-eminent is the quality of her own gifts as dancer and choreographer, but what makes her so influential is the fact that from the experience she gained over the years she evolved a technique that could be codified and taught by progressive daily exercises in the same way as classical ballet. It is based on a simple idea, the tension between opposites: balance and falling, or the contractions and stretching involved in breathing."²

Contemporary dance, initially a revolution against

1 John Percival, Modern Ballet (New York: E. P. Dutton and Company Inc., 1970), pp. 23 and 26.

2 Percival, Modern Ballet, p. 62.

impersonalized ballet training and the total ballet 'dance-dramas' of the Romantic Period, was rejected by rigid ballet enthusiasts. Its influence as an independent art form, as is common with new theories and practices proven valid through the passage of time, spread to other art forms including the ballet, and the initial opposition to formalized ballet training, as a detriment to modern dance, began to fade. The need for formalized training became a prerequisite of modern dance, and an increased originality and sense of awareness, as developed by modern dance choreographers, were utilized to add depth and meaning to the ballet.

"As a consequence of this breakdown of the wall between the two forms, there has in recent years been a widespread use of modern dance choreographers to develop works for major ballet companies. One of the frequently noted problems of the ballet world is its lack of gifted young choreographers. Thus, company directors have felt free to cross the line."³

Modern dance and ballet continued to exist within their own aesthetic, separately, in opposition to one another, but the influence of one upon the other has allowed the two styles to grow and evolve into valid mature art forms.

"The dance is one of many human experiences which cannot be suppressed. Dancing has existed at all times, and among all people and races. The dance is a form of expression given to man just as speech, philosophy, painting or music. Like music, the dance is a language which all human beings understand without the use of speech."⁴

3 Richard Kraus, History of the Dance (New Jersey: Prentice-Hall, Inc., 1969), p. 251.

4 Mary Wigman, "The Philosophy of Modern Dance," in Dance as a Theatre Art (edited by Selma Jeanne Cohen, New York: Dodd, Mead and Company, 1974), p. 149.

Through the synthesis of art forms, modern ballet became capable of expressing any musical style.

Reflections of a Fool should be conceptualized as a modern ballet, conceived within a total electronic medium. Lighting, costumes, set design and movement should reflect the framework of the music. The interaction and communication of the inner languages of dance and music should help to evoke a mood and convey the mythical atmosphere of the story to the audience.

"But although the use of modern music sometimes makes life harder for the choreographers and dancers, it is observable that even the most difficult music becomes easier to follow when it is accompanied by relevant movement. And the music for its part can lead the choreographer into paths he might not otherwise have found."⁵

The music, born of the technology of the time and the creative mind of man, is a testimonial to that philosophy.

Section 3: Precompositional Study of Electronic Works

Following the study of the electronic medium and twentieth century dance, the analysis of music, in relation to the two subject areas, was necessary. Compositions relating to the electronic medium were chosen since the work was to be derived from electronic sound sources. Scores, while in abundance in the field of ballet music composed for acoustical sound material, were

5 Percival, Modern Ballet, p. 126.

not readily available in the aquisition of research materials to aid in the study of electronic music. After listening to a large number of recordings a list was made which best reflected the character of the individual sections within the ballet. From this list a tape was prepared. The ordering of the recordings on the tape followed an outline of dance sequences, utilizing the sound material which best produced the desired mood within each sequence. Throughout the creation of the ballet, this tape was used as reference material. Appendix I contains a chronological listing of each work studied and an accompanying analysis. Following the precompositional study of twentieth century ballet, of the development of the electronic studio and of the analysis of electronic works, sketches for Reflections of a Fool were developed.

CHAPTER III

General Description of the Story

The myth of King Midas and the 'golden touch' is a familiar one in which Midas has been given the ability to turn all that he touches into gold. What happens to Midas, after the 'golden touch' has been given to him, encompasses Act I and II of the ballet. The Introduction and Interludes, placed prior to and between Act I, Act II and the Epilogue, are meant to provide pivotal points of reference which delineate the outer form of the work. The Epilogue is a short section designed to bring the composition to a quiet, peaceful close. The ballet is approximately forty minutes long. Appendix II represents a synopsis of the dance sequences, the time required and the performers needed for each sequence. The story of Midas is located in Book XI of Ovid's The Metamorphoses, pages 301-305. Following is a description of the action taking place within each dance sequence:

Introduction: Music

The Golden Touch: The story opens with Midas, King of Phrygia, who has just been granted the 'golden touch' as a favor for a service given the god, Bacchus (the god of wine and of ecstatic liberation). The curtain raises as Midas is revealed, at first quite timid, but growing more confident as the dance continues. Midas, now

possessing the 'golden touch', tests his new-found ability. Unsure, at first, he reaches slowly toward and touches a tree leaf which is immediately transformed from mere leaf to golden treasure. Midas then touches a blade of grass and an apple. Both turn to gold. Even the running water of a nearby stream and rays of sunlight through the shadows are unable to escape the 'golden touch'.

The Feast: Midas arrives home anxious to show everyone he sees his divine 'golden touch'. He dances joyously becoming overbearing and arrogant. His royal court and servants, eager to please their master, praise him and fall to their knees bowing and declaring their admiration. Dancers and acrobats entertain Midas' court as servants bring in massive amounts of food. Midas attempts to eat and drink, but cannot. All that he touches turns to gold. "By his own choice, gold had become his torture." All others, insensitive to Midas' plight, continue their feasting. Midas becomes angry. Does no one care for him? As a spoiled child throws his tantrum to claim underserved attention, so Midas rants and raves. Still they ignore him. He runs from one to another to plea for help, but everyone he touches turns to gold. All see this and flee in terror from the hall to avoid his accursed touch. Midas, alone and frightened, reaches toward the heavens and cries to Bacchus in despair and self-pity. "Take away your gift that shines gold. It's damned-it curses me." Bacchus hears the prayer sending four water nymphs, daughters of the river Pactolus, to cleanse Midas of the 'golden touch'. They entice Midas to follow them as they guide him to the river at the foot of the mountain, Tmolus.

Interlude: Music

The River, Pactolus: The scene begins as the nymphs enter with Midas close behind. They run into the open arms of their father, the river, Pactolus, and ask Midas to join them. Midas quickly removes his clothes and walks, without hesitation, into the mighty river. "And gold fell from him to the waters that ran gold. Even now the 'golden touch' has stained the river, and the soil its waters is as hard as gold."

The Mountain, Tmolus: One nymph, called Naias, leads Midas out of the river and waves goodbye to

her sisters. Midas declares his intentions to stay in the forest and learn of the simple life forsaking all of his wealth, if necessary. Naias, enamored of the simple King turned nature-lover, volunteers to guide Midas on his journey. First, she introduces Midas to Mount Tmolus. "An oak wreath held his dark green hair in order, while acorns dangled round his cloud-white forehead." Midas and Naias ask permission to live "where tall Mount Tmolus looked out far above the sea." The mountain grants his permission, and, in a grand manner similar to that of a proud father, begins to show the couple his lands and the life which abounds in them.

The Forest: Mount Tmolus shows Midas and Naias his forest and the creatures who live there. The three happen upon a ritual dance performed by Maneads(women who follow Bacchus, dressed in skins of fawns or panthers). During the dance Pan(the god of the pastures-half man with the legs of a goat and little horns on his head) is revealed. Pan boasts of his musical talents telling how "much better his voice was than Apollo's. Nor could Apollo whistle on his lyre." He holds up his fist in defiance of Apollo. Placing a crown of laurel on his head and a lyre to his side, Pan mocks Apollo by badly imitating his music. Pan plucks haphazardly on the lyre, breaking strings as a panorama of noise causes one and all to fall to the ground holding ears. Midas is totally amused by Pan's caricature, laughing and applauding. Pan casts the wreath of laurel on the ground smashing it with his hoofs. He holds the lyre in one hand and his pipes in another and breaks the lyre to pieces against a stone. Suddenly, the sky darkens and the winds blow. An arrow pierces the air finding its mark in a nearby tree. Apollo(the principle god of prophecy and divination, and of the arts and especially music, and of archery) appears glaring at Pan. Naias looks to Mount Tmolus, fearful of the consequences of a fight between Pan and Apollo. She pleads with the mountain to end the conflict between the two gods peacefully. Mount Tmolus sees the wisdom in her words and comes between the angry gods. He commands the winds to be still and suggests a musical contest between Pan's Pipes and Apollo's Lyre to settle the conflict. "In this way, with Mount Tmolus as the judge," the two gods, "entered an unequal competition."

The Contest:

"And Pan began to whistle country airs
Which Midas overheard and stood enchanted
Hearing them rock and roll and scream and moan.
The noise was of a kind that pierced the head
And Pan was done. Then Tmolus quickly turned
His face to Phoebus, and with him all the forest
Faced the god.
Apollo's golden head shone through his laurels,
His cloak swung from his shoulders to the earth,
And 'gainst the purple folds the ivory lyre,
Flashing with diamonds, was held in his left hand,
The plectrum in his right. He was the very image
Of the artist, all poise and pose;
He touched the string and Tmolus gazed down at him;
He then told Pan to throw his pipes away.
The show was over: only echoes filled the air;
Tmolus had spoken and the lyre won."

Midas' Ass Ears:

"Tmolus was cheered by every one who heard--
And who would have his say against a mountain?
Only poor foolish Midas raised his voice
To speak for Pan. Apollo Delius
Knew well enough that Midas' ears were not
The kind of ears that human creatures wore--
And as they twitched, they wheeled for better hearing.
Midas looked like a man, except for ears--
Which were the property of mules and asses.
Even Midas felt a loss of dignity."

Pan prepares to leave the site of his defeat
bowing to the supreme authority of Mount Tmolus.
Sad, at first, he has only to catch a glimpse of
Midas, and his humor is revived. Pan plays the
goat to Midas' jackass. Maneads join in the fun,
riding Midas and braying to the tune of Pan's
Pipes. Pan tires of the activity and leaves with
the Maneads following his lead. Midas continues
to act the ass, a natural part for the fool to
play. Apollo takes his arrow from the tree and
leaves in a manner similar to his entry. The
winds blow and subside. Only Mount Tmolus and
Naias remain with Midas. Mount Tmolus looks down
at the long eared Midas openly displaying his
disdain for the unlikely king. The mountain asks
Naias to join him in his departure. Midas looks
at the nymph, but she has grown weary of the fool.
With sharp biting laughter and a mocking glance,
she leaves with Mount Tmolus. Midas is alone with

his shame.

Interlude: Music

The Epilogue:

"Only the slave who trimmed King Midas' hair
Knew what another slave would love to know.
The story burned his lips--where could he tell it?
He kneeled as if to pray and with quick fingers
Thrust hand in earth, his lips above it whispered.
'King Midas has ass ears,' then closed his voice
Within the hole he made, covering it up
With large handfuls of moist earth. Then frightened,
He ran away. But whispering reeds grew up
Around that spot and through the earth beneath them
The imprisoned voice came whispering to the wind,
Then all the world learned of King Midas' ears."

Midas, the character upon which the title is based, forever plays the fool lost within the narrow limitations of his own mind. The music reflects the superficial personality of Midas which seems to vary throughout the work, but in reality, changes only on the surface level. Midas cannot hide his 'ass ears' for no matter how he masks his outer appearance the truth will eventually be revealed. There is no escaping his inner self, his true foolish nature. The organization of the music is derived from such 'surface change'. The ear will recognize the timbral change which appears on the surface, but will not, at first, hear the cyclical manner through which the voices are manipulated and transformed, each new section or motivic cell building upon the former. An analysis of the ballet reveals the inner working out of material, derived from a grouping of eight voices and the motivic

cells each voice introduces. The cells join to form the nucleus upon which the formal structure of the ballet is built. The following chapter presents an analysis of this structure and the process through which it was created.

CHAPTER IV

Analytical Basis

Section 1: Timbral Designs and Textural Sketches

Prior to the realization of the work, 'instruments' were designed to form an 'orchestra'. Seven original voices and variations of these voices were developed through the General Development System. Another grouping of voices was derived from various patches on the ARP 2500. The eight resulting groups were distinguished by their envelope shapes(amplitude-frequency), the register in which each was centered(low-middle-high) and the brightness of the resultant timbre. Throughout Act I and II, the Interludes and Epilogue, the 'orchestra' was derived from these eight groupings of voices. Individual voices were developed, combined and transformed in content as each evolved independently and in conjunction with the others throughout the remainder of the work. Each voice introduced pitched or indefinite pitched melodic and rhythmic cells for future development.

Sketches consisted of specialized symbols, determined by the composer, which best represented the various timbres of the orchestra. A time line based on seconds was drawn below the graphic symbols and a click track was

laid down on tape. In the sketch, the tracks on which each line would be laid, were plotted. Voices were designated with numbers 1-8 and tracks with Roman numerals I-VIII. When necessary, meter, tempo, dynamics, articulations and overall style descriptions were marked. The tape was realized in the Kansas State University Electronic Lab by the composer.

Each timbre, derived from the GDS, is named according to the section of the work within which it is most prevalent. 'Intouch' refers to the Introduction prior to The Golden Touch. 'Touched', 'Touch3D', 'Touchpop' and 'Touchstp' provide the primary motivic material for The Golden Touch. 'Begfeast' applies to the voice heard at the beginning of The Feast and 'Festive' is derived from the middle of the same section. Voices, such as 'Tched2' and 'Tched3', 'Begfest2', and 'Festive2' are variants of the original 'Touched', 'Begfeast' and 'Festive' timbres, respectively. The ARP patches are named according to the percussive effects they produce (wood block, gong-like chime, white/pink noise, R/M metallic timbre, water drops, snake-like rattle and insect-like sounds).

Section 2: Descriptive Analysis

The following is an analysis tracing the exposition and development of various timbres as they appear within

the work. Throughout the analysis, reference can be made to Appendix III. Appendix III contains eight groupings of timbres accompanied by the motivic units introduced by each and a short description of their individual sound shapes(envelopes).

Rhythm, melody and harmony were secondary elements within the ballet owing their existence to the overall timbre and texture of each section. Motivic units, exhibiting rhythmic and melodic relationships, were coupled with each timbre and combined harmonically to produce the desired texture. In the Introduction, an atmosphere of deep forboding was created utilizing those elements which would best provide this dark texture. A slow, ponderous ostinato placed in a low register resulted, fluctuating microtonally within the 'Intouch' voice. The Golden Touch dance was to be bright and taunting, a contrast to the ominous Introuction. Voices were prepared within a middle to high register utilizing a biting, sharp attack and short rhythmic motivic units.

The Feast was a mixture of scenes, each revealing a building tension and anxiety, culminating in Midas's cry to Bacchaus. The final scene of The Feast was marked by the entrance of the nymphs, sent by Bacchaus to free Midas of the 'golden touch'. 'Begfeast', a sustained voice of overlapping two-note clusters, provided a thickening texture through which tension could be controlled within

the section. As dancers and acrobats entertained several rhythmic patterns of percussive origin were developed. The rhythmic patterns were clear and concise to be joined later by the 'Festive' voice. Rhythmic activity slowed as the 'Tched2' voice entered producing an overlapping, sustained cluster of irritating high pitches, each maintaining a slow wide vibrato. This provided a tortuous background for Midas, who, incapable of eating, was becoming more and more aware of the curse of the 'golden touch'. Rapidly overlapping voices produced a rush of sound depicting Midas' cry of remorse to Bacchaus. Immediately after, the nymphs entered providing a sense of order to Midas' chaotic strife. Serial development of a twelve-tone row introduced ordered pitch relationships to the organizational format of the ballet. The Interlude intervened, reflecting the constant, unyielding, dark mood of the Introduction.

Whereas Act I is expository in nature, Act II is developmental. Timbre and texture continue to dictate the organizational format of the work. The River, Pactolus demands bright, fast-paced actions through which Midas is lured into the river and washed of the 'golden touch'. Previous material, derived from The Feast, is played at twice its original tempo in diminution portraying the abrupt, harsh manner in which Midas is treated. The bright timbre, so dominant in Act I, is washed off in an

instant. The transition from bright to dark is made musically by repeating material, derived from the conclusion of The Feast, at half its original tempo. This material overlaps and follows the previous fast moving section. As Midas pulls himself exhausted from the river so does the slow replace the fast tempo, and the dark-low replace the bright-high timbre.

Act II begins with the entrance of the Mountain, Tmolus. A mood of mystery and awe prevails. A low, percussive, gong-like timbre enters, followed by a snake-like rattle and water drops. Filtered and amplified, with added reverberation, the sounds bring the Mountain to life. The ARP percussive timbres dominate this section. Controlled by the sequencer, the water drop sound acquires an increased rhythmic character. Spontaneous, nature-related sounds create a primitive atmosphere through which the Mountain guides Midas and the nymph, Naias, through his domain. As they near the forest a repetitive, rhythmic pattern is heard within a drum-like timbre. The sensual dance of the Maneads follows delineated by the constant, unaltered ostinato. Previous material from Act I occurs in augmentation, coupled with the percussive timbres of Act II as Midas and Naias become aware of the presence of Pan amid the Maneads. Through degrading, ridiculing actions, Pan mocks Apollo. Apollo angrily appears in retaliation to Pan's actions. An

insect-like, pinched-sound joins the augmentation of overlapping, serially conceived lines derived from the sub-section, 'Entry of the Nymphs' of The Feast. A ring modulated voice enters in rebutal to Pan's mocking laughter. The insect-like and ring modulated voices move sequentially in an alternating descending and ascending, directional pattern. The independent lines move in opposition to one another occupying the same melodic range. A low gong-like timbre depicts Tmolus's intervention between the feuding gods. A fanfare announces a contest between the two gods, as Pan prepares to extol his torture upon an unsuspecting pannel of judges.

The musical material for The Contest is derived from an ordered row which first appears in Act I, marking the entrance of the nymphs. The matrixes from which Pan's Prelude and Apollo's Fugue are derived, accompany the scores which appear in Appendix IV. The original(P), inversion(I), retrograde(R), retrograde-inversion(RI) and transposition(1-12) of each form of the row are outlined within each score. The process by which each matrix is derived from the initial statement of the twelve-tone row, originating within the 'Tched3' voice, can be observed in Appendix III, example 9. Three groupings of voices, utilizing distorted envelopes, are used to realize Pan's Prelude. Each version of the Prelude is recorded and mixed to provide a continuous timbral transformation of

the original. Unrest among the judges is communicated through the recurrent percussive grumblings audible during the performance of the Prelude. A snake-like rattle ends Pan's performance as Mount Tmolus can take no more. Another fanfare marks the beginning of Apollo's Fugue. Acoustically imitative voices are chosen for their plucked string timbre, providing clarity within the unified contrapuntal art form. The Fugue is played twice, the second time doubled with wind-like voices which add depth to the previously balanced texture. Throughout the Fugue, the judges are in awe of the perfection present in Apollo's music. Apollo is declared the winner, even before his performance is finished.

Material from the first half of Act II is present throughout its second half, beginning with The Contest and continuing through the sub-section, 'Departure of Tmolus and Naias' from Midas' Ass Ears. Plate IV graphs the formal texture of Act II as the primary layer of material begins following the ~~transitional~~ section of The River, Pactolus. The primary layer of material, the B section, is repeated as a second layer of material, B', is added. Depending upon its effect on the overall sound, this primary layer of material is boosted or attenuated to provide an underlying basis for the second half of Act II. Immediately following The Contest, Midas speaks for Pan against Apollo. Augmentation of material from Act I, the

drum ostinato of the Maneads dance, the mocking laughter of Pan, Pan's Prelude in augmentation and the rising amplitude envelope derived from the 'Festive' voice, are combined to form the background for Apollo's gift of ass ears to Midas as a testimonial to Midas' lack of taste. Tension mounts as Maneads and Pan humiliate and mock Midas. Apollo leaves as his Fugue is recapitulated in diminution. The scraping of the ground around the area which Midas lays can be heard within a filtered white noise, repetitive, long-short pattern, as Mount Tmolus leaves with Naias. This pattern is a retrograde of a short-long rhythm present in The Feast and is introduced by the 'Touchstp' voice. The drum-like ostinato pattern continues as augmented material from Act II becomes audible. Another ostinato pattern is introduced to mark the point at which Naias turns away from Midas, ignoring him as she leaves with Mount Tmolus. Augmentation of material from Act II continues, accompanied by the scraping short-long pattern and the insect-like timbre. The short-long pattern is transformed into a repetitive grouping of slow taps which mark the end of Act II. The Interlude returns, an exact repetition of the Introduction.

The Epilogue opens with material directly quoted from The Golden Touch. A slave has discovered the secret of King Midas' ass ears and buries the secret deep within the

ground. The entry of a segment of Apollo's Fugue in augmentation, overlapped with material from the main section of The Feast, depicts the growing reeds around the area where the secret was buried. The reeds whisper Midas' secret as the ballet peacefully concludes.

Section 3: Micro-Formal Analysis

The formal elements within the ballet are derived from the linear development of segments of motivic material. Segments are provided by the individual expository statements of the original eight groupings of timbres. Rhythm serves as a basis for delineating the various motivic cells. The more rhythmic the motive, the better able the ear is to distinguish and compare motivic patterns. Melodic shape, in addition to rhythm, aids in creating the character of a motivic unit. The contour or melodic movement within the motive, as well as the preparation and resolution of the motive itself, also helps to establish the inner formal unity of a work. Linear patterns overlap and combine, utilizing contrapuntal techniques, resulting in a vertical, harmonic framework. No intervallic relationships between motivic units are intended, with the exception of the final sub-section of The Feast which employs an ordered twelve-tone row. Within each individual cell, this is not

the case.

The Introduction utilizes a repetitive, hexachordal pattern based on the E Phrygian mode, chosen for its subtonic and neopolitan relationship to the tonic. Voices within The Golden Touch linearly exploit semitone, perfect fourth and perfect fifth combinations. The tri-tone is also evident in a vertical as well as linear context. The 'Touchpop' voice is derived from an oscillating, indefinite pitch pattern. 'Touchstp' uses a repetitive long-short, two-note rhythmic cell and other rhythmic units created to contrast short and sustained, indefinite pitches. The Feast utilizes voices which produce sustained, overlapping two-note clusters. In the last scene of The Feast, a relationship between the intervallic combination of individual motives can be established. Trichord and tetrachord subsets are derived from an original row, whose primary intervals are the same as those used in The Golden Touch (semitone, perfect fourth, perfect fifth and tri-tone). The 'Tched3' voice utilizes a symmetrical row within Apollo's fugue. In the remainder of the ballet, material from the Introduction and Act I is contrapuntally transformed. The contrapuntal interaction and combination of various motivic cells form the micro-organizational basis of the ballet.

Section 4: Macro-Formal Analysis

The ballet consists of a series of dance sequences which are referred to as sections. The Introduction and Interludes are individual sections as are The Golden Touch and The Feast of Act I. Within various sections are smaller formal units designated as sub-sections. For example, The Feast contains the following sub-sections; 'Entry of Midas', 'Dancers and Acrobats Entertain', 'Feast', 'Midas's Cry to Bacchus' and 'Entry of the Nymphs'. Each section or sub-section maintains its own general character. Rhythmic sections maintain a constant, repetitive rhythm throughout as in the sub-section, 'Dancers and Acrobats Entertain' of The Feast. If a unifying ostinato does not occur a section is said to be arhythmic, even though motivic rhythmic activity is present. In this manner, rhythm provides a point of stability between and within arhythmic sections. There are also sections which provide a consistent melodic subject, such as the sub-section, 'Apollo's Lyre' of The Contest. Contrasting sections occur which seem anti-melodic, but still contain motivic units within which a linear intervallic consistency is maintained.

Harmony is the resultant of voices combined linearly. The work contains no key centers, but does include tonal areas which form a secondary organizational role. Indefinite pitched melodic units produce bitonal or

polytonal passages when linearly combined with pitched cells. The Introduction and Interludes, based on the Phrygian Mode, revolve around the tonal area of E. When combined with the 'Festive', 'Begfeast' and 'Touchstp' voices a polytonal effect is produced. The lack of any consistent tonal center within the work is defined as atonality. The more constant and repetitive the harmonic implications, the more stable the section. When the musical elements of rhythm, melody and harmony are relatively constant, a consistent texture results and an overall form becomes clear. The Introduction is one such section. Plate V shows an outline of the formal design of the Introduction. A consistent, repetitive 'Intouch' voice is maintained throughout the section. At irregular time intervals of 8, 22 and 40 seconds new voices are added. As voices combine, the texture thickens. Directly following the point at which the texture is its thickest, the same voices exit in the opposite order of entry. An Arch form results, derived from the textural combination of overlapping voices.

Throughout the ballet, individual sub-sections maintain their own degree of textural-harmonic stability, dependent upon the interaction and combination of rhythmic and melodic motivic units. The sub-sections join to form larger sections, centered around an evolving combination of timbres designed to produce an overall mood or

atmosphere within each section. When larger sections are joined, four macro-formal designs, each valid in their representation of the overall form, take shape. A synopsis of each of the four formal designs follows:

1. Sonata: Act I-Exposition of new material
Act II-Development of new material
Epilogue-Recapitulation utilizing
both expository and
developmental material
2. Rondo: The Introduction and recurrence
of the Interludes between sections
produces an ABACA(BC) formal structure
and serves in a transitional capacity
from one section to another
3. Theme and Variations: Each voice is
representative of one
theme which is introduced
and transformed in a
cyclical, continually
evolving manner
4. Ronded Binary: Introduction; Act I--A
Interlude; Act II--A'BB'
Interlude; Epilogue--A'B'

The rhythmic character, melodic shape and harmonic implications, as determined by the manner through which cells connect and interact, combine with the timbral voices of the orchestra. Sub-sections form, each maintaining a consistent texture. The sub-sections join to form larger sections determining the macro-formal organization of the work.

Chapter V

Conclusion: The Electronic Sound World

Reflections of a Fool is an electronic composition for modern ballet. The music is designed to produce an atmosphere through which the dancers can convey the mythical story of King Midas. A disciplined approach to the creation of electronic music is necessary. The electronic music studio provides the appropriate tools through which a composition can be realized, but the ability to work with these tools is not so easily acquired. Years of study should be undertaken in order to understand and comprehend the full impact the development of electrical sound sources has had on the compositional practice of twentieth century music.

Due to a misinformed public, not willing or able to pursue the study of contemporary twentieth century music, all music derived from electronically conceived sound sources is grouped into one category. This misconception should not be tolerated, especially among the 'musically educated' population. Classifying the serious electronic compositions of Milton Babbitt with the work of popular artist 'Prince' is as incorrect as equating the work of

Arnold Schoenberg with 'Bill Halley and the Comets'. Grouping the music of all electronic composers into one area is as false as combining the works of the twentieth century masters into one style period.

Modern dance and contemporary ballet are also misunderstood art forms. The tendency to separate the two dance styles into opposing camps is a popular practice. Modern dance was initially an uprising against the formalized structure of 'classical' ballet, but has long since established formal training of its own. The 'classical' ballet, influenced by the philosophy and innovative ideas of modern dance choreographers and twentieth century music, has evolved into a more flexible 'modern' art form. Modern ballet is capable of performing within any musical style and expressing any concept.

Even the most basic study of the evolution of electronic music and twentieth century dance, as presented in this paper, reveals a complex history and practice. Due to the variety of styles available in the composition of a modern ballet, the decision to compose an electronic work becomes only one of many made during the compositional process. Voices must be designed, style determined and notes kept of the entire procedure. Sketches are invaluable, containing musical information expressed symbolically in a uniform style. The acoustical sound world must be left behind with extra care applied

toward the development of new sounds rather than poor acoustical imitations. The extreme to which a composer excludes the techniques previously derived from working within an acoustical environment varies. The ballet represents an attempt to bridge acoustically conceived techniques with the variety of timbral resources available in the electronic studio. Through the contrapuntal development of motivic cells, expository material is explored and transformed. In this manner, a form based on repetition, contrast and the cyclical treatment of voices, is developed. A form as variable as the motivic cells from which it was derived.

The electronic studio allows the composer the freedom to realize his own compositions. This can be viewed as a tremendous advantage and a valid justification for the development of a work within the electronic medium. Time is saved by not writing out a formal ink score and parts. Communicating to the performer the desired style is no longer a necessity since the composer is fully capable of interpreting his own work. The added responsibility of creating an acoustically acceptable tape seems a small price to pay for the satisfaction gained from the immediate realization of a new work. Composing through the electronic studio requires an incredible amount of study and patience, but can prove an invaluable experience. In contrast to the acoustical sound world,

the electronic studio provides the composer with increased control over his craft and through this control the ability to create and interpret his own works.

Appendix I

Chronological Analysis of Electronic Works

In the Beginning, from Theatre Piece #2-Otto Luening-1956: Low, forboding ostinato pattern, fluctuating microtonally, based on varying tonal areas. Reverberation added to enhance the sound. Contrasting higher pitched timbres create an illusion of depth. A female soprano voice enters in a legato, flowing manner. I was interested only in the first few minutes of the work. The more the voice dominated, the more the work strayed from the mood I hoped to evoke, that of deep forboding.

Evolutions-Ballet Suite(Overture, Air, Ragtime, Intermezzo, Waltz, Finale)-Henk Badings-1958: Of the six movements, I became interested in four; The Overture, Air, Intermezzo and Finale. Overture: Clumsy, rapid movement from a short ostinato recurrent rhythmic motif to longer, filtered pitch and white noise sounds. Rhythmic patterns are used, but only as sound events, appearing on an equal basis with a variety of other sound events. Air: An ABA formal design, beginning with a metallic ostinato pattern accompanied by hollow filtered(band pass) sound events employing a small degree of resonance and vibrato resembling an altered flute timbre. The middle section consists of a long, sustained low-pitched sound with a slow wide vibrato, resembling a sine wave, which enters alone and is joined later by short bird call imitations. Intermezzo: An ABA formal design beginning with a melodic, lightly articulated, bell-like broken chord pattern over a low pitched buzz which is altered by the opening and closing of a filter in a sine wave pattern. Percussive, short attacks with a small degree of reverberation which occur at a rapid rate dominate the middle section. When the A section returns, a flute-like timbre is added with a short definitive melody. Finale: Similar to the Overture, utilizing similar sound material. The melody, employed in the Intermezzo, returns followed by a distorted, brass-like fanfare which concludes the work. Evolutions, while being a well organized work, left me with a feeling of uncertainty. It's short sections and the constant employment of contrasting timbres could also reflect the aimlessness and lack of continuity in the actions of various characters employed in my work.

Transition I-Mauricio Kagel-1958-60: A slowly evolving

work passing from one 'timbre-surface' to another. A contrast to the Evolutions of Henk Badings, the piece intensifies the occurrence of a single sound event. It dissects the individual sound event, i.e. the raindrop, into microscopic proportions. These proportions are then magnified, explored and transformed becoming the basis for the formal unity of the work. A 'Minimalist' approach applied to the electronic medium. The piece begins with a long, sustained, metallic sound which, as the work progresses, is divided into a variety of sound effects derived through the alteration of the envelope shape. The attack, decay, sustain and release of individual sounds are altered until the original sound source is no longer audible. It is my opinion that the movement from one 'timbre surface' to another can be accomplished in a much shorter time frame, although the transformation of sound material is an important concept in the composition of electronic music. Its use as a method through which tension and release can be controlled over a long time span, as in Transition I, is imperative in establishing the overall formal continuity within a large work, but it should not be the sole concept through which a work is conceived.

Contrasts-Dick Raaijmakers-1959: The work is in two movements, the first of which utilizes two rapidly moving voices treated in canonic fashion. This movement reminds me, in a small way, of Switched on Bach. The second movement derives all sound material from nine variations in noise. Contrasts moves quickly and ends abruptly. The concept of deriving musical sound material from a grouping of various timbres interested me and helped in establishing an organizational framework for Act I of my ballet.

Hymnen-Karlheinz Stockhausen-1966: An extensive work based on the transformation and manipulation of national anthems from various countries.

"Numerous compositional processes of inter-modulation were applied in Hymnen. For example, the rhythm of one anthem is modulated with the harmony of another; this result is modulated with the dynamic envelope of a third anthem; this result in turn is modulated with the timbral constellation and melodic contour of chosen electronic sounds: finally, this result is given a specific spatial motion. Sometimes parts of anthems are allowed to enter the environment of electronic sounds, in raw, almost unmodulated form; sometimes modulations lead almost to the point of unrecognizability. There are many degrees in

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between, many levels of recognizability."¹

Hymnen is not a work through which I conceived any formal basis for the ballet, but opened my mind to the incredible possibilities of sound manipulation which were now made available to me through the electronic studio. The idea of transforming one musical element with another is one which merits attention.

Tragoedia(Kouros, Hybris, Peitho, Ate)-Andrew Rudin-1967-68: This work is a study of Greek and Shakespearean tragedy. Each of the four movements explores one condition portrayed in a tragic scenario. Kouros-excess, Hybris-pride, Peitho-temptation and Ate-desolation. The pseudo-programatic depiction of a mood or event, especially Rudin's conception of pride and temptation, interested me. The inclusion of only white noise, sine, triangle, pulse, and sawtooth waveforms as a basis for the work was also of interest. Rudin used no concrete sounds in his composition. Hybris-pride utilizes the recurrence of brass-like cells as points of delineation which outline the first section. Other sound material is derived from 'isolated events' used in the first movement, Kouros, which employs a twelve note series and subsets of the series. 'Klangfarbenmelodie' treatment of the sound events is contrasted with glissandi which overlap in a canonic fashion. Section B continues to use similar sound material, but does so at an intensified rate. This material is added to by the retrograde transformation of elements of section A. The use of a twelve tone series, microtonal material and the traditional transformations associated with a series(fragmentation, transposition, inversion, retrograde), while not new concepts, seemed to be valuable techniques with limitless possibilities. Movement three, Peitho-temptation, is one which does not soothe, but irritates the ear through the 'perpetual motion' of three, bright, grating timbres. Pitch material is again taken from the twelve note series, and the Binary form is treated in a similar manner to movement two utilizing original and retrograde material in the second section.

Kolyosa-Pril Smiley-1970:

"Kolyosa(the Russian word for wheels) is a portrayal in sound of an abstract hypocycloidal concept relating to images of whirlwinds, windmills, spinning wheels, and interlocking ellipses."²

1 Karlheinz Stockhausen, Hymnen (Deutsche Gramophon Gesellschaft 139 421/22).

2 Pril Smiley, "Kolyosa," in Columbia-Princeton Electronic Music Center Tenth Anniversary Celebration (Composers Recordings CRT SD 268). side 3. band 3.

The abstract conceptualization of actual objects is not a foreign technique in music. Programatic works are an attempt to do the same. The sound sources available to the electronic composer and their picture or mood evoking capabilities widen the scope for such experimentation. A sound collage of varying timbres clouded by overlapping, sustained waveforms and modulated by fluctuating filters, as depicted in Kolyosa, produces an atmosphere of mystery and awe.

Stereo Electronic Music #2-Bülent Arel-1970:

"The composition is based on two element: long lines and percussive sounds constantly interrupting them. Modification of previously introduced elements occurs throughout the piece,³ All the sounds are electronically produced."

The work utilizes these 'long lines' and 'percussive sounds' which gradually grow in intensity and amplitude only to fall away again. This begins again, in a cyclical manner, until a second climatic point is reached. The treatment of tension and release in a circular fashion is very effective. Clusters of overlapping timbres create an evolving mass of sound which fades quietly away to conclude the work.

Alternate Routes-Ronald Perera-1971: Composed with the movement of a dancer in mind. How to best organize and shape sound to fit the rapid turns and sporadic actions contrasted by the graceful and delicate movements also possible in dance determined the character of the work.

"The shape of the piece evolved as a tension between these opposing ideas of movement and music alternates between two materials: one densely percussive, the other fragile and transparent."⁴

Gestes-Peter Lewis-1973: High pitched, piercing sounds with sharp attacks. Metallic, sporadic manifestations of clashing, indefinite pitched, bright timbres. The work explores only a few easily recognizable sounds, with similar envelope shapes (sharp attack, short release), and treats each as individual particles of matter, appearing

3 Bülent Arel, "Stereo Electronic Music No. 2," in Columbia-Princeton Electronic Music Center Tenth Anniversary Celebration (Composers Recordings CRI SD 268), side 4, band 1.

4 Ronald Perera, "Alternate Routes," in International Electronic Music (Composers Recordings CRI SD 364), side 1, band 2.

and disappearing, separately and adjoining, bumping and clashing in a violent manner. This work served as a role model for the beginning of Act I of my composition, from which I hoped to convey the pompous, selfish nature of my lead male character, Midas.

Appendix II
Synopsis of Dance Sequences

- 1:20 Introduction: Music
- 1:55 The Golden Touch: Midas
- 8:55 The Feast: Midas, royal court, servants,
 dancers, acrobats, nymphs
- Entry of Midas (1:15)
Dancers and Acrobats Entertain (2:10)
Feast (2:20)
Midas' Cry to Bacchaus (1:00)
Entry of Nymphs (2:10)
- 1:00 Interlude: Music
- 2:40 The River, Pactolus: Nymphs, Midas
- Nymphs Enter the River (0:55)
Midas Enters River (1:45)
- 3:00 The Mountain, Tmolus: Midas, Naias,
 Mount Tmolus
- Departure of Midas and Naias (1:50)
Midas and Naias meet Mount Tmolus (2:00)
- 6:10 The Forest: Maneads, Pan, Apollo, Midas,
 Naias, Mount Tmolus
- Maneads Ritual Dance (2:10)
Pan Mocks Apollo (2:30)
Entry of Apollo (1:00)
Tmolus Intervenes (1:00)

Appendix III

Musical Examples of Motivic Units

1. ostinato Neapolitan semi-tone sub-tonic whole step

E Phrygian

Intouch: Five-tone, six-note ostinato derived from the E Phrygian scale. Chosen for its Neapolitan semi-tone and sub-tonic whole-step relationships to the tonic. Placed in a low register with each note fluctuating microtonally.

2a.

Touched: Tri-tone(primary interval), perfect fifth(secondary interval) and minor second(derived from the difference between primary and secondary intervals). Sharp attack with or without a long decay depending on the velocity with which the key is depressed.

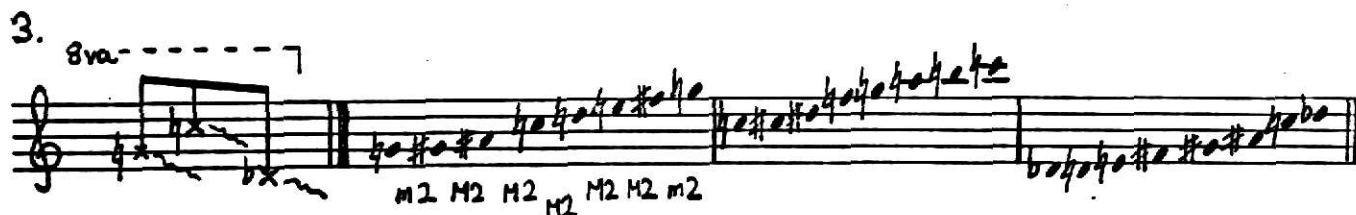
2b.

Tched2: Overlapping, sustained, indefinite pitches each with a wide, slow vibrato. A five second release with a slow, steady decrescendo.

2c. $\text{♩} = \pm 104$

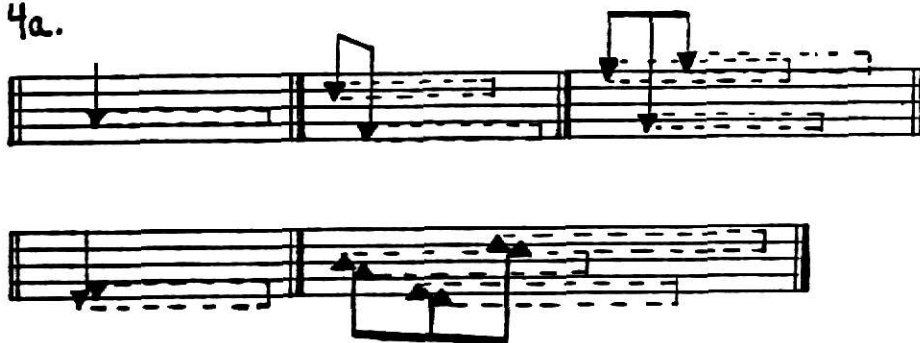


Tched3: Periodic, rhythmic, indefinite pitched pattern based on the original 'Touched' voice. See also example 9.



Touch3D: Bright, wind chime voice derived from eight tones, producing a symmetrical pitch relationship. When a key is depressed, the eight tones are repeated rapidly in an unordered manner.

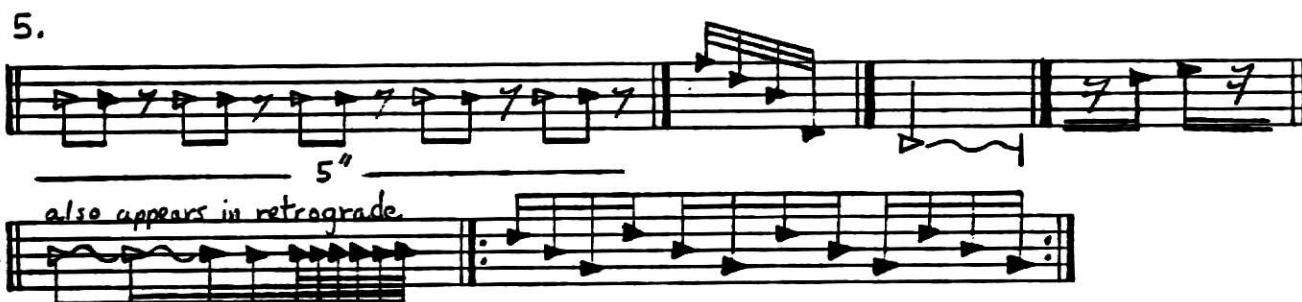
4a.



Touchpop: Indefinitely pitched one, two or three note combinations. Vertically spaced according to the approximate interval between notes. A hollow timbre with a sustained frequency envelope which bends and returns to the original pitch.



Tchpop2: Initial 'Touchpop' voice without sustained frequency envelope. Introduces a repetitive measured pattern.



Touchstp: Filled in triangular shape representative of an indefinitely pitched, pink/noise timbre with a short crisp amplitude envelope. When the key is depressed quickly, a vocal vowel sound is produced following the sharp attack. Open triangular shape representative of a sustained, indefinite pitch derived from the 'touchstp' voice.



Begfeast: Overlapping, slowly evolving, two-note clusters. Position on staff suggestive of register only. Pitches are indefinite. When the key is depressed quickly, a seven second crescendo is initiated followed by an eleven second decrescendo. When key is depressed slowly, the reverse is initiated.

6b.



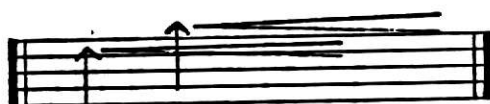
Begfest2: Original 'Begfeast' voice with crescendo eliminated. Only the decrescendo remains. Uses two and four-note clusters. Indefinitely pitched notes until the last sub-section of Act I; 'Entry of the Nymphs'. See also example 9.

7a.



Feastive: Backward envelope effect of ten second duration if key is depressed for ten seconds or longer. Sound terminates immediately after release of key. Short blips are possible if key is depressed and released quickly. Regular eighth note rhythm appears utilizing 'Feastive' envelope in subsection two ('Acrobats and Dancers Entertain') of The Feast.

7b.

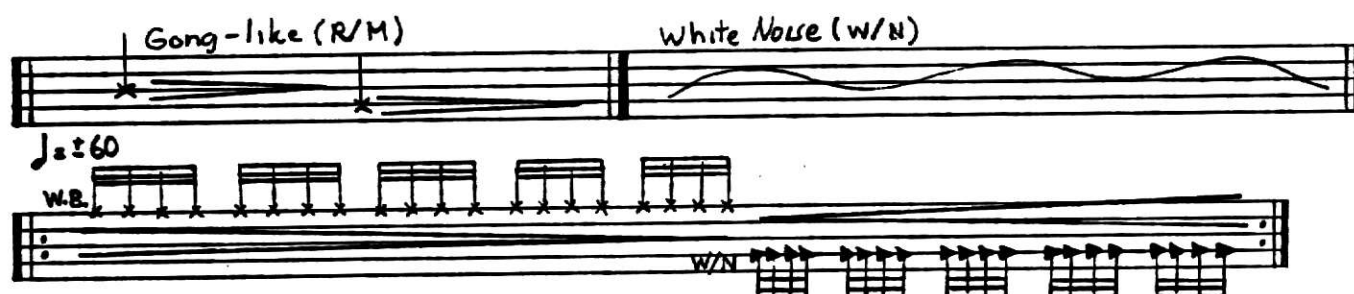


Festive2: Original 'Feastive' voice with a three second envelope.

8. $\text{♩} = \pm 104$ woodblock (w.B)



$\text{♩} = 72$



ARP 2500: Percussive timbres derived from patches completed on the ARP Analog Synthesizer and accompanying rhythmic and arhythmic motivic patterns.

9.

(a) Original twelve-tone row

take every fourth tone

(b) same row in tetrachord subsets reveals a symmetrical relationship of which the minor third is the pivotal point

(c) every fourth tone combined vertically

(d) using the tri-chord members to linearly produce a symmetrical row of which the perfect fifth is a pivotal point

(e) from the rearrangement of tri-chords a second symmetrical row is formed of which the minor third is a pivotal point

(f) same row in tetrachord subsets

(g)

Intervals labeled in (c): M3 m3 M3 M3 m3 M3 M2 m3 M2

Intervals labeled in (e): M2 m3 m3 m2 m2 m2 m2 m3 m3 M2

Intervals labeled in (g): m2 m2 m3 m3 M2 m3 M2 m3 m3 m2 m2

The Feast:

Original row(a) and first derived row(c) introduced through tetrachord subsets by 'Begfest2' and 'Tched3' voices, respectively. Vertical, tri-chord sonorities of second derived row(d) and overlapping tetrachord subsets of second symmetrical row(g) developed by 'Tched3' voice.

The Contest:

First derived row(c)-organizational basis of Pan's Prelude.
Second symmetrical row(f,g)-organizational basis of Apollo's Fugue.

Appendix IV
Musical Scores

Pan's Prelude

Catherine Gundlach

The musical score is handwritten and consists of three systems. Each system has a single treble clef staff at the top and a grand staff (treble and bass clefs) below it. The music is written in 2/4 time. The key signature starts with one sharp (F#) and changes to two sharps (F# and C#) in the second system. The score includes various musical notations such as notes, rests, and dynamic markings. The title 'Pan's Prelude' is written above the first system, and the composer's name 'Catherine Gundlach' is written above the second system. There are also some handwritten annotations like 'P₀ ↓', 'R₅ ↓', 'R₁₀ ↓', and 'P₅ ↓' scattered throughout the score.



I

P	D ⁰	B ⁸	G ⁵	E ¹	E ²	C ¹⁰	A ⁷	F ³	D ¹¹	B ⁹	A ⁶	G ⁴	R
	G ⁴	D ⁰	B ⁹	G ⁵	A ⁶	E ²	D ¹¹	A ⁷	F ³	E ¹	C ¹⁰	B ⁸	
	A ⁷	F ³	D ⁰	B ⁸	B ⁹	G ⁵	E ²	C ¹⁰	A ⁶	G ⁴	E ¹	D ¹¹	
	D ¹¹	A ⁷	G ⁴	D ⁰	E ¹	B ⁹	A ⁶	E ²	C ¹⁰	B ⁸	G ⁵	F ³	
	C ¹⁰	A ⁶	F ³	D ¹¹	D ⁰	B ⁸	G ⁵	E ¹	B ⁹	A ⁶	G ⁴	E ²	
	E ²	C ¹⁰	A ⁷	F ³	G ⁴	D ⁰	B ⁹	G ⁵	E ¹	D ¹¹	B ⁸	A ⁶	
	G ⁵	E ¹	C ¹⁰	A ⁶	A ⁷	F ³	D ⁰	B ⁸	G ⁴	E ²	D ¹¹	B ⁹	
	B ⁹	G ⁵	E ²	C ¹⁰	D ¹¹	A ⁷	G ⁴	D ⁰	B ⁸	A ⁶	F ³	E ¹	
	E ¹	B ⁹	A ⁶	E ²	F ³	D ¹¹	B ⁸	G ⁴	D ⁰	C ¹⁰	A ⁷	G ⁵	
	F ³	D ¹¹	B ⁸	G ⁴	G ⁵	E ¹	C ¹⁰	A ⁶	E ²	D ⁰	B ⁹	A ⁷	
	A ⁶	E ²	D ¹¹	A ⁷	B ⁸	G ⁴	E ¹	B ⁹	G ⁵	F ³	D ⁰	C ¹⁰	
	B ⁸	G ⁴	E ¹	B ⁹	C ¹⁰	A ⁶	F ³	D ¹¹	A ⁷	G ⁵	E ²	D ⁰	

RI

Apollo's Fugue

Gatherine Gundlach

59

Handwritten musical notation for the first system of "Apollo's Fugue". The system consists of three staves (treble, middle, and bass clef) in 2/4 time. The notation includes various musical symbols such as notes, rests, and accidentals. Above the first staff, there are handwritten labels: P_{11} , P_{10} , and P_6 . The notation is written in a cursive, handwritten style.

Handwritten musical notation for the second system of "Apollo's Fugue". The system consists of three staves. Above the first staff, there are handwritten labels: P_7 , P_{11} , P_4 , and P_0 (false entry). The notation is written in a cursive, handwritten style.

Handwritten musical notation for the third system of "Apollo's Fugue". The system consists of three staves. Above the first staff, there are handwritten labels: P_3 , P_1 , and P_1 . The notation is written in a cursive, handwritten style.

Handwritten musical notation for the fourth system of "Apollo's Fugue". The system consists of three staves. Above the first staff, there are handwritten labels: P_6 , P_6 , and P_6 . The notation is written in a cursive, handwritten style.

(30)

(Aug)P₂

60

Handwritten musical score for measures 30-39. The score is written on three staves. The first staff has a treble clef and a key signature of one flat (B-flat). The second staff has a treble clef and a key signature of one flat. The third staff has a bass clef and a key signature of one flat. The notation includes various musical symbols such as notes, rests, and accidentals. Labels P₂, P₇, and P₁₀ are present above the staves. A circled measure number 40 is visible at the end of the first staff.

(40)

Handwritten musical score for measures 40-49. The score is written on three staves. The first staff has a treble clef and a key signature of one flat. The second staff has a treble clef and a key signature of one flat. The third staff has a bass clef and a key signature of one flat. The notation includes various musical symbols such as notes, rests, and accidentals. Labels P₉ and I₅ are present above the staves.

Handwritten musical score for measures 50-59. The score is written on three staves. The first staff has a treble clef and a key signature of one flat. The second staff has a treble clef and a key signature of one flat. The third staff has a bass clef and a key signature of one flat. The notation includes various musical symbols such as notes, rests, and accidentals. Labels P₉ and P₁₁ are present above the staves.

Handwritten musical score for measures 60-69. The score is written on three staves. The first staff has a treble clef and a key signature of one flat. The second staff has a treble clef and a key signature of one flat. The third staff has a bass clef and a key signature of one flat. The notation includes various musical symbols such as notes, rests, and accidentals. Labels P₁₁ and P₁₁ are present above the staves.



I

P	G ⁰	A ¹	A ²	G ¹¹	E ⁸	F ¹⁰	D ⁷	E ⁹	D ⁶	B ³	B ⁴	C ⁵	R
	G ¹¹	G ⁰	A ¹	F ¹⁰	D ⁷	E ⁹	D ⁶	E ⁸	C ⁵	A ²	B ³	B ⁴	
	F ¹⁰	G ¹¹	G ⁰	E ⁹	D ⁶	E ⁸	C ⁵	D ⁷	B ⁴	A ¹	A ²	B ³	
	A ¹	A ²	B ³	G ⁰	E ⁹	G ¹¹	E ⁸	F ¹⁰	D ⁷	B ⁴	C ⁵	D ⁶	
	B ⁴	C ⁵	D ⁶	B ³	G ⁰	A ²	G ¹¹	A ¹	F ¹⁰	D ⁷	E ⁸	E ⁹	
	A ²	B ³	B ⁴	A ¹	F ¹⁰	G ⁰	E ⁹	G ¹¹	E ⁸	C ⁵	D ⁶	D ⁷	
	C ⁵	D ⁶	D ⁷	B ⁴	A ¹	B ³	G ⁰	A ²	G ¹¹	E ⁸	E ⁹	F ¹⁰	
	B ³	B ⁴	C ⁵	A ²	G ¹¹	A ¹	F ¹⁰	G ⁰	E ⁹	D ⁶	D ⁷	E ⁸	
	D ⁶	D ⁷	E ⁸	C ⁵	A ²	B ⁴	A ¹	B ³	G ⁰	E ⁹	F ¹⁰	G ¹¹	
	E ⁹	F ¹⁰	G ¹¹	E ⁸	C ⁵	D ⁷	B ⁴	D ⁶	B ³	G ⁰	A ¹	A ²	
	E ⁸	E ⁹	F ¹⁰	D ⁷	B ⁴	D ⁶	B ³	C ⁵	A ²	G ¹¹	G ⁰	A ¹	
	D ⁷	E ⁸	E ⁹	D ⁶	B ³	C ⁵	A ²	B ⁴	A ¹	F ¹⁰	G ¹¹	G ⁰	

RI

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REFLECTIONS OF A FOOL: A MODERN BALLET
DERIVED FROM ELECTRONIC SOUND SOURCES

by

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B. A., KEARNEY STATE COLLEGE, 1976

AN ABSTRACT OF A MASTER'S REPORT

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KANSAS STATE UNIVERSITY
Manhattan, Kansas

1985

Reflections of a Fool

by

Catherine Gundlach

Abstract:

Reflections of a Fool is a modern ballet, musically derived from electronic sound sources, visually depicting the mythical story of King Midas.

Structural organization within the ballet was derived from the contrapuntal interaction of motivic cells.

Motivic units were introduced by eight distinct groupings of timbres.

The evolution of electronic hybrid instrumentation, the 'classical' electronic studio, 'analog' synthesis and 'digital' synthesis provided the framework through which electronic sound sources were developed.

Contrapuntal techniques utilized in combination with the timbral resources available in the electronic studio are analyzed within the composition.

An analysis of two serially conceived works and their corresponding matrixes is included in this paper.

In summary, the state of twentieth century electronic composition and its relationship to modern dance and the ballet is noted.

Tape Playback and Test

A TDK Metal Alloy Cassette and a Maxell XLII Reel to Reel Sound Recording Tape were utilized to complete the final mix-down of the ballet, Reflections of a Fool. The cassette tape should only be used on a cassette recorder which has a metal bias position. Both the cassette and reel to reel tapes contain 90 minutes of playing time (45 minutes on each side) and were recorded with Dolby B Noise Reduction. The ballet is approximately 40 minutes in length.

A test, prior to the beginning of the work, was taken from Act I of the ballet. This test is to be played, without distortion, at a forte level. When listening to the test, which is approximately 3 minutes long, the treble and bass control dials need to be adjusted. The treble should be attenuated enough so the tape hiss disappears without affecting the high pitches used in the test. The bass needs to be boosted as much as the speakers will allow.

To determine the level needed on the bass dial, the Introduction can be used. The low ostinato of the Introduction should be at a forte level and, though the attack of each note of the ostinato varies, each note should forcefully assert its initial appearance. After the dynamic level is set and the above conditions have been realized, simply rewind the tape to the beginning of the Introduction following the test. The work occupies only the first side of the tape.