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# Locustream Open Microphone Project

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## Abstract

*This article traces the history of the Locustream Open Microphone Project, a network of open microphones that has streamed live soundscapes from locations around the globe since 2005. The author describes the human, collective, and technological aspects of this project as well as the creative research it has engendered.*

## 1. INTRODUCTION

Locus Sonus is a research group specialized in audio art supported by the Aix En Provence art academy (ESA-Aix) and the French Ministry for Culture, and integrated with the CNRS unity PRISM. Our main research area is the study of “New auditoriums” or ways of sharing audio spaces through emerging technologies with the aim of investigating and developing the artistic potential they offer.

*Locustream open microphone project* is one of the group’s longest running creative research initiatives. It consists of a worldwide network of open microphones, installed and maintained by volunteers that permanently capture and stream local soundscapes via a dedicated server. The initial aim was to provide the research group with a resource for research into remote listening and interconnected sound spaces. However, Over the last twelve years this project has developed from a single remote microphone, to become a worldwide-pooled resource. When it was opened to other users it evolved rapidly into an open-source, shared and international project used by many musicians, artists and researchers for a variety of projects. Today, these include installations, concerts, performances, web radios but also ecological studies and bioacoustics.

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## 2. REMOTE LISTENING (HISTORICAL CONTEXT)

*Manifesto Della Radio* published by the futurists Marinetti and Pino Masnata describes the first conception (to my knowledge) of real time transmission art. It sought to emancipate radio from its historical references and to create, to quote: “an art without time or space without yesterday or tomorrow” [1].

On October 8, 1966 Max Neuhaus created the radio and telephone event *Public supply* [2]. To do so, he took over the transmitter of WBAI radio in New York, opened 10 dedicated phone lines and invited the public to call in and contribute any sound of their choosing which he then mixed and played over the radio. Neuhaus asked the participants to keep their radio sets close to their telephones thereby making the whole electro acoustic system “resonate” through feedback. A few days later – the 15 & 16 of October 1966 – John Cage presented *Variations VII* [3] that, among other ethereal sources, used open telephone lines to transmit the sound of various iconic NY soundscapes.

Throughout the 1970s composer Maryanne Amacher pursued the development of an art of remote live microphones establishing transmission art as a *genre*. In the early days of the internet (1999), Australian sound artist Bill Fontana established conceptual and audio connections between remote sounds and historical sites to create in situ installations such as *Wave Memories* [4] that played the sounds of the waves from Trafalgar (on the coast of Spain) in Trafalgar Square in London.

## 3. LOCUSTREAM ORIGINS

*Locustream Project* dates back to 2005; the beginning of Locus Sonus and the recruitment of our first group of artists/researchers. The main characteristics that distinguishes it from the examples cited in the previous section are its permanence and its evolutionary nature.

Based on our research theme: “Sound in its relation to space, place and usage” – the project was initiated to conduct research into emergent forms of sound spaces. More specifically, we set up a microphone that permanently streamed a soundscape to the internet: asking the question: What are the changes in the status of sound - how we listen to it, play it, share it ... if we receive this

sound, continuously and permanently, transmitted from a remote locality. The idea was that this would become both a communal object of investigation and at the same time audio raw material for individual artistic projects.

Our first artistic experiments were performance based, in the sense that we attempted to use the audio flux as the basis for concerts. The problem that immediately faced us, was that more often than not there were no notable audio events transmitted by the stream. So while the idea of “playing” a remote soundscape was conceptually enticing, it was difficult to consider that it was worth consecrating the specific time of a performance to it. This gave rise to various developments in the project. The first was that we decided to multiply the number of open microphones. This changed the spatial paradigm, since we were no longer dealing with an audio “spot” but rather with an expanse that enabled a possible reinterpretation of geographical space or the instauration of an audio cartography. Secondly and arguably most importantly, our focus shifted from playing to listening. Various practices were developed within the group one of which, attributed to Esther Salmons [5], consists of writing while listening, navigating the audio streams. The result is a sort of “stream of consciousness”<sup>1</sup> where the “inspiration” finds its source in a journey through the remote streams as opposed to the within authors sole imagination.

#### 4. A GLOBAL SHARED *DISPOSITIF*

There was another consequence of the decision to multiply the audio captures. Since in order to do this we called on other people to participate, we created a global network of musicians, artists and researchers with similar interests to our own. This strongly reinforced the collective identity of the project and beyond that pushed it to become what we refer to as an open *dispositif* or device and which we propose is a useful model for interdisciplinary research projects.

I use the French word here in reference to the philosophical sense that it has acquired during the 20th century firstly through the writings of Foucault who uses the term to designate collectively the (architectural, social, geographical, etc.) elements that culminate to create a system (a prison for example) see *The Order of Things* [6] and *Discipline and Punish: The Birth of the Prison* [7]. Gilles Deleuze later extended the concept as a more general philosophical model in his essay *qu'est-ce qu'un dispositif* [8]. Jean Cristofol, epistemologist, member of Locus Sonus and PRISM has applied this approach to artistic practice [9].

The *dispositif* model is useful here since it allows any number of participants to take possession of a common project using different methodologies while contributing to a common object. It enables the co-existence of multiple objectives which, rather than being in competition, contribute to the whole. It implies the creation of

knowledge through emergence (rather than through a set program) and facilitates the engendering of new aesthetic paradigms. Thus *Locustream* is arguably an art project in itself but can also be considered from the point of view of community, as an ecological statement, as a bio acoustical resource or as a program of technological developments.

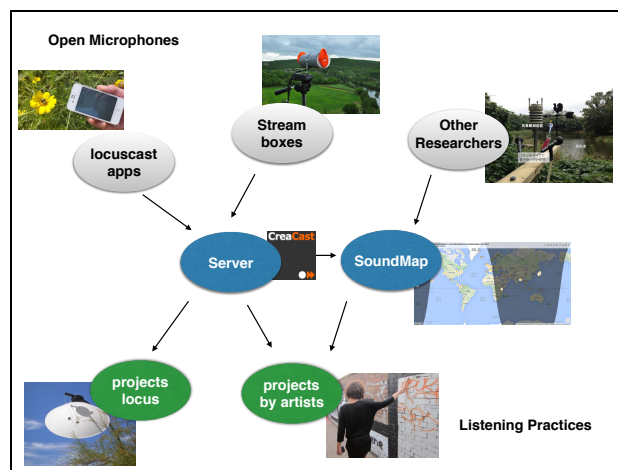


Figure 1. Locustream *dispositif*.

*Locustream* can be broken down into the following elements:

- A community of people who set up and maintain the microphones.

- Dedicated streaming hardware and software - stream boxes mobile “apps” for steaming;

- A robust *Icecast* streaming server (sponsor who offers us unlimited bandwidth);

- A permanent interface to access the streams via the web (soundmap);

- Experimental projects developed by Locus Sonus and tools to create various forms of installation and performance;

- Other people, research groups and art projects outside our research unit, working in collaboration with us;

- The listening public.

#### 4.1 Streamers

When we first put out a call for participation it was mainly addressed to our network of colleagues – sound artists and musicians interested in environmental sound and audio transmission art. We also took the opportunity, when travelling to set up streams in collaboration with our hosts. Some people from this original network continue to participate 12 years later, however, over the years through public presentations – conferences, demos, exhibitions and concerts – the number of participants has steadily grown. Last time I counted, over 600 people had

<sup>1</sup> A psychological term coined by William James in 1890, which refers to our permanent flux of thoughts and feelings. The idea has been exploited as a literary technique by writers such as Proust or James Joyce.

set up a stream account and therefore opened a microphone at one time or another, and there were 30 streams running on the server. This is roughly average for a normal day but the number can double when we put out a call indicating that there is some kind of event taking place.

Setting up a permanent open microphone is not as simple as it might at first appear and it was even more complex when we first started the project with 2006 technology. The audio environment is carefully chosen for the subjective qualities of the soundscape to be captured by the microphone(s) but the choice of the emplacement is also subject to other constraints: the microphone has to be placed somewhere where it will not be considered to “spy” on people – although most streams are maintained by individuals on their private property this often becomes an issue; it is also necessary to access the internet and power networks. Although we have successfully installed solar powered *streamboxes* that use mobile phone networks, these are costly to build and to run and our aim is to avoid such constraints where possible.

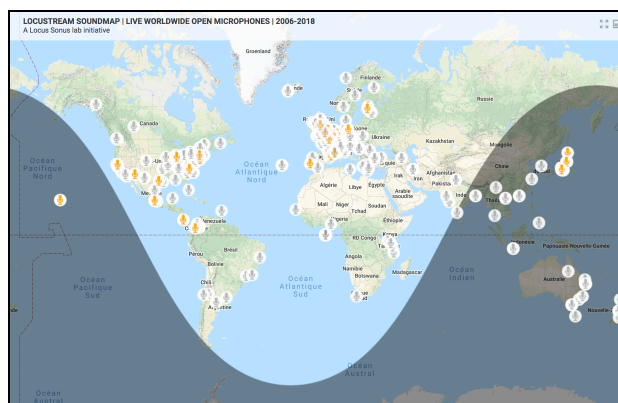
#### 4.2 Streamboxes

Effectively one of the aims of our development is to provide simple solutions to set up open microphones that are not prohibitively expensive for everyday users. To do this we have experimented with various solutions over the years:

The first solutions we offered used a PureData [10] patch that the user could run on a personal computer. Although this worked as a temporary solution, it rapidly appeared unsatisfactory for permanent microphones – the streamer would need to move or reboot their computer or felt uncomfortable with the microphone running permanently nearby. However these patches are still available and some people continue to use them.

The first *Streamboxes* we developed used old (recuperated) PCs for which we customized a Linux Debian OS. The machines were programmed to run “headless” and would reboot and reconnect to our server automatically if the *OggVorbis* stream stopped for any reason. If this might seem like an inelegant solution, over the years it has proven to be the most effective way of dealing with the wide variety of breakdowns that can occur. These PCs however were big, noisy and power consuming and so we continued to look for lightweight solutions. This research led us to use *Alix* mini computers and later reprogrammed *Asus* Wi-Fi routers with a reasonable degree of stability. However since the *RaspberryPi* [11] mini computer appeared on the market (2012), it has become the focus of our *Streambox* development. The advantages of the *RaspberryPi* are that it is small, silent and inexpensive and that there are various solutions for incorporating soundcards of acceptable quality. We have developed an operating system dedicated to *Locustream*, so would-be streamers simply need to buy a *Raspberry Pi* and copy our OS to an SD card after which they can configure their stream using a web browser.

#### 4.3 Locustream Soundmap



**Figure 2.** Locustream Soundmap: screenshot showing live microphones – <http://locusonus.org/soundmap>.

Perhaps the best-known manifestation of the *Locustream* dispositif is the *Locustream Soundmap* (see Figure 2.) It has been online since 2006 and, to our knowledge, is the first initiative of its kind to offer a soundmap dedicated to live streams. It uses a simple interface (Google map) to access the available open microphones and offers the possibility for users to invent their own listening/navigational practices. The soundmap shows active streams and, by clicking on a microphone icon, the user is able to access the corresponding soundscape in real-time. The streamer can also offer additional information about the microphone’s environment – photos and a short text. The soundmap is also the interface for setting up a microphone so it is by creating an account on the soundmap that users identify their audio stream and get access to our server.

#### 4.4 LocusCast App

More recently (since 2014), as a complement to the permanent open microphones using *Streamboxes*, we have developed applications for mobile devices (iOS and Android) that can be used to create a temporary stream. These are automatically located on the *Locustream Soundmap* using their GPS coordinates, in fact by, adjusting the refresh rate of the map, it is now possible to see a mobile microphone moving in (close to) real time. These are examples of features that we have included in response to projects proposed by resident artists.

### 5. INSTALLATIONS, CONCERTS AND OTHER FORMS OF LISTENING

It is impossible in this article to go into details concerning all the projects that have developed based on the *Locustream* project over the last 12 years. The following are some descriptions some of the more notable ones.





**Figure 3.** Locustream promenade presented at Brussels international train station during the festival Today Art in 2010. Photo Grégoire Lauvin.

### 5.1 By Locus Sonus

Several of the forms developed by Locus Sonus experiment with hybrid media and physical spaces. Initially a project by Lydwine Van der Hulst, *Locustream Tuner* (2007) offers an interactive interface to select streams. It consists of a spherical slider threaded on wires that span the entire exhibition space. The device acts as controller that scans the live streams. The installation adapts to the dimensions of the exhibition space, so to play, or navigate the streams, it is necessary to pull the cursor while physically crossing the space. The visitor is thus bodily involved in modifying the sound space. *Locus stream promenade* (Figure 3.) integrates the local space using a different approach. The soundscape of the streams is played using loudspeakers fitted with parabolic reflectors in such a way that the auditor only hears the remote sound when directly beneath the device. Figure 3. shows the installation presented in Brussels international train station. Passengers in transit found the audio topology of their journey virtually extended as they traversed from one part of the station to another and at the same time the remote soundscape mixes subtly with the “normal” acoustic space.

Other forms remain anchored in virtual space such as Brett Balogue’s *Marconi Radio in Second Life* which offered access to the open microphones via a 3d model of a vintage radio placed in *Second Life* (2007) and, more recently (2017) we have included access to the streams through our own virtual world, dedicated to audio experimentation *New Atlantis* [12]. In 2014 Amandine Provost,

created *Mubli* an application for mobile phones. Inspired by online sailing games such as *Virtual Regatta* where a virtual boat is influenced by “real” meteorological data, *Mubli* allows the user to trace a global path through the open microphones but the mix of the sounds is influenced by current winds.

Grégoire Lauvin is currently completing his doctoral thesis with Locus Sonus and PRISM. His research project entitled *Split Soundscape* focuses on leveraging conceptual and acoustic relationships between the situation in an exhibition space. Lauvin’s research has called for the development of tools both for streaming and for playing. He has largely contributed to the development of different versions of *streamboxes* as well as designing custom microphones and preamplifiers. For playback purposes Lauvin along with developer Stephane Cousot have compiled an object for Pure Data [Locusamp] which, as well being more stable than the previously existing [oggamp] object, is capable of reading practically any audio stream or file format.

### 5.2 Beyond Locus Sonus

Many other sound artists, musicians and composers have made use of Locus Sonus streams. The following is a selection of artists who we have helped with projects based on Locusstream. Since Locusstream is free and open and there is no obligation to contact us in order to use it as a source of audio material, there are also very likely to be many projects we are not aware of.

Udo Noll (Germany), *Radio Aporee* (1995-2018)

Cédric Maridet (France), *La Mouvance des flux*, streamed sound work, 2007.

Cécile Beau (France),  $C=1/\sqrt{\rho \chi}$  Installation, 2008

Pauline Oliveros (USA), *Droniphonia*, 2009.

Ragnar Helgi Olafsson (Iceland), *Daybreak [forever]*, installation, 2010.

Robin Renwick (N.Ireland), *Sourced Cities*, networked performance, 2014.

Lech Kalita (Australia), *DRONE*, (automatic web radio) 2017.

Eric Leonardson (USA), *World listening project* various listening events, ongoing.

EricM (France), *Blank Memory and Live Akousma*, Concerts 2015-2018.

Grant Smith and Maria Papadomanolaki (UK), *Sound Camp/Reveil*, 2014-18.

This last project is of particular interest. The functioning principal of *Reveil* is to circumnavigate the globe by selecting and mixing the audio streams that are closest to the advancing daybreak as it shifts from East to West. The resulting mix is re-streamed to our server and also relayed by an increasing number of alternative radio stations. The moment the artists have chosen for this 24-hour event is international birdsong day (early may), thus the audio mix is dominated by an almost continuous dawn chorus. *Soundcamps* are organized in different lo-

cations around the world where people can sleep out while listening to the *Reveil* mix and contribute an open microphone when dawn comes to their time zone [13].

## 6. SCIENTIFIC COLLABORATIONS

As we mentioned, Locus Stream is both open and interdisciplinary and today several other research groups participate in the project. One such initiative is *Cyberforest*, a transdisciplinary research and development program attached to the University of Tokyo that captures, streams analyses and archives sounds and images from a variety of rural areas in Japan. *Cyberforest* use the *Locustream* resources to showcase their work (and by the same token contribute their open microphones). Another initiative Leah Barclay's *Biosphere soundscapes* uses our stream-box design to setup socially engaged sound projects based on the *UNESCO biosphere reserves*. Prof Hervé Glotin a bioacousticien uses the existing Locus Streams to develop Automatic indexing for bioacoustic analysis. And finally as an extension to our *locuscast* applications, we have collaborated with Dr Franziska Schroeder and Prof Pedro Rebelo from the School of Creative Arts, Queen's University, Belfast in Northern Ireland on streaming app *LiveShout* [14] destined to be used for live collaborative performance.

## 7. CONCLUSIONS

*Locustream* has evolved from an experimental and confidential project to become a permanent resource for sound artists and musicians as well as an open invitation to all to adopt new forms of listening. Participating in the *Locustream* project by opening a microphone or using streamed soundscapes as audio materiel requires that we question our listening habits and compositional and improvisational practices, in which the contents are generally predetermined. This in turn raises questions relating to notions of "real time" and "real space", as well as those relating to our perception of continuity and mobility. This array of interconnected questions is the basis for a permanently evolving body of artistic and scientific work within and beyond Locus Sonus and PRISM. After twelve years of development I feel that it is safe to say that the *Locustream* initiative or *dispositive* participates in a new paradigm in audio art that finds resonance in participative practices and different forms of ecological engagement.

### Acknowledgments

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