

A
BRIEF SUMMARY OF THE
EARLY HISTORY OF ANIMATED SOUND ON FILM
(FROM AVAILABLE INFORMATION)

Norman McLaren
August 16, 1952.

Before the general adoption of the sound film in 1927, the possibility of the synthetic production of sound on film was already foreseen. In 1922, for instance, Moholy-Nagy discussed some of its potentialities in articles published in Holland and Germany. (1) Later, Ernest Toch, the German theoretician suggested the direct writing of sound without traditional performer,

The first body of investigation and practical work seems to have been done in Russia at the Scientific Experimental Film Institute in Leningrad, where in 1930 A.M. Avzaamov, a musical theorist and mathematician worked with the animators N.Y. Zhelinsky and N.V. Voinov on the "ornamental animation of sound". Later this work was carried on at the Leningrad Conservatory by G.M. Rimsky-Korsakoff and E.A. Scholpo.

From a study of the available papers, (2) their work appears to have been fairly extensive and along a number of different lines.

Avzaamov used a frame-by-frame method with a standard animation camera. Geometric figures such as rectangles, triangles, trapezes, ovals, parabolas, ellipses, etc. were the basic units for his sound waves. Pitch was controlled either by bringing the camera closer to or further away from drawings of these shapes, or by preparing separate drawings for each pitch.

Volume was controlled by varying the exposure; harmony or counterpoint by multiple exposures, or by sub-dividing the sound track lengthwise into sections, or by the very rapid alternation of several tones; portamento by a rapid series of micro-tones.

Avzaamov, who had set as his goal the freeing of his music from the restrictions of the 12-tone tempered scale, and the creation of new tonal systems assimilating many of the scales of the traditional folk music of the Eastern and Southern Republics, achieved very accurate control over pitch and volume; his range of timbres was more limited; the fact that he used geometric forms like triangles and rectangles indicates he was using an empirical approach to tone-quality. He was not searching for complete flexibility in timbre, but rather for a limited number of new tone qualities, arising naturally from simple graphic shapes.

(1) "de Styl" July 1922, "Der Sturn" November 1922.

(2) S. Bvgoslavski on "Music and Sound in Animated Films", in the publication "The Animated Film", printed by Kinophotoizdat, 1936.

Soon afterwards Sholpo and Rimsky-Korsakoff began the oscillographic analysis of natural sounds, and this in turn led to the building up of the music for a film (3) by the assembling of small units of film, each bearing separate tones, into an edited whole, of music and sound effects.

Around the same time, in Moscow, B.A. Yankovsky developed a system of animated sound in which he abandoned the frame-by-frame shooting of drawings on a standard animation camera in favor of continuously moving patterns (obtained from rotating wheels with cog patterns).

Animator N. Voinov's system was said to be the most practical of all the soviet animated sound technique; he had a library of 87 drawings, graded in semitones covering slightly over seven octaves of the 12 tone equally-tempered chromatic scale, with a fixed tone quality of great purity. With this he produced an interpretation of Rachmaninoff's "Prelude in C Sharp Minor", and Schubert's "Moment Musical".

Almost simultaneously with the soviet experiments, there was in Germany a Munich electrical engineer called Rudolph Pfenninger working on his own system of animated sound. (4) His researches seem to have been done quite independently from the Russians.

Pfenninger's method was rather similar to Voinov's and Avzaamov's. He had a library of cards each bearing the drawing of a single pitch, graded in semitones over a wide pitch range. In these drawings the basic units for sound waves were sine-curves and saw-tooth forms (using variable area); they were therefore not so arbitrarily chosen but were related to natural soundwave forms. To control volume he used variations in the amount of exposure (variable density).

Around 1932 he produced an interpretation of Handel's "Largo", a series of musical compositions as played by various musicians, and the musical sound track for an animated cartoon film. He achieved great control over dynamic nuances. His method of making animated sound was clearly shown in a documentary film made in the early thirties called "Toenende Handschrift".

(3) "The year 1905 in Bourgeois Satire".

(4) See the magazine "Filmtechnik", Nov. 12, 1952.

About this same time, also in Germany, the Fishinger Brothers in Berlin were photographing geometric shapes on the sound track, and I. Moholy Nagy was boldly using alphabetical letters, finger prints, and people's profiles as the basic graphic material for sound waves.

In England the film maker Jack Ellit experimented along lines similar to Pfenninger, and in 1933 pioneered in drawing sound directly on the celluloid without the use of a camera.

In the U.S.A. there has never been either on the part of the government or the large film industry any interest in the possibility of this kind of sound, and it was only during the later forties that private individuals seem to have taken it up.

In California, the Whitney Brothers have developed a system differing in principle from European systems. It depends on the building up the basic sound waves by the physical swinging of pendulums (which have a sine-wave motion); the movement of the pendulums (several of which may be added together to produce the fundamental and overtones of a note) are made to operate a shutter in front of a light source, the fluctuations of which are recorded on film. Their approach is therefore more radical. It has been applied in a number of their abstract films.

The sound track is made mechanically by linking together twelve pendulums of various lengths by means of a fine steel wire attached to an optical wedge. This optical wedge is caused to oscillate over a light slit by the motion of the pendulums, producing a variable-area type of sound track. The pendulums can be operated together in any combination, or separately. The frequency of each can be adjusted or tuned to conform to any kind of scale by adjustment of a sliding weight. Through the choice of pendulum lengths and driven speeds the full range of audio frequencies can be recorded. No actual sound is involved in recording the wave patterns generated by the pendulums, since these move at subsonic frequencies. Only when the resultant film is projected at regular sound-projection speed is sound produced.

In London, England, it is said that in recent years C.E. Buckle has worked out a system of synthetic sound.

In Ottawa, under Canadian government sponsorship, the writer has developed a system of animated sound. In general principle it is very little different from the Voinov and Pfenninger system; however, a number of refinements have been incorporated, especially in relation to the contouring of tones, and the method has been streamlined to a point where it has become a simple and economic operation.