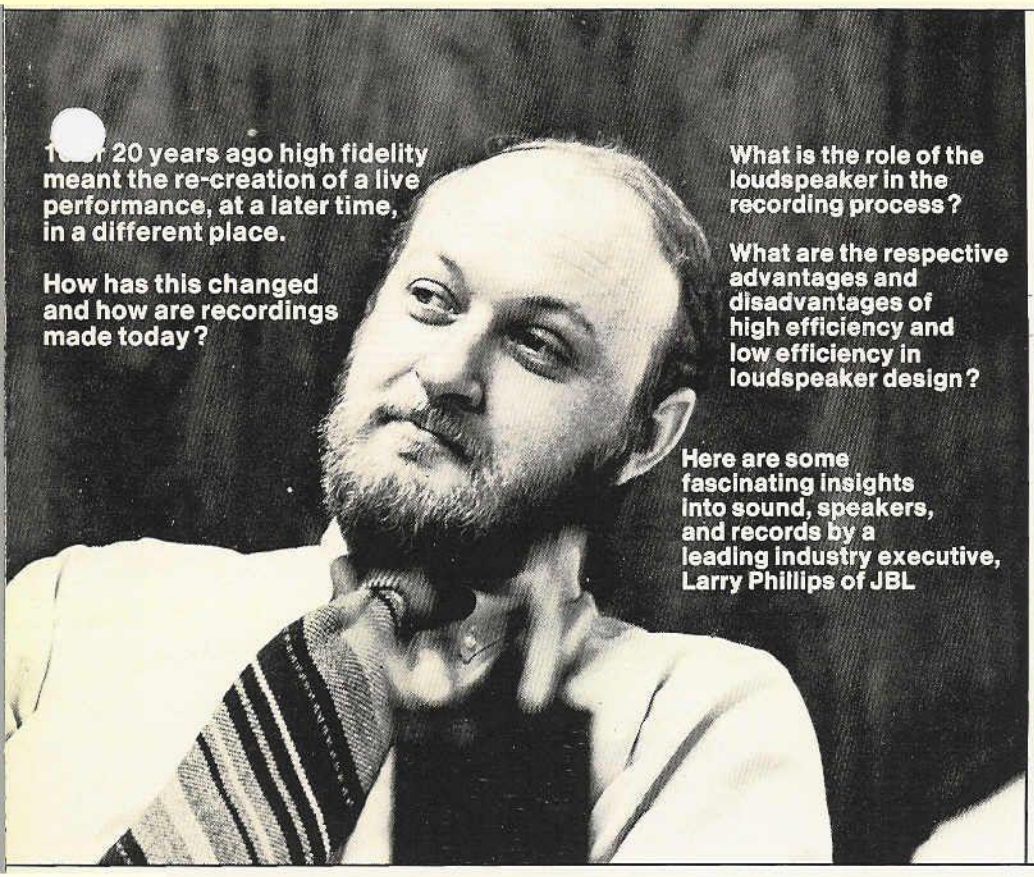

The Authentic Speaker Sound

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OF ALL THE CONTROVERSIES that have appeared (and disappeared) in high fidelity over the years, one of the most persistent—and, to me, most fascinating—is that between the proponents of high-efficiency loudspeaker systems and those who believe that by ignoring the question of efficiency a better system can be produced. I don't propose to raise all the arguments again; they're too well known. Dozens of articles have been written on both sides, with elegant and conclusive proofs. Pages of laboratory data, mathematical derivations, and theory have been produced to support one hypothesis or the other.

Today, most manufacturers have switched to the low-efficiency approach—for a very good reason. It permits loudspeakers to be built for considerably less money. If electroacoustic efficiency is to be ignored in the design and manufacture of loudspeakers, little or no machining is required, parts can be stamped, ceramic magnets can be used instead of alnico, voice coils can be mass produced from round wire instead of hand wound on edge. The loudspeakers themselves usually cost less than the enclosure in which they are housed, no matter who makes them and irrespective of the final selling price. And of course the enclosure itself will cost less if it is small—which the most common of low-efficiency speaker designs are. Only a couple of manufacturers continue to insist that efficiency is necessary to the proper reproduction of music.

In the final analysis theory is relatively unimportant; you and I will listen to whatever sound we prefer, and the mass of the cone or the volume of the enclosure will not intrude on our pleasure in hearing the music. That pleasure is the object of our search in choosing a loudspeaker, and it is in this respect that I believe an important—or even overriding—consideration has been lost in the welter of technical invective.

Many articles have been written to define the term "high fidelity." Ten or twenty years ago, it meant the re-creation of a live performance, at a later time, in a different place, in so realistic a manner that the listener could imagine himself present at the original performance. The concept of recording as a preservative, as an acoustical photograph if you will, no longer is valid however. Recording has ceased to be merely the medium and now is part of the message. It has become a creative art form in itself.

This is important: The sounds on many recordings today cannot even be approximated in live performance. And unless you are a conductor you will not be able to hear a symphony as well in a hall as you can, potentially, from a record. If that causes your brow to furrow and raises your blood pressure a bit, bear with me while I review how recordings are made today.

To begin with, modern studios use highly specialized tape recorders. These machines cost about

$20,000 apiece and will record up to sixteen tracks (or sometimes more) across the width of two-inch tape. The engineer uses a track chart to log which musical sounds are on what portion of the tape. A typical track chart for a middle-of-the-road pops session might show the following: Track 1, left drums; Track 2, right drums; Track 3, bass drum; Track 4, acoustic bass; Track 5, acoustic guitar; Track 6, left piano; Track 7, right piano; Track 8, percussion; Track 9, lead vocal; Track 10, chorus; Track 11, left horns; Track 12, right horns; Track 13, left strings; Track 14, right strings; Track 15, woodwinds; Track 16, open.

As I say, this track layout suggests a middle-of-the-road recording scheme and may be taken as more or less prototypical of the techniques that dominate the recording industry today. These techniques apply in varying degrees to different types of music, with the potential of multitrack recording applied quite differently from job to job. At one extreme is classical music, where as a general practice the entire musical forces for a given passage are present in the studio or hall and record simultaneously. The separate tracks can be used for the several portions of the orchestra, solo instrumental passages, vocal soloists, chorus, and so on. In some cases two tracks may be reserved for the same sound—one with and one without echo or similar special effects, so that the effect can be altered or moderated in subsequent mixing. Sometimes microphones are placed toward the back of the hall and used to record its "ambiance" as a separate track or tracks. At the other extreme are many modern rock sessions, where some tracks may be "laid down" as much as months later and thousands of miles away in another studio, sometimes by musicians who had nothing to do with the original sessions. But there are no set rules. Techniques are borrowed and adapted to fit the job at hand.

The arranger may have planned to use forty musicians for this particular performance. When we look in the studio, however, we might see microphones set up for only drums, bass, guitar, and piano because only these instruments are being recorded today. As you can see from the track chart, they will take up Tracks 1 through 7. Three days from now, the string section (perhaps three violins, one viola, and two cellos) is scheduled to record. The performers will listen to the original seven tracks, played back through headphones while they record their portion of the score right onto Tracks 13 and 14 of the same tape through a process known as Sel-Sync.

While the recording is being made the engineer and the producer will listen, in sync, to Tracks 1 through 7, as well as 13 and 14, on the monitor speakers in the control room. In this way they can hear the previous tracks together with the new material that is being added. As the days go by, each group of musicians will repeat this process until the track chart is completed.

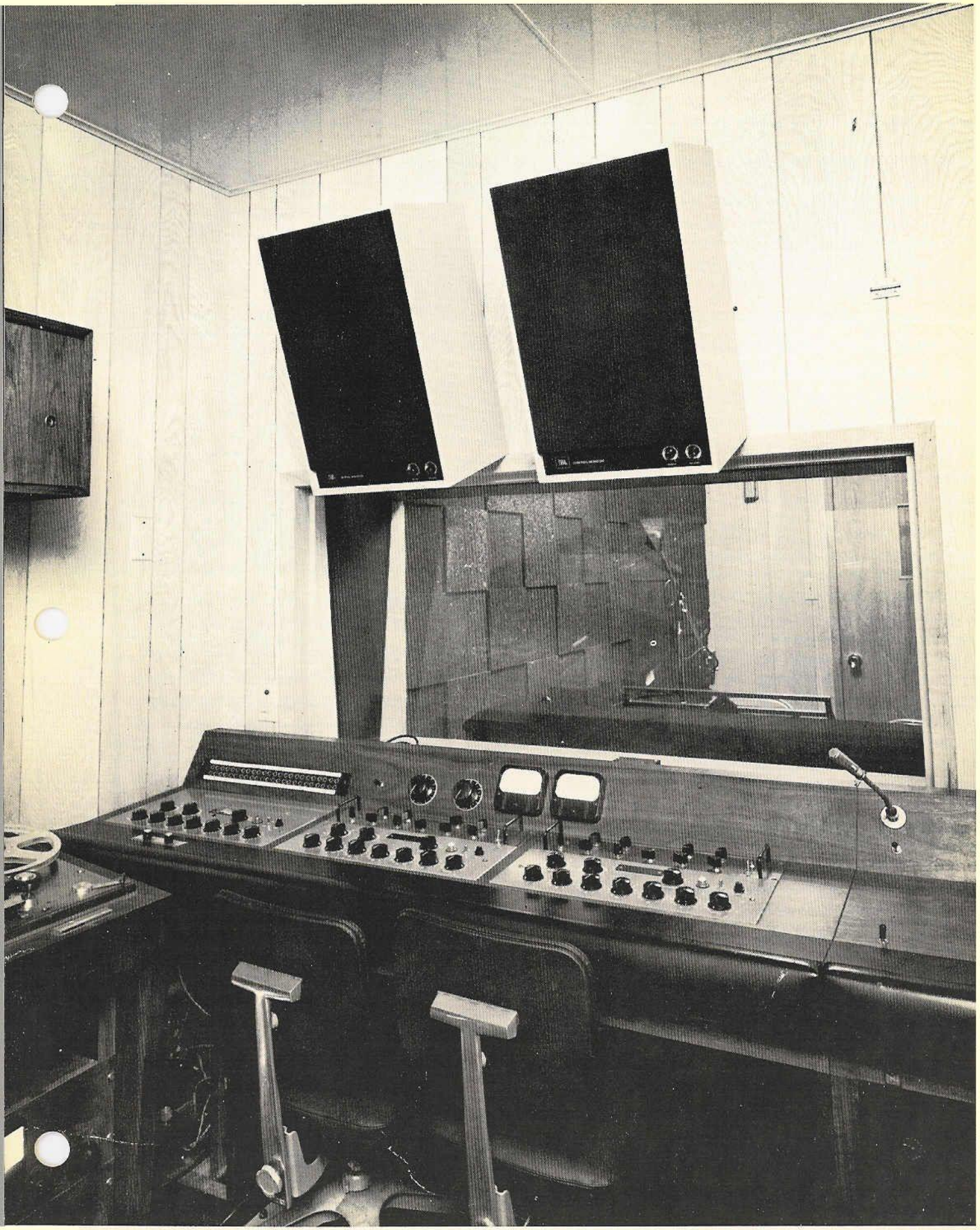
Let's go out into the studio and look at the microphone setup. There are five microphones on the drums, mixed down to three tracks on the tape. The mikes are located very close to the instruments; that for the bass drum actually is inside it, resting on a foam pad. Another mike picks up the traps, another the cymbals, and so forth. These percussion instruments may be isolated from the others—the bass, guitar, and piano—by acoustical barriers. By close miking, the engineer captures all the transients and harmonics generated by the drums; by acoustical isolation he ensures that only the drums will appear on Tracks 1, 2, and 3. Similarly close miking is used for the other instruments as well. One mike may be suspended inside the piano or placed directly under it.

Throughout the recording, the engineer will be trying to get as much signal as possible onto each track to improve the S/N ratio. No attempt is made at relative balance— which cannot be assessed until all tracks are complete of course. What the engineer will be listening for, via the monitor speakers, is the clarity and vividness of the individual sounds rather than their combined effect. That comes later.

When all tracks are filled, the mixdown sessions can begin. The musicians have gone home, and we are left with the producer, the engineer, perhaps the featured artist, and fifteen tracks of raw musical material. These fifteen signals must be mixed down to two (to make the stereo master tape), and become an artistic whole in the process.

In the mixing process the signals will be altered. Echo will be added to the strings and perhaps the voice. There will be about 6 dB of boost at 5 kHz added to the voice and 10 dB of cut at 100 Hz applied to the guitar. The drums will have 4 dB of boost at 10 kHz and 6 dB at 100 Hz. The vocal track will be compressed to reduce the dynamic range of the voice. Relative balances will be set between tracks. Each of the fifteen can be assigned to the left, the right, or anywhere in between on the final stereo copy.

> At the risk of being a bit precious I'd like to suggest an analogy that is both accurate and useful in understanding the mixdown process. Consider the producer an artist. The fifteen tracks become his paints, the console his brushes, the two-track tape his canvas, canvas, and the monitor loudspeakers the light source by which he sees what he is doing.



JBL 4310 Control Room Monitors

The producer and the engineer may begin with the rhythm tracks, adding equalization to get the sound they want and some echo on the rim shots. They bring in the bass, and then the guitar for three bars only, then fade down and bring up the piano—and so it goes. This mixdown process can require weeks of concentrated effort for a single tune. The producer and engineer must get to know all the subtleties of each track, how to alter each instrument, when to bring up which instrument, and when to fade down which combination of others. A recent popular LP required over two thousand hours of studio time for eleven tunes—an average of over five forty-hour weeks for each.

> High fidelity, then, might be redefined as the recreation at a later time and different place of a musical experience in so faithful a manner that the listener can imagine himself present at the recording session.

All the complex and subtle evaluations that the engineer and producer must make in subsequent processing are bent on one end—maximum effectiveness in translating the musical performances in the studio into a vivid, convincing musical experience in your home.

Any team that will spend over two thousand hours mixing an LP obviously is not looking for convenience in choosing its techniques. And this is true whether it is recording pops or classics. Bach, Haydn, and Mahler were innovators and often were misunderstood by their contemporaries. We must not assume that the live-concert perspective for which their music was written defined their musical values for all time. It seems to me that Bach would not have hesitated to put a microphone inside the piano—one can extract much more from the instrument that way. Remember, the sound on the recording is a function of what the microphones "hear." And the mikes are located among the performers, which the audience is not.

At a live concert the conductor arrives at the final mix of musical forces based on what *he* hears during the performance. If you sit in the right front of the hall, the brass dominates the strings. Not so on the recording. It can present the music to you much more as the conductor—or, in imagination, the composer—might hear it because of the endless series of decisions made by the producer and the engineer on the basis of what *they* hear through their monitor speakers.

Since the original experience that generated the stereo (or quadraphonic) recording to which you listen was *created* from raw material in the studio, we must now try to re-create that experience. Remember, some recording consoles have as many as two thousand control positions on them. The permutations and combinations of changes in sound, both subtle and overt, that can be effected during the course of the performance are literally infinite.

> Since all these changes are made using the sound from a loudspeaker as a reference point, the characteristics of that loudspeaker obviously will be reflected in the final sound that is pressed into the recording.

To re-create that original studio experience (the only reality that exists) we must use a similar type of loudspeaker. I don't mean the same model number or even the same manufacturer, but a similar type. Low-efficiency designs have a different and characteristic sound from high-efficiency designs, no matter which manufacturers are involved.

> I've been intimately involved with recording and recording studio design for several years, but I dont't know of a single studio that uses low-efficiency loudspeakers for monitoring–though there undoubtedly are some. The essential point is that, for all practical purposes, modern recordings are mixed using high-efficiency loudspeakers, and that the sound on those recordings reflects what the producer or conductor heard from those loudspeakers in the studio. To hear the recording the way they heard it, you need a similar loudspeaker.

Use of a dissimilar loudspeaker will, to some extent, represent a reinterpretation, rather than a recreation, of the recorded reality. Whether reinterpretation is good or bad I leave to you. This is not a reflection of any ethical stance on my part—I simply cannot judge for you, nor will I pretend to. You are the person who is listening, and you must be pleased with what you hear. Listen to both and choose the one you prefer.

Enjoy! That's what it's all about!