

MID-SIDE RECORDING AND PLAYBACK TECHNIQUES

A NEW FRONTIER IN THEATRICAL SOUND DESIGN

BY RICHARD THOMAS

For visual artists, the use of *space* in executing the design is typically a dominant concern. For auditory designers, time wants to dominate. However, in recent years, visual designers and auditory designers, in endless attempts to push the boundaries of their design areas, have experimented with the *other* area.

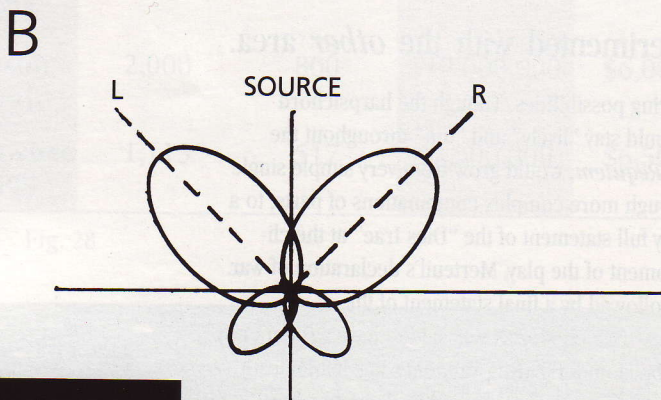
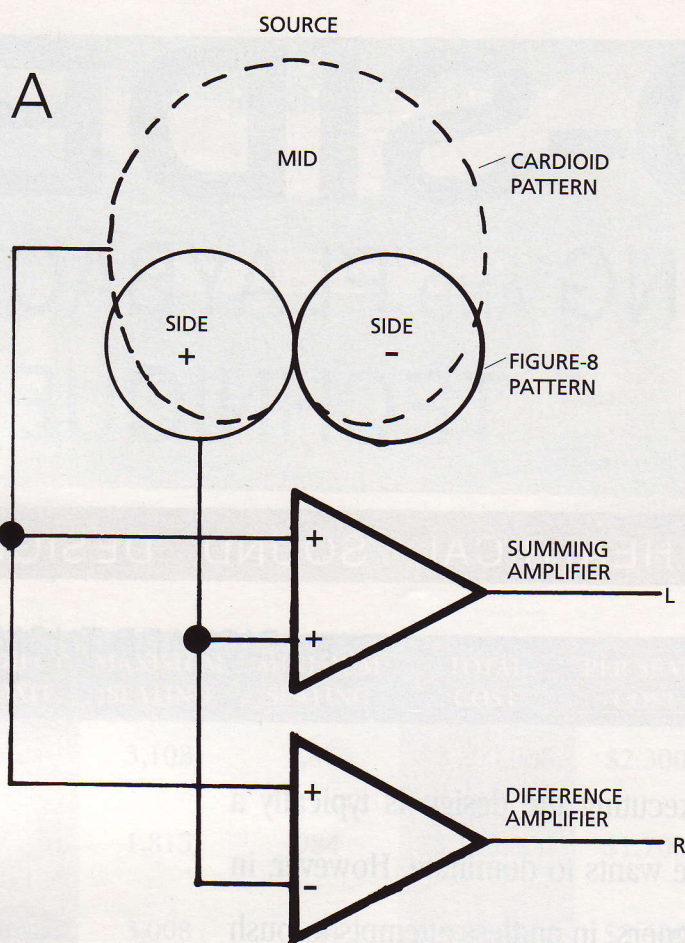
Lighting designers found a new sense of freedom in lights that could move in time, and scene designers discovered that not only could scenery move, but it could move "musically." Conversely, space is the next frontier for sound designers.

So we're always looking for new and unique ways to use space in our sound designs. A recent production of *Les Liaisons Dangereuses* offered up a wonderful aesthetic opportunity to incorporate some forward-thinking technology. Here was a play about a society that had draped itself in elaborate outer layers and mannerisms, but inside was being eaten away by the very passions and desires the outer layers were meant to suppress. We wanted to manipulate the audience to experience the size and strength of those inner desires, and by contrast, understand the smallness of the facades constructed to keep those passions in check.

To accomplish this, we chose two contrasting musical styles of the period: the small intimate sound of harpsichord pieces by Haydn versus the large, majestic orchestrations of Mozart's *Requiem*. The harpsichord pieces would serve as scene changes and underscores in the polite "society" scenes where manners and style predominated. We "deconstructed" the *Requiem*, pulling apart Mozart's great work to find an incredible array of

underscoring possibilities. Though the harpsichord themes would stay "lively" and "fun" throughout the show, the *Requiem*, would grow from very simple single lines, through more complex combinations of parts, to a reasonably full statement of the "Dies Irae" at the climactic moment of the play, Merteuil's declaration of war. This was followed by a final statement of the "Lacrimosa" (which Mozart was said to have written on his death bed) underscoring Valmont's inevitable death. In a final scene, the same light and lively harpsichord theme we heard at the top of the play returns to underscore the re-establishment of the same societal order that existed at the beginning of the play. Now, however the audience is hopefully aware of the facade and the paradox of that society, perhaps in some part due to the contribution of the sound score.

The contrast between the size of a harpsichord, and the size of Mozart's orchestra helped to convey the struggle of society to "civilize" itself. However, this difference in size could easily be lost if the physical size of the music did not match. Imagine both sounds emanating from a 5" un baffled loudspeaker! So to communicate this difference in size to a modern audience, we tried to push the mass and space of these two types of music to opposite extremes. We wanted to make the harpsichord



TRADITIONAL MID-SIDES STEREO TECHNIQUE

A figure-eight SIDES microphone combined with a cardioid MIDDLE microphone through suitable electronics (A) results in traditional left and right stereo signals (B). This technique was popular in broadcasting for its mono capability.

seem very small, and the *Requiem* very large. The harpsichord needed to emanate from a single loudspeaker, yet still provide a reasonably accurate representation of a real harpsichord. The *Requiem* needed a much larger space in which to work; it needed to overwhelm us spatially.

Two problems present themselves here. First, the harpsichord loudspeaker needs to be centered to the visual, whether playing pre-show music through the proscenium speakers, or scene transitions through the stage speakers. Providing a strong center image with a pair of stereo loudspeakers is all but impossible in a theatre. Audience members on the left side of the theatre perceive the location of the sound to be coming from

the left side of the proscenium or stage, and those on the right side of the theatre perceive the sound as coming from the right side of the proscenium or stage. The second problem is the development of a playback system that allows the audience to localize the source of the *Requiem* music to the proscenium or stage, yet be surrounded by the sound, like in a film, or even in a live performance of the piece in a large symphonic hall. As will be seen, solutions to both of these problems can be found by investigating a recording technique known as M-S recording.

M-S MICROPHONE TECHNIQUES

Broadcasting often required both mono and stereo transmissions of the same program. MS recording makes this possible by simultaneously recording both types of signals.¹ Two microphones are placed on the same stand. (See illustration at left.) A middle (or M) cardioid pattern microphone covers an ensemble being recorded along its major axis, emphasizing the middle of the group, while a coincident side (S) microphone with figure-eight pattern oriented at right-angles to the sound source emphasizes the sides of the group, and the auditory characteristics of the recording space. The coincident microphones can provide both mono output (from the M cardioid pattern microphone alone) or stereo output with L and R signals derived by adding and subtracting output from the sides of the S figure-eight microphone.

M-S microphone techniques also have application to our work as sound designers in theatre. At the 1995 USITT Conference & Stage Expo in Las Vegas, Tom Mardikes, resident sound designer at Missouri Repertory Theatre, and a member of the faculty at the University of Missouri, Kansas City, presented an extremely useful approach to solving the problem of localizing music to the center of the dramatic action. Mardike's approach is based on innovative usage of MS microphone technique.

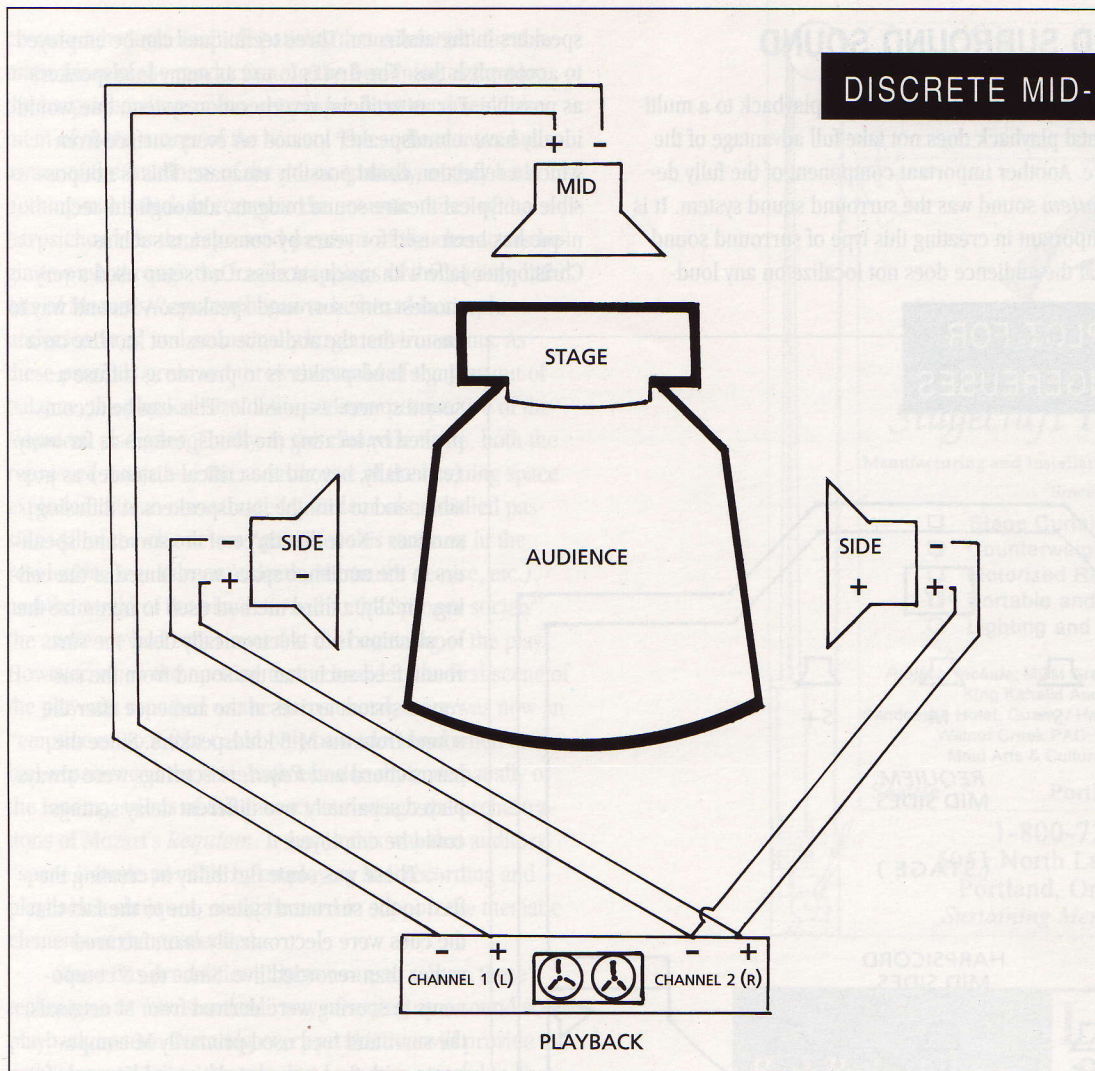
Mardike's innovation is in the use of direct M and S signals instead of their derived R and L counterparts. The M signal is a true monaural signal; the S signal, by contrast is rich in environmental and spatial content.

M-S PLAYBACK TECHNIQUES

Traditional left-right stereo uses two loudspeakers to create virtual positioning of sound images. This technique only works for a limited number of listening positions, which makes it less than ideal for a theatre audience. The conventional approach to creating various sound images in large spaces such as theatres is to use more loudspeakers, with clever delay and level settings to mimic or synthesize the virtual positions.

Mentally, however, we want the illusion that the sound emanates from the scene, not from whichever

DISCRETE MID-SIDES PLAYBACK



Mardike's innovation is to keep the signals from the cardioid MIDDLE and figure-eight SIDES microphones discrete on separate tape channels and then to play them back through separate MIDDLE and SIDES speakers. Note that the polarity of the SIDES going to the right SIDES speaker is reversed with respect to the left SIDES speaker.

loudspeaker happens to be closest to us. Each and every listener should be able to localize sound to the center of the dramatic action yet still experience a sense of spaciousness that doesn't distract by calling attention to sound that appears to emanate from a single loudspeaker box. But can the score mediate between the center (middle) and the environment (sides)?

Using M-S recording and playback techniques, it can. The sound can be localized to the center of the visual stage picture—for the harpsichord passages—by eliminating the side channel from playback, providing a consistent and central sound image to the entire audience. Similarly, in the *Requiem* we can add only as much side channel as is necessary to increase spaciousness, without shifting the perceived source of the image for the audience members who are located closer to the side speakers.

The basic concept is shown in the illustration above. The coverage angle for each loudspeaker is selected to provide direct sound to every listening position. For elements recorded with the M-S technique, this arrangement approximates a physical "decoding" of the pickup patterns. Convention assigns the Middle signal to channel one, and the Side signal to channel two.

Even if you are not able to record your sources using M-S technique, it is possible to playback any recording using the M-S technique and reap some of the benefits, though better results will be obtained if show tapes are specifically prepared with M-S playback in mind. In the case of *Les Liaisons Dangereuses*, all of the music was created using MIDI based sequencing and sampling.² Although it was not possible to record the electronic instruments in M-S, we were able to prepare our show tapes specifically for this M-S type of playback. For instance, we mixed our direct harpsichord to channel one (knowing it would ultimately be played back in the Middle speaker), and added only a little bit of ambiance (from a reverb processor) to channel 2 (knowing it would be played back from the side speakers). This kept the harpsichord sound small, but still fairly realistic, and always centered to the dramatic action.

In actual playback, two separate M-S systems were used. (See illustration on p. 44.) The harpsichord was played through a proscenium M-S setup, to thematically support the two-dimensional facade of the social world of the play. The *Requiem* was played back through an upstage M-S system to create the sense that the underscoring emanated from deep within the characters.

M-S AND SURROUND SOUND

Just going from a more or less monaural playback to a multi-channel frontal playback does not take full advantage of the theatre space. Another important component of the fully developed *Requiem* sound was the surround sound system. It is extremely important in creating this type of surround sound to ensure that the audience does not localize on any loud-

speakers in the audience. Three techniques can be employed to accomplish this. The first is to use as many loudspeakers as possible. For an artificial reverberation system, one would ideally have a loudspeaker located on every surface from which a reflection could possibly emanate. This is not possible on typical theatre sound budgets, although the technique has been used for years by consultants such as Christopher Jaffe with much success. Our setup used a very

modest nine surround speakers. A second way to ensure that the audience does not localize on a single loudspeaker is to provide as diffuse a sound source as possible. This can be accomplished by locating the loudspeakers as far away (especially, beyond the critical distance) as possible, and to aim the loudspeakers at diffusing surfaces. Note that three of the surround speakers in the audience space were aimed at the ceiling. Finally, a third method used to minimize the localization is to electronically delay the surround feed such that the sound from the surround system arrives at the audience after the sound from the M-S loudspeakers. Since the harpsichord and *Requiem* scorings were always played separately, two different delay settings could be employed.

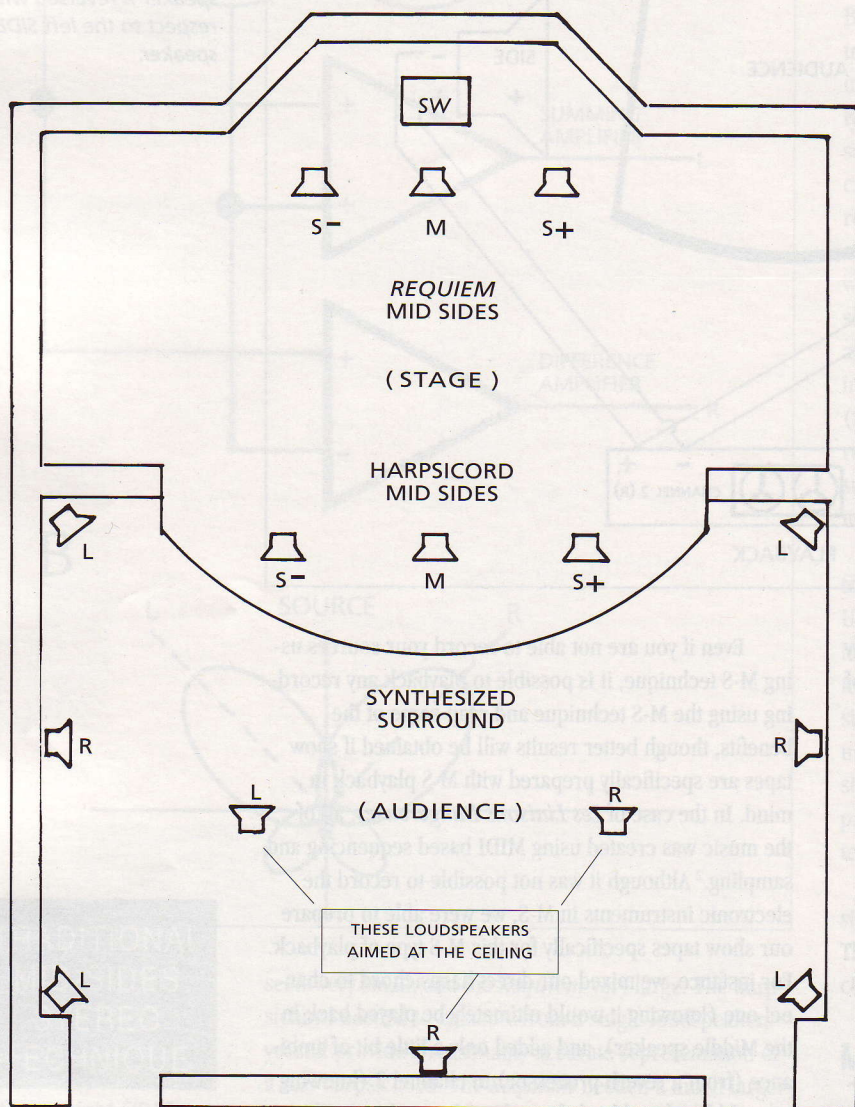
There was some flexibility in creating the feed to the surround system due to the fact that the cues were electronically manufactured rather than recorded live. Since the S components in scoring were derived from M originals, the surround feed used primarily M components, with S components being added only for particular cues. The surround signal, after delay, was further enriched with electronic reverberation, with the reverberation output adjusted to its full "wet" position, (i.e. no input signal mixed with the processed signal). For more diffusion, the synthesized left and right "stereo" outputs of the effects unit were distributed to alternate surround loudspeakers.

M-S TECHNIQUES IN PERFORMANCE

From the moment we fired up the entire system, I was amazed! Not only was the system capable of localizing to the center of the action, but the identity of individual loudspeakers seemed to disappear. It was the first experience I've had in my own sound score design work in which I was happy with the spatial characteristics of the sound. The underscoring with the *Requiem* seemed not only to come from within the visual space of the actors, but it also seemed to be as wide as the acting space—and from virtually every seat in the audience.

The net result of these techniques was to

LOUDSPEAKER PLOT FOR LES LIAISONS DANGEREUSES



LOUDSPEAKER KEY

MIDDLE
M
SIDE+
S+
SIDE-
S-

SYNTHESIZED LEFT SURROUND
L
SYNTHESIZED RIGHT SURROUND
R
SUB WOOFER
SW

create a "through-line" of spatiality that reinforced the thematic ideas of the production. In the beginning of the play, the harpsichord was a fun, yet proper emotional reinforcement of social mores of the society. The audience was not aware of the smallness of the music spatially, as they had nothing with which to compare the acoustic "size" of the harpsichord. As the repressed passions of the characters begin to push through the fragile trappings of this society, little bits of Mozart's *Requiem* began to be heard in simple underscorings, and acoustically larger environments. As these passions grew and threw the world of the play out of balance, the physical size of the auditory perspective of the *Requiem* also grew. Finally, in the climactic scene, both the repressed music and the acoustic size of the listening space exploded into an unrestrained grandeur of unbridled passion. All of the characters "paid" for this outburst in the resolution (e.g. Valmont's death, Merteuil's demise, etc.), and the world of the play returned to the "proper society" the audience had experienced at the beginning of the play. However, when the opening theme heard in the first scene of the play was repeated on the harpsichord, there was now an "emptiness" to it that could only be understood when one had experienced the size, both emotionally and spatially of the inner passions of the characters through the orchestrations of Mozart's *Requiem*. It was in this way that auditory "space," made possible by employing M-S recording and playback techniques, could be used to support the thematic elements of the production.

Since this production, I have come to rely on these techniques as "the standard" way of setting up a sound score playback system. Certainly, every production will provide me with "exceptions" to the rule, but I am very grateful to Tom Mardikes for giving us such a valuable addition to our "sound designer's tool kit." What may get lost in the superlatives, however, is the fact that this was all accomplished with extremely modest sound equipment. It is the techniques that make M-S loudspeaker playback wonderful—not having really expensive equipment. Surround loudspeakers do not have to be extremely expensive, most reverb processors will allow you to set an initial delay, and the playback is still from two tracks! As Tom stresses "try it, and above all, experiment." You'll be amazed at what you can accomplish. ♦

Richard Thomas is USITT Sound Co-Commissioner and professor of theatre at Purdue University.

1. For further reading on M-S Microphone Techniques, see John Eargle's *Sound Recording* (New York: Van Nostrand Reinhold Company, first edition, 1976), 53-57.
2. MIDI-based sequencing and sampling is often necessary in theatre sound score design to allow production teams the flexibility to change sound cues quickly and easily during the rehearsal process. Recording and re-recording cues with live musicians would be prohibitively expensive.



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