

THE ARCHIVES OF THE COLUMBIA- PRINCETON ELECTRONIC MUSIC CENTER

BY NICK PATTERSON



INTRODUCTION

The Columbia-Princeton Electronic Music Center (CPEMC, hereinafter referred to as the Center) was one of the earliest and most influential hubs of electronic music activity in the United States, especially during the decade or so after its founding. Established in 1959, assisted by a grant from the Rockefeller Foundation, it was a joint venture between Columbia and Princeton Universities. Composers Otto Luening (1900–1996) and Vladimir Ussachevsky (1911–1990) representing Columbia, and Milton Babbitt (b. 1916) and Roger Sessions (1896–1985) representing Princeton, formed the Committee of Direction for the Center, with Ussachevsky serving as chairman.¹ Roger Sessions's involvement appears to have been rather nominal (judging at least from his record of compositional activity at the Center). Peter Mauzey (b. 1930) served as the Center's lead engineer, and played a critical role in enabling Ussachevsky, Luening, Babbitt, and no doubt many other composers, to technically realize their ideas at the Center. Personnel added at later dates included associate directors and graduate assistants. Alice Shields, who served 1965–82 as a technical instructor and then associate director, has described four broad periods of activity relevant to the Center: (1) 1951–59, as an independent studio created by Luening and Ussachevsky, in various locations on the Columbia campus; (2) 1959–83, as the official Columbia-Princeton Electronic Music Studio; (3) 1983–94, as the Columbia University Electronic Music Center, under director Mario Davidovsky (after Ussachevsky's retirement); and (4) 1994 to the present, as the Columbia University Computer Music Center, under co-directors Brad Garton and Fred Lerdahl.²

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URLs cited herein accessed 17 November 2010.

1. Charles Wuorinen and Carl Rahkonen, "Ussachevsky, Vladimir," *Grove Music Online*, <http://www.oxfordmusiconline/public/>.

2. Alice Shields, biographical and program notes for *Columbia-Princeton Electronic Music Center 1961–1973*, New World Records 80521-2 (1998), CD. The dates surrounding the transition from Ussachevsky to Davidovsky as director are not entirely clear; some sources report Ussachevsky's retirement, and Davidovsky's assumption of the role of director, as in or around 1980.

A very important component of the Center was the RCA Mark II synthesizer, the first programmable electronic synthesizer (manufactured by the Radio Corporation of America at their Sarnoff Lab in Princeton in 1957) which was subsequently installed in 1959 in one of the Center's studios at Columbia, in Prentis Hall on 125th Street. Luening and Ussachevsky were also important pioneers of using the tape recorder as a compositional tool, and had been actively experimenting and composing using the tape recorder since 1951–52, laying the groundwork for the establishment of the Center.

The Center was active in supporting the work of many U.S. and international composers wishing to work in electronic media, and was the locus for the composition of many important and influential works of electronic music by Luening, Ussachevsky, Babbitt, Mario Davidovsky, Halim El-Dabh, Bülent Arel, Charles Dodge, Jacob Druckman, Charles Wuorinen, and many others. From the mid-1960s forward, voltage-controlled synthesizers, digital computer music, and, eventually, commercial digital synthesizers with MIDI control (MIDI [Musical Instrument Digital Interface] was introduced in 1983)³ gradually eclipsed both the RCA Mark II and classic tape-music studio techniques, changes reflected in the output of composers working at the Center (the RCA Mark II was no longer functional as of 1976, after vandalism during a break-in). The Center today remains active and engaged in the New York, U.S., and international music communities.

This article will provide a brief overview of the history and importance of the CPEMC, and will then describe the archives of the Center (the collection was recently deeded to the Columbia University Libraries) which contain important records, including audio recordings of concerts, program notes, work tapes, technical documentation, music manuscripts and sketches, printed music scores, photographs, and administrative records, all documenting the Center's vital role in the history and development of electronic music in the United States and elsewhere.

HISTORY & ORIGINS OF THE CPEMC

The Center was officially established in 1959, but this event represented a culmination of activities and compositional interests around electronic music, which both Luening and Ussachevsky had been pursuing since (at least) the early 1950s. Luening has provided an excellent summary of the development of both composers' interests in using the tape recorder as a tool for music composition, in his 1968 article "An

3. David Burnand, "MIDI," *Grove Music Online*.

Unfinished History of Electronic Music.”⁴ He describes important developments in the history of early electronic music, from conceptual references in the seventeenth century, through early experiments with mechanical and electrical instruments, leading up to, and providing context for, the beginnings of his and Ussachevsky’s experiments with tape recorders in the early 1950s. Luening describes his own personal interest in the physics of sound dating back to 1918, and, interestingly, relates it to his studies under Ferruccio Busoni during 1918–20.

In 1944, Luening joined Columbia as director of opera productions, and as a professor at Barnard College.⁵ Ussachevsky, after pursuing post-doctoral studies at Columbia with Luening,⁶ joined the Columbia University Music Department’s faculty as an instructor in 1947.⁷

Valuable documentation of their early experiments using tape recorders, and of the artistic climate surrounding these experiments, is provided by an interview conducted by Alice Shields and Pril Smiley (both of whom served at various points as associate directors at the Center) with Luening and Mauzey, conducted on 7 December 1991, and transcribed by Smiley.⁸ In it, details of the tape recorders and other equipment used in the early experiments are described, and a chronology of some key events is laid out.⁹ It details Ussachevsky’s first access to a tape recorder at Columbia, a Magnachord that had been obtained by the campus radio station WKCR. Peter Mauzey describes their work with that machine in this excerpt from the interview transcript:

AS [Alice Shields] — Peter, could you review the equipment [at that time]? In 1951, I think, you got involved.

PM [Peter Mauzey] — My recollection of dates is not very good. But I know that Vladimir [Ussachevsky] came over to WKCR . . . some time around there — Otto [Luening] thinks it was 1951, and he may be right.

We had a Magnachord tape recorder, which we had just gotten at the radio station. Vladimir came over and we experimented with it. Now this wasn’t

4. Otto Luening, “An Unfinished History of Electronic Music,” *Music Educators Journal* 55, no. 3 (November 1968): 42–49, 135–142, 145.

5. Lester Trimble and Severine Neff, “Luening, Otto,” *Grove Music Online*.

6. Wuorinen and Rahkonen, “Ussachevsky.”

7. Alice Shields, program notes for *Pioneers of Electronic Music*, CRI American Masters, Composers Recordings, Inc., CRI CD 611 (1991), CD.

8. Transcript by Pril Smiley is at the CPEMC archives.

9. The interview also makes reference to “master tapes,” with numbers such as “M-34” (for example), which document some of these experiments, some of which were apparently transferred to the Library of Congress after Ussachevsky’s death in 1990, and some copies of which were retained by the Center. Ussachevsky’s papers are housed in the Music Division, and the tape reels are housed in the Motion Picture, Broadcasting and Recorded Sound Division (MBRS). No official finding aid as yet exists for the papers, but a summary for the collection is found at “Vladimir Ussachevsky Collection,” <http://memory.loc.gov/diglib/ihas/loc.natlib.scdb.200033819>, and there is a rough inventory available (110 pages in PDF format). There is no electronic finding aid or list for the recordings, but a printed list is said to be available from the MBRS division, although lacking details for many recordings.

musical experimentation; we were recording voice and playing it backwards and forwards, and at different speeds — and he found it very interesting. I don't know the sequence, but at some point, he himself got a tape recorder.

The interview goes on to detail how Ussachevsky obtained an Ampex 400 model tape recorder through the Music Department, and began to experiment with it in his New York City apartment. Mauzey describes demonstrating tape feedback to Ussachevsky, and creating a custom-built hardware unit for him that provided this effect. These events seem to have taken place from approximately late 1951 into the spring of 1952, as far as can be determined. The Ampex 400 model tape recorder, which provided the basis for these experiments, was originally purchased by the Music Department of Columbia University in order to record concerts. Its purchase was funded by the Alice M. Ditson Fund, an important and influential source of financial support for new American music, which is still active today.¹⁰ The Ditson Fund was also active in supporting the Composers' Forum concerts in New York, recordings of which form an important part of the Center's archives (discussed in more detail below), and the fund is mentioned in various documents in the archives as a source of support for the activities of the Center, including the commissioning of musical works, and the purchase of equipment.

After this period of initial experimentation, from 1951 to early 1952, Luening (in the 1991 interview) describes the presentation, at a Composers' Forum concert at McMillin Theater at Columbia University on 9 May 1952, of "experiments" by Ussachevsky, realized using tape recorders and Mauzey's custom-feedback hardware.¹¹ Virgil Thomson served as moderator at the concert. Carlos Surinach was the other composer represented (in the typical format of the Composers' Forum concerts, of two composers plus an after-concert discussion). Non-electronic works by Ussachevsky and Surinach were also on the bill. The concert is reported to have been well-attended. The composer Henry Cowell, in a later review from October 1952, in the *Musical Quarterly's* "Current Chronicle" section, commended Ussachevsky for calling the presentations "experiments" rather than compositions, and quoted a description by Ussachevsky of some of the techniques used, including (apparently)

10. Anne Gefell (Alice M. Ditson Fund administrator), personal communication, 20 September 2010. On the Ditson Fund, see Theodore Wiprud, "On the Money: New Music Funding in the United States: The Alice M. Ditson Fund," *NewMusicBox: The Web Magazine from the American Music Center* (1 August 2000), <http://www.newmusicbox.org/article.nmbx?id=839>.

11. Pril Smiley, personal communication, 8 September 2010. There is again some question on the date—at least one physical reel of a recording of the concert gives the date as 8 May 1952, and former associate director Pril Smiley said that she thought the date might actually have *been* 8 May, based on notes she had seen in Ussachevsky's hand, and I have seen that date on the Composers' Forum tape reel box—but the date of 9 May is more widely cited.

the feedback hardware unit.¹² Cowell closed his review with the following: “Ussachevsky is now in the process of incorporating some of these sounds into a composition. The pitfalls are many: we wish him well!”

The Composers’ Forum reels (CF008a, b, and c in the numbering series used on the tape reel boxes, and in the card file in the archives that indexes some of the content of the reels), which would have included the discussion session following this concert, seem, very regrettably, to have been lost.¹³ Pril Smiley, former associate director of the Center, has indicated that Ussachevsky essentially re-created the concert for a broadcast on New York City radio station WNYC in 1953, as part of a series of broadcasts of the Composers’ Forum concerts. Ussachevsky played-back material from the May 1952 concert, and provided commentary. Portions of this broadcast are apparently in the Center’s archives, and attempts are being made to document and piece together the contents, which may help to compensate for the missing CF008 Composers’ Forum reels.¹⁴

After the concert in May 1952, Luening describes how he, Ussachevsky, and Mauzey subsequently brought recording and playback equipment (including multiple tape recorders and microphones, as well as an acetate-disc-cutting machine) up to the Bennington Composers’ Conference (in Bennington, Vermont) in the summer of 1952, and there presented a “semi-public” demonstration of sound experiments using the tape recorder.¹⁵

Word of Ussachevsky’s May 1952 Composers’ Forum concert and the August 1952 Bennington Composers’ Conference experiments spread, and at the end of the summer of 1952, Luening and Ussachevsky were invited to contribute short compositions for a planned October concert sponsored by the American Composers Alliance and Broadcast Music, Inc. (BMI), under the direction of Leopold Stokowski, at the Museum of Modern Art. The composer Henry Cowell offered his home near Woodstock, New York, for Luening and Ussachevsky’s use, to prepare material for the concert, and they spent two weeks there with the necessary audio equipment, Luening working on *Fantasy in Space, Low Speed*, and *Invention*

12. Henry Cowell, “Current Chronicle,” *Musical Quarterly* 38, no. 4 (October 1952): 599–600.

13. Unless Ussachevsky himself took them; perhaps they may be found in his many tapes at the Library of Congress (see n. 9 above). It is also possible that a recording of the post-concert discussion might be found in the archives of WNYC, but I have not yet been able to determine this.

14. Pril Smiley, personal communication, 9 September 2010.

15. Otto Luening and Peter Mauzey, interview transcript, 1991. Copies of at least some of these recordings described are preserved in the archives. Terry Pender, the current associate director of the Center, has kindly provided me with copies of early experiments (referencing the “master tape” numbers M-16 and M-34) which were conducted in 1951–52, and eventually contributed to the completed compositions *Sonic Contours* by Ussachevsky, and *Fantasy in Space* by Luening. These recordings demonstrate the sense of exploration and fun that marked this period of discovery of a new medium for these composers.

in *Twelve Tones*, and Ussachevsky on *Sonic Contours*. Subsequent mixing and editing took place back in Ussachevsky's living room, and on tape recorders at the Union Theological Seminary (both in New York City) and in the basement sound studio of Arturo Toscanini's apartment (in Riverdale, New York), with access to the latter provided by Toscanini's sound engineer David Sarser (apparently Toscanini himself was not involved in these sessions, which are said to have typically taken place between midnight and 3 AM!).¹⁶

The resulting concert at the Museum of Modern Art took place on 28 October 1952,¹⁷ and represented the "first public concert of tape recorder music in the United States," and, according to Luening, garnered a fair number of positive reviews, including ones from noted jazz critic Nat Hentoff (in *Downbeat*) and composer Luciano Berio (in an Italian magazine). *Time* magazine reported in the issue of 10 November 1952 ("Music: The Tapesichordists") that "The twentieth-century [musical] instrument is the record machine—a phonograph or tape recorder." The program was also broadcast on WNYC in New York, and WGBH in Boston.¹⁸

This inaugural concert of "tape recorder music" was followed up by the inclusion of Ussachevsky's and Luening's "tape music" (this is the term that became widely used) compositions in an April 1953 festival sponsored by Radiodiffusion Française. Ussachevsky attended, representing both composers, marking an important beginning of an exchange between Ussachevsky and Luening, and European composers also active in various phases of experimentation with electronic music. Various other concerts, appearances, and commissions followed. In 1953 Luening received a commission from the Louisville Orchestra, and invited Ussachevsky to collaborate with him in a joint composition, which would "test the feasibility of combining the new medium with a symphony orchestra. . . ."¹⁹ This "joint composition" model would be repeated in several subsequent compositions, although it seems that the working model would be more the combination of independently-created sections, than a true collaborative composition of sections together.²⁰ The resulting work, *Rhapsodic Variations*, was premiered on 20 March 1954, and "is believed to be the first performance of tape recorder music with symphony orchestra anywhere."²¹

16. Luening, "An Unfinished History," 48.

17. Although the date of 28 October 1952 is widely cited, a date of 22 November 1952 is given on p. 2 of Alice Shields's program notes for the recording *Tenth Anniversary, Columbia-Princeton Electronic Music Center*, Composers Recordings, Inc., CRI SD 268 (1972; reissue 1978), 2 LPs.

18. Luening, "An Unfinished History," 48–49.

19. *Ibid.*, 49.

20. Wuorinen and Rahkonen, "Ussachevsky."

21. Luening, "An Unfinished History," 135.

In another interesting detail from the 1991 interview, Luening describes the ongoing effort to document all of these experiments and activities, in order to build support for the establishment of an electronic music center, and describes the atmosphere at Columbia as “not at all supportive.” He continues:

OL — We had to proceed very carefully — it wasn’t a game. Again, it was the communication — to try to get some people to pick up the message that we were really trying to investigate this thing. On the one hand, Jacques Barzun [then dean of graduate faculties] was a great friend and so was Grayson Kirk [university president]. He would dig in once in a while and give us five-hundred bucks to do something with, but a lot of the rest of the time, we would have to do it on our own — whatever it took to do it. And that went on quite a long time, into 1959.²²

Through the Louisville Orchestra commission, the Rockefeller Foundation became interested in Luening and Ussachevsky’s work, and assisted with the purchase of an additional tape recorder (with a grant given through Barnard College, where Luening was on the faculty). After a period of additional works and performances, the Rockefeller Foundation was the source for another (and more substantial) grant, of almost \$9,995 through Barnard College, to “enable Ussachevsky and myself to devote a period of time to creative research in electronic music.”²³ This grant formed the kernel of a process that culminated in the establishment of the Columbia-Princeton Electronic Music Center in 1959. The grant enabled both composers to travel for a period of about six weeks in Europe, making important contacts and conducting studio visits at electronic music facilities such as the Radiodiffusion research center (Paris), Bonn University, a studio in Cologne led by Herbert Eimert with assistant Karlheinz Stockhausen, and others in Germany, Switzerland, Italy, and Denmark. A similar tour was conducted to assess the status of electronic music centers in the United States and Canada. They found some activity at the University of Illinois (the early computer music research of Lejaren A. Hiller and Leonard M. Issacson) and the research of Canadian composer Hugh Le Caine at the Canadian Research Council in Toronto, but not much else, and noted the lack of similar interest and support from radio stations in the U.S., in contrast to the support from such institutions in Europe.²⁴ This process of assessment of the landscape of electronic music research, both in the U.S. and in Europe, formed the basis of a report to the Rockefeller Foundation, by Luening and Ussachevsky, in 1955 (a copy of the report is available in

22. Luening and Mauzey, interview transcript, 36.

23. Luening, “An Unfinished History,” 136.

24. *Ibid.*, 138.

the archives of the CPEMC). As mentioned before, support was provided by both Columbia president Grayson Kirk, and Jacques Barzun (dean of graduate faculties, later provost). Attempts were made by the university administration to find some physical space that might serve as a home for the activities in electronic music research. Luening describes a period of increasing engagement with both the university administration and the Rockefeller Foundation from 1955 to 1959.²⁵

This activity brought forth a proposal from Luening, Ussachevsky, and Milton Babbitt (at Princeton) to form a “University Council for Electronic Music with representatives from those institutions that had begun working in the field.”²⁶ Milton Babbitt’s involvement had come through work that all three composers had been conducting on the RCA synthesizer (the first programmable music synthesizer) which was at that time housed in Princeton, New Jersey, some time after the debut of the machine in 1955 (more on this to follow). The Rockefeller Foundation (particularly director Charles Burton Fahs) recommended a more limited partnership, suggesting that Columbia and Princeton collaborate, as they were already working together in this area.²⁷

The report to the Rockefeller Foundation had laid out what were considered to be the equipment and resources needed to establish a center for electronic music research. A five-year grant of \$175,000 for both universities, was approved, with the recommendation that they purchase the RCA synthesizer. This was not financially feasible, so an arrangement was made to lease the machine (eventually, it was loaned and finally turned over to the Center by RCA).²⁸ In January of 1959, a press release announced the grant, and the Columbia-Princeton Electronic Music Center was officially born. As noted earlier, the Committee of Direction comprised Luening and Ussachevsky (from Columbia) and Babbitt and Sessions (from Princeton), with Ussachevsky serving as chair, and Peter Mauzey as lead engineer.

In 1961, two initial concerts were presented, in McMillin Theater, on 9 and 10 May. Luening reports a generally favorable reception, but mentions a series of “purposefully devastating” criticisms by Paul Henry Lang published in the New York *Herald Tribune*, to which Barzun (who had written an opening essay in program notes for the concert) responded in defense of the works. It had been nine years since Ussachevsky’s initial

25. *Ibid.*, 136–40.

26. *Ibid.*, 140.

27. *Ibid.*

28. Joel Chadabe, *Electric Sound: The Past and Promise of Electronic Music* (Upper Saddle River, NJ: Prentice-Hall, 1997), 16.

presentation of his “experiments” at the Composers’ Forum concert of 9 May 1952.²⁹

A period of rapid activity followed, with the Center fulfilling its mission to provide a working platform for composers from many areas outside of the host universities who wished to work in the new medium. Robert Gluck has written an interesting study of the role that the Center played in disseminating electronic music to international composers via their work in the Center; composers who, in some cases, subsequently established similar centers for electronic music in their own countries.³⁰

THE RCA SYNTHESIZER

Milton Babbitt, in particular, was drawn to the capabilities of the RCA Mark II synthesizer, now housed in the Center at Columbia, on 125th Street, after having been transferred from Princeton, where Babbitt, Luening, and Ussachevsky had all worked on it. The first RCA synthesizer is described in a 1955 paper by its developers Harry F. Olson and Herbert Belar.³¹ The Mark II model was a more musically-focused update of the Mark I synthesizer (which eventually ended up being used mostly for speech research), and was completed in 1957 and described in a later paper by Olson, Belar, and J. Timmens.³² A subsequent paper, by Babbitt, describes in great detail the expanded musical capabilities and technical operation of the RCA Mark II.³³ As one of the first programmable music synthesizers, the RCA was the jewel in the crown of the Center.

The RCA Mark II synthesizer had four identical, and programmable, channels for sound production (whereas the earlier Mark I had only two). The sound-producing mechanism was a tube-based analog modular electronic synthesizer, offering both fixed- and variable-pitch oscillators, and was activated by instructions punched (using two typewriter-like keyboards) onto paper rolls, which were then fed into the machine. Some of the holes punched onto the paper represented binary code, specifying control parameters for the generation of sound by the synthesizer. So, although the synthesis of sound was analog, the instruction system was partially “digital” in its encoding. Rhythm, however, was specified not by encoding but by the physical disposition of attacks (punched

29. Luening, “An Unfinished History,” 141–43.

30. Robert Gluck, “The Columbia-Princeton Electronic Music Center: Educating International Composers,” *Computer Music Journal* 31, no. 2 (Summer 2007): 20–38 (issue titled *Creating Sonic Spaces*).

31. Harry F. Olson and Herbert Belar, “Electronic Music Synthesizer,” *Journal of the Acoustical Society of America* 27, no. 3 (May 1955): 595–613.

32. Harry F. Olson, Herbert Belar, and J. Timmens, “Electronic Music Synthesis,” *Journal of the Acoustical Society of America* 32, no. 3 (March 1960): 311–19.

33. Milton Babbitt, “An Introduction to the R.C.A. Synthesizer,” *Journal of Music Theory* 8, no. 2 (Winter 1964): 251–65.

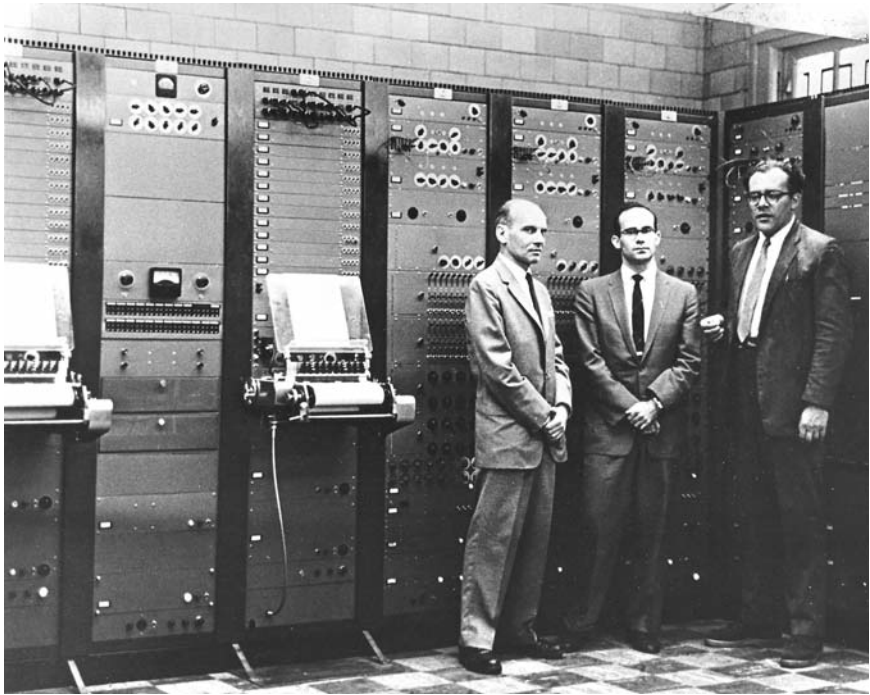


Fig. 1. From left to right: Milton Babbitt, Peter Mauzey, and Vladimir Ussachevsky, with the RCA Mark II synthesizer (ca. 1959?)

holes) on the paper rolls. The design of the RCA Mark II included a final output stage that recorded to disc, actually cutting a vinyl record, although, in practice, this seems to have been modified at the Center so that magnetic tape captured the synthesizer output. One feature of note, which Babbitt describes in his 1964 article, is the flexibility of the programming: encodings originally used for one musical parameter (for instance, pitch) could be re-interpreted, or re-mapped, onto another musical parameter (for instance, spectrum) by re-configuring the synthesizer routings. This would seem to be a good fit with some of the compositional practices of 12-tone serial composition, where collections of values were put through various re-mappings and transformations. One can see how this might well have appealed to Babbitt, given his compositional interests.³⁴

34. Ibid., 259–60; also, Milton Babbitt in Joel Chadabe, *Electric Sound*, 15–18.

TITLE: Synth, 1 MBS
(♩ = 8 holes) (left)

TIME	→ 3	→ 17	→ 22	→ 7
ENV	4 12 8	A	1 2 11 8	4 2 10 8
DUR	2 3 1	6	4 4 6 1 7	1 6 0 1 2
VOL		9 > 6	9	15 > 9
TIMB		0	4	0

R 9 3 4 5 5

Fig. 2. Score for the RCA Mark II synthesizer by Milton Babbitt. Note the tempo indication “♩ = 8 holes.” This information would be encoded on punched paper rolls and fed to the synthesizer.

Both Olson and Babbitt, in separate articles, make the claim that the RCA synthesizer was capable of producing any imaginable sound.³⁵ In reality, although the RCA synthesizer offered unprecedented control of pitch and rhythm in electronic music, the timbral capabilities of the machine did not seem to represent an unlimited paradise of sound, at least based on the musical output we can hear documented. The fixed- and variable-pitch tube oscillators generated harmonically-rich sawtooth waves, and these, along with white noise, could be filtered, combined, or otherwise altered to arrive at a variety of timbres (Babbitt does point out that external sounds could also be run through some of the synthesizer’s processing stages, as he did to the voice in *Philomel*, for soprano, recorded soprano, and synthesized sound).³⁶ The transposition of various tones by

35. “Oral-History: Harry F. Olson,” interviewed by Mark Heyer, 14 July 1975, transcript available on the Web at *IEEE Global History Network*, http://www.ieeeahn.org/wiki/index.php/Oral-History:Harry_F._Olson. See also Milton Babbitt, interviewed by Charles Fowler, “An Interview with Milton Babbitt,” *Music Educators Journal* 55, no. 3 (November 1968): 56–61, 127, 129–30, 132–33.

36. Babbitt, “Introduction to the R.C.A. Synthesizer,” 260.

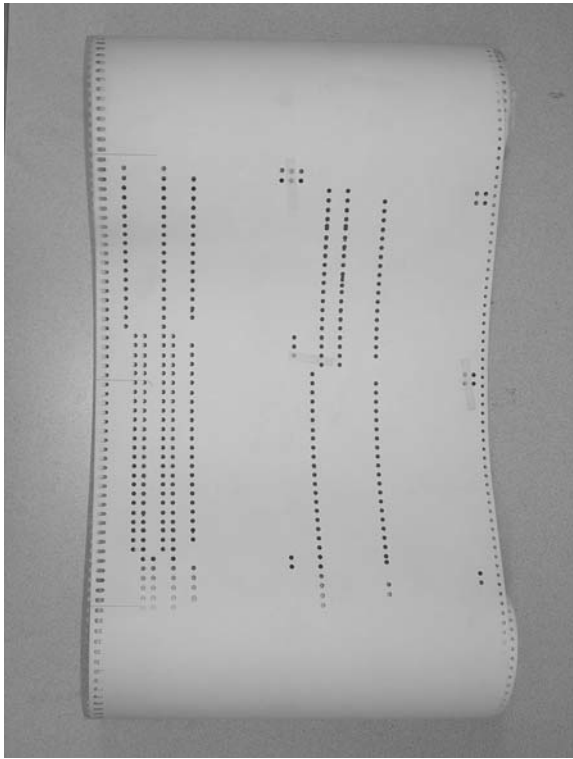


Fig. 3. Example of a punched-paper roll to control the RCA Mark II

octaves, and their mixing, allowed the construction of various harmonic spectra. In practice, though, much of the output of the synthesizer had a fairly limited timbral palette, given the claims of unlimited sound-production capabilities. It seems to be a common problem in electronic music that there is always the gap between what is theoretically possible, and what any human being actually has time, knowledge, and ability to do in sound synthesis.

RCA apparently had a notion that the synthesizer would aid in the production of popular music.³⁷ Particularly amusing are the early demo recordings, produced by RCA, of popular music selections, realized on the first RCA synthesizer, including, for example “Blue Skies” by Irving Berlin.³⁸ It is not clear whether Olson or Belar had any musical training,

37. Olson and Belar, “Electronic Music Synthesizer” (1955), 610.

38. These selections were issued as a box set of four 45 rpm extended-play discs, with a descriptive brochure, as *The Sounds and Music of the RCA Electronic Music Synthesizer*, RCA Victor 45 EP ERD-1922

although Olson in particular had done a lot of work around music and acoustics. But it is interesting to note how often the word “objectionable” comes up in their 1955 article, when describing the sounds of real musical instruments: “the *objectionable* noise of the hammer striking the string” (about piano sounds), and “bow scratch which has always been *objectionable*” (about the violin), and “the tones produced by bells . . . and xylophone are *objectionable* . . . because the strike tones are *disagreeable*. . . .”³⁹ It seems from these statements that the aesthetic of total control over sound, which was presented as the promise of the RCA synthesizer, was envisaged to be superior to the perceived messiness of music making by acoustic instruments.

But the real impact of the RCA Mark II was the ability to precisely specify pitch and rhythm, and to sequence events in time, without having to do this by tape splicing. Babbitt also reported the importance of being able to get (almost real-time) feedback on the compositional choices being made, and contrasts this with having to wait for hours or days to hear the output of early computer-generated synthesis. It was apparently possible to play with and audition parameter settings on the RCA before committing events to the “score” by punching them onto the paper rolls.⁴⁰

The RCA Mark II had a steep technological learning curve, and Babbitt ended up being the composer who worked the most on it, and was the most associated with it. Most, if not all, of his electronic works utilized the RCA synthesizer. Notable works include his *Composition for Synthesizer* (1961), *Philomel* (1964), which featured the live and recorded voice of soprano Bethany Beardslee, and *Reflections* (1975) for piano and tape.⁴¹ Luening used material generated by the Mark II in several pieces, including the *Dynaphonic Suite* (1958) and *Gargoyles for Violin Solo and Synthesized Sound* (1960). Ussachevsky, although he had traveled to work on the RCA Mark II at Princeton before it moved to the Center at Columbia, remained more interested in the classical techniques of the tape studio, although he did experiment with computer music composition some time later. Charles Wuorinen utilized material generated by the RCA, but then subjected it to further electronic manipulation, away from the synthesizer, to compose *Time's Encomium*, which was the first electronic music piece to win the Pulitzer Prize, in 1970.

Experimental (1955); also issued as a 12-inch LP. A description of the project, and the digitized recordings of these selections are available at http://www.uv201.com/Misc_Pages/rca_synthesizer.htm. At this site: “This may not have been a commercial release (note the ‘experimental’ designation) or, if it was, it saw very limited distribution.”

39. Olson and Belar, “Electronic Music Synthesizer” (1955), 608–9. Emphasis added.

40. “An Interview with Milton Babbitt,” 58.

41. A full list of Babbitt’s works that include tape is available in: Elaine Barkin and Martin Brody, “Babbitt, Milton,” *Grove Music Online*.



Fig. 4. From left to right: Otto Luening (playing an electronic organ), Vladimir Ussachevsky, and unidentified man

As the technology of electronic music advanced, the RCA was eclipsed by voltage-controlled modular synthesizers, such as models by Moog and by Buchla, which were more capable of real-time feedback, programming, and performance, and by digitally-synthesized computer music, which allowed much more specific control of parameters, although with the loss of real-time feedback, due to processing-power limitations of the computers of the time. Ultimately, the RCA synthesizer was a manifestation of a particular moment in the history of electronic music, but an important and influential one in moving that history forward.

The CPEMC, since its founding, contained a suite of tape studios and other equipment, as well as the studio housing the RCA, and documents in the archive that describe the setup of various studios in the Center trace the development of the technology of electronic music, as the studios' configurations changed. Modular synthesizers like the Moog and



Fig. 5. CP EMC personnel (ca. 1970) from left to right: Milton Babbitt, Mario Davidovsky, Pril Smiley, Vladimir Ussachevsky, Otto Luening, and Alice Shields

the Buchla are represented, as well as computer music and commercial digital synthesizers, such as the Yamaha DX7.

Many notable works of electronic music were produced at the CP EMC; the archives contain several typed discographies of the Center's output, including works such as the series of *Synchronisms* (nos. 1–6) by Mario Davidovsky for instruments and electronic sounds, *Earth's Magnetic Field* by Charles Dodge, *Laborintus II* by Luciano Berio, the electronic sounds for Edgard Varèse's *Déserts*, and many others. Work in the present day at the Center, under current director Brad Garton, is reflected in more-recent instruments such as the Yamaha Disklavier, and most especially in software, as much work in electronic music has moved on to personal desktop and laptop computers. Many of the staff and the composers working in the Center today are active programmers, authors of software, and designers of physical computing interfaces (for example,

Garton's CMIX and RTcmix programming languages, and the sound art and installation art of Douglas Repetto).⁴² The Center remains very active in the New York, U.S., and international music communities.

THE ARCHIVES

The archives of the former Columbia-Princeton Electronic Music Center (now the Columbia University Computer Music Center) are currently located in Prentis Hall, on the Columbia campus on West 125th Street. They occupy a small room on the 3d floor, without proper climate and access control. The collection has not been processed, beyond signs of various attempts over the years to organize portions of it (and any original organization that is in place). The collection has recently been deeded to the Columbia University Libraries, and planning is underway to begin the transfer of the materials to a climate-controlled location, along with preliminary work on identifying and prioritizing materials for preservation. The RCA Mark II synthesizer is still housed in the Center, although no longer working.

In 2008, I conducted a sampling survey to assess the condition of the tape reels, which form the bulk of the collection. I used the AVDb audio survey tool (software developed by Marcos Sueiro Bal for other audio surveying work at Columbia; it allows non-experts to identify and to check for signs indicating the condition of audio materials in many formats, and weighs the results to make recommendations on condition and preservation priorities).⁴³ The results confirmed an urgent need for preservation of the materials. Along with this survey of the tape reels, I also conducted a rough inventory of the documents and other materials held in the archives (table 1).

CONTENTS OF THE ARCHIVES

The archives consist of approximately 80 percent recordings, and 20 percent other documents.

The recordings, in the formats listed in table 1, include: complete works on tape (in some cases perhaps master tapes); composers' work-tapes of raw and manipulated source material; recordings of concerts of both electronic and non-electronic music (reels include the Composers' Forum, League of Composers/International Society of Contemporary Music, and Guild of Composers concerts); lectures; dubs of commercial

42. For current activities of the Computer Music Center, see "works&research" at http://music.columbia.edu/cmc/works_research.html.

43. See Columbia University Libraries, Preservation and Digital Conversion Division, "Survey Instrument for Audio and Moving Image Collections," <http://www.columbia.edu/cu/lweb/services/preservation/audiosurvey.html>.

Table 1. Rough inventory of the archives of the Columbia-Princeton Electronic Music Center

Recordings		
Open-reel tapes:	7"	2,682
	10"	2,177
Total reels:		4,859
Other formats:		
CDs + CDRs		73
DATs		430
16" sound discs		16
12" sound discs		100
10" sound discs		3
7" sound discs		8
Audiocassettes		6
Beta PCM tape		1
Mini-discs		6
VHS tapes		15
Mini-DV cassettes		42
Total, other formats:		700
Other Documents		ca. 72.5 linear feet

recordings (probably made for teaching purposes); copies of tapes made for earlier attempts at preservation; and radio broadcasts.

The other documents, which principally occupy four file cabinets, include: manuscripts, typescripts, and publications related to the Center (including documents concerning the establishment of the Center, such as the report to the Rockefeller Foundation and files on grants from the Alice M. Ditson Fund); some correspondence (mostly by Babbitt); reprints of articles on electronic music topics (organized into a lending library of folders with checkout slips); a section of documentation and clippings on activities of composers who had worked at the Center; lists of works created at the Center, discographies, and bibliographies of electronic music; music manuscripts and sketches (including a handwritten score for Babbitt's *Composition for Synthesizer*), some with annotations; ozalid reproductions of scores; printed scores; photographs; large-format slides; technical documents, manuals, and blueprints related to the RCA Mark II synthesizer (including several of the punched paper rolls used to generate sound on the machine), and to other studio equipment; studio log books; administrative records; and ephemera.

RECORDINGS OF THE COMPOSERS' FORUM CONCERTS: 1951–1975

One group of materials among the recordings is of particular interest: a series of recordings on 7" reels of the concerts of the Composers' Forum in New York, from early 1951 to the mid-1970s. The Composers' Forum concerts, started by Ashley Pettis in the 1930s, presented an important series of public performances of new music. One noteworthy feature of these concerts was the inclusion of a discussion section, during which the composers would answer questions put to them via a moderator. Melissa J. de Graaf has written an interesting article in a 2008 issue of *Notes* on the Composers' Forum concerts from 1935 (when the series began) through 1940.⁴⁴ The series went on hiatus during World War II, but was revived in 1947 under joint sponsorship of Columbia University and the New York Public Library. Otto Luening was a participant in the concerts during the 1930s. Pril Smiley, a former associate director of the Center, has indicated that the Center recorded the concerts of the Composers' Forum (sometimes transporting the heavy tape recorder to the concert's location by bicycle!). Concerts were held in McMillin Theater at Columbia, and at the Donnell Library of the NYPL, in midtown Manhattan.

The reels in the archives date from 1951 through 1975 (although, scattered reels may yet be found that could extend this date range, since the collection has not yet been methodically organized, and it is also possible that some of the later concerts were recorded on DATs and other media). Although the roster of composers represented on these tapes may lack the breadth of the concerts from the 1930s, there are several important composers represented, among them George Antheil, Milton Babbitt, Jack Beeson, George Crumb, Mario Davidovsky, Luigi Dallapiccola, Irving Fine, Kenneth Gaburo, Leo Kraft, Ezra Laderman, George Perle, Daniel Pinkham, George Rochberg, Ezra Sims, Harvey Sollberger, Carlos Surinach, and Charles Wuorinen. Virgil Thomson served as moderator for several concerts, and other composers also took that role.

Another feature of these concerts that is of interest are the performers, or in some cases, composers performing their own works; examples of performers represented include Bernard Greenhouse, Carlos Surinach, Bethany Beardslee, Gilbert Kalish, Walter Trampler, David Tudor, Russell Sherman, George Rochberg, Paul Jacobs, Leontyne Price, Jan DeGaetani, Bertram Turetzky, Robert Starer, and the Juilliard String Quartet.

44. Melissa J. de Graaf, "The Records of the New York Composers' Forum: The Documentary Motive and Music in the 1930s," *Notes* 64, no. 4 (June 2008): 688–701.

With the assistance of a volunteer, we began working from a card-file index located in the archives that listed the contents of several of the reels in the Composers' Forum concerts, transcribing the content into a spreadsheet. Thankfully, some detail-minded person had kept this index up, through about 1967, as many of the reels lack program notes, or any kind of contents note on the container. The index cards listed the contents of the reels for particular concert dates, but did not have listings by composer, for example. From the card-file index, we were able to compile a spreadsheet of the reel numbers, concert dates, composers, works (some with movements and timings), performers, venues, and other information. The reels from 1967 forward are being checked for program notes, and that information will be captured where possible.⁴⁵

VALUE TO RESEARCHERS

The archives of the CPEMC present an interesting range of materials that will be of value to researchers. Some possible areas of interest include: the history of electronic music; the individual composers working at the Center, including materials such as music manuscripts, sketches and score annotations demonstrating working methods; the transcripts of oral histories taken from staff of the Center; the contacts that the Center maintained with other studios and centers for electronic music; the RCA synthesizer and RCA's work and research in electronic music; technical aspects and manuals of electronic musical equipment used by the Center; the Composers' Forum concerts from 1951 through mid-1970 (especially as preservation and indexing continues; a partial index is available now from the author); recordings of the Guild of Composers, and the League of Composers/International Society for Contemporary Music; arts funding (documents on the Rockefeller Foundation and Ditson Fund grants); and the teaching work of the faculty at the Center. As mentioned earlier, Robert Gluck has published an article on the role of the Center in the education of international composers, to list one example of research that has drawn on the materials in the archives.

The value of the archives will, of course, grow in proportion to the physical and intellectual access that can be provided. Preservation of the fragile audio recordings is a pressing priority. At present, preservation

45. The New York Public Library has a collection of programs from the Composers' Forum concerts 1937–67 (<http://www.nypl.org/archives/2974>), so perhaps some of the gaps can be filled in from their copies, if the reels in the archives lack programs or contents notes. There is apparently also another collection of correspondence and administrative documents relating to the Composers' Forum, 1935–65 (mentioned at <http://www.nypl.org/locations/tid/55/node/35708>). Since NYPL was a co-sponsor of the Composers' Forum concerts, it is tantalizing to imagine that they might have copies of any missing concert dates with missing reels; however, my inquiries so far have indicated that they do not hold tapes of any of the Composers' Forum concerts.

work on about 150 hours of content from the reels of the Composers' Forum concerts is underway, and it is to be hoped that much more will follow. It would also be valuable to capture whatever oral histories can still be obtained from participants on the work of the Center, to help identify and to broaden understanding of materials in the archives.

ABSTRACT

This article presents a brief history of the Columbia-Princeton Electronic Music Center (CPEMC), and an overview of its archives. The Center was one of the earliest and most influential centers of electronic music in the United States, especially during the decade or so after its founding. Established in 1959, assisted by a grant from the Rockefeller Foundation, it was a joint venture between Columbia and Princeton Universities, directed by composers Otto Luening and Vladimir Ussachevsky (representing Columbia), and Milton Babbitt and Roger Sessions (representing Princeton). The Center was active in supporting the work of many domestic and international composers wishing to work in electronic media, and was the locus for the composition of many important and influential works of electronic music. The Center also housed the RCA MKII synthesizer, the first programmable music synthesizer. The archives of the Center consist of roughly 80 percent sound recordings, principally reel-to-reel tapes, including original recordings of the concerts of the Composers' Forum from 1951 to the mid-1970s. The remaining holdings include documents; manuscripts; technical manuals and blueprints, music manuscripts, sketches, and scores; bibliographies and discographies; photographs; slides; a small amount of correspondence; administrative records; and ephemera. The Center is still active today, as the Columbia University Computer Music Center. The archives have been recently deeded to the Columbia University Libraries, and some processing and preservation work has commenced.

