

Aug. 11, 1942.

H. K. MARKEY ET AL
SECRET COMMUNICATION SYSTEM

2,292,387

Filed June 10, 1941

2 Sheets-Sheet 2

Fig. 7.

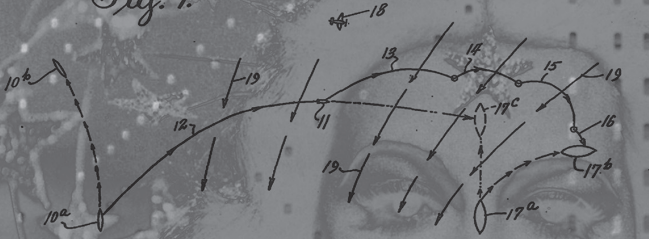
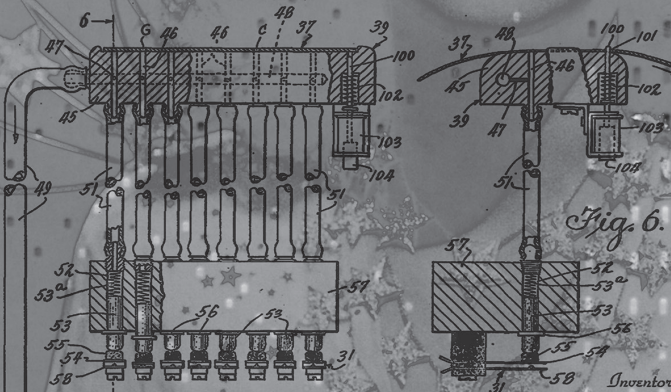
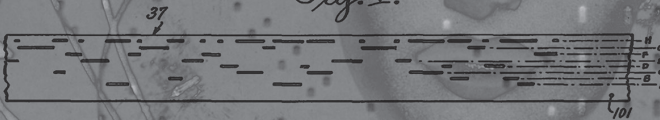


Fig. 4.



Aura Satz, Impulsive Synchronisation preparatory sketch, 2018, © and courtesy the artist

AURA SATZ Impulsive Synchronisation

HAYWARD GALLERY PROJECT SPACE
Friday 22 March – Sunday 26 May
Free

THE
REST
IS
NOISE

Inspired by Alex Ross' book *The Rest Is Noise*



Supported using public funding by
ARTS COUNCIL
ENGLAND



Impulsive Synchronisation, a work realised especially for the Hayward Project Space, centres on the invention of ‘frequency-hopping’, patented in 1941 by Hollywood star Hedy Lamarr and composer George Antheil. Their wartime ‘Secret Communications System’ drew on Antheil’s unsuccessful attempt to synchronise 16 pianolas in his 1924 avant-garde masterpiece *Ballet Mécanique*. It has since become the basis for today’s spread-spectrum technology, widely used in wireless telephone and wi-fi technology. In her new film and sound installation, Aura Satz refers to these technologies in order to explore visual, musical and data notation, as well as its encryption, synchronisation, and decipherment.

Background notes

‘Secret Communications System’

In June 1941, Hedy Lamarr and George Antheil submitted their application to patent a new ‘Secret Communications System’, which was granted to them the following year. In a bid to help the war effort, they had devised a system of ‘frequency-hopping’ to protect radio-controlled torpedoes from enemy jamming or interference, by synchronising frequency changes in transmitter and receiver. They suggested the use of a mechanism similar to pianola (player piano) rolls to synchronise rapid changes between 88 frequencies (the number of keys on a piano). The idea of ‘frequency-hopping’ was not implemented by the U.S. military until 1962.

Hedy Lamarr (1913 – 2000)

Born in Vienna, Austria, Hedy Lamarr was an international film star renowned for her beauty and came to prominence for her role in the controversial 1933 Czech film *Ecstasy*. The same year she married Austro-fascist arms dealer Fritz Mandl, through whom she gained knowledge about military weaponry technology, before fleeing to America in 1937. It was only in 1997 that she was properly recognised as the co-inventor of ‘frequency-hopping’.

George Antheil (1900–1959)

George Antheil was an American avant-garde composer, pianist, writer and inventor. Pursuing a career as a concert pianist in Paris, he developed a reputation for performances using modern industrial and mechanical sounds in unusual arrangements. In 1924 he composed a score which called for pianolas, airplane propellers, sirens and bells, originally intended to accompany Fernand Léger’s film *Ballet Mécanique*.

Aura Satz talks to Stephanie Rosenthal, Chief Curator, Hayward Gallery

Stephanie Rosenthal: What was your interest in using Hedy Lamarr and George Antheil’s invention as a starting point for *Impulsive Synchronisation*?

Aura Satz: I am interested in inhabiting the unstable, uncertain moments of technologies on the cusp of invention. Inventions are often an amalgam or hybrid of other technologies – in Lamarr and Antheil’s case, perforated paper of pianola rolls, radio-controlled torpedoes, etc. A patent text or drawing is somewhat hermetic, at once specific and open enough to disclose the invention, but not to allow someone else to steal it. It needs to be vague to encompass its potential future developments and applications. An idea that is patented is not necessarily yet worked out, nor put into practice or even used. I am repeatedly drawn to exploring texts, notation systems, languages or codes which are not quite fixed, only just surfacing, hovering between noise and signification, interference and meaning, abstraction and the figure. To me this is the most appropriate way of approaching all texts, as a kind of code which is unfixed in its reading, like a visual score, open to a plurality of interpretations, and very much in tune with the notion of sharing voices and authorship. The collaborative aspect of Lamarr and Antheil’s invention is fascinating, the fact that their authorship

is merged and blurry, and their respective areas of specialisation remain unclear (though Antheil no doubt brought his knowledge of pianolas to the project).

I was also attracted to the principle of synchronicity in their invention, and the jamming of the signal, as well as potential slippages into asynchronicity. The patent describes 'a secret communication system employing a pair of synchronous records, which change the tuning of the receiving and transmitting apparatus from time to time.' Frequency-hopping suggests multiple channels of communication, where the pattern of tuning from one to another is continually shape-shifting. This de-stabilisation of linear communication is also at the heart of any method of encryption.

SR: You have created other works which have female inventors at their core. What is the source of this interest?

AS: I want to put women back into the history of technology. I like those inventive applications of technology which allow for paradigm shifts in our philosophical understandings of inscription, writing, communication, and it is for the most part the unlikely candidates who do the most poetic thinking around this.

SR: Where does your interest in science and technology come from?

AS: In my works I am not aiming to illustrate or demonstrate scientific principles, as much as point to a mode of perceptual engagement, and perhaps make the familiar unfamiliar through an estranged wonderment. Philosophical toys, scientific instruments and technological devices present the object, its technique and its perceptual effect as all closely inter-related and, even if you don't quite understand the physics of the phenomena, some kind of sensory revision takes place and a new kind of knowledge can emerge.

I like to spend time prying apart technologies, looking inside them not so much to break them but rather to see

them afresh, from different angles, and providing new readings, new associations and metaphorical qualities. It is important to look into moments when things don't quite fit, are slightly out of synch (with their time, historically or linguistically), where sound and image are at a productive discrepancy, occasionally dissonant. Sometimes this can lead to a heightened awareness of the fact that you are watching/listening.

SR: You seem here to move into installation – creating sound, image and sculpture. Why did you make this shift from more straightforward film?

AS: Film is still at the core of my practice... I like to create patterns of looking and hearing, and the moving image does this very effectively. But I also need to explode the film into other modes of seeing and hearing. I want to create works that suggest a certain physical, perceptual perplexity or hypnotic pull, but also awaken the body into a focussed state of attention, making sense using the senses. In *Impulsive Synchronisation* the immersive qualities are conveyed by the light patterns created by the scrolling pianola screen, and the semi-flicker effect of the various conflicting light sources (projector, torch, lamp), which are communicating with each other, sometimes in vaguely recognisable Morse-code patterns, other times randomly, disrupting one another's decipherability. The soundtrack implies a multitude of frequencies or an immersive seascape/soundscape, full of interference and noise. The vintage hydro-ponic recordings of torpedoes, submarines and other underwater sounds detected by sonobuoys during WWII, are additionally filtered by the distorting generations of technologies used to record them (optical sound, 78 RPM records and magnetic tape). I have also extracted sections from Antheil's *Ballet Mécanique* which feature sirens, further aligning the installation with the sounds of war, and the call to attention. Just as the siren glides from high to low, the light patterns pulse to and fro. It's those volatile spaces in between

that I want to accentuate. Hedy Lamarr appears as a beacon of light, a signal appearing and disappearing, the carrier of a complex strategy of communication rather than a message.

Ultimately the project has all the elements of film (a screen, a projector, music, even a famous Hollywood actress and Hollywood film), but it dissects each element to create a rudimentary assemblage, an incongruous hybrid combination of technologies that only just hold together, exploring the impulse to synchronise signals which lies at the heart of communication.

Aura Satz

Aura Satz works with film, sound, performance and sculpture to explore our interaction with inventions and technologies primarily associated with the visualisation of sound. Interested in modes of heightened perception and sensory disorientation such as psychoacoustics, Satz has used various technologies as the subject of her work, including the Chladni plate, Rubens' tube, theremin, mechanical music, phonograph grooves and drawn/optical sound. Satz looks at how the physical and sonic properties of such objects also play with ideas of knowledge and communication in their use of notation systems, languages or codes. Satz is also interested in bringing to the fore key female figures in technological and scientific developments that are largely excluded from mainstream historical discourse.

Aura Satz holds a PhD from the Slade School of Fine Art, where she was awarded a Henry Moore Foundation Post-doctoral Sculpture Fellowship. She has performed, exhibited and screened her work nationally and internationally. During 2009-2010 she was artist-in-residence at the Ear Institute, University College London.

Aura Satz would like to thank Mark Pilkington, Thomas Gardner, Chris Weaver, Scott Klein, Gernot Fuhrmann, Rex Lawson, David Edelsztein and the Historic Naval Ships Association.

Curated by Stephanie Rosenthal, Chief Curator, Hayward Gallery
Curatorial Assistant Rahila Haque
Screen fabricated by ArtAV

Artist's talk

Sunday 24 March, 3.30pm

Hear Aura Satz in conversation with Hayward Gallery Chief Curator Stephanie Rosenthal.

Dan Graham Waterloo Sunset Pavilion at Hayward Gallery

Free

The Rest Is Noise Timeline

During 2013, art presented in the Hayward Project Space will have connections with *The Rest Is Noise: the Soundtrack of the 20th Century*. Inspired by Alex Ross' award-winning book, *The Rest is Noise*, this yearlong festival at Southbank Centre sets out to capture the spirit of a century and how music reflected its discords, wars and revolutions.

The back room of the Project Space is devoted to a graphic timeline detailing events in culture, science and politics during the twentieth century. This timeline aims to give a wider context for the exhibitions, covering developments in art forms other than music, as well as reflecting politics, social changes, science and technology.

This instalment of the timeline covers the first half of the 20th century. The years from 1950 to 1999 will feature in a second 'chapter' which will be shown later in the year.

The Rest Is Noise Timeline Dominik Czechowski
Graphics Philip Miles