

Capturing Feedback, by E M Thomas

I recorded the Feedback tour with six audio inputs thus:

- 2 x line inputs from the live mixing desk
- 2 x stereo inputs from microphones on a binaural head
- 2 x inputs from PZM microphones mounted on the PA speakers

My approach to recording has always been based on something Michael Gerzon used to say.

“It must sound as if you are in the same room as the musicians”.

This defined a quality in music recording later called 'musicality' at the many conferences on data compression which Michael attended at the time. It was the ideal in recorded sound.

Michael was a big fan of unusual music and would show up, when he could, to record any interesting concerts with his 4 track mixer and heavy boxes of gear.

I was ignorant at the time but I noted that he used stereo microphones and stereo line out from the mixing desk. The stereo microphone input was a pair of Calrec CM1050 mounted with capsules touching and axes at 120 degrees.

And for those who don't know what a line out is: it is the stereo signal leaving the desk headed for the PA amplifiers, loaded with reverb, instrument effects and equalisation to match the acoustics of the room. Not a pure signal at all, but somehow agreeing with the space.

During the concert he would mix 4 tracks down to 2 while wearing headphones (!). I remember being fascinated by his description of how he would alter the ratio of the centre of the stereo with the L/R by tweaking something, I don't know what, which seemed like magic.

Obviously, in order to experience the space in which the musicians are playing as though you were present at the performance, any recording must include the reactions and qualities of the space in which the music is performed. Nothing new in this, it's what you get when you don't close mic any instruments. This was the old fashioned way of recording, musicians making their own dynamics in a good room, gathered around a microphone or two, producing abundant 'musicality'!

Apropos the sound of the recording space, in this case with studios, I remember a period in the '70s when audio experts with their expert guns would tour British studios anxious to keep up with new trends in recording emerging from the US. The ideal recording space then was an audio zero without reactivity or character, a sound deprivation chamber where any noise from an instrument would travel a few inches then fall on the ground and die. This deadness was supposed to be corrected by very expensive Lexicon reverb units which would create a new space feeling according to the desired result. But as Michael pointed out, the very best and most frighteningly expensive gear could only simulate tens of thousands of early reflections whereas the ear is sensitive to millions. Our ear must tell us what the space is!

The line out of a mixing desk picks up the room (or rather, stage) space along with a loud signal from instrument that is being recorded. The results, as we know, will range from

dreadful to sublime. However, I decided to use a line out, because you never know what you might get and it always adds another dimension to the sound.

Then we have the microphone inputs:

The best options for recording a true spatial feel with 2 tracks available to me then were either binaural or MSC pair.

The binaural effect works in this way: humans locate sounds in left-right-front-back space by the phase difference created by a sound from the left, say, arriving first at the left ear, then a tiny bit later at the right ear, since the sound must bend around your nose which makes the distance longer. This creates a phase difference which you interpret as coming from a point in space. I don't know how you can hear behind you but it's to do with the way the ear structure, the pinna, points forward and sound coming from behind will also have a phase difference relationship to sounds from the front.

MSC (mono stereo compatible) recording is one of my favourite recording techniques. It's lovely, if you have half a day to set it up!

For those who don't know, this uses a figure 8 microphone set horizontally so the two faces point left and right. Jammed on top, as close as possible, is the same breed of hypercardioid mic which points forward centre. The figure 8 signal is split into phase and antiphase (pin 3 and pin 2) and goes into separate tracks on the recording device. The centre goes on its own track. So, in theory, one is supposed to put pin 2 out of phase – really, back into phase – (with USA mics and mixing desks it's pin 3!) but in practice... it's an exciting world of sound, you can alter the stereo picture with L/R/centre track volumes and do weird things by changing the phase, and finally, magically, it ends up as stereo!

However, this set-up is not suitable for recording on a tour, so, still in pursuit of musicality, I went for the first option:

Some time in the late '60s many experiments were being made by German radio to develop possibilities in stereo sound. People walking around with speakers, microphones being walked around by people while recording. I don't know about this research at all, but Neumann produced their binaural head as a result of it at the beginning of the '70s. This was unattainably expensive for most because aside from all the fiddling and twiddling for perfection in the circuit, they had also modelled perfectly, in plastic, rubber etc., not just the surface of the human head with nose, ears, (hair? I'm not sure!) but also imitated the different densities within the human head itself, bone, sinus cavities, even the brain, whatever. Yes! The bestest!

Michael, incidentally, around this time helped develop the Calrec sound field microphone which seems to have knocked the Neumann head out of the market. Although also fabulously expensive, it was more affordable and much more flexible. One of the first ones the BBC bought was suspended permanently in the Albert Hall. It's a four-capsuled beast where you can adjust the polar response of each capsule and get just about anything. And even better, you can adjust the polar responses *after* the recording! But we don't know about these expensive things! We're from the alternative rock world!

The BBC became very interested in binaural recording in the late '70s for stereo radio transmission, but since the binaural effect can only be properly experienced with headphones or extra super-duper hi-fi equipment, the idea was not pursued. Stereo can

be produced pretty well with 2 microphones and no one minds if you can't hear behind you. Normal two track recording lacks binaural space but this is acceptable.

In their binaural period they came up with 'Henry' which was a flat disc with a nose, separating two omnidirectional forward-pointing microphones. These microphones – just standard BBC tie-clip interview microphones – have to be in the same position as the ears on a head, i.e. at the correct distance apart and the correct distance from the nose. They cost £15 each at the time from Tandy (Radio Shack) at the time and the BBC did some exciting things with Henry, showing that you didn't need a lot of money to make binaural recordings.

As we know, you can pay a lot of money for a microphone. This cost is always for the intricate labyrinthine workings and electronics inside the case in order to minimise phase shift over frequency and reshape the polar response: cardioid, hyper, super etc. Good omni microphones are much cheaper since they have none of this extra stuff. I chose two of the original Oktava MK12 microphones with an omni capsule. I had previously operated on them, replacing the main FET, and the bipolar junction transistor, putting in classier capacitors and better matched resistors. These improvements are posted on all Oktava forums. Result is a very nice microphone. These I mounted on my Henry head, remembering that the microphones have to be 15cm apart. I covered the head in acoustic foam, no reason really, and put in a screw fitting to attach to the microphone stand.

Michael Gerzon specialised in psychoacoustics and maintained that human hearing was very poorly understood and much more complex than science realised. He once confided to me: "People think it's nonsense but one of the best ways to record a concert is to put 2 PZMs on the side of the PA speakers". That way you capture the stage sound (where the musicians are, indeed) as well as the amplified sound coming from the mixer by vibration, and finally the room sound returning to the speakers. It's so psychoacoustic it hurts!

Likewise, I operated on my cheap Tandy PZMs, I put in a better quality capsule, converted them to phantom power to change their impedance and balanced them (this prevents the leads from acting as a nice antenna to pick up any electromagnetic junk flying around). What was left of the original PZMs? The Magic Gap. It's all about the patented gap. Thank you Crown!

So we have our inputs now: the line out from the mixing desk, the binaural head and the PZMs stuck to the PA speakers. This makes a total of six tracks which leads to another requirement; the recording device and the interface, or mixer.

Laptops were fairly rare in 2004 in Britain – hard to believe, but true. Also they were pretty expensive and only the Sony Vaio was reputed to be stable enough to make sound recordings. I decided to ask my friend Utsunomia, the sound engineer for After Dinner, in Osaka, if he could find me a secondhand Vaio in Japan. He too was a good friend of Michael Gerzon, they had met in London in 1987, and although neither could speak a word of each other's language, they communicated perfectly with pen, paper and mathematical formulae! Quite something to see: scribble scribble, Really? Scribble scribble (Japanese) Hmmmm!

He found one and posted it over so we installed Samplitude, an East German recording software for Windows recommended to us previously by East European friends. Lovely software and the developers are always on the forums. It's still a Windows platform and although they consider now and then doing a Mac version, they have decided to spend

their time only working on the Windows version. With Mac of course, the standard is ProTools, this is a perfect example of how long something can keep going on a previous good reputation, like cartoon characters running off a cliff.

I recorded the concerts in 32 bit floating point which is in fact unnecessary for a simple recording; it becomes useful later during a mix where a great deal of processing might increase levels and result in an overload. I don't understand it of course but 32 float means that there is no theoretical headroom and thus you can avoid that vile digital clipping. (Otomo!!!) It gives a larger file size, but storage space is no longer a problem as we know. The concerts came in at about 11GB each if I remember rightly.

The A/D D/A converter was an RME Multiface, 8 in, 8 out, good quality, German (thus can be repaired!) and very compact. We got it for the studio originally and used it with the optical interface. For recording onto a laptop the only possibility at the time was to get the RME protocol cable to PCMCIA plug and a PCMCIA card for the laptop. (Personal Computer Memory Card International Association, yay!)

We had asked Utsunomia to find us a Vaio with these slots. We got a friend in the US to send us the card because it was impossible to find such things then in Europe without paying a fortune.

For storage I used a Dutch external drive, the Freecom, a massive 110GB and the coolest thing at the time with blue LEDs everywhere (and still working!). The Vaio had only USB1 in so Utsunomia found a converter to USB2 card which fitted into the second PCMCIA slot.

That left the mixer. No problem for me, I'm always building circuits. Borrowed a few circuits from Amek, Midas and Neve, and Utsunomia improved them – he is Yamaha's senior consultant. Got out the saws, drills and files and made a little case. Why was it purple? I wanted black! I had always wanted to try anodising aluminium. For this you need sulphuric acid, caustic soda, a car battery charger etc.

But don't try this at home folks!

Getting the sulphuric acid (battery acid) was no longer possible in the UK and after many suspicious gimlet-eyed stares in shops I went to Bell and Croydon in Wigmore street where just a few years before you were able to buy hydrofluoric acid. Not any more. In France, I got a 5 litre container of battery acid without arousing any interest.

So, after immersing your aluminium case in acid (or is it caustic soda?) and passing a charge, via an anode (or is it a cathode?) through it for a while – to open the pores of the metal – you then boil the case with a dye for cloth. In my case the black dye was actually a very deep purple and resulted in the metal turning purple. Then I think you pass another charge through the case while it is immersed in caustic soda to close the pores again and it's done. Lastly you boil the case in water to finish it off.

Or is it the other way around? I can't remember.

To dispose of the two toxic liquids I carefully added one to the other – REALLY don't try this at home – and ended up with some unaggressive liquid which I poured into our ditch and there was no bad reaction from the greenery living there. We have no drains.

So that is all there is to the recording. Later Knut came down to us and mixed the results with Bob Drake who was able to sort out some necessary phase adjustments between the 3 different stereo tracks and bring it all together into a coherent whole.