
*New Musical Instruments
in the Computer Age:
Amplified Performance Systems and
Related Examples of Low-level Technology*

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There is a very natural tendency to view recent history from today's viewpoint rather than in its true chronology. Where technology is concerned, it is clear that each successive stage of its creative application has been almost entirely dependent on scientific and technological advances, although there are a few instances where an artist has been 'ahead of his time' by using more primitive resources to achieve with difficulty something that subsequent developments made much more straightforward. A brief historical outline of the relationship between music and electrical technology is thus helpful in establishing the background for this chapter (see also Davies 1984).

During the second half of the nineteenth century the application of electricity and electromagnetism to all areas of communications and sound grew very rapidly. Initially the technology was primarily digital, but changed to being primarily analogue, especially as a result of the two most significant inventions in the field (both of which occurred in the mid-1870s) – the phonograph and the telephone. A century later, in our own time, it became necessary for the cycle of alternation between digital and analogue to

continue with a change from analogue electronics back to a more sophisticated digital form. It is likely that at some time in the not-too-distant future a new super-analogue will, in turn, become essential for opening up new areas for further development – or else our present forms of digital will be expanded to incorporate analogue on equal terms.

The first serious applications of electricity to the production of musical sounds date from around the 1880s; they involved early forms of electric piano that used special microphones, which we would now call contact microphones. These electroacoustic instruments were followed during the 1890s by the earliest instruments to produce sounds electromechanically (based on technology first devised some fifty years earlier), in which the varying electrical voltages created in an electromagnet by the rotation of a nearby toothed or profiled disc or cylinder were used to activate a loudspeaker. Such instruments (including the Telharmonium and parts of the contemporaneous Choralcello, both of which took around a decade to plan and construct) were enormous, and required one or more rooms of machinery that must have resembled small power stations. Only thirty years later, in the original Hammond organ, similar mechanisms were completely contained inside the instrument's console.

It is the third category of sound generation that has become of greatest significance: to distinguish it from the others it might be called 'fully' electronic. It did not come into being until around 1920, since it depended on the invention of the electronic valve (1904–6) and its commercial production during the First World War. The valve also formed the basis of the electronic amplifier, which – together with appropriate loudspeakers – was perfected in the mid-1920s, immediately becoming an essential feature of all instruments that were based on electrically or electronically generated sounds, as well as of all electrical sound recording and broadcasting equipment.

At this juncture it is important to establish the precise meaning of the terminology used so far. I differ from some of my colleagues who refer to all music reproduced over loudspeakers as 'electroacoustic'; for a variety of reasons I prefer the term 'electronic'. Typically, neither is completely accurate. The three types of instruments can be defined in the following way (Davies 1988):

electroacoustic	instruments whose sound sources are derived from vibrating objects, equivalent to acoustic instruments, but influencing an electrical circuit by means of special transducers (microphones) and often (deliberately) producing a minimum of acoustic sound.
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