

Listening to Music Live vs. Recorded
And
Changing Trends in Audio Technology and Recording Practices
By
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This article is really two articles in one. But since the first topic deals with something nearly every one of us is interested in and the second, I suspect, many are also interested in, AND since there are some related issues between the two, we may as well talk about them together.

Listening to Music Live vs. Recorded

It is more or less the conventional wisdom among musicians that the experience of listening to music in live performance is better than listening to recordings. I have no argument to make against this, only some observations about the relative merits and disadvantages (yes, there are some disadvantages to attending live performances) of live music and a few sometimes underappreciated advantages of recorded music.

First and most obviously there's the matter of convenience. This sounds like laziness but it's a reality. Most of us have full-time jobs, professional responsibilities of one sort or another, not to mention our families and personal lives. True, most concerts are at night or on weekends. But we're TIRED! Many, many times there are notices of a concert that I really want to hear, but by the time 7:00 or 8:00 PM rolls around, the enthusiasm has dwindled. Weekends are better, but again, various obligations often interfere. So chalk up one distinct advantage of recorded music: We can have it at our convenience - not an inconsequential consideration since it means we're able to listen to more of it, and perhaps even better. Some may say that the environment of a concert space allows for more attention, whereas listening in other places such as a car or at home allows for more distraction. But listening to recorded music can be a quality experience, and with more ease than attending concerts, if we plan for it and make good decisions about our tools for realizing recordings.

And it's not as though live performances are free of distractions. Certainly most concertgoers are well behaved B I don't mean that kind of distraction - but the distraction of the players themselves. It's usually considered that one of the advantages of seeing the performance as well as hearing it is that one gets to see the interaction of the player with their instrument, to understand the body language that is part of musical performance. And to be sure, this is an essential part of playing an instrument well. To audience members who do not play, the body movements of performers may seem like a bit of theatrics. But the physicality of performance is part and parcel of playing music well and expressively. And observing this is indispensable for those listeners who are performers. So for them, particularly, there is much to learn by seeing the music performed; the insights observation gives into the art of playing are inestimable. But I question whether it is that essential for the enjoyment of the music itself. In a way, a case might be made that if the gesture and nuance of music cannot be fully communicated to the listener through the medium of sound alone, the compositions and/or performances must be lacking.

Humans, like most higher animals, are stimulated by the presence of others in social environments. This mild excitement is part of the pleasure of being at social functions. And that

stimulation, some could argue, makes one more attentive, more receptive to the music. But speaking only for myself, I'm usually a little distracted by people around or by some visual features in the environment, and many times even by the actions of the performers, the non-musically expressive kinds, I mean, such as wiping hands or instruments, shaking spit from horns, rosinning bows, tuning, throat clearing, seat adjusting, hand wiping, even facial expressions. With recordings there are none of the visual distractions and generally fewer of the audible ones too. But doubtless other listeners may concentrate as well in a crowd as alone. It's probably more a matter of differences in personalities. For many concertgoers, it's probably less about the music alone than about the full experience. And for some it may even be just a social event, a place to bring guests or an excuse for an evening on the town. And that's fine, even very beneficial. For just as almost surely well-publicized and popular Broadway plays would not run nearly as long as many do, without the influx of audiences made up of out-of-town visitors who, when in New York, feel it expected of them to see a play and report the experience to friends and acquaintances upon their return, I doubt that without revenues from those who attend symphony concerts more as a social outing than to hear music, the orchestras could continue to exist without complete subsidization which is nearly the case now. This no doubt partially accounts for why so many orchestras have become essentially sonic museums.

But composers have a deeper, more professional interest in the music. So I suspect there are many who, like myself, listen far more to recorded music than live (the music of others, that is; probably most of the live music many of us hear is the sound of our own playing). We are interested not only in the overall impact of the music, but in details as well: harmonies, voicings, orchestrations, instrumental effects, rhythmic juxtapositions, pitch and thematic relationships, and of course, organization. These things require repeated listening to fully appreciate, something not practical or even possible with live performances. And for really illuminating these features, nothing compares with listening to a work with the score, again, something not as easily done in a concert environment. So for us composers, there are several significant advantages to recorded music. And from an aesthetic standpoint, for the sheer unmitigated experience of the music and only the music, there is nothing like being able to concentrate solely on sound. One may close one's eyes at a concert, of course, but the sense of isolation and intimacy is not the same.

And finally there's the oft-stated superior aural experience of the live, original performance over any recording, no matter how good. And that is undeniable. Or is it? Certainly the quality of recording and playback systems have been improving steadily over the past few decades, and now the experience of listening to recorded music, though not the same as hearing it live, can be very good. And in many cases, better, for recording allows evening the balance between soloists with orchestras, of overcoming weaknesses of concert hall acoustics, and for better balancing the sound from different sections of a large ensemble since mikes can often be placed where a listener cannot possibly sit. So, although not the same as the sound heard when attending a concert, and certainly not the social experience, nor as instructive for performers, listening to music through recordings, I don't think, is in any way an inferior means of appreciating and understanding music. Which brings up the second topic:

Changing Trends in Audio Technology and Recording Practices

A few weeks ago, contemplating the purchase of a new speaker, I read reviews of some of the models I was considering, posted on various web sites by consumers. And the disagreement (and lack of technical understanding about speakers specifically and audio reproduction and acoustics in general) were striking. Some of the differences of opinion over the pros and cons of various speaker designs reminded me that the way recordings are made and the design philosophies of building speakers have changed a lot over the past few decades. But despite the proliferation of products and all kinds of claims about them, there still seems to be little understanding by most consumers about the nature of sound, the ways it's recorded, and how to get the best possible listening experience in a home environment. And the audio industry doesn't help much to advance understanding. Among all the industries producing consumer products, the audio and cosmetics industries are perhaps the more flagrantly rife with hyperbole, myth, misinformation, falsehoods, and outright Voodoo nonsense than any others. So for those of you who value highly, good recorded music, this second part of the article may be entertaining and mildly informative.

My interest in audio reproduction dates from the years when it was called hi-fi, and when the proud owner of a state-of-the-art sound system might have a single speaker the size of a fireplace at one end of a room, driven by a huge, heat-radiating tube amplifier pumping out a mammoth 30 watts of monaural power. Then came stereo, and with it the need for two speakers, and speaker size began to shrink. The development of the acoustic suspension speaker cabinet design in the early seventies, typified by Advent, was one of the innovations that allowed good bass response from smaller cabinets, albeit at some loss of efficiency. This didn't matter, though, since by then amplifiers had become transistor devices with somewhat more power. And since then, the sizes of speakers have steadily shrunk to the point where one now often finds satellite/subwoofer arrangements in which very small units carry only midrange and high frequencies, typically elevated on tall slender stands, while the lowest octaves are handled by a monolithic looking box containing a single larger driver producing the bass, and which often has its own amplifier since the lowest pitches require the most energy input. This setup keeps the midrange frequencies, to which the human ear is most sensitive, away from walls and interfering enclosure surfaces that can set up interference patterns in the first arrival sound. And even without subwoofers, relatively small speakers alone can produce quite fine sound, since most music, especially acoustical classical music, contains relatively little content below 60Hz. or so.

There have been other innovations along the way from those behemoth speakers to the current state of affairs. In the sixties, Dr. Amar Bose produced the Direct/Reflecting model 901, in which the most of the radiation bounced off the wall behind the speakers with only about 1/9 (hence the name) broadcast directly at the listener. These speakers are still around B along with giant corporation he founded B and despite that the audiophile community generally dismisses them as an archaic design, they still can sound quite good with certain recordings in certain environments. Specifically, the kind of recordings that were common in the late fifties when the design was developed. And that brings up the connection between the design of speakers the changing practices in the way recordings are made, and how those two things are related . . .

In the late fifties, and well into the early seventies, the practices of recording engineers centered around balancing the various instruments and sections in large ensembles and minimizing the levels of ambience in the recordings. In other words, rather dry recordings. To achieve this they typically placed lots of microphones very close to the instruments in an environment with

controlled reverberation, and balanced things in the mix. The resulting recordings were very lifelike and accurate representations of the instruments but from a very close perspective, with little broad spatial quality. So when played back, such recordings didn't present an integrated, coherent soundstage with a single, unified ambience. This was the kind of sound the "direct/reflecting" principle was intended to improve by radiating all frequencies of the sound against room surfaces to establish some reverberation and ambience in the listening room and simulate the way sound reaches listeners' ears in a concert hall. But over the decades since then the practices of engineers have slowly changed (with regard to classical recordings more than pop and rock but those are still often done in studios under very controlled conditions, which is why for those genres, listening to recordings over a good system is frequently better than hearing the group in live concert). In recent years, engineers typically record orchestras simply with a pair of good microphones in a coincident or Blumlein configuration, carefully placed at a central point out in front of the orchestra, and so also capturing a considerable amount of ambience since these are more often made in a concert hall than in a studio. And as you might expect, this type of recording, when played back over speakers that then add listening room reverberation sounds terrible. This is what's called the two-room effect and it's simply too much ambience, and conflicting ambience at that, so that the signal is seriously degraded. These kinds of recordings sound best when played back over speakers that minimize, rather than maximize echo on the listening end. So increasingly the trend in speaker design has been to contain midrange and high frequency drivers in enclosures that interfere with the radiated sound as little as possible, have the flattest and most accurate response curves, and allow the listener to hear first arrival sound least affected by room or other surfaces. This means placing them well away from walls and floors, and even advising listeners to sit closer to the speakers to increase the delay between first arrival sound which the brain uses for perception and localization and reflected sound (the Haas Effect). Incidentally, interference from room surfaces is unavoidable at lower midrange and bass frequencies, which is why subwoofer modules are effective while offering some placement flexibility. The wave periods are simply too long and contain too much energy to be unaffected by room boundaries.

The point of this all is that there is no such thing as a "best" speaker. High-end audiophiles and cognoscenti with a socially competitive mindset often behave as though there is some perfect speaker, some audio holy grail that can be achieved, and search, audition, and compete to have identified the "best" speaker. There is no such thing.

Note: To say there is no one best speaker isn't to say some aren't better than others in measurable ways. Distortion, for example, is a serious problem in speakers. While most decent amplifiers these days can truthfully advertise infinitesimal amount of THD (total harmonic distortion - the least offensive kind of distortion, by the way, compared to intermodulation distortion and Doppler distortion) speakers have tremendous amounts of it. 10%, 20%, even 30% or more. This is usually harmonic distortion, which means that the distortion products of fundamental tones are constituents of the overtone series, and most often the distortion will simply be a reinforcement of frequencies occurring in the signal an octave or two higher than the fundamental. In fact, in some cases, what's perceived by many listeners as good bass, is actually partly distortion.

The reason there is no one ideal speaker is because the process of recording and recreating sound has three basic components to it: The recording, the storage, and the playback. The middle part, the archival storing of the converted signals, is now quite excellent and mostly a uniform computer protocol. Through the digitization of analog signals and conversion to a huge string of

binary digits, the signal is degraded very little. But the other two parts B the conversion of analog acoustic impulses to an analog electrical current, and then the conversion back from an electrical impulse to acoustic waves in the air of listening room environments - are still seriously lacking. Microphone response curves differ slightly, and, more significantly, when recordings are made their number and placement may vary quite considerably, and even input gain varies, which affects the spatial sense. In other words, there is no uniform standard to the encoding part of the process. And similar vagaries exist on the playback end. Room sizes, proportions, surface materials, decay time, seating position relative to sound source, and speakers also vary widely. The full process of recording and reconstituting an acoustical event is an encode-decode process with no standard on either end. So there cannot possibly be an ideal speaker, or even best general speaker design. Different listening rooms require different speakers. And further, every single recording one has in their collection will have been recorded in at least a slightly different way (and often very significantly different) and would be most realistically presented by a speaker with a certain kind of radiation pattern, response curve, volume level (let's don't even get into the issue of human hearing and the Fletcher-Munson Curve and the variation found in loudness compensation circuits of amplifiers intended to minimize the effect of hearing the recording at a lower volume level than the original sound), seating position, speaker placement, and playback equalization! The best one can do is select speakers that have low distortion, good damping (another issue entirely too lengthy to go into here) and transient response, reasonably smooth response curves (both anechoic or FFT computer simulations of anechoic environments and typical room response curves), experiment with speaker placement and listening position, AND recognize that equalization is not some kind of audiophile sin. Most of the time we listen at volume levels somewhat lower than the decibel level of the sound at the microphones so some equalization is needed to at least compensate for our hearing sensitivity loss at the treble and bass ends when listening at anything less than earsplitting sound pressure levels (again, the Fletcher-Munson Curve).

So the trend in the last forty or so years has shifted from dry recordings made in rigidly controlled environments, sounding best played back in a rather more reverberant way, to recordings with more ambience, best listened to in more controlled environments. One could assume that this current practice of recording orchestras in their natural environment of a concert hall rather than in a recording studio is better in every way, the result of progressive thinking, driven entirely by the quest of record companies to produce the best possible sound. And to some extent it is. But it has also been driven by economics. With the equipment required to record and store audio signals having become increasingly small, portability has allowed recordings to be made on location more easily than in the studio. This combined with the fact that fewer recording companies actually have large studios means it is more convenient and economical to bring recorder to the orchestra than transport and squeeze the orchestra into the studio. Some record companies now consist solely of an office, an engineer, a digital or DAT recorder, a couple of good microphones with stands, and a computer. Since they have no studio, location recordings are all they can make. The question of whether it has been the change in the way recordings are made that drove the change in speaker design, or vice versa is rather like the chicken or the egg folk conundrum. These have been reciprocal pressures within the industry as a whole, largely driven by technological change and economic considerations, for it also easier and cheaper to build, store, and ship small speakers than giants the size of an EV Patricia or Klipschorn folded corner horn.

The whole idea of stereo, that a three-dimensional representation of music that has been recorded elsewhere can be accurately recreated by two speakers, has always been problematic. Our ears are not exactly like our eyes. We don't perceive direction and distance aurally the same way we do visually, although there are some similarities. But the adoption of stereo did improve things a lot. And now with the possibilities for computer processing of multi-channel surround sound and as research into the psychological complexities, not just the physiological mechanics, of hearing and perception advances, I've no doubt that recorded music in the decades to come will be even more realistic and satisfying. So for those of us who take fullest advantage of the benefits of recorded music and make no apologies for it, there's a lot to look forward to.

But all this having been said and it must be obvious that I enjoy listening to recorded music there is one aspect of this, one kind of circumstance in which recorded music falls miserably short . . . when there is no recording. Unfortunately, so much of the really good music and the many fine performances that take place around the country on university campuses, art museums, churches, and various other usually slightly attended community venues aren't commercially released and are unavailable to those who don't happen to live near enough to attend or know about them. Yes, these days most such performances are recorded privately, and usually quite well, or at least about as well as possible in whatever the environment and with the unavoidable audience noises, but if one doesn't know about them getting a copy isn't going to happen unless some thoughtful friend sends it to you! One of my great and wonderful professors (of which I've been so fortunate to have had many) used to say, "the tragedy is that we're all going to die before we've had a chance to hear all the great music there is." And sadly, that is true, and sadly, he is gone now. So although I listen as much as I can - mostly to recorded music - I regret those live performances I missed.

A few postscripts . . .

In addition to the Bose 901, other notable speakers that also attempted to simulate the radiation patterns of concert halls were the Ohm F speaker, a unique design featuring a single, deeply inverted conical driver which radiated sound in a 360-degree horizontal pattern, and from Britain, the Quad speaker, a large, flat-panel, dipolar electrostatic speaker notable for its delicate transient response but somewhat limited bass reproduction.

Since the fifties American and British designers, arguably the leaders in speaker research and production, have pursued slightly different design paradigms, each focusing on an important aspect of speaker performance (although in recent years these have been converging). Traditionally, American firms, typified by pioneering companies like Altec (formerly Altec-Lansing), JBL (James B. Lansing), Klipsch, and Electro-Voice emphasized the efficiency of speakers, realizing, rightly, that authentic reproduction depends very much on the ability of the transducer to cleanly produce sound pressure levels that approach those of the original sounds. This meant big speakers and big enclosures, sometimes sacrificing accuracy with regard to frequency response. British designers working for companies like KEF, B&W, and Tannoy, emphasized on-axis accuracy of frequency response, using what I call the "subtractive" approach. That is, damping the drivers, adding shunt circuitry, and manipulating crossovers to reduce offending peaks in the output. This usually resulted in speakers that are less efficient, but are extremely precise. And now that amplifier power is less a factor, the British approach has become a more important consideration than efficiency.

Another bit of arcane but essentially trivial to all but designers bit of information is that there is no real important advantage of either sealed or vented cabinets. There are differences in the way these two kinds of cabinets damp resonant peaks in woofers, to be sure, but it's more a matter of certain kinds of drivers performing better in one or the other kind of enclosure. There is some slight difference in efficiency but it's not significant, especially these days (in the days of LP phonograph records, these was one disadvantage to vented cabinets, in that record warp

produced infrasonic impulses not damped by vented enclosures, allowing the woofer to make large excursions, producing frequencies below hearing and contributing distortion and robbing amplifier power, but nowadays with CDs, is much less a problem). And in connection with vented enclosures, it should be noted that a passive radiator, a non-functioning speaker that responds only to pressure changes from within the enclosure, is (or rather, was, since you don't see them much anymore) functionally the same as a vent in the enclosure. Installing a passive radiator was a somewhat easier way to tune the enclosure empirically by changing the mass of the radiator by adding weights to the cone - but its greatest advantage was probably in its marketing appeal: consumers are more likely to be favorably impressed by a speaker cabinet with an "extra speaker" than one with a hole in it.

One can still buy very large speakers, of course, and, all other things being equal, they are better in some respects than smaller . . . in some respects . . . chiefly, efficiency of low frequency production. But that's much less a matter of concern these days than in 1957. Smaller cabinets can produce good bass, just not as loudly for the same power input. So the idea of a separately powered sub-woofer simply trades smaller size for greater power demands. It is, to some extent, a space/decorating consideration. But an additional advantage to the subwoofer is that it allows the cabinet housing the midrange transducer to be as small as possible, thereby, contributing the least to any degradation of the radiation from the speaker, and allowing that driver to be freed from the distortion creating effects of having to reproduce bass frequencies. Tower speakers accomplish some of this as well, while retaining larger cabinet volume.

And finally, in the early eighties, the years shortly after the introduction to the consumer market of CDs, many listeners complained that digital sound was harsh, gritty, grainy, screechy, and not smooth, warm or "musical." There was some truth to this, but it wasn't the fault of the digital medium, rather the way many analog master tapes had been made. Knowing that there were unavoidable losses of high frequency response when master tapes were transferred to microgroove LP phonograph records it was common for recordists to fudge a bit, to boost the highs somewhat in the original recordings to compensate for those losses (bass wasn't likewise boosted because the compression required to keep a reasonable playing time per record side prohibited it; in fact, bass was compressed, which is why an RIAA standard playback equalization was incorporated in the phono input of amplifiers. Try plugging some other device not playing a microgroove record into this input and hear how excessive the bass will be!). When CDs became such a quick success recording companies early-on relied heavily on producing CDs from recordings that had been originally made on analog tape (and incidentally, most listeners who've never been in a recording studio have no idea just how good old analog master tapes running at 30ips listened to over good near field monitors can be!). When these recordings were transferred to digital format with virtually no loss of high frequency response, many CDs in the early years did sound rather brittle.

One more thing, speaking of high frequency response, acoustics texts typically state the range of human hearing as 20-20,000 Hz. (remember when it was called cps?). And that's been somewhat the benchmark for audio performance, at least for advertising audio performance. One wonders how many people are swayed to buy a product that cites its frequency response as high as 25K or 30K Hz. The fact is that most men over age thirty-five or forty can't hear above 15K, often less. My own upper limit is about 5-7K Hz, an unfortunate reminder, along with tinnitus, of youthful days playing in bar bands before stage monitors, when musicians would stand only a few feet in front of sound reinforcement speaker cabinets for hours each night.

And now lastly. In the early days of stereo there were experiments with a recording/playback process that did attempt to standardize the encode/decode process: binaural sound. And it did a pretty good job of it. For readers who may not know, this was the practice of making a recording with two microphone imbedded in the ears of a life-sized dummy of a human head which had been placed in front of the performing musicians. The resulting recording was to be listened to through headphones only. And it gave startlingly realism. It was never commercially viable, presumably because people don't want to be confined to listening with headphones, especially the heavy uncomfortable ones used in the late fifties. But essentially it was the nearest thing to placing the listener in front of the music, as freed from any subsequent room interference as possible. And come to think of it, that approach is not too different from the way virtual reality experiments with other senses are being approached now.