



Hearing Things

Pat Pilcher discovers subliminal communication is alive and well and making a comeback in music



ABOVE NeuroPop's Seth Horowitz began his career as a musician before being seduced by the possibilities of digital sound created by computers

A baby cries out in a shopping mall; you can't help but turn and look. Sound has a powerful hold over us whether we like it or not, and US company NeuroPop has taken this fact and developed it into a precise science.

After throwing NeuroPop's showcase CD, *Overload: The Sonic Intoxicant* into the CD player for a listen, I was definitely impressed. The music and subliminal sensations ranged from something akin to getting a brain massage through to a serious dose of vertigo. Powerful stuff indeed!

I caught up with Seth Horowitz, NeuroPop's chief technology officer and quizzed him on just how this technology works

So what got you into NeuroPop?

After leaving (read: was thrown out of...) college first time around, I worked as a musician. I was fascinated with the possibilities of digital sound as soon as the first personal computers started showing up in useful form. (Commodore 64 was my first.) I ended up spending more time working with computers and sound, and built the first computer music and MIDI lab at the State University of New York at Old Westbury in the '80s.

Around that time, I first met Lance Massey, who was working in a pro audio shop and had just received the first Bachelor's Degree from Oberlin. We decided that no one was really using digital sound to its full extent. We stayed in touch as he went on to become a successful composer and advertising jingle writer, and I went to grad school at Brown University to get a Masters in Psychology and PhD in neuroscience.

My work in grad school had been on how the brain processes sound (and music) in a variety

of species, including dolphins, frogs, bats and humans. But I was increasingly interested in how the hearing system connected up to other parts of the brain - the ones that *don't* process sound, but rather process emotions, memories and orientation. I began playing with the idea of using sound as a 'carrier' to get information to these other parts of the brain.

What events inspired NeuroPop?

Lance emailed me one day and asked the fateful question: 'What's psycho-physics?'

I explained to him that a) it's psychophysics, not psycho-physics and, b) it was the mapping of physical phenomenon, like a sound frequency, onto the psychological perception of pitch.

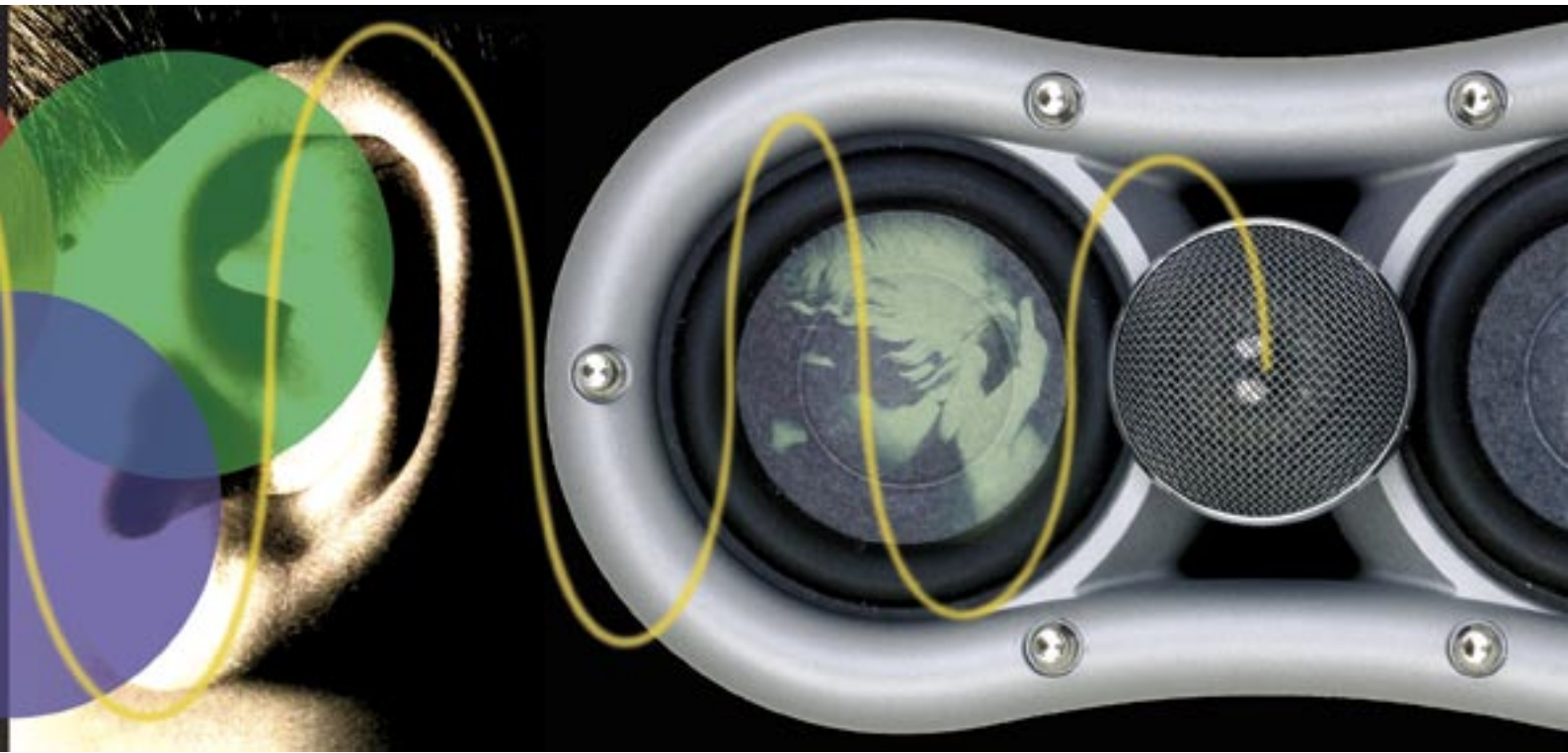
After a lot more explanation on both sides, Lance said he wanted to create a musical piece that could psychologically affect an audience in controllable ways.

He wanted to call this piece *The Overload* and also wanted to know if I would work on it with him. It sounded like a welcome break from studying, so I went down to his studio and we began playing with sounds and eventually ended up with an early version of the piece in a series of concerts in New York City.

Well *Overload* definitely worked on me.

What's the secret?

The Neuro Sensory Algorithms (NSAs) employed by NeuroPop are usually a basic sound that is then modulated at specific rates and amplitudes to create a specific effect in a non-auditory part of the brain. These algorithms can be mixed into existing music and used as a carrier wave within



the auditory system. The various frequency and amplitude modulations embedded within that sound are the 'code' for getting effects out of other parts of the brain that the human auditory system connects with.

What sort of audio setup delivers the best results?

The best would definitely be something with a decent subwoofer and well-defined stereo separation, but we have designed some things to work on cheap computer speakers.

One of our key breakthroughs was the ability to get a lot of free-field spatial effects that previously required headphones, to also work with freestanding speakers by embedding our signals in structured sound. Oh yeah, it's also important to get your left and right speakers placed on the correct sides...

What are possible applications for NeuroPop technology?

Because we can mix our algorithms into any kind of sound, almost any form of media using sound could benefit from our work. NSA sound design would be ideal for projects like movie trailers where you've got to get viewers intensely interested in a very short period of time. NSAs would also be highly effective in movies when the director wants tight emotional control over the audience in very tense scenes.

Video games are also an ideal application. Our algorithms allow us to create sounds that can make a player who is being injured in a game actually feel ill, or have someone whose character is falling feel dizzy, or even a player being healed

within the game, would feel calm and relaxed.

We're also looking at educational applications for NSAs. For example, we have sounds that can direct a person's eyes to a certain place on a screen. If you wanted to get a student audience to get a particular piece of information at a particular time, you can apply one of our eye-mover NSAs and have the info 'pop-up' at just the point when their eyes are in the right position.

Where is NeuroPop currently being, or about to be used?

After initial flirtations with the advertising industry, we decided to stick with arts and media projects. We've 'neuralized' music for bands like Paul Thrush, Clan Chi and a few others, and also did the soundtrack for an independent film *Black and Blue* by Kim Jackson. More recently, we've been contacted by a number of major software publishers and are discussing doing musical soundtracks and sound effects for the next generation of first person shooters....

Sounds really cool! So where to from here for NeuroPop?

I'd like NeuroPop to become the 'go-to-guys' for anyone who wants to use sound in ways it's never been used before, even if those uses are seen as 'impossible' at the moment.

We're in a weird niche - neuroscience and psychology, sound and music. But if you think about it, those four concepts are so intertwined, I honestly believe that in five years everyone will be doing this, and in 10 years most of this work will be available as plug-ins for your teraflop laptop. It just so happens, that we've got it now.

More information on NeuroPop and copies of *Overload: Sonic Intoxicant* can be found at <http://www.neuropop.com/>