Fig. 1 *Mémétique Élucubrations 36.6:* in-situ electromagnetic fields sensor converting CPU as sound and processed by a 4DSOUND spatialisation engine (Budapest, 2018).

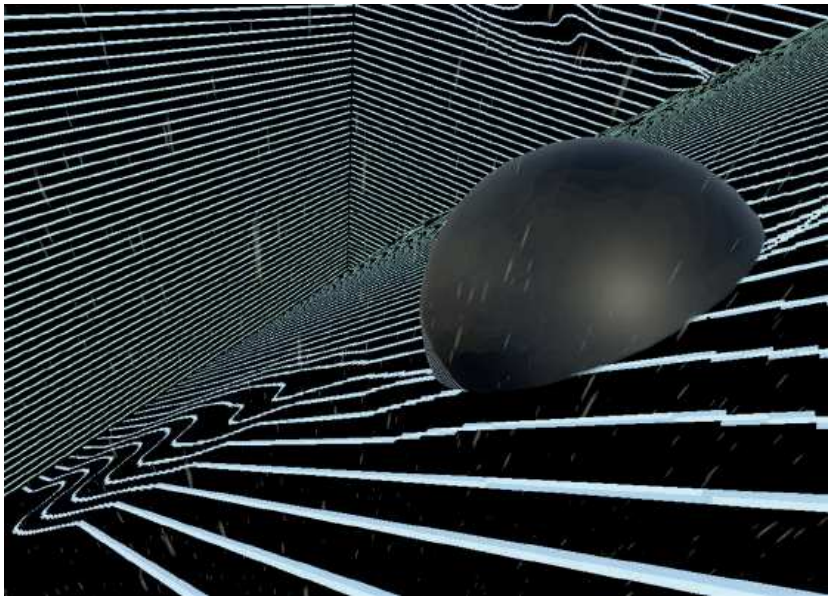

Fig. 3. Sensorial Memetism: creative research about VR and Processing texture mapping with weather assets using HTC Vive and Muse for EEG environmental affects (2017)

# Sound Art, Biofeedback and Sensing Virtual Reality

**Pierre Jolivet**

*Born in 1964, Pierre Jolivet aka Pacific 231 is a French artist living in Ireland. He has been composing music for a long time, has released a huge number of pieces & recordings and adopted a wide, ever-changing and evolving range of sub-genres. He found the roots of his early works in noise and industrial sounds, never leaving a certain inspiration in noise structures. A few years ago, he began to make more experiments with sound generators and field recordings of various kinds as well as sensor technology. Discovering the magic of abstract arrangements, self-generated processed art and electronic sound collages also led him to co-operate with other artists such as Lieutenant Caramel, Vox Populi! or Rapoon. He's also a performer and presented his multimedia artwork in MACBA (Barcelona) or the Beirut Art Center (Lebanon).*[1]

Fig. 2. *Planetary Control Room*: conceptual sketches by Jack Kirby created for the *Lord of Light/Argo* project for Heavy Metal magazine (1978).[2]

As a practitioner and performer of Experimental (Electronic) Art, everything started way back in 2007 using Gypsy MIDI and Quartz Composer for an interactive project, coming from university research, in a performance called *Stif(f)le* (sound+video).[3] Back then, the technology was rather antiquated (MIDI) and Open Sound Control (OSC)[4] was not yet mature enough to achieve what can be achieve nowadays. Nonetheless, the arrival of on-the-self hardware was reaching a critical point for an autonomous artist to work with technology without substantial investment or support from institutions. Also, system interoperability had

been crucial for any work dealing with biofeedback or environmental sensors and years of experimentation were ahead in the work. The conceptualisation was around the physical aspect of sound related to the human body and the immersive prospect to include space as a compositional factor. This was to become the very core of my doctoral research to develop a flexible methodology to allow fluid composition using all the technological tools currently at our disposal.

Sound Art has been on the rise since a few decades and at the crossing between Experimental Music and Conceptual Art. The scene involves a lot a do-it-yourself transforming the artist into a craftsman and creating unnecessary non-creative challenges. In the practice, I've experienced first-hand the conundrum of developing projects around what is available instead of adapting resources to the creative process. Evolution has been notable since the two pieces created for my Master of Fine Arts a few years ago (*Palindrome* in collaboration with Marco Gutierrez and *Espace Altéré*) with the departure from restrictive MIDI and the arrival of platforms such as Arduino or Raspberry Pi running Open Sound Control. Now, after this lengthy framing introduction, let's talk in details about how my practice came into sensorial perception. My work as an artist started in the early eighties, in the realm of experimental music and body art performance. My earliest influences being a mixture of musique concrète, power electronics, drone and abstract repetitive ambient, it was only natural to be interested about the potentiality and relationship between the artist and his audiences.

Also, early sixties and seventies innovators such as Nam June Paik using domestic TV appliances[5], and David Rosenboom[6] at the Aesthetic Research Centre of Canada helped me to perceive what could be done artistically using our technological environment and biofeedback systems. The main challenge was to find spaces open to technological experimentation, especially in the domain of multichannel reproduction and concomitant sound spatialisation. It is relatively easy to adapt art spaces to sound specification but most music venue will not provide above and beyond a stereophonic image. One of my first live action, *The Last Morality* (1984)[7], uses the dis/connection between nature and our consumerist society with an infrasonic bound to antagonistically liaise the public with the concept by using a 3000W subwoofer system and a super 8mm loop of a cemetery in time lapse. A subsequent piece, entitled *The Lost Judgement* (1985)[8] and subtitled "Technique of Mental Self-Destruction", expanded on the subsonic theme through a one-to-one model making the listener facing himself in an existentialist limbo.

The nineties had been a decade of collaborations and reflexion, partly through my university involvement. I was one of the first, in Ireland, to get Internet connected back in 1993. The network provided an inexhaustible source of material for research and development. Consequently, progress quickly culminated in 2006-2007 as I started to consider a global Immersive Art. I had been teased with the idea of VR since the early nineties, at the time in a very theoretical perspective. The doctoral research brought VR back into the limelight; at long last the technology and expertise was there to do the work necessary for creative endeavour. As primarily a sound artist, having at my disposal material for visual abstraction is a fantastic opportunity to completely merge audition and vision. I immediately thought of the pop culture of my childhood, with graphic artists such as Steve Ditko or Jack Kirby (Fig.2), in creating non-euclidean universe and phantasmagoric worlds.

The VR industry seems to be concentrated on games or educational aspects leaving pure artistic works trailing behind. Time is now right not only to explore VR but to integrate a more global perspective using sensors and biofeedback. Open source plays a large part in the integration of technologies that are not obviously connectable. Processing, originally developed at MIT, and protocols such as Syphon or Spout are inherent to self-generative art and intercommunication processes beside the ubiquitous OSC. Amazingly, the sound part still seems to be in the hand of commercial entities: Ableton, Native Instruments, Max/MSP, just to name a few. I'm stating this fact as Pure

Data or SuperCollider are mostly restricted to pure academia or extremely technically oriented creatives.

Self-generative art or what I often described as a medium between the artist and the machine is provided by the inclusion of not only the compositional canvas but also by the sensors and/or biofeedback — this is where analog (flesh) meets digital (circuitry). As a performer, I foresee that the public will even be included into the process of creating a biofeedback clustering. Interestingly, during my last questions and answers post-performances sessions, while I left the system running and turned the sound down, the audience indirectly became a soundscape modulation. *Mémétique Élucubrations* (Fig. 1), my current work, is now through a second iteration involving sound, biofeedback and light.[9] The first version was based on environmental feedback and Processing based on visuals and the third will, I hope soon, includes VR.

The VR orientation in my sound art research represents the blur between the real world and an extension of our senses, the investigation of an experimental realm considering the Local Area Network/Wide Area Network as a neuronal network somehow improving our brain and creative faculties. Many perceptions and environments are at play going from musical composition to evolutive texture mapping and even weather conditions such as rain and wind. The multichannel studio space provides a sense of real sonic depth and physical presence in comparison to the artificial artefacts commonly provided through headphone. Strong assertions have to be made to create and manipulate surroundings in correlation with our senses, but is it not a perfect 21th century vehicular endeavour to imagination?

As a matter of conclusion over a practice spreading thirty years, I would like to go back on some of the challenging aspects of a technologically oriented art practice. The path has been arduous, going from the institutionalised context to the individual autonomous studio. Affordability and independence are now keywords and the following are now widely available, going from DAW (Ableton Live) to VJing and Projection Mapping (Resolume) to truly realtime programmable VR (HTC Vive). Most importantly, Open Source creates the necessary bridge to make all talk to each other and, to a wider extend IOT and biofeedback – through sensor technology – gives an access to the world and a mean of interaction/integration to the creative process. HTC Vive and Muse (Fig.3)[10] are particularly worth noticing through the way they easily talk to each other via OSC — Unity (VR authoring) and Muse Monitor offering wireless flexibility by controlling every single feature of a VR world with even further expansion if the Spout video[11] sharing framework is throw into the mix for Processing based evolving texture mapping. Last but not least, the total integration of sound, sensors and VR allow to twist the physicality of our world broadening our sensorial perceptions.

[1] http://www.beirutartcenter.org/en/archive/pacific%20231/504/all/concert-%25e2%2580%25a2-pacific-231-lt-caramel-live
[2] http://www.laweekly.com/content/printView/5879973
[3] http://www.monochromevision.ru/mvxx.html
[4] http://opensoundcontrol.org/introduction-osc
[5] https://www.youtube.com/watch?v=7UXwhIQsYXY&-feature=youtu.be
[6] https://www.youtube.com/watch?v=aBIgu6tWZ7o&feature=youtu.be
[7] https://www.youtube.com/watch?v=-n3PboYVckI&feature=youtu.be
[8] https://www.youtube.com/watch?v=0M4mAZOZ44I&-feature=youtu.be
[9] *Mémétique Élucubrations* has been premiered at the Centro Mexicano para la Música y las Artes Sonoras (Mexico) in 2016 and further developed at MART (Ireland) in 2017. It has been demonstrated at VSMM 17 (Ireland) and Sound Out the Space (Ireland).
[10] http://www.choosemuse.com/research/
[11] http://spout.zeal.co/

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