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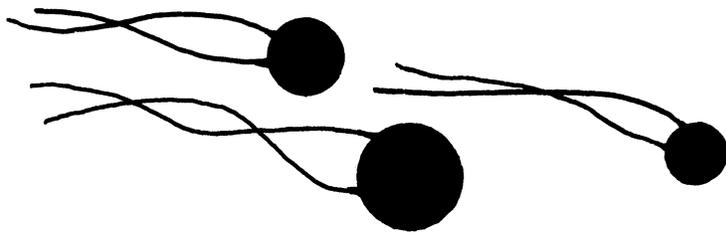
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AN UNFINISHED HISTORY OF ELECTRONIC MUSIC

BY OTTO LUENING

There is a tendency on the part of today's public to assume that everything even remotely connected with the media of electronic music was discovered yesterday. The advocates of a new composer who uses the media like to profess that their man invented electronic music, or perhaps even discovered music itself.

However, the historical record contradicts such a premise and sets the contemporary scene into proper perspective without in any way detracting from its importance. Within the limits of this article, only main events can be highlighted. If at times it becomes autobiographical, it is because the author has been theoretically and practically involved with the medium since 1918.

Studies in sound began in antiquity. The Sanskrit grammarian Panini in the third or fourth century B.C. showed the relationship between mouth positions and sound; Pythagoras related arithmetic ratios to string length and to the numbers of sound vibrations.

The English philosopher and essayist Francis Bacon wrote in his scientific utopia, "The New Atlantis" (1627): "We have Sound Houses where we practice and demonstrate all Sounds

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We have Harmonies, which you have not, of Quarter sounds and lesser slides of Sounds. Diverse Instruments of Musick, likewise to you unknown, Some sweeter than any you have, together with Bells and Rings that are dainty and Sweet.—Francis Bacon, 1627

and their generation. We have Harmonies, which you have not, of Quarter sounds and lesser slides of Sounds. Diverse Instruments of Musick, likewise to you unknown, Some sweeter than any you have, together with Bells and Rings that are dainty and Sweet.” Abbé Delaborde actually constructed a “Clavecin Électrique” in Paris in 1761. Maelzel, inventor of the metronome and friend of Beethoven, was then the foremost exponent of automatic instruments, one of which, the “Panharmonicon,” inspired Beethoven to compose a piece to commemorate the Battle of Vittoria. By the end of the eighteenth century many mechanical instruments existed. Haydn liked mechanical trumpeters, and Mozart composed some beautiful pieces for the barrel organ and also played musical composing games that incorporated random selections of musical materials.

E. T. A. Hoffmann, in the early nineteenth century, wrote in a story, “The Automaton,” that any kind of musical sound, no matter how it was produced, was useful and dynamic material for musical composition. At about this time there were extensive experiments in the construction of speaking machines. Some of the pioneers were Kratzenstein (a Russian), Abbé Mical (a Parisian), and von Kempelen (a Hungarian).

In the early nineteenth century, one reads about Koppen’s “Componium,” a kind of composing machine that (so it was alleged) played variations on tunes without ever repeating them. Hipp’s “Electromechanical Piano” built in Neuchatel in 1867, Elisha Gray’s “Electroharmonic Piano” demonstrated in Chicago in 1876 at approximately the same time Koenig’s “Tonometric” apparatus (dividing four octaves into 670 equal parts) was demonstrated in Philadelphia, as well as Julian Carrillo’s interesting theories of microtones and preoccupation with a ninety-six-tone scale (Mexico, 1895), bring us to the threshold of the twentieth century.

In the last decades of the nineteenth century, Edison’s patents for the phonograph, the development of various acoustical principles by Alexander Melville Bell called “visible speech,” von Helmholtz’s experiments using resonators and an accurate ear to analyze and synthesize voice-sound by isolating the component frequencies, laid the foundation for further work by scientists like Sabin, Morse, Lord Rayleigh, Dayton Miller, and Harvey Fletcher, all of whose experiments and findings influence us to this day.

On March 10, 1906, *Electrical World*, a professional electrotechnical journal published in New York, described a demonstration of the “Dynamophone” that took place in Holyoke, Massachusetts, on that date. The machine produced music, made by a group of

dynamos run by an alternating electrical current. L. Stokowski signed the editorial. The machine (also called “Telharmonium”) was the largest musical instrument in the world. It weighed 200 tons. The music was transmitted over telephone wires too delicate to carry such an array of signals, so that this “Extraordinary electrical invention for the production of scientifically perfect music” turned out to be impractical. The inventor, Thaddeus Cahill, had first presented experiments in 1900. Later ones came to the attention of Ferruccio Busoni, the Italian pianist-composer, when he read an article in *McClure* magazine, “New Music for an Old World,” published in July 1906. Busoni was then engaged in writing his *Sketch of a New Esthetic of Music*, published in 1907. In this remarkable collection of notes he pointed out, among other things, the limitations of our musical system and expressed the thought that instrumental music had come to a dead end.

In Cahill’s electrical instrument Busoni saw a way out of what he had thought to be insurmountable instrumental limitations. But he warned that a long and careful series of experiments and ear training would be necessary to make the unfamiliar material plastic and useful for coming generations.

Two years after Busoni published his booklet, the Italian Futurist Movement was launched, and Luigi Russolo, a painter, made a compilation in 1913 of “the art of noises.” These were classified into groups, the first of which listed “Booms, Thunderclaps, Explosions, Clashes, Splashes, and Roars.” The other five groups included equally detailed noise descriptions. Edgar Varèse, in a reminiscence of Busoni in the *Columbia University Forum* (Spring 1966), said:

In 1907, still in my early twenties, I went to Berlin, where I spent most of the next seven years, and had the good fortune of becoming (in spite of the disparity of age and importance) the friend of Ferruccio Busoni, then at the height of his fame. I had read his remarkable little book, *A New Esthetic of Music*, a milestone in my musical development, and when I came upon “Music is born free; and to win freedom is its destiny,” it was like hearing the echo of my own thought. . . .

He was very much interested in the electrical instruments we began to hear about, and I remember particularly one he had read of called the “Dynamophone,” invented by a Dr. Thaddeus Cahill, which I later saw demonstrated in New York. All through his writings one finds over and over again predictions about the music of the future which have since become true. In fact, there is hardly a development which he did not foresee, as for instance in this extraordinary prophecy: “I almost think that in the new great music, machines will also be necessary and will be assigned a share in it. Perhaps industry, too, will bring forth her share in the artistic ascent.”

Like Varèse’s salute to Busoni, Pierre Schaeffer, in his diary about “Concrete Music,” gives credit to Russolo as the pioneer of noise montage, as it developed at the Centre d’Étude of the Radiodiffusion Télévision Française by mid-century.

Technical developments in the early part of the twentieth century were far more important than either artistic speculation or musical experimentation. Lee DeForest, with inspired vision, thought first of the “Audion” in 1906 (now called the “Triode”). This and his 300 other patents had a deciding influence on modern communications. In the early 1920’s, Varèse suggested greater cooperation between composers and engineers, a point of view repeated by Carlos Chávez

in his *For a New Music* (W. W. Norton, 1937). There was also much activity in the production and use of electronic instruments in the 1920's and the 1930's.

In Germany in 1926, Joerg Mager's electronic "Sphärophon" was presented at the Donaueschingen Festival. He used this and other electronic instruments in theatrical productions, but they were all destroyed in World War II. Friedrich Trautwein introduced his "Trautonium" a few years later. It was used by Richard Strauss, Egk, and Hindemith, who, in his *Craft of Musical Composition*, acknowledges that Trautwein and his instrument provided the foundation for many of the theses in Hindemith's book. This research ended because of World War II. Oscar Sala produced a "Mixtur-Trautonium" (an improvement on the previous Trautonium) for which he composes with skill and which he plays brilliantly. Henze, Orff, Erbse, and others have composed for the instrument.

In 1923, Leon Theremin introduced to Russia the instrument bearing his name. A number of composers incorporated it in their compositions, among them: Schillinger, Slonimsky, Varèse, Martinu, Fuleihan, and Percy Grainger, a pupil of Busoni's who since 1895 had been developing a Free Music, with eighth tones and complete rhythmic freedom of the single voices, notated on graph paper, and for which he himself built music machines. Henry Cowell's tone clusters gave the impulse for further extension of piano resonance and for other preparations of the piano and other instruments useful as sound sources for experimental music.

In France, the "Ondes Martinot" was presented at the Paris Opera in 1928 by its inventor, Maurice Martinot. Many famous composers have used this instrument, among them: Honegger, Milhaud, Messiaen, Jolivet, Köchlin, and Varèse. Martinot built for Rabindranath Tagore and Alain Danielou a special model of this instrument in 1938 to reproduce the microtonal refinements of Hindu music.

At the 1926 Chamber Music Festival in Donaueschingen, it was proposed that recordings could be used as creative tools for musical composition. The *Hochschule für Musik* in Berlin established a research program for this and related ideas two years later. By 1930, Paul Hindemith and Ernst Toch, using phonographic speed-up and slow-down, polyrhythmic experiments, sound transpositions, and mixings, presented short montages. And in the article "Das Problem der Kommender Musik" in *Die Musik* (Vol. 19, 1928), Robert Beyer expressed new ideas on space or room music without having gained positive reactions from the musical world.

From the 1930's until after World War II, many small electric instruments were built that could imitate already existing instruments. Some composers tried to introduce them, but they were not readily accepted by the public or by professional musicians because they seemed to displace standard instruments. In this same period, the tape recorder was perfected, and its use as a creative tool was recognized. Research and development took place in part at great institutions like the Bell Telephone Laboratories, the Brookhaven National Laboratories, the University of California, and the Institute of Physics in Berlin and in Moscow. Important developments, both technical and

musical, in the new medium soon followed.

Pierre Schaeffer, an engineer in Paris, had presented a "Concert of Noises" over the French radio in 1948. Like the Hindemith and Toch experiments of the 1920's, he had arranged natural and instrumental sounds into a series of montages, but with much greater freedom than the German composers. He used phonographs to treat, manipulate, and present his works. In 1949, Schaeffer was joined by the engineer Jacques Poullin, and they experimented with instrumental sound. He suggested the name *Musique Concrète* because it is made of concrete material and organized experimentally, whereas ordinary music is created abstractly, written in symbols, and only at the completion results in instrumental concrete sounds. The composer Pierre Henry next joined Schaeffer to compose jointly *Symphony for a Man Alone*.

The first public performance of *musique concrète* was given in 1950 at the Ecole Normale de Musique. Recordings and tapes of the program were subsequently presented at Salzburg, Austria, and at the Berkshire Music Center in Lenox, Massachusetts. In the same year the new medium was used in broadcasting and in the theater.

In the following year, Radiodiffusion Française organized the "Research Group on Concrete Music" with a specially equipped studio for technical and acoustical and artistic research. Schaeffer and Henry produced an opera, *Orpheus*, for concrete sounds and voice, and opened the research studio to outside composers. These included: Messiaen, Boulez, Delannoy, Jolivet, Phillipot, Barraque, Dutilleux, H. Barraud, and Y. Baudrier.

In 1952, patents for the machines of concrete music and space projection were deposited outside France. André Moles of the National Committee of Scientific Research worked with the group. The first commercial films with concrete music and broadcasts of the concerts reached Holland, Denmark, Switzerland, and the Koussevitzky Festival at Brandeis University in Waltham, Massachusetts. In that same year, Schaeffer published his book *In Search of a Concrete Music* with Editions du Seuil.

The program notes for these early concerts best express the underlying philosophies of these pioneers. Schaeffer wrote:

I belong to a generation which is largely torn by dualism. The catechism taught to men who are now middle-aged was a traditional one, traditionally absurd: spirit is opposed to matter, poetry to technique, progress to tradition, individual to the group and how much else.

From all this it takes just one more step to conclude that the world itself is absurd, full of unbearable contradictions. Thus a violent desire to deny, to destroy one of the concepts; especially in the realm of form, where, according to Malraux, the Absolute is coined. Fashion faintheartedly approves this nihilism.

If concrete music were to contribute to this movement, if,



**Music is born free;
and to win freedom is its
destiny. In the new great music,
machines will also be
necessary.—Ferruccio Busoni,
1907**



Photography, whether the fact be denied or admitted, has completely upset painting, just as the recording of sound is about to upset music.—Pierre Schaeffer, 1952

hastily adopted, stupidly understood, it had only to add its additional bellowing, its new negation, after so much smearing of lines, denial of golden rules (such as that of the scale), I should consider myself rather unwelcome. I have the right to justify my demand, and the duty to lead possible successors to this intellectually honest work, to the extent to which I have helped to discover a new way to create sound, and the means—as yet approximate—to give it form.

. . . Photography, whether the fact be denied or admitted, has completely upset painting, just as the recording of sound is about to upset music. . . . For all that, traditional music is not denied; any more than the theater is supplanted by the cinema. Something new is added, a new art of sound. Am I wrong in still calling it music?

Pierre Henry said, “The only criterion valid in history is that of modernity. . . . Thus today noise is organized, melted down, echoed, reshaped. . . . Thus music which is neither denial nor acceptance of itself, but which asserts itself for the same reason as communication, under its most modern form: electroacoustics.”

Messiaen had this to say: “Music, in the harmonic sense of the word, has now attained its limit. The composers of the twentieth century will not go beyond it. We must wait at least two hundred years for a renewal in this direction. On the other hand, the other elements of music (especially rhythmic ones that have been forgotten for so long: duration, timbre, attack, intensity) are nowadays restored to a position of honor.”

The complete Schaeffer-Henry opera *Orpheus* was performed at the Donaueschingen Festival in Germany in 1953. The outraged audience and press were so vociferous that international attention was soon focused on the new music and its composers. Since then the Group for Research on Musique Concrète, Club d'Essai, Radiodiffusion Française, 37 rue de l'Université, Paris VII^e, has developed its workshops and study groups, produced much music for broadcasting, concert, and theater, built a concert hall to perform the music, and trained and introduced many French composers and those of other nationalities to the public. Schaeffer and his colleagues have taken out many patents, and the work of the Club d'Essai has become internationally famous.

■ Several years before his untimely death, Werner Meyer-Eppler supplied me with a list of the important dates in the development of electronic music in Germany with an urgent request to keep the record straight by publishing it at an appropriate time. Meyer-Eppler was an eminent German physicist and director of the Institute of Phonetics at Bonn University. In 1948, Homer W. Dudley, a visitor from the Bell Telephone Laboratories in New Jersey, demonstrated for Meyer-Eppler the vocoder, a composite device consisting of an analyzer and an artificial talker. This instrument and the *Mathematical Theory of Communication* (1949)

by Claude Shannon and Warren Weaver made a strong impression on Meyer-Eppler. He used a tape of the vocoder to illustrate his lecture, “Developmental Possibilities of Sound,” given at the Northwest German Music Academy in Detmold in 1949. During the lecture, Robert Beyer of the Northwest German Radio, Cologne, took notice of the new possibilities of producing sound. Beyer was known as the author of the previously mentioned article, “The Problem of the ‘Coming Music’” (*Die Musik*, Vol. 19, 1928).

After the Detmold meeting, it was decided to prepare lectures on “electronic music” for the International Summer School for New Music in Darmstadt. These lectures were to be in the form of a report about known electronic instruments and the process of speech synthesis as stated in Meyer-Eppler’s book, *Electronic Tone Generation, Electronic Music, and Synthetic Speech*. The term “electronic music” was therefore used to describe any kind of music that could be produced by electronic instruments.

Two lectures by Beyer and one by Meyer-Eppler on “The World of Sound of Electronic Music” were presented at the International Summer School for New Music in Darmstadt in August 1950. Among those attending were Edgar Varèse and Herbert Eimert.

In 1951 Meyer-Eppler made systematic examinations and produced models of synthetic sounds leading to the conclusion that the past limitations of sound could be considerably expanded. He used a “Melochord,” invented by H. Bode, and an A.E.G. tape recorder to conduct his experiments. He presented these samples (with demonstrations) in a lecture, “Possibilities of Electronic Sound Production,” in July at the International Summer School for New Music in Darmstadt. Schaeffer attended the lecture. Under the same auspices, Beyer discussed “Music and Technology” and Eimert lectured on “Music on the Borderline.”

At the Tonmeister meeting in Detmold in October, Meyer-Eppler lectured on “Sound Experiments” with examples of sound; the demonstrations were received with reservations by some of the attending composers and with great enthusiasm by others. The term “authentic composition” was coined. Fritz Enkel, technical director of the Northwest German Radio, Cologne, was present.

On October 18, 1951, a night program of music called “The World of Sound of Electronic Music” was broadcast over the Cologne radio station. It was a forum with Beyer, Eimert, and Meyer-Eppler participating, the last providing the examples in sound. On the same day, a committee consisting of those gentlemen and also Enkel, Schulz, and a few others from the technical department recommended “to follow the process suggested by Dr. Meyer-Eppler to compose directly onto magnetic tape” and to attack the problem at the Cologne radio station. This recommendation was the upbeat for the creation of an electronic studio in the Cologne radio station. In December of that year, Meyer-Eppler lectured on “New Methods of Electronic Tone Generation” for an audience of about a thousand at a meeting of technical and scientific societies at the House of Technique in Essen.

In collaboration with Meyer-Eppler at the Institute of Phonetics at Bonn University in 1952, Bruno Maderna produced his *Musica su due Dimensioni* and

performed it at the Darmstadt Summer School before an audience that included Pierre Boulez, Karel Goeyvaerts, Bengt Hambraeus, Giselher Klebe, Gottfried Michael Koenig, and Karlheinz Stockhausen. The program stated that the work was for flute, percussion, and loudspeaker, and Maderna wrote "*Musica su due Dimensioni* is a first attempt to combine the past possibilities of mechanical instrumental music with the new possibilities of electronic tone generation as presented by Dr. Meyer-Eppler in the Darmstadt Summer School for New Music in 1951."

In December 1952, Meyer-Eppler lectured at a technical *Hochschule* in Aachen on "Authentic Compositions." Samples of sound and models of sounds were presented, but no real compositions were played. However, H. Eimert in his article, "Electronic Music—a New World of Sound," had this to say: ". . . The idea of infinite tonal material is an age-old music dream. At the beginning of our century Busoni and Schoenberg occupied themselves with such 'free compositional flights'. . . They were stopped at the borders of instrumental mechanism, Busoni with his splitting of his tonal materials [Eimert neglected to mention Busoni's description of Cahill's "Dynamophone" and electric sound production as one way out of the dilemma!], Schoenberg with his tone-color melodies. But both saw the problem in its present-day importance, even though Busoni said, 'For a generation it will not be possible of solution.' The technical solution today, thanks to electronic production of sound, is no longer a doubtful quantity. . . It is also not a matter of fantasies about the future. The first problem is rather just as concrete as it is difficult. It is simply: 'Begin!'"

In 1953, Eimert and Beyer produced the first compositions using only electronically generated sounds with the technical assistance of Enkel, Bierhals, and Schuetz. Eimert and Meyer-Eppler gave samples of this program at the International Summer School in Darmstadt in July, and then Meyer-Eppler lectured at the International Acoustical Congress in Delft, The Netherlands, and Eimert at the *Première Décade Internationale de Musique Expérimentale* in Paris.

The Cologne radio presented a public concert in a small hall on October 19, 1954, in the series "Music of Our Time," using only electronically generated sounds by Stockhausen, Goeyvaerts, Pousseur, Gredinger, and Eimert. The new pieces were in strict serial technique. In spite of the previous concerts, it was attempted later to represent these works as the "first truly electronic compositions anywhere." In 1956, under the same auspices, a similar concert took place with works by the composers Hambraeus, Koenig, Heiss, Klebe, Stockhausen, and Křenek. In contrast to earlier presentations, it was concerned with space music that was fed through five separate channels and through groups of speakers distributed throughout the hall. Stockhausen joined the ranks of the lecturers, who now spread the new gospel to new cities and other European countries. Since then, many new works and some new studios have been developed in Germany. At present, Stockhausen is director of the Cologne studio. Fritz Winckel heads a new studio at the Technische Universität in Berlin.

Excerpts from reviews of the Conference on Electronics and Concrete Music over Radio Basel (Switzer-

land) in May 1955 give a good indication of how these compositions were received:

Just as this development necessarily had to come about and could not be stopped, it will be impossible to do anything against this new machine music in the future. The innovators will not bypass any of the unlimited possibilities in their experiments; prominent critics and aesthetes will praise the product of "progress" and will say profound things about it. The public will not want to appear stupid and the snobs will be happy and enthused. A time, perhaps decades, of strange music and music practice is ahead of us, no question about that. Of course, in the process good minds of quality will emerge and . . . geniuses will impart to the matter something like sense and form. . . . Thus music leaves the realm of man with its thousands of physical restrictions and enters the fantastic realm of technical omnipotence. . . . The works . . . offered acceptable sonority, nothing new, and were uninteresting and weak. . . . In the "Concrète" noise art, . . . one could, if one followed it with good will, find nothing but barefaced nonsense occasionally thrown together with a great degree of refinement. . . . But let us not insult the animal that cannot laugh and let us talk more correctly about human seriousness, the seriousness of the charlatan!—*Volksrecht*

It is now up to the artist, to the composer, to derive creatively from the inner laws of this novel music a new musical theory, new music aesthetics. As in every art, here, too, the creatively shaping mind has the last ruling word.—*Schweizerische Illustrierte Zeitung*

The reviewer of the *Landschaftler* reported the remarks of H. Stuckenschmitt:

For two days a new world of music has opened to us; its sounds and sonorities put us through all degrees of intellectual and sensuous disquiet. Amazement and fright, admiration and resistance, skepticism and positive responses alternate within us. We ask ourselves whether truly this is the beginning of a new world or whether perhaps the world, whether our cultural world, is about to perish. There are people who earnestly and seriously fear this, where music becomes the slave of the machine, or, where, if you will, technical progress takes hold of art.

The newspaper critic added:

The sounds range all the way from muted snoring to a howling storm, from the twittering of birds to the chatter of machine guns. But it can hardly be said that this has anything to do with music, all the less so since the poverty of musical thought was manifested with striking impressiveness. Perhaps the matter is as . . . Stuckenschmitt said on another occasion, "The oftener we encounter these sonorous phenomena, the more they fascinate us. The initial resistance, the negative experience, gives way to curiosity and interest; the experience becomes positive. We recognize the new sounds as artistic components of our world, this technicized world, that has reshaped our lives in all its parts; already a young generation is at work to organize the forms into great works of art."

The newspaper's reviewer ended his remarks with, "Whether this electronic music of the future has a future will in all probability be decided by its further development."

■ The story of electronic music in the United States takes quite a different turn from the paths followed in



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the creatively shaping mind
has the last ruling word.**

**—Schweizerische
Illustrierte Zeitung, 1955**



This is the greatest thing to have happened in the theater since the invention of incandescent lights.—Orson Welles, on hearing electronically produced incidental music for Shakespeare's King Lear, 1956

Europe. The first public demonstration of the new medium was given by Vladimir Ussachevsky at his Composers Forum on May 9, 1952, in McMillin Theatre, Columbia University, shortly before Meyer-Eppler's lectures at the Summer School in Darmstadt. Ussachevsky, whose training has been traditional (Ph.D. in composition from the Eastman School of Music), is a brilliant contrapuntist and a superior vocal composer. Long before his Forum, he had had a predilection for electroacoustical speculations. His experiments were quite independent of any in Europe. The equipment at his disposal consisted of an Ampex tape recorder (7½ and 15 ips.) presented by the Ditson Fund to the music department at Columbia University for the purpose of recording student concerts and a simple boxlike device designed by the brilliant young engineer, Peter Mauzey, to create feedback, a form of mechanical reverberation. Other equipment was borrowed or purchased with personal funds. The Forum attracted a great deal of attention and Henry Cowell in the *Musical Quarterly* (Vol. 38, October 1952) wrote a positive review of Ussachevsky's demonstration that ended, "Ussachevsky is now in the process of incorporating some of these sounds into a composition. The pitfalls are many; we wish him well."

The story of electronic music in the United States becomes at this point, in part, a personal narrative. I invited Ussachevsky to present his experiments at the Bennington, Vermont, composers conference in August 1952. My own connection with the medium began when I studied with Ferruccio Busoni in Zurich, Switzerland, from 1918 to 1920. My studies in acoustics continued during the 1920's when I was preoccupied with the problem of untempering a piano. I consulted the eminent physicist, Dayton Miller, in the early 1930's about new sound relations. In 1949, in the Introduction to Harry Partch's book, *Genesis of a Music*, I ventured to predict that we could expect a strange and beautiful music to develop if new musical ideas were used in conjunction with electronic and other scientific developments in sound.

At Bennington, Ussachevsky, at the controls of the Ampex, conducted a series of experiments involving violin, clarinet, piano, and vocal sounds. Equipped with earphones and a flute, I began developing my first tape recorder composition. Both of us were fluent improvisors and the medium fired our imaginations. We played several tiny pieces informally at a party. After our demonstration a number of composers almost solemnly congratulated us saying, "This is it" ("it" meaning the music of the future).

The word reached New York City with lightning

speed, and Oliver Daniel telephoned to invite us to produce a group of short compositions for the October concert sponsored by the American Composers Alliance and Broadcast Music, Inc., under the direction of Leopold Stokowski at the Museum of Modern Art in New York. After some hesitation, we agreed to provide several pieces for this program. Henry Cowell placed his home and studio in Woodstock, New York, at our disposal. With the borrowed equipment in the back of Ussachevsky's car, we left Bennington for Woodstock and stayed two weeks.

Other equipment appeared almost magically from around the countryside. Sidney Cowell had a portable tape recorder on hand; the folklorist, Eskin, produced an oversized speaker that resembled a large doghouse; carpets for sound-deadening appeared from somewhere.

Using the flute as a sound source, I developed an impressionistic virtuoso piece, *Fantasy in Space*, and *Low Speed*, an exotic composition that took the flute far below its natural range. *Invention in Twelve Tones*, with complex contrapuntal combinations, was also sketched. Ussachevsky began work on an eight-minute composition with piano as the main sound source, transformed by simple devices into sounds like deep-toned gongs and bells, tone clusters on an organ, and a gamelan orchestra with metallic crescendos organized into an expressive whole.

In late September 1952, the traveling laboratory reached Ussachevsky's living room in New York, where we eventually completed the compositions. Peter Mauzey was then and has been all these years our invaluable collaborator and consultant. David Sarser, Arturo Toscanini's sound engineer, invited us to use the studio in the basement of Toscanini's Riverdale home to put the finishing touches on our compositions. These visits generally occurred between midnight and 3 A.M., but apparently never bothered the maestro. For the mixing of my *Invention*, we learned that the Union Theological Seminary had a collection of tape recorders, which we used for purposes other than those they were intended for.

The concert took place at the Museum of Modern Art on October 28, 1952. It was the first public concert of tape recorder music in the United States. Ussachevsky's *Sonic Contours* and my *Low Speed*, *Invention*, and *Fantasy in Space* were played. Ussachevsky and I with Mauzey transported the equipment to the hall, carried it in, set it up, and Ussachevsky operated the machine during the concert.

The public and professionals alike were cordial and astonished. Jay Harrison wrote in the New York *Herald Tribune* the next day, "It has been a long time in coming, but music and the machine are now wed. . . . The result is as nothing encountered before. It is the music of fevered dreams, of sensations called back from a dim past. It is the sound of echo. . . . It is vaporous, tantalizing, cushioned. It is in the room and yet not part of it. It is something entirely new. And genesis cannot be described." Nat Hentoff in *Downbeat* liked my *Fantasy in Space*. Luciano Berio writing for an Italian magazine singled out Ussachevsky's *Sonic Contours* as the most significant piece and followed through by establishing the Studio di Fonologia in Milan, Italy. *Time* magazine said, "The twentieth-

century instrument is the record machine—a phonograph or tape recorder.”

The program was broadcast over WNYC in New York and WGBH in Boston, and we were invited to give a live interview demonstration on Dave Garroway's news program, *Today*, on NBC television. The broadcasts were at 7 and 9 A.M. We arose at 4 A.M. and rehearsed at 5. As usual the three of us carted the equipment. We were met at the studio by a member of the Musicians Local 802, who asked if I had a union card. I said, “No, but if any flutist in the union can improvise the program, I will be glad for him to take over.” That settled the matter. A crew of eight engineers tried to connect Mauzey's little box, but it would not work. Five minutes before the telecast, he was allowed to take over.

After Garroway's introduction, I improvised some sequences for the tape recorder. Ussachevsky then and there put them through electronic transformations. I looked up for a moment and to my astonishment found myself staring through a plate glass window with passersby staring back. These included a mounted policeman on his horse. Somewhat startled, we finished the broadcast and repeated the interview at 9. Everybody seemed to have viewed it, for piles of letters arrived, many from friends and relatives we had not heard from in twenty-five years!

In April 1953, Radiodiffusion Française in Paris included “tape music,” as our contribution was called, in their festival. It was introduced to the Paris listeners by Bernard Blin. Broadcast Music, Inc., sent Ussachevsky to represent us. Our contributions, stemming from a desire to extend the resonance of existing instruments, were different from the European compositions. Our works were received with interest and respect.

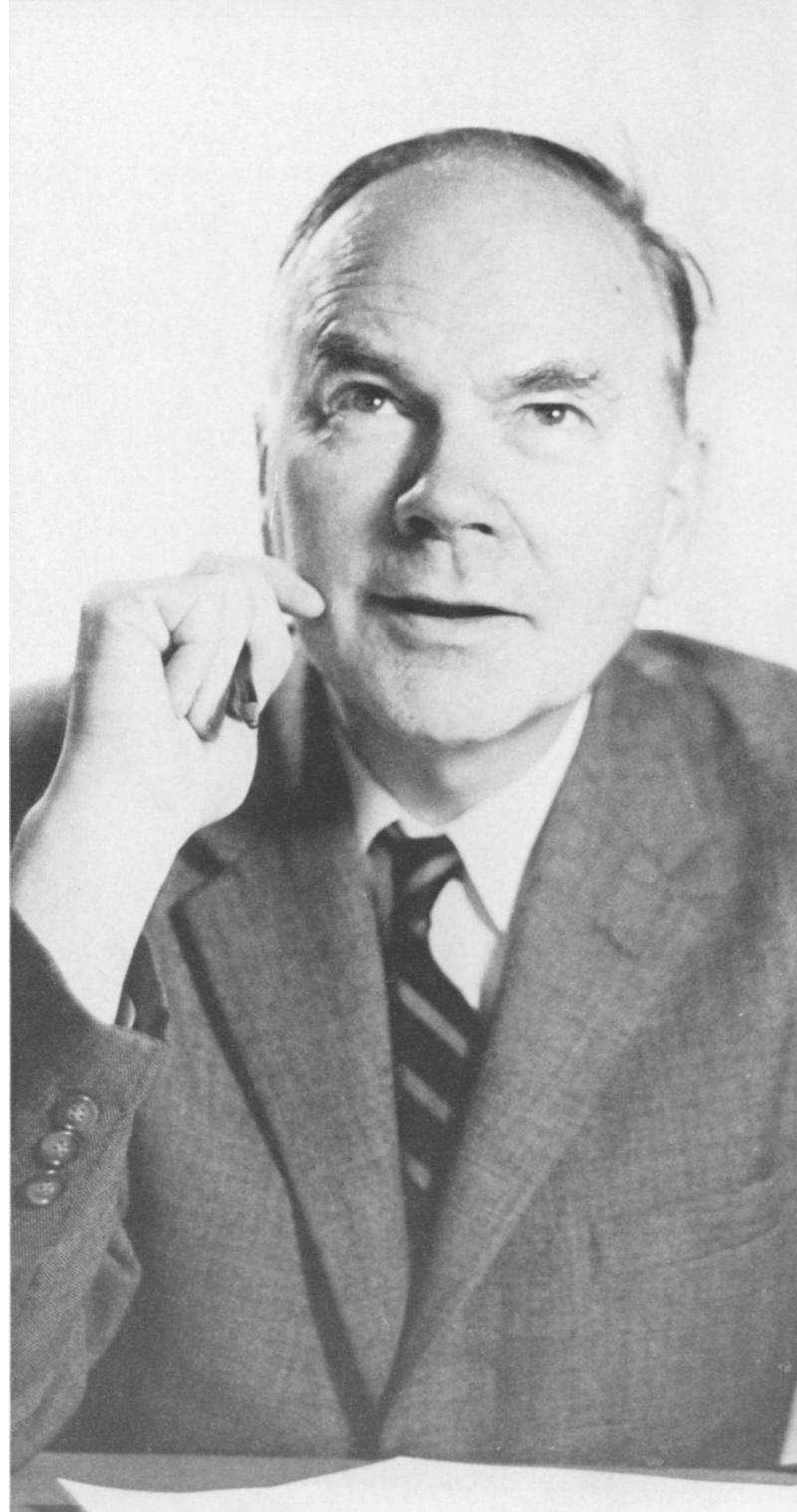
In that same summer, Stokowski commissioned us to do a two-and-a-half-minute piece for his CBS program, *Twentieth Century Concert Hall*. *Incantation* was the piece produced in the Ussachevsky living room by the two of us. We used woodwind instruments, voice, bell sonorities, piano sounds, and anything else available as sound sources. The piece was performed in October and was followed a month later by background tape music for CBS *Studio One*, “Crime at Blossom.” Alfredo Antonini was musical director.

A concert with “Music in the Making” at Cooper Union under the partial patronage of the Music Performance Trust Fund and the Musicians Union established good relations with the union. The fact that the conductor, Broekman, announced that this probably meant the end of live music did not seem to detract from the audience's very real interest.

In late 1953, I received a commission from the Louisville Orchestra. I also received a small faculty grant from Barnard College. Ussachevsky consented to share these with me and to produce a joint composition to test the feasibility of combining the new medium with a symphony orchestra, even though we knew that we would have to purchase some materials and equipment from personal funds, a repeated necessity for a number of years.

Edward D'Arms and John Marshall of the Rockefeller Foundation became interested in the Louisville project and helped us to purchase another machine

CONTINUED ON PAGE 135



Only if we develop a sense of responsibility and a deep desire to bring human satisfaction to large numbers of individuals can our vision become penetrating enough to draw on the greatness of the past, add to it our new findings, and move forward into a future that even now promises beautiful new experiences as yet undreamed of.—Otto Luening, 1968



AN UNFINISHED HISTORY OF ELECTRONIC MUSIC

BY OTTO LUENING

CONTINUED FROM PAGE 49

through Barnard College, where Henry Boorse had also shown interest in our work. William Kraft provided us with some percussion sounds for transformation.

Collaboration on the work *Rhapsodic Variations* was aptly described by Howard Shanet in program notes for our later composition *Concerted Piece*, played by the New York Philharmonic Symphony Orchestra: ". . . The nature and degree of their collaboration vary from one composition to another. . . . In general they work quite independently, the collaboration usually taking the form of criticism and suggestions offered to each by each other at frequent stages along the road." Sometimes we would actually exchange or borrow materials from one another. In the pieces from this period, we not only mixed the new sonorities with the timbre of the symphony orchestra but also devised a system of notation that would enable the conductor to follow the tape recorder and that would be acceptable for copyright in the United States, where every composition must be recorded in musical notation, often a trying and not too accurate technique.

Rhapsodic Variations, first performed on March 20, 1954, by the Louisville Orchestra, Robert Whitney conducting, is believed to be the first performance of tape recorder music with symphony orchestra anywhere.

A recording of our earliest music was released by Gene Bruck on the Innovations label in 1954. Re-

viewers said, ". . . The composers have entered this vast new realm in a sense of high adventure but also with a sense of responsibility." A recording of *Rhapsodic Variations* was released in 1955. Reviewers described the piece as a serious and fascinating listening experience. The worst comments pointed out that time would bring improvements, and the best ones said that the field already had ardent supporters.

To produce *Rhapsodic Variations* the traveling laboratory was transported to the Bennington Composers Conference and set up in a private living room. The score was tried out with the Conference Orchestra. In 1954, we packed up the mobile laboratory and took it to the MacDowell Colony, together with a projector, to make a score for a ballet, *Of Identity*, commissioned by the American Mime Theatre. The problem was that there was a voltage drop at certain times, but Ussachevsky, with mathematical meditations that I do not understand to this day, timed the score accurately enough so that we could deliver it just before the dress rehearsal, and it worked.

A new assignment came from Alfred Wallenstein for the Los Angeles Philharmonic Orchestra. The peripatetic equipment and professors took off from New York to the MacDowell Colony and produced *A Poem of Cycles and Bells*, an orchestral paraphrase of our two early pieces, *Fantasy in Space* and *Sonic Contours*. The transcription proved a post-graduate course in notation

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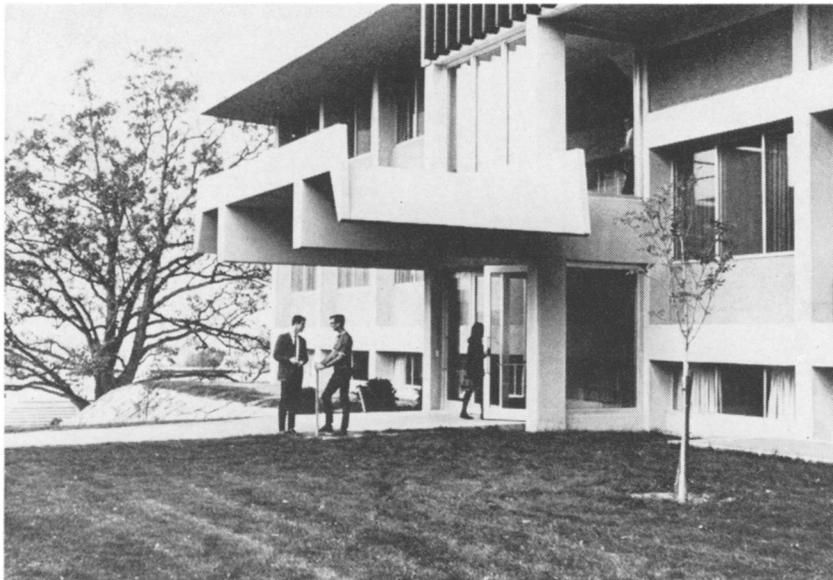
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and ear training for the composers. The work was performed repeatedly in Los Angeles.

During this same period, other private studios became active in the United States. The commercial studio of Louis and Beebe Baron produced electronic sound scores for films such as *Atlantis*, *Jazz of Lights*, *Forbidden Planet*, and others shown in this country and abroad. They depended on electronic sound generators as their only sound source. John Cage and his friends did early work with multiple speaker projection of highly fragmentary tape compositions. They established a bank of sounds in a private studio in the Bowery. In 1954, Cage's *William Mix* (with eight loudspeakers) was first performed at the Donaueschingen Festival, where it made a strong impression. Edgar Varèse worked in his private studio in Greenwich Village with very little assistance. In 1954, helped by the Musique Concrète Studio in Paris and Marconi, he completed his composition *Déserts*, first performed in Paris at the Concert de L'Orchestre National under the direction of Hermann Scherchen over Radiodiffusion Télévision Française on December 2, 1954. This work combining live sounds and electronic sounds was received with much interest and repeated in other European centers and later in the United States where it was recorded. Composers in the United States up to this time had practically no foundation, institutional, governmental, or commercial support.

In June 1955, Barnard College received a grant of \$9,995 from the Rockefeller Foundation to enable Ussachevsky and myself to devote a period of time to creative research in electronic music. We went to Europe for six weeks, first to Paris, where we were met at the airport by the leading dignitaries of the Radiodiffusion research center. Royally entertained by Monsieur Blin, Pierre Schaeffer, Phillipot, Arthuys, and others at the radio station, we were invited to make a careful study of their works. They permitted us to tape materials in the studio for our future use and gave us many tape copies of their compositions for our archives.

We moved on to Bonn Univer-

sity. There we visited the eminent physicist Meyer-Eppler, who with his assistants arranged not only a comprehensive visit at the Phonetic Institute but also spent many productive social hours giving us an opportunity to discuss the directions the movement was apparently taking. Herbert Eimert, director of the Cologne studio, with Stockhausen as his assistant, also opened doors to us, and we observed what both technically and artistically was going on there. For one afternoon we were invited to tape record sounds produced by their machines.

We visited many other establishments and centers in Germany as well as von Braunmühl, Ludwig Heck, and Fred Buerck at the Southwest German Radio in Baden-Baden, where an interesting *Klangumwandler* (sound transformer) had been developed and was being perfected. Ussachevsky was invited back for several months to work and test this machine. With it he produced sound models that were useful for his artistic work. Conversations with Trautwein, Beyer, and Sala in Düsseldorf were also most rewarding, but at that time the main activity seemed to be concentrated in Cologne. Visits to some factories were less interesting, but conversations with Professor Philipp Jarnach in Hamburg awakened his interest in the new musical possibilities.

In Switzerland, we found the unique electro-acoustical experimental studio founded by Hermann Scherchen to be of great interest. An international congress was in progress and we exchanged ideas with leading composers and technicians from various European countries. At the Albis Werke in Zürich, a very refined and practical sound filter had been built.

In Milan, we saw our old friend Berio and met Bruno Maderna. The electronic studio in Milan built under the patronage of the Italian Radio, RAI, was then the newest and best-equipped in Europe. Its moving spirit, Berio, invited us to produce some materials there and to come back for a more lengthy stay.

In Rome, we found only traces of interest in the new work, and at the American Academy we prepared our *A Poem in Cycles and*



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Bells for recording in Copenhagen. There we recorded the work with the Royal Danish Radio Orchestra's third team in minimum rehearsal time. With very precise conducting techniques on my part, wearing earphones and resorting to grunts and groans because of language difficulties, and with Ussachevsky in communication with me via earphones and walkie-talkie from the control booth, we made the tape in record time, but only after I told the orchestra in at least four fractured languages to imagine that they were playing something by Sibelius. Ten years later, the record was the best seller of Composers Recordings, Inc.

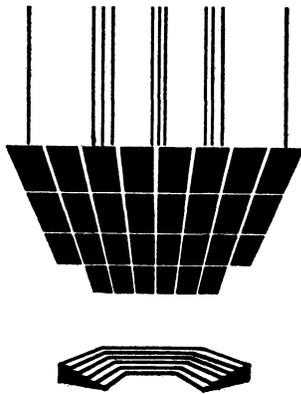
We kept detailed data of our trip. Soon after our return home, we took off again to see what was going on in the United States. With the exception of certain significant research at the Bell Telephone Laboratories and at Ampex, we discovered that most research in acoustics was being conducted under the defense program. Industry was hesitant about basic research unless it could be applied practically within

six months. Most universities in the country were not yet interested in electronic music with the exception of Illinois, where work with computers was developing under the direction of Hiller and Isaacson, and at Toronto where Hugh Le Caine, through the Canadian Research Council, was doing interesting work. Commercial radio stations did not seem interested in setting up studios and research programs like those in Europe, so Ussachevsky and I decided that university auspices would best help electronic music to develop in the United States. Douglas Moore, executive officer of the Columbia University music department, gave us permission to deal directly with Grayson Kirk, president, and Jacques Barzun, provost. In turn, they helped us with space and with some outside contacts, which we were permitted to develop on our own. In addition to numerous demonstrations, lectures, and concerts, we wrote a report for the Rockefeller Foundation on the state of experimental music in Europe and the United States with recommen-

dations about the best program to be followed here. The interest initially shown by Mr. D'Arms and Mr. Marshall was picked up by Mr. July and Mr. Fahs, who helped us to formulate further ideas.

In 1956, Doris Humphrey commissioned me to write a score for *Theatre Piece No. 2* to be performed at the Juilliard Anniversary Festival. Our studio in the Ussachevsky living room was by now so crowded with equipment and materials that it seemed desirable to move the portable laboratory to the back room of my apartment. Mrs. Ussachevsky had endured the perambulating laboratory without a murmur for years and it was time for a change. But our efforts did not settle the problem.

While I was busy with the ballet (assisted by Chou Wen-Chung), my house man and some neighbors became very suspicious about what was going on in the back room and reported their disturbance to the building management. I explained, but as my apartment was in a building owned by Columbia, we finally reported to President Kirk



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that unless we could have some space on the campus our whole program would be seriously jeopardized. Soon afterwards, we were provided with a suitable and charming Charles Adams house located on the site of the former Bloomingdale Insane Asylum on the campus.

The next major assignment came when, at the request of Mark Blitzstein, Orson Welles asked us to do an abstract sound score for his production of *King Lear* at the New York City Center. Welles came to the studio to listen to our basic sound materials, which we played for him after his stentorian command: "Proceed!" After five minutes' listening, Welles, who has an extremely musical ear, said, "This is the greatest thing to have happened in the theater since the invention of incandescent lights." We produced forty-four cues for *King Lear*. But at the first dress rehearsal there was trouble. Ussachevsky was not allowed to operate the machine but had to relay his suggestions to the regular union sound man, and this slowed up things considerably.

Finally, all was straightened out and the show ran for three weeks. The press response recognized the great contributions the new medium could make in the theater.

Varèse's *Déserts* continued to attract attention here and in Europe, and he was now planning his *Poème Électronique* for the Philips Radio Exhibition at the Brussels Exposition. This composition of eight minutes used four hundred loudspeakers accompanied by a series of projected images chosen by Le Corbusier. It was heard by an audience of fifteen or sixteen thousand people daily for six months. The reactions ranged from terror, anger, and stunned awe to amusement and wild enthusiasm. Varèse called his work "organized sound."

John Cage made numerous trips to Europe and the Orient where his particular influence was strongly felt.

Studios at the universities of Illinois and Toronto continued planning their futures each in its own way. Ussachevsky and I were constantly asked to give reports, write

articles, produce music, give lectures, concerts, and interviews, to take part in forums, and to introduce other composers to the medium.

In 1955, RCA demonstrated the Olson-Belar Sound Synthesizer. A recording on which existing instruments were imitated was released. The present director of the School of the Arts at Columbia University, Davidson Taylor, suggested that we try to get the synthesizer on loan. Because Ussachevsky had a great desire to pursue this possibility, I wrote to several RCA executives. We heard that Professor Milton Babbitt at Princeton University, who had been preoccupied with electronic music since the late 1930's, was also interested in working on this comprehensive machine. We joined forces! Grayson Kirk wrote to David Sarnoff, president of RCA and to Elmer W. Engstrom, then executive vice-president, who gave us permission to do research on the machine at the Princeton laboratories. The universities paid our expenses. Since I had to leave for Rome in three

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weeks, my colleagues suggested that I be the first to work with the machine. Basic materials that I produced with the help of Mr. Belar, later greatly modified, became the material for my *Synthesis for Orchestra and Electronic Sound* and *Dynamophonic Suite*.

Babbitt, Ussachevsky, and I, in discussing the possible future development of electronic music, suggested first to the Rockefeller Foundation a University Council for Electronic Music with representatives from those institutions that had begun working in the field. Mr. Fahs wisely suggested that because Columbia and Princeton were able to work smoothly together we had better leave it that way.

The Luening-Ussachevsky report to the Rockefeller Foundation included a detailed description of the equipment and personnel needed for a representative center in the United States. It asked for technical assistants, electronic equipment, space, and materials to permit other composers to work there free of charge, and a concert setup consisting of a control console and nineteen loudspeakers for public concerts. One hundred seventy-five thousand dollars were needed for both universities for a period of five years. Our application was approved with the recommendation that we procure the RCA synthesizer. At first we rented it. Then RCA loaned it to us. The press release in January 1959 announcing the grant caused a great deal of commotion in the world of music. The Committee of Direction consisted of Professors Luening and Ussachevsky of Columbia and Professors Babbitt and Roger Sessions of Princeton with Professor Ussachevsky acting as chairman.

As soon as possible, we invited other composers to work at the Center. These included Michiko Toyama from Japan, Bülent Arel from Turkey, Mario Davidovsky from Argentina, Halim El-Dabh from Egypt, and Charles Wuorinen of the United States, soon followed by many other distinguished composers from this country and abroad. Varèse revised the electronic part of *Déserts* in the Center and for a while worked there regularly.

In the midst of our new obliga-

tions, Ussachevsky and I were commissioned by Leonard Bernstein and the New York Philharmonic Orchestra to compose a work for tape recorder and symphony orchestra. Our *Concerted Piece* was first performed on March 20, 1960, at a youth concert that was televised, followed by four regular performances in Carnegie Hall and a CBS network broadcast.

The Columbia-Princeton Electronic Music Center gave its two initial concerts at McMillin Theatre, Columbia University, on May 9 and 10, 1961, before an invited audience that included music luminaries from New York and elsewhere. The program was well received by the two overflowing audiences; it consisted of an introduction by Jacques Barzun, *Electronic Study No. 1* (Davidovsky), *Leiyla and the Poet* (El-Dabh), *Creation—Prologue* (Ussachevsky), *Composition for Synthesizer* (Babbitt), *Stereo Electronic Music No. 1* (Arel), *Gargoyles for Violin Solo and Synthesized Sound* (Luening, Max Pollikoff—violinist), *Symphonia Sacra* (Wuorinen, The Hartt Chamber Players—Bertram Turetzky, director); technical assistants—Malcolm Goldstein, Edward Schneider, Peter Smith; lighting—Richard Greenfield.

Much of the daily press and many magazines reported the concert as being of historic significance and wrote favorably of it. There was, however, strong opposition from one, the now defunct New York *Herald Tribune*. Its leading critic and our Columbia colleague Paul Henry Lang had been invited to attend our various activities since 1952 but had never found the time to come. In his early reviews of *musique concrète* and after Harry F. Olson published his book, *Musical Engineering*, Lang, the master of the ponderous headline, wrote a purposely devastating attack on the movement, "Music by Hardware" (May 20, 1956), including John Cage as another target. He labeled the other American efforts experimental, sparing them his attack—at that time. After the Columbia-Princeton concert, the *Herald Tribune* printed an innocuous review by Bernheimer, who had stayed for only half of the concert. In the following week's Sunday issue, there appeared an



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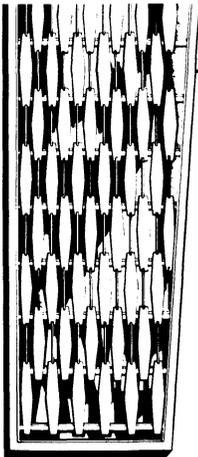
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article by the leading critic, Lang himself, under the resounding headline, "Dictatorship of the Tube," which hinted that young composers interested in these things had lost their bearings.

Lang received some vitriolic letters about his statements but also some support. Long debates about whether to answer the attack finally resulted in a letter from Barzun to Lang published in the *Herald Tribune* on May 28, 1961. With great zeal, Lang rose to the bait and headed the second Sunday article, "Music and Musicians: the Chaos Machine." Barzun's letter said, "Your second-hand report of what I am supposed to have said in opening the concert of electronic music at Columbia University shows again how hard it is to insinuate a fresh notion into the mind even of the judicious and the interested. The thought-cliché on the given subject is automatically substituted for the unfamiliar idea. . . . It is because audiences and critics approach the new in the self-indulgent mood of a political crowd at a rally—hostile or infatuated—that the history of artistic change is such a sorry spectacle of fighting in the dark."

Lang's initial response began with his version of not too well-known notions about aesthetics. He feared the machine had taken over, but forgot to mention that each electronic composition was controlled by the composer, not by a machine, just as Beethoven's piano sonatas were controlled by the composer and not the piano. After this article, most of our friends and enemies congratulated us on the magnificent publicity we were receiving.

But Lang was persistent; he wrote yet another Sunday article, "Electronic Game: Its Ground Rules." He stated, "Since electronic music will figure in the news more and more, perhaps we should examine the premises from which it proceeds." He described the American contributions as ". . . a harmless pastime, although actually the one legitimate facet of electronic music, for eventually these new tonal resources will be harnessed, and . . . will undoubtedly prove useful." Lang has not yet visited the Columbia-Princeton Electronic Music Center, but our initial invi-

tation to the critic still stands!

Since the 1961 concert, all the composers on the program have made outstanding reputations. Babbitt has produced many works using synthesizer material; Wuorinen and I have each done several; Usachevsky has worked with computers at the Bell Telephone Laboratories; courses in the various disciplines were established at Princeton, Columbia, and elsewhere. The works have been widely performed throughout the world. New recordings have been issued. There have been many personal appearances. The pop-music field has accepted the new media. A new group in the United States includes Mel Powell, James Randall, Charles Dodge, Harvey Sollberger, John Eaton, William O. Smith, Pril Smiley, Alice Shields, and James Seawright. The list from other countries is too long for inclusion here.

There are now about fifty electronic studios in the United States and Canada, most of them in colleges and universities; in the entire world there are about one hundred. Newer electronic instruments are appearing on the market and instruction is beginning in the public schools.

Countless foreign musicians, composers, and musicologists have visited or worked in the Columbia-Princeton Center. We have considered it our duty to advise and help as much as we were able in promoting new developments, an attitude commonly accepted in the world of electronic music. For future guidance one can only paraphrase Busoni's statements of 1907: "Only further ear training and careful experimentation will continue to make this material plastic, artistically useful, and humanly satisfying." Novelty and tradition, methodology and complete freedom, systems and automation are by themselves not enough to bring music to new heights.

Only if we develop a sense of responsibility and a deep desire to bring human satisfaction to large numbers of individuals can our vision become penetrating enough to draw on the greatness of the past, add to it our new findings, and move forward into a future that even now promises beautiful new experiences as yet undreamed of.

Bon Voyage. ☞

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