STEREO

FOLKWAYS RECORDS FM 3438

ELECTRONIC MUSIC FROM RAZOR BLADES TO MOOG

PRODUCED & COMPOSED BY J. D. ROBB

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STEREO

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SIDE 1

Band 1	Retrograde Sequence From A Tragedy	7:04
Band 2	Excerpt From Spatial Serenade	2:36
Band 3	Collage No. 2, (1965)	4:06
Band 4	Tarantella	4:16
Band 5	Canon In Percussive Sound	1:14
Band 6	Rondino	2:28
Band 7	Pleasant Obsession	4:19

SIDE 2

Band 8	Green Mansions (Abel and Rima)	12:54
Band 9	Les Ondes Martenot	4:15
Band 10	Transmutations For Orchestra and Electronic Instruments Movements 2 and 3	4:16
Band 11	Analogies - Analog Computer Music	3:15

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DESCRIPTIVE NOTES ARE INSIDE POCKET

COVER DESIGN BY RONALD CLYNE

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ASCH RECORDS Album No. AHS 3438

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The increasing sophistication of the electronic instruments, designed for or used in the production of electronic music, do not necessarily involve an improvement in the product.

While more advanced instruments clearly have advantages, such as greater precision, the individual composer may find these advantages partially offset by the difficulty of controlling the more complicated instruments. The early classics of electronic music were written without them.

Nevertheless there have been successive waves of electronic music, resulting from the development of the newer instruments. As one who, as a composer, has participated in all of these phases, it may not be without interest for me to summarize them in terms of the instruments and techniques which made them possible, for it is obvious that all electronic music depends upon the use of some electronic instrument or instruments.

The employment of examples chosen from the writer's own compositions has three justifications. First, it eliminates the possibility of infringing the rights of others; second, it simplifies the process of evolution by eliminating a profusion of musical personalities since it shows what the different phases have meant in the production of one person; third, it makes it possible to speak of these pieces with primary authority. It is usually difficult, if not impossible, for anyone but the composer to say what instruments or processes he employed in composing a given piece of electronic music.

Here then are the phases, sometimes overlapping one another in time, from which works have been chosen for inclusion in this album. Some of the examples because of their length have been abbreviated.

1. Compositions on tape produced by the aid of microphone, tape recorder, amplifiers and speaker.

Since the sounds were produced without the use of electronic sound sources, they were necessarily natural sounds picked up by a microphone, recorded on magnetic tape, and heard with the aid of loud speakers.

Early tape recorders had only one speed and, what is more important, only one track or channel so that when a tape was simply played backward, strange transformations took place which would not occur if a piece of music was played in retrograde on conventional instruments. Both speech and musical tones took on unfamiliar qualities due partially to the fact that the so-called attack or emphasis was heard at the end instead of the beginning and the inflection or loudness of each note increased instead of decreasing.

Example 1: *Retrograde Sequence from a Tragedy* is simply a scene from the writer's opera, Little Joe, played in reverse without any editing whatsoever. It dates from about 1950. Because of its length this example has been abbreviated.

II. Sounds of Electronic Origin. Electronic sound has its origin in oscillators which vibrate at rates of speed perceptible by the human ear. If the oscillator vibrates at a rate of perhaps 30 to 20,000 times a second and the vibration (or pulses) are amplified and transmitted through a speaker, the resulting changes in atmospheric pressure are heard as a musical sound. One of the first experiments which the writer made with oscillators was based on a 1964 lecture by Augustus Ciamaga, of the University of Toronto. He demonstrated that it was possible to couple oscillators to an electronic switch. The switch alternately accepted and passed on the vibrations coming from the two oscillators. When the switch is itself an oscillator, operated at more than about 30 oscillations per second, it created a third sound wave. This was a square wave, a form of sound wave in which a basic wave or fundamental was mixed with the odd numbered overtones. The two oscillators could produce either a simple, fundamental, so-called sine wave or a square wave. Furthermore, both of the oscillators, as well as the switch, had both volume and pitch controls. Hence a great variety of sounds were possible. For instance, when two oscillators vibrate at a rate of say 440 and 441 times a second, they vibrate together only once a second and a single louder vibration, known and heard as a beat, is heard, and there are other similar effects.

Example 2, called *Spatial Serenade,* was made with this simple arrangement of instruments. As the sounds made by oscillation are continuous, there is in this piece a continuous flow of musical sound, however constantly changing its form.

III. Classical Studio Technique - Splicing. Composers working with electronic tapes had to find a way to interrupt this continuous flow of sound coming from the oscillators in order to produce what we know as notes. They discovered that this could be done by cutting the tape with a razor blade. Sections thus cut out, containing single notes or combinations of notes, could be reassembled in a different order. The usual speed at which the tape passed the playback head was 7-1/2 inches per second. Therefore notes could be shortened to a precise time value based on the equation, 7-1/2 inches (or 19 centimeters) = 1 second, and many interesting pieces were thus assembled by composers adept at splicing.

An example of this technique is the piece Collage, which is included in a Folkways Album previously released (Electronic Music, 33436). A brief portion of that piece is included.

IV. Head Reverberation. The better tape recorders come provided with separate recording and playback devices called heads. The tape on these machines passed the recording head before it passes the playback head. The distance between the recording and playback heads averages between an inch and an inch and a half. At the standard tape speed of 7-1/2 inches per second there is therefore a delay of about one-seventh of a second while a given point on the tape passes from the recording head to the playback head.

By connecting channel 1 of the playback head of a stereo machine to channel 2 of the recording head of the same machine, the sounds recorded on channel 1 will be recorded and repeated about one-seventh of a second later on channel 2. If a single short sound is played on channel 1, it will keep on repeating itself a number of times with diminishing degrees of loudness.

An example of this technique is the piece called Tarantella, executed at the laboratory of the R. A. Moog Co., in Trumansburg, in New York, in 1965.

V. Canonic Imitation. A longer delay between the original sound and its echoes could be produced by using two tape recorders. In this case the distance between the recording head of recorder No. 1 and the playback head of tape recorder No. 2 would be measured and altered merely by moving the tape recorders farther apart. If, for instance, this distance was 15 inches, there would be, with a tape moving at 7-1/2 inches per second, a delay of two seconds. Thus, artificial canonic imitations at the unison of any melody or sequence of sounds could be achieved and to some extent controlled. The tape, of course, had to be threaded from the supply reel through the head assembly of No. 1 to the takeup reel of No. 2.

Canon No. 1 in Percussive Sound illustrates this technique.

VI. The Coming of Stereo. Though originally designed to make taped music sound more like live performance by recording the same sounds through two microphones, separated like two ears, the invention

of the stereo tape recorder made it possible for composers to combine on two tracks, two different sounds or sequences of sound, and composers were quick to sense this new possibility and act on it.

An illustration of this kind of stereo sound is the short piece, entitled Rondino. In this piece (also realized with the help of Prof. Ciamaga, at the University of Toronto in 1966), a melody consisting of fundamentals only was recorded on one track or channel. The overtones supplied with each tone were recorded on the other track. To illustrate this technique, Track 1 will be heard first, Trace 2 will be heard next, and then the two will be heard together.

VII. Mixtures and Miscellaneous New Techniques. The improvement of the tape recorder added new dimensions. With two identical tape recorders, which now became standard studio equipment, each having two tracks, it was possible to mix sounds with greater ease. For example: Two Tracks from one machine could be "dubbed" on to one track of another, and two more added to the other track of the second machine, etc. Thus, four or more different sounds or melodies could be heard together. The process could be repeated indefinitely. One limitation lay in the fact that with each "dub" the omnipresent noise level which on the original, if it was a good tape recorder, could be reduced to such a low level as to escape notice, was increased on a third, fourth or fifth generation copy until it became objectionable.

Another improvement was the development of two or three speeds on the same machine. This made it possible to repeat a phrase at double or half the speed at a pitch an octave higher or an octave lower.

The example which I have selected illustrates mainly four techniques:

1) Stereo sound on two channels which we have already considered; 2) variations of tape speed by hand manipulation of the take-up reel; 3) the use of a loop of tape to bring about a repetition of the bass line in the manner of boogie woogie or in classical music, the chaconne; and 4) aleatory or random high frequency sounds generated by playing a prerecorded tape at the fast forward or fast-reverse mode. It is called Pleasant Obsession.

VIII. The Moog Synthesizer. This fine instrument is manufactured by R. A. Moog Co., of Trumansburg, New York. Although it can be ordered in three standardized forms, varying in cost, etc., it is not essentially a standardized instrument but consists of a series of voltage controlled oscillators, amplifiers, filters, envelope generators and other specialized instruments. These can be and often are assembled especially for the customer as was my own which is probably not precisely like any other.

The most valuable feature of this instrument is probably the fact that the continuous tones of the oscillators can be shut off or attenuated to the point of inaudibility and turned on for any desired period of time by various devices known as triggers. In order to accomplish this the oscillator output is connected to an amplifier whose output is set at zero. However, when the amplifier is triggered, the oscillator signal is given a shot of energy and allowed to pass through the amplifier to the speaker or speakers directly, or through filters, reverberation units, mixers, etc. See Figure 1.

The triggers are of various types, the most interesting being the Sequencer and the Keyboard. The Sequencer permits the composer to set up a series of eight successive tones or pulses of pitches and durations in advance by the composer. By the aid of a new component known as the Sequential Switch, the length of the series can be extended to twenty-four consecutive tones or pulses.

The Keyboard, which looks like the standard keyboard of a piano, is merely a voltage output. Each octave doubles the voltage. If the oscillator is tuned to the standard pitch, A = 440 cycles or waves per second, touching the corresponding key an octave higher doubles the voltage and produces the sound of A (880 cycles) an octave higher. Each of the 12 semitones produces an increase in voltage equal to one twelfth of the octave voltage increase.

The Moog Keyboard is a versatile device. It has controls which permit 1) the entire range to be raised or lowered a few semitones; 2) a portamento to be applied to a movement from note to note; 3) the interval between the semi-tones to be slightly enlarged or slightly diminished. In addition, by means of an attenuator incorporated into the mixer, these intervals can be further enlarged or shrunk in size. Thus it is easy, by setting the dial of this attenuator to 10 on a scale of 10, to tune the whole keyboard to a whole tone or hexatonic scale. The

keyboard can easily be tuned to coincide with the standard pitch by depressing the middle A key and setting the Vernier dial of the oscillator to which the keyboard is connected to that pitch (440 cycles per second) with the aid of a tuning fork or frequency counter.

In the piece called Green Mansions, after the novel by W. H. Hudson, designed as a ballet piece, the Moog keyboard was used to generate sounds on the right channel, representing the hero, Abel.

The left channel generated on the famous European Synthesizer, the Synket was prepared by me with the help of Igor Ketoff, its inventor, in Rome, Italy in June 1968. It represents the forest into which Abel penetrates following the voice of Rima.

It may be unique in that it combines the sounds of these two famous Synthesizers on one tape.

IX. The Ondes Martenot. There have been other interesting instruments invented over the years. One of the earliest and best of these, the Ondes Martenot, was used to make the next example which I have called Les Ondes (The Waves).

X. Electronic Music Combined with Orchestra. The following example, the second movement of Transmutations for Orchestra and Electronid Instruments, illustrates the use of a tape in combination with orchestral sound - in this case, mostly the strings. In the third movement, the Synthesizer was used *live* with the percussion instruments.

XI. Analog Computer Music. The following example, Analogies, was produced by connecting an analog computer to oscillators and a tape recorder. The computer was then made to add and multiply sine wave voltages which actuated the oscillators whose output were recorded on the tape recorder.

The sounds were generated and recorded by the writer with the help of Prof. Eugene Wambold, at the College of Engineering, of the University of New Mexico. The piece was realized in the Rio Grande Electronic Music Laboratory in Albuquerque, New Mexico by splicing, editing and reassembling of the taped sounds.

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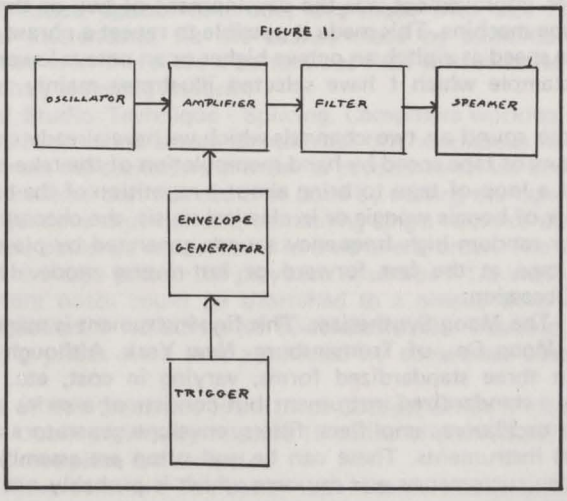
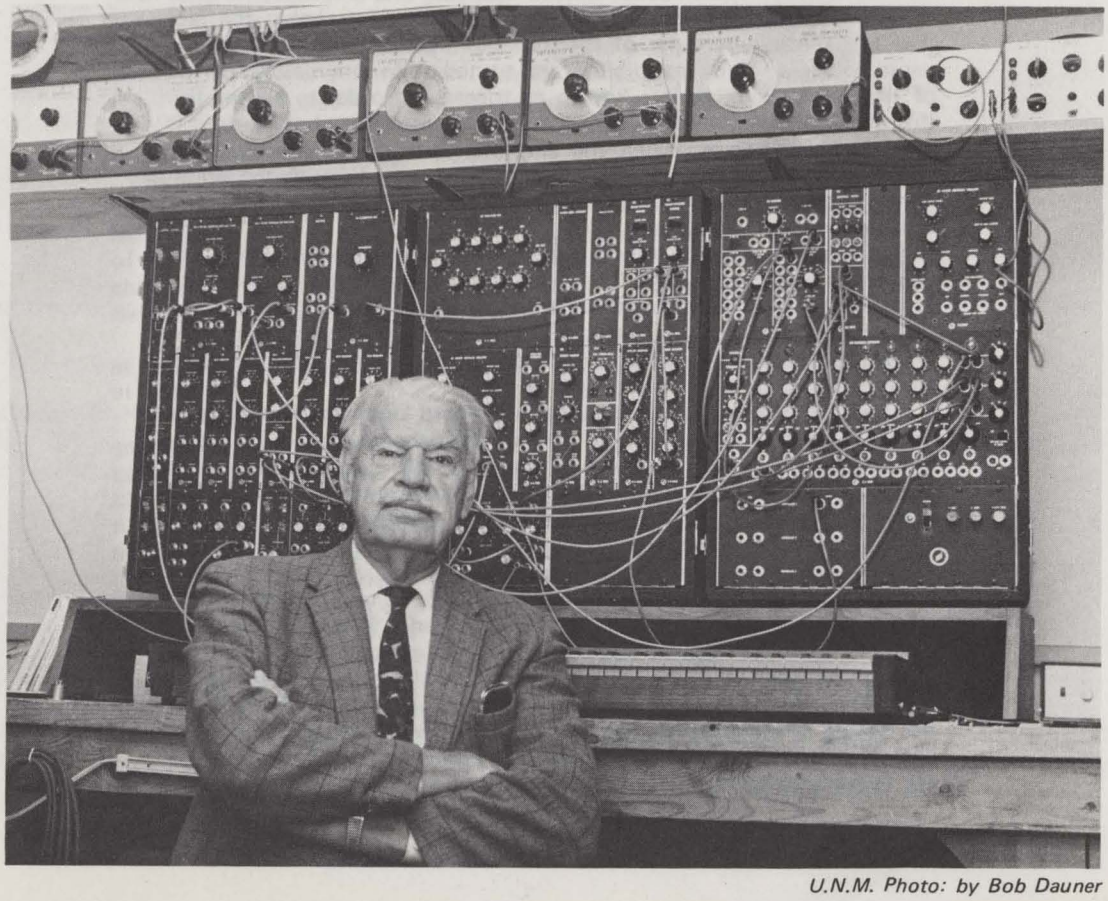
FIGURE 1.





U.N.M. Photo: by Bob Dauner