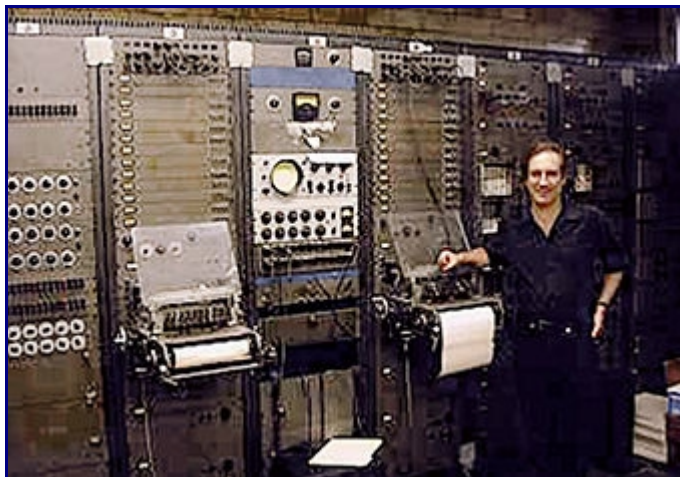


RCA Mark II Sound Synthesizer

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RCA Mark II

The **RCA Mark II Sound Synthesizer** (nicknamed *Victor*) was the first programmable electronic [synthesizer](#) and the flagship piece of equipment at the [Columbia-Princeton Electronic Music Center](#). Designed by Herbert Belar and [Harry Olson](#) at [RCA](#), it was installed at [Columbia University](#) in 1957. Consisting of a room-sized array of interconnected [sound synthesis](#) components, much of the design of the machine was contributed by [Vladimir Ussachevsky](#) and [Peter Mauzey](#). The Mark II gave the user more flexibility and had twice the tone oscillators of its predecessor, the Mark I.^[1] The synthesizer was funded with a large grant from the [Rockefeller Foundation](#).

Earlier 20th century electronic instruments such as the [Telharmonium](#) or the [theremin](#) were manually operated. The RCA combined diverse electronic sound generation with a [music sequencer](#), which provided a huge attraction to [composers](#) of the day, many of whom were growing tired of creating electronic works by splicing together individual sounds recorded on sections of [magnetic tape](#). The RCA Mark II featured a fully automated [binary](#) sequencer using a [paper tape](#) reader analogous to a [player piano](#), that would send instructions to the synthesizer, automating playback of the machine.^[2] The synthesizer would then output sound to a synchronized [shellac](#) record lathe next to the machine.^[media 1] The resulting recording would then be compared against the punch-tape score, and the process would be repeated until the desired results were obtained.

The sequencer features of the RCA were of particular attraction to [modernist](#) composers of the time, especially those interested in writing [dodecaphonic](#) music with a high degree of precision. In fact, the RCA is cited by composers of the day as a contributing factor to the rise of musical [complexity](#), insofar as it allowed composers the freedom to write music using [rhythms](#) and [tempo](#)s that were impractical, if not impossible, to realize on [acoustic instruments](#). This allure of precision as a mark of [aesthetic](#)

progress (played out even today with contemporary [computer](#)-based sequencers) generated high expectations for the Mark II, and contributed to the increased awareness of electronic music as a viable new art form. An album featuring the instrument and its capabilities was issued by RCA (LM-1922) in 1955. [\[media 2\]](#)

The synthesizer had a four-note variable [polyphony](#) (in addition to twelve fixed-tone [oscillators](#) and a [white noise](#) source). The synthesizer was very difficult to set up, requiring extensive [patching](#) of [analog](#) circuitry prior to running a score. Little attempt was made to teach composition on the synthesizer, and with few exceptions the only people proficient in the machine's usage were the designers at RCA and the engineering staff at Columbia who maintained it. [Princeton University](#) composer [Milton Babbitt](#), [\[3\]](#) [\[media 3\]](#) though not by any means the only person to use the machine, is the composer most often associated with it, and was its biggest advocate ([Igor Stravinsky](#) was rumored to have [\[vague\]](#) suffered a [heart attack](#) upon hearing Babbitt's glowing description of the synthesizer's capabilities). [\[citation needed\]](#)

A number of important pieces in the electronic music [repertoire](#) were composed and realized on the RCA. Babbitt's *Vision and Prayer* and *Philomele* both feature the RCA, as does [Charles Wuorinen](#)'s 1970 [Pulitzer Prize for Music](#)-winning piece *Time's Encomium*. [\[media 4\]](#) [\[4\]](#) Over time it fell into disrepair, and it remains only partly functional. The last composer to get any sound out of the synthesizer was [R. Luke DuBois](#), who used it for a thirty-second piece on the [Freight Elevator Quartet](#)'s *Jungle Album* in 1997.



Closeup of *Victor* that lives up at Columbia [Computer Music Center](#)

Though part of the history of electronic music, the RCA was hardly ever used. Made to [United States Air Force](#) construction specifications (and even sporting a USAF [oscilloscope](#)), its operating electronics were constructed entirely out of [vacuum tubes](#), making the machine obsolete by its tenth birthday, having been surpassed by more reliable (and affordable) [solid state](#) modular synthesizers such as the [Buchla](#) and [Moog modular synthesizer](#) systems. It was prohibitively expensive to replicate, and an RCA Mark III, though conceived of by Belar and Olsen, was never constructed. Nor was RCA long for the synthesizer business, prompting Columbia to purchase enough spare parts to build two duplicate synthesizers. [\[citation needed\]](#)

Much of the historical interest of the RCA, besides its association with the Electronic Music Center, comes from a number of amusing (and possibly apocryphal) stories told regarding the synthesizer. One common story is that Ussachevsky and [Otto Luening](#) effectively [conned](#) RCA into building the machine, claiming that a synthesizer built to their specifications would "replace the [symphony](#) orchestra," prompting RCA executives to gamble the cost of the synthesizer in the hopes of being able to eliminate their ([unionized](#)) radio orchestra. The RCA is sometimes (falsely) attributed as the direct cause of the [New York City Blackout of 1977](#), having been powered on moments before the lights

went out.^[*citation needed*]

In 1959, the Columbia-Princeton Electronic Music Center acquired the machine from RCA. At Columbia-Princeton, Milton Babbitt used it extensively. His tape and tape and instrument pieces were realized using the RCA Mark II, including his masterpiece *Philomel*, for synthesized sound and soprano.

^[5]



Victor in 2007

The RCA is still housed at the Columbia [Computer Music Center](#) facility on 125th Street in [New York City](#), where it is bolted to the floor in the office of Professor [Brad Garton](#).^[*citation needed*]

References

1. [Jump up ^ "RCA Mark I and Mark II Synthesizers". *IEEE Global History Network*. *IEEE*. 2012. *The success of the Mark I led to the creation of the Mark II, which had twice as many tone oscillators and gave the composer more flexibility.* External link in |work= \(\[help\]\(#\)\)^{\[*verification needed*\]}](#)
2. [Jump up ^ Olson & Belar 1955](#)
3. [Jump up ^ Gross, Jason \(April 2000\). "Milton Babbitt talks about "Philomel", *OHM- The Early Gurus of Electronic Music*". *Perfect Sound Forever* \(online magazine\) \(April 2000\). *Still going strong at age 84, renowned composer Milton Babbitt was a founding member of the Columbia-Princeton Electronic Center \(see \[related article\]\(#\)\) where he created "Philomel," one of the first compositions of the synthesizer \(available on New World Records\).*](#)
4. [Jump up ^ "Wuorinen's story of Time's Encomium". *Art of the States*. Archived from \[the original\]\(#\) on 2012-07-16.](#)
5. [Jump up ^ "RCA Mark II". *Synthmuseum.com*. ; based on Forrest, Peter \(1996\). *The A-Z of Analogue Synthesizers. N-Z Pt. 2*. Devon, England: *Susurreal Publishing*. \[ISBN 978-0-95243770-3\]\(#\). , copyright 1994 Peter Forrest; with additional help from Eric Chasalow](#)

Media

1. [Jump up ^ 1950 early electronic synthesizer: 'This is music with a strictly electronic beat'. *YouTube \(Clips & Footage\)*. External link in |publisher= \(\[help\]\(#\)\) "Electronic Music Synthesizer, 'No instruments necessary!' "This is music with a strictly electronic beat". *Man demonstrates synthesizer, bit of an anticlimax as it plays 'Camptown Races'.*](#)
2. [Jump up ^ Various \(1955\). *The Sounds And Music Of The RCA Electronic Music Synthesizer* \(Vinyl LP\). US: RCA Victor Red Seal. LM-1922.](#)
3. [Jump up ^ Various \(2005\). *OHM+: The Early Gurus Of Electronic Music* \(DVD\). US: Ellipsis Arts.](#)

DVD 3694.

Babbitt describes the acquisition and use of the machine in an interview segment.

4. [Jump up ^](#) Charles Wuorinen (1969). *Time's Encomium (For Synthesized & Processed Synthesized Sound)*. Nonesuch Records commission. H-71225.

Bibliography

Overall

- Olson, Harry Ferdinand (1967). *"Electronic Music"*. *Music, Physics and Engineering*. Courier Corporation. pp. 408–448. ISBN 978-0-486-21769-7.

See "[D. Description of an Electronic Music Composing Machine Employing a Random Probability System](#)" for Olson-Belar composing machine (c.1950), and "[10.4.RCA ELECTRONIC MUSIC SYNTHESIZER](#)" for RCA Mark I (c.1955) & Mark II (c.1958).

- Holmes, Thom (2012). *"Early Synthesizers and Experimenters"*. *Electronic and Experimental Music: Technology, Music, and Culture* (4th ed.). Routledge. pp. 176–190. ISBN 978-1-136-46895-7.

See also excerpt of pp. 142–157 from the [3rd ed. in 2008](#) (ISBN 978-0-415-95781-6).

Olson-Belar composing machine (circa 1950)

- [US application 2855816](#), Harry F. Olson; Belar Herbert, "Music Synthesizer", published October 14, 1957, assigned to RCA Corp. (filed December 26, 1951)
- [Olson, Harry F. \(1952\)](#). *Musical Engineering*. New York: [McGraw-Hill](#).

Note: source of "[Figure 6.1 Schematic for the Olson-Belar composing machine ...](#)" on [Homes 2012](#), p. 179.

RCA Electronic Music Synthesizer, Mark I (circa 1955)

- Olson, Harry F.; Belar, Herbert (May 1955). *"Electronic Music Synthesizer"* (reprint). *Journal of the Acoustical Society of America* **27** (3): 595–612. doi:10.1121/1.1907975. The electronic music synthesizer is a machine that produces music from a coded record. The coded record, is produced by a musician, musical engineer, or composer with a fundamental understanding of the composition of sound. The electronic music synthesizer provides means for the production of a tone with any frequency, intensity, growth, duration, decay, portamento, timbre, vibrato, and variation. If these properties of a tone are specified, the tone can be completely described. ...

Note: a paper about RCA Electronic Music Synthesizer, also known as Mark I, which was unveiled in 1955 and housed at Princeton University (according to [Holmes 2012](#), pp. 179).

RCA Mark II Electronic Music Synthesizer (circa 1958)

- Olson, Harry F.; Belar, Herbert (1961). "Aid to music composition employing a random probability system". *Journal of the Acoustical Society of America* **33**: 1163.

Computer compositions

- *Hiller, LeJaren (1970). "Music composed with computers—a historical survey". In Harry B. Lincoln (editor). The Computer and Music. Ithaca, N.Y.: Cornell University Press. pp. 42–96.*

Note: a brief summary of work by Olson and Belar is given, and their "composing machine" is described as a prototype of RCA Electronic Music Synthesizers. (according to [Lincoln 1972](#), p. [75](#)).

- *Lincoln, Harry B. (1972). "[Uses of the Computer in Music Composition and Research](#)". In Morris Rubinoff. *Advances in Computers* **12**. Academic Press. pp. [73–114](#). ISBN [978-0-08-056644-3](#).*

External links

- ["The RCA Synthesiser"](#). *120 Years of Electronic Music*.
- *Milton Babbitt (1968–1971). [Occasional Variations](#). YouTube (music)*. , Realized on the RCA Mark II Sound Synthesizer, 1968–1971
- *[Garnet Hertz \(2016\). \[RCA Mark II Sound Synthesizer: the first programmable electronic synthesizer\]\(#\). Vimeo \(music\)](#)*. , Video of the RCA Mark II Synthesizer at Columbia University