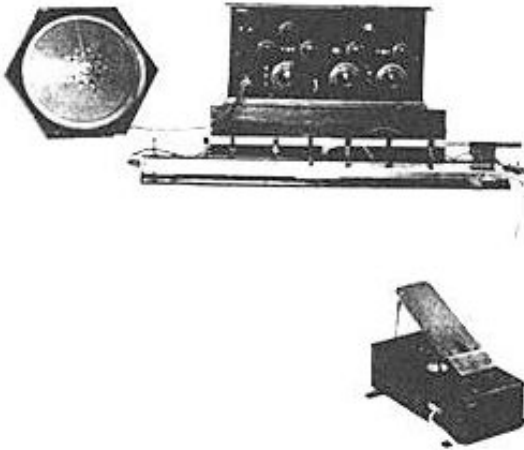


120 Years of Electronic Music

[Electronic Musical Instrument 1870 - 1990](#)

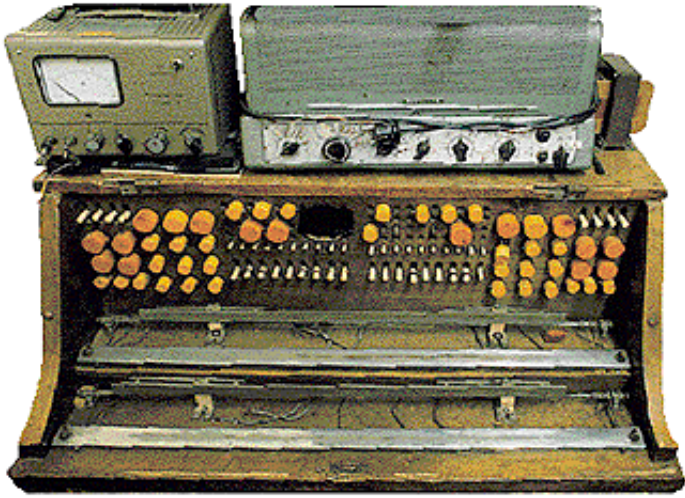
The Trautonium (1930)

The Trautonium was developed by the electrical engineer Dr Freidrich Adolf Trautwein (*b Würzburg 1888, Germany; d Düsseldorf 1956*) and first exhibited in Germany in 1930. The domestic version of the Trautonium was manufactured and marketed by Telefunken between 1932 and 1935. A number of composers wrote works for the instrument including Paul Hindemith who learnt to play the Trautonium and produced a 'Concertina for Trautonium and Orchestra' as well as Höffer, Genzmer, Julius Weismann and most notably Oskar Sala who became a virtuoso on the machine and eventually took over the development of the Trautonium producing his own variations- the 'Mixtur-Trautonium', The 'Concert-Trautonium' and the 'Radio - Trautonium'. Oskar Sala has continued to work with the Trautonium to the present day. Trautwein also produced an 'Amplified Harpsichord'(1936) and 'Electronic Bells'(1947), after the second world war Trautwein worked in Paris on aviation research and then set up a school for recording engineers in Düsseldorf (1950), Trautwein produced his last instrument the ['Elektronische Monochord'](#) in 1952.



An early model of the Trautonium with pedal board and loudspeaker c1930

The Original Trautonium had a fingerboard consisting of a resistance wire stretched over a metal rail marked with a chromatic scale and coupled to a neon tube oscillator. The performer on pressing the wire touches the rail and completes the circuit and the oscillator is amplified via a loudspeaker. The position of the finger on the wire determines the resistance controlling the frequency and therefore controls the pitch of the oscillator. The Trautonium had a three octave range that could be transposed by means of a switch. An additional series of circuits can be added to control the timbre of the note by amplifying the harmonics of the fundamental note, non harmonic partials can also be added by selective filtering. This unique form of subtractive synthesis produced a tone that was distinctive and unusual when compared to the usual heterodyning valve instruments of the 1920-30's. The foot pedal of the machine controlled the overall volume.



Dr. Friedrich Trautwein's "Trautonium" showing the fingerboard wires and the metal rails.



Oskar Sala and the "Mixtur-Trautonium"



The first Trautonium:(left to right)

Paul Hindemith, Oskar Sala,

Dr Friedrich Trautwein.1929

A later developments of the Trautonium by the Trautonium virtuoso and composer Oskar Sala was the Mixturtrautonium. The Mixturtrautonium used the same technology as the original Trautonium but in later models (1960's) used semi-conductors instead of triode lamps to give a more precise subharmonic frequency range. The first version, the 'Concert Trautonium' - using Thoratron electric tubes from AEG, was ready in 1936 for Harald Genzmer's "Konzert für Trautonium und Orchester". After the war Sala established a workshop for film music production in Berlin where he recorded music for Hitchcock's "The Birds" and continues to the present day to compose and record music.

The essential design principles of the Trautonium were retained in the development of the semi-conductor version of the Mixturtrautonium; sound production on the basis of

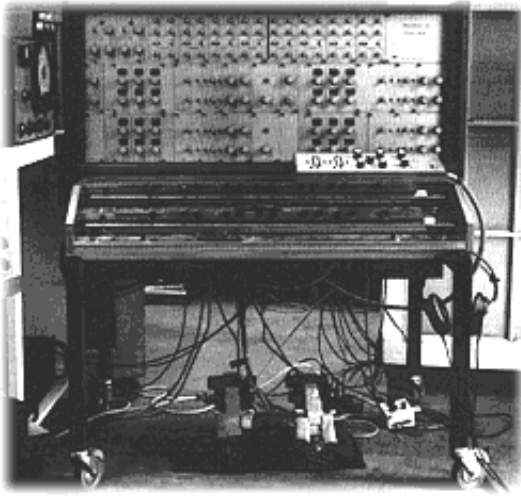
subharmonic mixture, and the method of playing with two string manuals. The latter are made of wire-covered catgut strings which act as variable resistors. according to the position at which they are pressed against the contact rail beneath them, they control the frequencies of the electronic sound generators. when the finger glides over the string a continuous glissando results over the entire tonal region which has just been tuned up.

Micro-tonal intervals could be produced on the Mixturtrautonium. To ensure accurate contact with the notes leather covered sprung and moveable metal tongues are added to each string. In a c-tuning they are located above the notes c,d,g and a in each octave. Unlike with a vibrating string, the gradation of the electrical string manual is linear and not exponential so that all octave have the same finger range.



The Mixturtrautonium showing the resistance wires with leather thongs.

"....A clear advantage of the semi-conductor Trautonium is the absolute precision in sub harmonic frequency division. Each string controls the frequency of a top oscillator. this operates parallel four dividers who's signals in their interrelationship results in a mixture. each divider can be switched to one of a maximum of 24 values (20 in the case of the tube version) Three settings can be pre-selected which correspond to the sideways switch positions of the trautonium pedal. additionally to the frequency of the top oscillator a simultaneously working frequency ("neighbouring tone") in a freely determinable interval can be produced, which alternatively is available for one of the dividers. In this way it is possible, for instance to make a major characteristic from the minor chord pattern of the sub harmonic series. The square wave-shaped basic signal of a divider initially enters a transformer which turns it into a saw tooth signal. Together with noise proportions which can be admixed, the latter is passed to a format filter which can impress on this raw material the vowel sounds u,o,a,e,i or gliding transitions. Each of the four mixture dividers has its own filter."



The Concertrautonium

"The next processing step is taken by the channel amplifiers with the four sound components being adjusted to each other in volume. what is known as the "percussion unit" produces an envelope with adjustable values for "attack" and "decay" by means of which via a channel amplifier percussive sound developments can be produced. the mixture formed from the four channels goes to the master amplifier whose intensity during performance is influenced by the pedal pressure as well as the liquid resistor beneath the manual"

Nikolaus Heyduck "Das musikinstrument 1/90"

Recordings of Oskar Sala:

- *"Subharmonische Mixturen".CD . Erdenklang (Address: Erdenklang.In Der Habbecke 18,59889 Eslohe,Germany)*
- *"My Fascinating Instrument" Oskar Sala. Fax records. ps08/76*
- [Sound sample \(1\)](#)
- [Sound sample \(2\)](#)
- [Sound sample \(3\)](#)
- [Sound sample \(4\)](#)

Sources: