

Comparing Stereo Miking Techniques

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Coincident-pair vs Spaced-pair

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We take a practical look at the pros and cons of coincident and spaced stereo miking techniques.

Back in the 1960s, Spiderman and Superman comic books from the USA had a middle section of pink-paper advertisements for pretty unbelievable technical gadgets. The goods on offer ranged from mind exercises to develop an 'awesome advanced memory' to geeky-looking X-ray specs, and most of them were clearly awful.

As a budding blues guitarist, though, one advert in particular always caught my eye and then stuck with irritation in my mind. This was a spiel for a special kind of guitar strap that, as the blurb emphasised, ensured that the guitar was 'always held in the correct position'.

The advert featured a picture of an electric guitarist with neat hair and a suit, and with his guitar impossibly close up under his chin. In the blurb, 'the correct' was not just italicised, but emboldened and underlined too — this was obviously an issue about which the guitar-strap maker felt very strongly. But no matter how strongly he felt, at the same time Jimi Hendrix was chipping his teeth on guitar strings and setting light to their bodies, while in the UK Cliff Richard allowed the staid Shadows to play a few notes with their guitars behind their heads. Just around the historical corner, of course, the Ramones would start to play their guitars impossibly low, making any notion of the universally correct standard strap length — let alone anyone trying to conform to it — look very silly indeed!

Theoretically Correct?

I was reminded of this inappropriate appeal to correctness just recently when reading through the booklet blurb of a very lovely American audiophile orchestral recording. As well as the intellectual notes these booklets usually contain regarding the music itself, the producer had been allowed to add his thoughts on the recording process. He used the phrase 'the theoretically correct microphone technique' three or four times, meaning the Blumlein microphone setup (a crossed coincident pair of figure-of-eight microphones) that his engineers had used.



A spaced configuration of Sonodore microphones was one of three microphone setups tested when recording David Chung's harpsichord playing. Now, I actually like using this technique myself for many projects, especially where a very precise stereo image is called for. However (and it is a fairly obvious point) it's worth bearing in mind that, despite the fashion and fetish surrounding some of them, both microphones and microphone techniques are actually mere tools — instruments we use in certain ways to get a job done. It is in the nature of tools that they are designed to do different jobs, so there isn't much sense in claiming there to be one best microphone or microphone technique, 'theoretically correct' or otherwise.

Just before the producer went on to tell his readership that there was also a 'theoretically correct' position for the chair to sit in while listening (sadly, I kid you not), the producer then justified his claims by repeating some of the myths about the 'dangerous defects' of omnidirectional microphones, including a dire warning about the production of comb-filtering, and how they could ruin any musician's day. Well, although comb-filtering effects can be a problem in some situations (and are not, of course, a problem limited to omni mics), problems are what recording engineers get paid to solve — especially when the technique which creates these 'problems' also has some significant advantages for the particular task in hand.

X-Y Versus A-B

Which brings me to my experiences comparing coincident-pair (also called X-Y) and spaced-pair (also called A-B) miking during a recent recording I did of a solo harpsichord recital for a CD. The harpsichordist — David Chung — is a recording engineer's dream musician: not only does he know exactly how he wants his instrument to sound on record, he also knows a fair bit about how to achieve his desired sound. David's requirements were for a naturalistic representation of his harpsichord's tonality with a fairly tight stereo image — wide enough to enable the different lines in contrapuntal passages to be distinguished, but not so wide as to suggest an unrealistically large instrument.

David also wanted an adequate amount of room ambience to allow the delicate tones of the harpsichord to be captured with their natural bloom. In one crucial respect a harpsichord is an unusual instrument: whereas the sound of most instruments consists of a fundamental tone with overtones which define its particular character and timbre, the harpsichord is almost the complete reverse. The fundamental fades very rapidly and most of what is heard consists of just the overtones: hence the 'delicate' nature of the characteristic sound of the harpsichord. This delicate nature can easily be destroyed — which I'm sure is what led to Sir Thomas Beecham's famous remark that the sound of a harpsichord is 'the sound of two skeletons copulating on a tin roof in a thunderstorm'. Avoiding this result is a matter of the musician's technique, a friendly acoustic, and the choice of microphone and microphone technique.

Call us reckless, call us theoretically incorrect, but we thought spaced omnis were probably just right for the job. For a start, high-quality omnidirectional microphones have a flat frequency response that, in general, extends far lower than most directional microphones. Furthermore, the spaced omni technique, whilst it definitely yields to Blumlein in terms of absolute image precision, is quite unparalleled in its ability to capture ambience and spaciousness. Given these desiderata, spaced omnis seemed the best way to go.

The session in question was what I call a 'rehearsal recording' — a prelude to the 'real' recording sessions normally held a few weeks later. Rehearsal recordings are mainly intended to benefit the musicians, giving them an objective view of their own work before they commit their interpretations to a CD for commercial release. And, of course, they also benefit the engineer, who can use the time to try out different microphone positions or, in this particular case, three completely different microphone setups.

Although we thought from the beginning that spaced omnis were very probably what was required, we decided to take the opportunity to compare three different setups: spaced omnis, spaced subcardioids (also called 'wide cardioids'), and a Blumlein coincident array. In no sense was this intended to be a microphone shoot-out — the differences in the characteristics of the various microphones used would make nonsense of any such trial — but it was a useful comparison of what could be achieved under identical conditions, with high-quality microphones, using three different techniques.

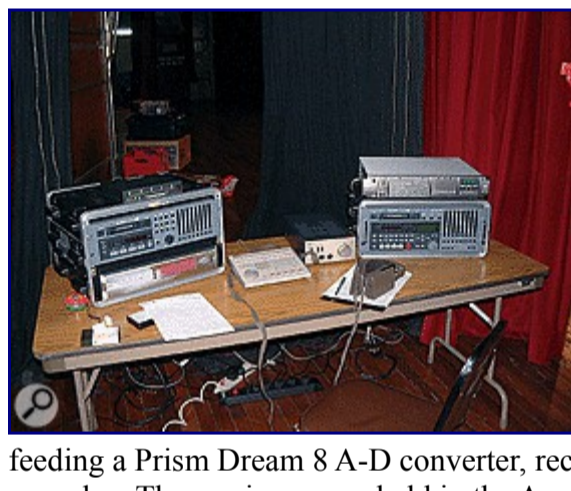
The Microphones

The three microphone setups were a pair of omnidirectional Sonodore RCM402s; a pair of subcardioid Schoeps CCM21s; and a stereo Royer SF12 ribbon mic. You may not have heard of Sonodore before — these microphones are made in Holland by Rens Heijnis and were, until very recently, only made to order. But now Rens has decided to go into small-scale production with the RCM402, with Bert van der Wolf as his distributor — the man whose recordings using these microphones for the Turtle Records label first brought them to my attention.

The pickup pattern of the Schoeps CCM21 is much like an omni at the front, but with a degree of attenuation to the rear. Although I tend to think of them more as omnis than cardioids, the Schoeps catalogue appears to favour the reverse: although it warns potential customers not to consider using them in an X-Y configuration, it makes no mention at all of spaced pair setups and so underplays their omni pedigree. But a quick call to Schoeps main UK distributor confirmed that there was no reason in principle to use them as a spaced pair, so that's how we used them. Of course, there is no reason in principle to exclude any pick-up pattern from being used as a spaced pair, though omnis have always been the traditional choice.

The Royer SF12 is an old favourite, consisting of two crossed figure-eight ribbon capsules, fixed at the 90-degree mutual angle specified by Blumlein. Like all ribbon microphones, the SF12 has a relatively low output and requires a preamp that can provide at least 60dB of clean gain. To that end, two channels on my Grace preamp are specially modified to provide the higher gain needed for the Royers.

Setting Up



The author's location recording rig: a Grace 801 preamp feeding a Prism Dream 8 A-D converter, recording to Tascam DA98HR and Tascam DA78HR recorders. The sessions were held in the Academic Community Hall of the university where David is a music professor. The hall is pretty big with a fairly large and warm acoustic signature. Although not acoustically 'tuned', it offered a decent, though slightly challenging, venue for our recording.

The technical setup was quite straightforward, with the microphone pairs mounted on a modified Manfrotto stand, each being fed to two channels of a Grace 801 preamp, which in turn fed a Prism Dream 8 A-D converter operating at 24-bit/96kHz resolution. The digital output was recorded on a Tascam DA98HR, with a digital line signal being passed to a Tascam DA78HR for backup. For simplicity (and showing great confidence in our recorders!), we monitored directly from the Prism, using its monitor outs to feed a Stax SRM006T driver and Stax Signature headphones.

I approached the microphone placement in a fairly obvious way: David showed me the sound he wanted by having me stand in the 'waist' of the harpsichord, facing the strings at an oblique angle. It was a thrilling sound and, although there is no genuine left and right separation of the sonic image with a harpsichord, the shorter high-register strings dominate the left side of the image and the longer, lower strings (though more diffuse) tend to dominate the right. David's instrument, a double manual harpsichord made by Bruce Kennedy on a Mietke model from 1704, presented a gorgeously full-bodied, spatially extended sound, and it was my job to capture exactly that on tape.

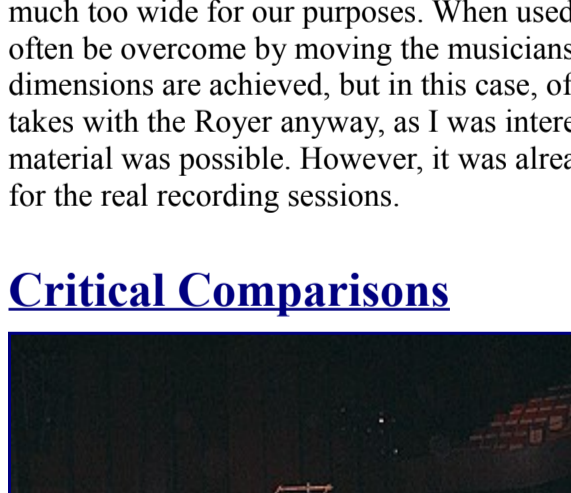
Given that we had no choice concerning the basic orientation of the microphones — they were aimed at the same angle as I'd been standing when I'd heard the harpsichord in its full glory — the only variables we had to play with were the spacing between the microphones (except for the Royer, which is fixed), and their height and distance from the instrument. Our goals were a particular image width, tonal accuracy, and a critical proportion of direct and ambient sound.

Starting with the Sonodores, the initial placement was intended somewhat to mimic my own position when hearing the required sound. I knew that this would not work perfectly, though, because, in a reverberant space, the place where the ears hear and the place where mics have to be to reproduce that sound in two-channel playback are never the same. However, I knew it would provide a good place from which to start. With the microphones 40cm apart, 1.2m from the sound source and 1.7m above the floor, the sound was very impressive, but much too direct, and the image was much too large. So the microphones were moved further apart, farther back, and higher in increments, listening carefully to the effect of each change. The ideal position was eventually found to be 60cm apart, 1.7m from the sound source, and 2m high.

Substituting the Schoeps microphones, I started, for simplicity's sake, from the position that was determined as ideal for the Sonodores. Somewhat to my surprise, I found it impossible to better the sound — any changes were for the worse! In the end, the only difference in the setup was the amount of preamp gain, because the Sonodores give a higher output.

Trying the same trick again with the Royer microphone proved a bit of a disaster, producing a muddy indistinctness. This was not what we had expected, nor what should happen according to theory. In general, bi-directional microphones (and cardioid mics even more so), because of their directional nature, should be placed at a distance greater than that of omni microphones to achieve the same ratio of direct to ambient sound. But whatever theory said, practice suggested different, so the microphone was quickly moved a few feet closer. Although the quality of the sound improved dramatically with a closer perspective, the stereo width we then wanted of the harpsichord became unavailable. Not surprisingly, at the distance at which the sound became optimum, the image was much too wide for our purposes. When used for recording an ensemble, this kind of problem can often be overcome by moving the musicians relative to each other until the desired image dimensions are achieved, but in this case, of course, there was no such option. I recorded some full takes with the Royer anyway, as I was interested to see what post-production manipulation of the material was possible. However, it was already very clear that this technique would not be suitable for the real recording sessions.

Critical Comparisons



A miking position in the 'waist' of the harpsichord yielded the most desirable tonality, as well as a suitable balance of ambience and stereo spread. The purpose of experimenting with the various microphone configurations was not to see which technique was in some abstract way 'best', but was part of a real-world enterprise to see which would be the microphone arrangement of choice for us to use on the recording for David's CD. So, after the recording session we held a more critical listening session in the mastering room later the same week. With a SADiE audio workstation feeding a high-resolution monitoring system — Mark Levinson D-A converter and power amp, with Nagra preamp and Wilson Benesch ACT1 monitor speakers — we were able to make quick comparisons (though I never bank on that), as well as listening to extended selections (which I much prefer) of all the material we had recorded.

There was one unequivocal result: the material recorded using the Royer, though of very good quality, pleasant and very listenable, was, for our purposes, simply not up to the standard of that recorded with the other microphones. The very nature of the coincident figure-of-eight arrangement produced the aforementioned position/image problem, but even beyond that (of a problem that could perhaps have been overcome by using an MS technique instead) the Royer ribbons produced a slightly unreal smoothness that was not appropriate for our project. In the past I have used this smoothing function of the Royer's with great success to tame some aggressive brass instruments, but for the harpsichord we wanted an accurate representation of its full frequency range and its transients. The Royers simply gave too much of an 'easy listening' tonality.

The Sonodore and Schoeps were much harder to decide between. This was not because they sounded so alike: indeed there were some clear differences between them. However, it was difficult to decide which of these two different pictures of the music was overall the most preferable. The Sonodores, which we listened to first, gave a startlingly realistic representation of the harpsichord, much as I had first heard it standing in the waist of the instrument. The task we set ourselves of getting that quality onto tape had been pretty well fully accomplished: the full frequency range, the transients, and the glorious spread of the cascade of notes were all captured by the Sonodores. And yet when we listened to the Schoeps recordings, there was an additional and very seductive warmth in the tone; a warmth achieved, it seems, with only a little sacrifice of the transient attack and nothing at all like the too-smooth rounding off of the Royer.

David and I took a rest from critical listening before coming back to compare the recordings again, but in a different order. Listening to David playing Bach's Chromatic Fantasia and Fugue (BWV903) as recorded by the Schoeps, we sat through the whole 11 minutes of the performance, both of us beginning to think that perhaps it would be these microphones after all that we would use for the CD recording. However, after playing through a minute of the Sonodore recording David suddenly made the musician's decision. "That's what I want," he said. "That has all of my harpsichord in it." The additional warmth of the Schoeps, although sacrificing only a small amount of ultimate transient attack, nevertheless did not come for free. The warmth was the result of a slight bloom in the lower mid-range and, being initially seduced by that, we had not noticed that the lower frequencies, as compared to the Sonodore, were much less in evidence. So we will be using the Sonodores in December, as he said.

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