THE ART OF MIXING

A VISUAL GUIDE TO

MIX PRO AUDIO SERIES

RECORDING ENGINEERING AND PRODUCTION

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by

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Preface

This book has been designed to answer the elusive questions, "What makes a great mix?" and "How do you go about creating a great mix?" Although most people know what they like, they often don't know how to achieve what they want when they're in the studio.

To answer these questions, I explain and use visual representations of sounds as a tool for understanding the whole world of dynamics that an engineer can create with the equipment in the studio.

It's easy to learn the function of each piece of equipment in the studio; you can read user's manuals or the tons of good books available that explain the equipment. The difficulty lies in knowing how to *use* the equipment and learning what combinations of equipment are used to create great sounding mixes. Once you know what the knobs do, which way do you turn them?

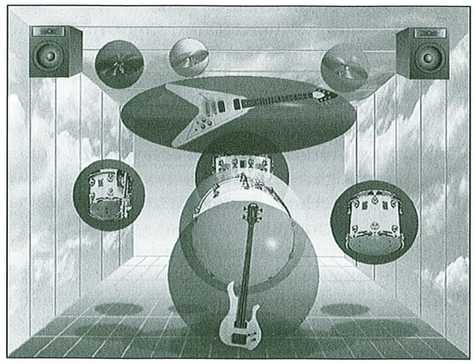
In other fields of art, there is no shortage of books that attempt to explain the whole world of aesthetics. From music to finger painting, scholars have tried answering the question, "What makes great art?" But recording is a relatively new field, and very little has been written about the aesthetics of mixing.

This is one of the first books that attempts to explain the aesthetic side of creating a great mix. This is no simple feat, as there are many musical styles based on any number of different instruments, all of which are recorded differently. Each style of music has its own world of values that are changing constantly. The number of variations is endless. Perhaps no one has attacked this complex subject of mixing due to the lack of a framework to analyze the process. Without a framework, it is difficult to explain what is going on and hard to remember all the different things that can be done in a mix. In music, music theory provides this framework. This book introduces a framework for understanding everything that engineers do in mixing.

The primary goal of this book is to give you a perspective on how the equipment works together to create every mix in the world. Once you have a perspective on what can be done, you can be truly creative on your own.

It has been said that there are no rules when it comes to recording. After all, the perfect mix to one person may be the worst mix to another. However, most bands want mixes that sound like their style of music, and for some styles of music—such as big band, acoustic jazz, and even certain types of rock 'n' roll—the rules are actually quite strict.

In the recording industry, there are certain high-level values that are commonly held. We know this because there are certain professional engineers who can create a great mix every time they sit in front of a console. These engineers command exorbitant fees because they are capable of coming up with something that most people perceive as great, every time. So what is it they are doing? It isn't magic. They are only doing some very specific things. If you could simply understand and learn what they do, you could start down the path to becoming a great engineer. Getting there might be a long process—but once you know where you're going, you'll get there faster! And once you understand what the successful engineers are doing, you can create your own style. This book will help you develop and recognize your own values through visuals, because visuals help us to remember. After all, *a picture is worth a thousand sounds.*



Visual 1. Sound Imaging (see color Visual 1C)

This book will help you discover the high-level values that major engineers have and help you do the most difficult job of all: make art out of technology. The recording engineer makes the relationship between the equipment dynamics and the musical dynamics work. This is the art of mixing.

Visual 2. Structuring Mix (see color Visual 2C)

Acknowledgments

There is a wide range of people that helped me along the way to this point where I am writing this book. The truth is that in this book I have simply gathered together a large amount of information from a huge number of contacts and sources—and then there are those divine inspirations, and who knows where they come from?

First, I probably would have never gotten into this business without the suggestion of my brother Bill. He was the first to say, "Ever thought about being a recording engineer?" Then, there were my various music instructors and all of my recording instructors, including Bob Beede and John Barsotti. There was also Herbert Zettl, whose book on video aesthetics helped to inspire the structure of this book. Craig Gower was also another inspiring force in learning about working with music. And then there was Chunky Venable who was kind enough to have the faith in me to run his studio even though I was so green.

There are also those various artists, engineers, and producers who have influenced my values on this long road. Everybody from Pink Floyd to Bob Clearmountain have made a huge impression on my recording and mixing values.

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Thanks are in order to Todd Stock, who has helped with editing and been a spiritual advisor of sorts. Thanks to Archer Sully, who has been helping to bring into reality an actual working version of the Virtual Mixer. Thanks also to Silicon Graphics for their support and for loaning me an Indigo 2 computer. Thanks go to Donna Compton for helping with the rough editing of the earlier version of the book. Thanks go to Fred Mueller for much of his graphics work on the book. Extra thanks go to Melissa Lubofsky for her visual inspirations and dedicated work in creating many of the graphics, as well as her patient efforts in helping me to learn Photoshop so I could do many of the visuals on my own. Thanks also to Alon Clarke for his enthusiasm and creativity with the photography.

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And finally, I would be amiss if I didn't thank all of my students from over the years for the innumerable suggestions and inspirations that they have brought to me. They are the real reason for this book. May this book begin an ongoing dialogue about what makes a great mix, to light the way for students in the future, so none of us are "all mixed up" ever again.

Introduction

This book is designed to explain how to create great mixes. However, the mix is only one aspect of what makes a great recording. Other factors also contribute to what is perceived as a quality recording and mix.

Chapter 1
"All Aspects of a Recorded Piece of Music" begins by covering the eleven aspects of a great recording: concept, melody, rhythm, harmony, lyrics, arrangement, instrumentation, song structure, performance, quality of the equipment/recording, and the mix.

Each of these aspects must be at least of basically good quality. If even one of them isn't, the recording will suffer. The mix is only one of the eleven aspects, but it is one of the most powerful because it can hide some of the weaker aspects or highlight the magic in the stronger aspects.

In the first chapter, we explore what the recording engineer can do to help refine each of these components. The rest of the book continues with what can be done with only the aspect of the mix.

Chapter 2
"Visual Representations of 'Imaging' " introduces the visual framework for representing "imaging," the apparent placement of sounds between the speakers.

Section A shows the difference between the perception of physical sound waves coming out of the speakers and the imagined perception of imaging. This is important because the two are sometimes confused, and the visuals represent only imaging, not physical sound waves.

Section B introduces volume, frequency, and panning visually and then defines the boundaries of imaging (the limited space where a mix occurs between the speakers).

Section C explains how and why specific visuals were chosen for each sound and effect in the studio.

Chapter 3
"Guides to a Great Mix" explains all of the reasons for creating one style of mix or another.

Section A explains how the style of music affects the way a song is mixed.

Section B describes how the song and all of its details dictate the way a song is mixed. It goes through every detail within a song and explains how each aspect might affect the placement of volume, EQ, panning, and effects.

Section C discusses how the people involved—the engineer, the band, the producer, and the mass audience—contribute to the way a song is mixed. It explains the most difficult job of all for the engineer: to take the values, suggestions, and ideas of everyone involved in a project; decide which ones are best for the project; then diplomatically work with everyone to bring about the best recording and mix possible. It also covers the extraordinary human dynamics that go into balancing the values of everyone involved.

Chapter 4
"Functions of Studio Equipment and Visual Representations of All Parameters" utilizes the images outlined in Chapter 2 to describe the function of each piece of studio equipment in the mix. It briefly, but technically, explains what each piece of equipment does. (As you will see, the visuals make the details of complex functions easily understandable.)

Section A explains the basic functions of faders, compressor/limiters, and noise gates and how to set them for different instruments in various styles of music and songs.

Section B explains the differences between various types of equalizers—graphics, parametrics, and rolloffs—and describes all the frequency ranges found in sounds.

Besides the individual frequencies, it is also important to understand how different frequencies work together to create sounds, or timbres. This harmonic structure is the basic building block of sound. It is important because when you use an equalizer, you are changing the harmonic's volume in that sound.

Most importantly, this section gives you a step-by-step process for using an equalizer to make something sound good—or just the way you want it to sound!

Section C covers the basics of left to right placement in a mix.

Section D describes each of the common functions and parameters of delays, flangers, choruses, phase shifters, reverbs, and harmony processors.

At this point, all of the details of the equipment will have been covered visually. Now the visual representations will be utilized to show how all of the equipment is used together to create different styles of mixes.

Chapter 5
"Traditions and Common 'Musical Dynamics' Created With Studio Equipment" first discusses the different dynamics found in music and the incredibly wide range of possible dynamics that different people perceive in music, including feelings and emotions; thought forms; psychological, physiological, and physical reactions; visual imagery; cultural and even spiritual connotations.

The mixing board and the rest of the equipment in the studio can also create musical and emotional dynamics. Therefore, the engineer must not only know what all of the equipment does but he or she must also become familiar with the dynamic complexities that can be created with the equipment in a mix.

This chapter embarks on an in-depth survey of how each piece of equipment in the studio creates musical and emotional dynamics based on the style of music, the song and its details, and what the people want. The chapter begins by defining the three levels of dynamics that can be created with each of the tools in the control room—volume, EQ, panning, and effects. Then it describes each tool in the control room, explaining what it does based on three levels of dynamics for volume, equalization, panning, and time-based effects: individual placement and relative settings, patterns of placement, and changing settings.

Once you see all that can be done with the equipment in the studio, a whole new world will open up for you

Chapter 6
"Styles of Mixes" is an exploration of the dynamics that can be created with all of the equipment together. It explains how high-level dynamics can be created using combinations of a variety of multiple settings.

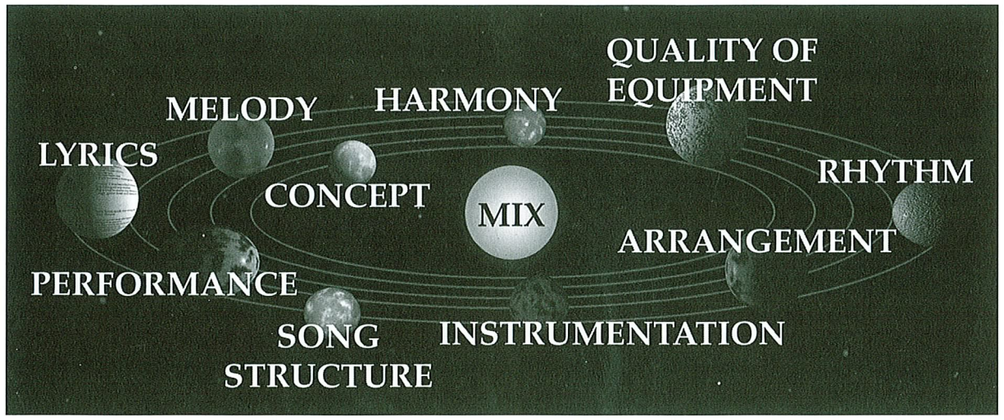
Once you have created a context or a particular style of mix, the most intense dynamic that can be created is to completely change all of the settings on all of the equipment at once to create a completely different type of mix or context. There is nothing so intense and powerful when it comes to engineering. This chapter discusses that technique.

Chapter 7
"The Relationship of Musical Dynamics Created by Equipment to the Musical Dynamics Found in Music and Songs" is designed to set you on your way in this lifelong exploration of all of the relationships between the dynamics you can create in a mix and the dynamics that are found in music. After all, relationships are what it's all about.

At this point, you will have a framework for understanding and remembering all that can be done in a mix. You can then use this framework to understand exactly what engineers are doing in the mix of every song you hear. Ask yourself, "Do I like what they are doing?" And after a while, you will develop your own style and you can confidently do whatever you want.

CHAPTER 1

All Aspects of a Recorded Piece of Music



Visual 3. 11 Aspects of Recorded Piece of Music (see color Visual 3C)

When I did my first album, the mix sounded great but the band and the song weren't that hot. Everyone who listened to it agreed that it wasn't that great—they couldn't separate the mix from the music. Most people don't differentiate between the individual parts that make up a recorded piece of music.

An engineer, however, will often make comments about aspects of a recorded piece of music other than the recording or the mix. If there is a producer, he or she is actually responsible for the details, but most often there isn't a producer, so the engineer takes on that role. Even when there is a producer, he or she will rely heavily on the values and critiques of the engineer. In fact, groups often go to major studios solely because of the production assistance they get from professional recording engineers. This chapter covers the aspects that go into creating a quality recorded piece of music.

All of these eleven aspects contribute to what is perceived as a quality recording and mix. Every aspect of a song should meet at least the minimum requirements of perfection. If any one of them is lacking, it will show through as the weak link in the whole recording. Even though each aspect is only a small part of the overall song, any single flawed aspect could destroy the whole song. If all of the eleven aspects are incredible or perfect, the chances of a song becoming a hit are probably a million to one. If any one of these components is less than perfect, the chances for success go down exponentially. Therefore, it is necessary to critique and refine each of these aspects whenever possible. You wouldn't think the job of an engineer would include working on things like the concept of the song, the melody,

rhythm, and harmony; after all, aren't those things the responsibility of the band? Besides, if the music or band is bad, it isn't the engineer's fault; and making comments in these sensitive areas could be hazardous to your health and/or job security. However, the big secret is that professional engineers do more than just getting sounds on tape and mixing them down. Professional engineers help refine all these aspects whenever possible. This is a secret for obvious reasons: If you call engineers "producers," they get a lot more money. In fact, the engineers who are really good at it often become producers.

There are plenty of great books and no shortage of classes on how to refine these aspects. Therefore, we'll briefly examine each of these components in order to put "the mix" into perspective. The rest of this book is about the mix.

Quality is defined in different ways by different people, so it can take awhile to learn all the ways in which songs can be refined. But if you pay attention, you will develop your own values. If you ask yourself every step of the way, "Do I like this or not?" you will naturally develop your own perspective on what you like and what is "good." When it comes to values, the only one that's really bad is "no values at all." If you don't have an opinion, you're in the wrong business. If you don't know what you like, just listen.

The definition of what constitutes "good" and "quality" is extremely subjective and ever changing for each of the eleven aspects. People have very strong opinions; therefore, the only way to approach this emotionally charged subject is to list commonly held values and preferences. You can use this list to begin your lifelong study of people's values. It is important to recognize where people's values and preferences lie, so that you know where they are coming from. It makes it easier to work with them, please them, and negotiate with them. With this in mind, let's discuss each of the aspects of a recorded piece of music that can be refined and common suggestions that recording engineers make in each area.

Aspect #1: Concept or Theme

The concept or theme can be defined as the combination of the other ten components. It is also known as "the mood," "the flow," or "the aura," depending on your perspective. It is usually defined as the feeling or idea that is conveyed most consistently and strongly in the most number of aspects of a recorded piece of music.

Songs vary in the consistency or cohesiveness of the concept. In some songs, the concept is quite strong and cohesive, while in other songs it might be non-existent (although the concept could be "no concept"). As an engineer, you might suggest ideas that help make the concept stronger and more cohesive. Such a comment might be made when something in a song just doesn't seem to fit. For example, you might point out that a screaming heavy metal guitar just doesn't fit the mood of a love song, or a spacey flange effect might not fit a straightforward rock 'n' roll song. Perhaps someone wants to use a sound or effect that they heard in another song, but it isn't appropriate for the current song. It is the engineer's responsibility to point out these inconsistencies (with kid gloves, of course).

Discovering how each aspect relates to and contributes to the cohesiveness of the whole song can often reveal inconsistencies and deficiencies that might need to be fine tuned. Even more importantly, such a detailed analysis can sometimes provide inspiration and lead to the creation of new ideas.

Positive values for the concept or theme can be its existence, cohesiveness, color, or complexity. Negative values can be that it is rote, uncreative, or predictable.

Aspect #2: Melody

Commenting on someone's melody line can be especially dangerous. Statements such as, "The melody sucks," does nothing for the creative process, much less your relationship with the band. The truth is that there isn't too much that you can say about a melody line. You might point out that it is too busy or too simple, but in both cases it might just be what the band really wants.

In order to avoid copyright problems, you would want to comment if you find that the melody line is exactly the same as another song. As an engineer, you would probably point out a bad note in a melody, but it might turn out to be intentional. You might also come across a case where the band is improvising around the melody in the choruses of a song (especially in jazz). You could mention that it might be a good idea for them to go ahead and sing or play the melody line straight in the first chorus in order to establish the melody.

Positive values for a melody can be that it is catchy, hummable, beautiful, or interesting. Negative values can be that it is busy, banal, simplistic, annoying, or chaotic.

Aspect #3: Rhythm

Those of you who know a lot about the complexities of rhythms, might make some suggestions if you feel it is appropriate. There are entire worlds of rhythm that are taught in music theory classes. However, even if you know nothing about rhythms, there is still one thing you could critique: Is the rhythm too busy or too simple? Anyone can tell if the rhythm is boring or too complex. If you are falling asleep, it could probably use some spicing up. If you can't keep up, the rhythm might need to be weeded out a bit.

When one rhythm part is not working with another, you might want to inform the band. Perhaps the guitar part is stepping on the keyboard part. If so, say something. In fact, if any part is bugging you, you might just quack (then duck).

It is also a good idea to check out the variation in rhythm parts from section to section in the song. For example, you might suggest that the drum pattern be changed a bit for the lead break or bridge. A change in the guitar part might be appropriate for the choruses. Perhaps the way that the rhythm parts change from section to section doesn't work for you or is distracting. If so, you might say, "Hey, is that really the way you want it?"

You might comment on the tempo of the song if it seems to be Russian or dragon (hee, hee). Often listening to the vocals can be a good clue as to whether the tempo is right.

Positive values for rhythm can be that it is too intricate or too simple. Negative values can be that it is too simple, too busy, has the wrong tempo, or is disjointed.

Aspect #4: Harmony

First, if you can arrange the harmony parts for the band, they will normally think you are God—that is, if they can sing them. Even if you don't know anything about chord structures, inversions, or voicing, most people can tell if it just doesn't sound right somehow. If so, squawk.

Besides critiquing the actual notes in the harmony parts, you can also make suggestions about the number of parts and their ultimate placement in the mix. A band may not be aware of all the different ways that background vocals can be recorded.

You could record a three-part harmony on one microphone and place them in the left speaker in the mix, then record the same three parts on another track and place them in the right speaker, creating a full stereo spread of harmonies. You could also record the three parts with three separate mics and place them left, center, and right between the speakers; then record the same three parts again and place them so that you have two parts of each left, center, and right. You could also record a three-part harmony ten times on ten different tracks so that you have thirty vocals. Then "ping-pong" (bounce) the thirty parts down to two open tracks. Once you have mixed the thirty tracks down to only two tracks, you can then erase the original ten tracks and reuse them. You end up with thirty vocals on two tracks in full stereo for that Mormon Tabernacle Choir effect.

Many bands don't realize all the possibilities for recording background vocals, so it is the responsibility of the engineer to suggest these possibilities when they might be appropriate. I will commonly have the band at least double the background vocals (record them twice).

Positive values for harmony could include it having multiple parts or unique chord structure. Negative values could be that it is too simple, too full, or has an inappropriate chordal arrangement.

Aspect #5: Lyrics

Telling someone that their lyrics are lame is not good for your health. It is amazing how many hit songs have stupid lyrics. Therefore, I recommend that you be especially careful when making comments about someone's lyrics, unless you know the people well.

If you add one word to a song, you then own half of the song by law. As you can imagine, this makes some songwriters quite wary of taking any suggestions. Therefore, because of copyright laws, an engineer should be extremely careful when making suggestions in this area. Instead of coming up with some new lyrics, it is always better to try to get the band to come up with new ideas themselves.

One of the most important things to watch out for is that the lyrics are rhythmically correct. In certain types of music, such as rap, it is critical that the lyrics fit the music rhythmically. If you hear lyrics that have too many or too few syllables, you might say something. Ask the band if they are happy with the way the lyrics work with the music rhythmically. If they're not, try to get them to come up with something else. Going out on a limb to help refine any weak lyrics could mean the difference between a hit or just an overall great song.

Positive values for lyrics can be that they are heartfelt, sincere, thoughtful, rhythmic, poetic, or lyrical. Negative values can be that they are banal, clichéd, corny, or nonsensical.

Aspect #6: Arrangement

The term "arrangement" is used here to refer to the density of the arrangement, the number of sounds in the song at any single moment, including how many sounds are in each frequency range.

The main aspects to evaluate in an arrangement are the sparsity or density. If the band is obviously trying to create as full a mix as possible, you might make some suggestions to help. Adding more sounds or notes is the best way to fill out a mix. Therefore, you might suggest doubletracking (recording the same part twice) or even tripletracking. You could recommend doubling a part with a different instrument or

even suggest that someone play a busier part. You can also mention that adding time-based effects, such as delays, flanging, or reverb, will help to fill out the arrangement. And recording a part in stereo with multiple microphones will add to the fullness of the song.

However, a more common problem with arrangements is that they are too full and need weeding out. There are some bands that would record 48 tracks if available, just because they are there and they can! Even worse, when it comes to the mix, they want all 48 tracks in the mix because they have become attached to their parts. After all, they spent so much time recording them. Even if there isn't enough room between the speakers for all of the sounds, they want it all in there because they did them.

It often becomes your duty to try to weed out the arrangement, for clarity's sake. An engineer will often suggest turning off (muting) certain tracks in particular sections of the song. Dropping out parts like this can make certain sections of the song seem more personal and will contribute to the overall clarity.

Bands often don't think about dropping out sounds from the mix because they are used to playing live onstage. It might never occur to them to actually stop playing in certain parts of the song: "What do you mean stop playing?!" Often, simply demonstrating what it would sound like will convince the band. It is especially common when mixing hip hop or techno to turn various tracks on and off throughout the mix.

On a more detailed level, the engineer might point out when too much is going on in a specific frequency range. You might suggest playing a part at a different octave or in a different inversion.

Positive values for an arrangement could be that it is sparse, full, builds and breaks down, or changes in interesting ways. Negative values could be that it is too busy or full, has too many instruments in a particular frequency range, or is too thin.

Aspect #7: Instrumentation

As the engineer, you're responsible for making sure that the sound of each instrument is good, even though it is the band who has chosen the instruments. If there is something wrong with an instrument sound, you can only do so much to fix it in the mix, no matter how much you process or effect it. Therefore, it is important to recognize bad sounds in the first place, so you can replace them. If you can't replace them, point them out so that the band realizes the instrument sound was bad, not the mix.

For example, if you have a drum kit that doesn't sound so great, see if you can rent another set. In addition, make sure all the heads are new. Let the band know that there is nothing in the control room that can fix a drum head that's held on with duct tape. Also make sure that there is nothing wrong with the guitar sounds. Each guitar should be set up so that the intonation is right. There is no reason for a guitar player to use the one guitar they have for the entire album. Beg, borrow, or steal a selection of guitars for the project. The album will normally sound much better with a variety of guitar textures.

Make sure all the amps sound good. Again, there is no reason for you to have only one amp sound on an album. It is especially effective to use a "Y" cable, so one guitar can feed two different amps. Recording the two amps on two different tracks gives you a variety of sound combinations, creating a totally unique sound.

You should also become familiar with all of the sounds within each synthesizer in the studio you are working in, so that the band won't have to spend two hours going through all 5000 presets. You can easily direct them to the banks with the types of sounds they are looking for. An engineer will commonly suggest unique sounds to incorporate into a song. There is a huge number of totally unique and bizarre sounds that could be used. There is a world of different ethnic percussion instruments available these days. You might even suggest designing a new sound altogether with a synthesizer or computer. You might also think about sampling some unusual natural sounds and using them as instrument sounds. When placed low in the mix, some very unusual sounds can actually fit in quite well, even in the most normal type of song.

The recording engineer is quite commonly the most knowledgeable person in the studio when it comes to being aware of all the types of musical instruments and sounds available. Professional engineers get to know the difference between different brands and types of instruments intimately. Often the engineer is the most qualified person to make suggestions on the appropriateness of a particular instrument for a song. In fact, producers commonly rely on the engineer's expertise when it comes to instrument sounds.

Positive values for instrumentation can be that it is unique, unusual, bizarre, or new. Negative values can be that it's the same old same old.

Aspect #8: Song Structure

The song structure refers to the order and length of the song sections (intro, verse, chorus, lead break, bridge, vamp). As an engineer, you wouldn't normally say very much about the structure of someone's song, unless you knew the songwriter well. However, if the structure somehow bothers you, or if you have an idea to make it better, you might ask the band what they think.

For instance, you might point out that a five-minute lead break is a bit long, and a record company might not be patient enough to listen to an introduction that is longer than ten seconds. You might suggest that they do two different versions or that you edit the final mix to make a shorter version.

A positive value for song structure can be that it is different from the norm, while a negative value can be that it is too simple or normal.

Aspect #9: Performance

The recording engineer—whether there is a producer on the project or not—is most often responsible for critiquing and refining a performance. There are five main aspects of performance that a recording engineer may be involved in: pitch, timing, technique, dynamics, and greatness (the goosebump factor).

PITCH

Normally, the recording engineer is ultimately responsible for all instruments being in tune and every note of a performance being in pitch.

There are two levels of pitch perception. Perfect pitch is when you can recognize the exact note or frequency of a sound. Some people can tell you the frequency (such as 440Hz) when they hear a note. This skill, although great to possess, is fairly rare.

Relative pitch, the ability to tell if a sound is in tune with previous sounds in a song, is much more common and is extremely important. It is critical for a recording engineer to develop good relative pitch perception. Although some people are born with it, if you are not, it *is* a skill that can be learned. There are some very good computer programs and study courses on tape that teach this skill.

I know from personal experience that just about everyone interested in this business has very good pitch, though they might not be quick at it. The trick is to become skilled at hearing the pitch of every single note in a string of notes at a fast tempo. Ultimately you need to be able to hear the pitch of each note as well as the relative pitch of the beginning, middle, and end of each note. It all comes down to simply concentrating on finer and finer moments. And, of course, this amount of concentration becomes easier with practice.

The hard part is getting to the point where you can remember which note is out of tune in an entire riff. It is great if you can also tell if a note is flat or sharp, but it is not absolutely necessary. It is enough to know simply if a note is out of pitch and which one it is.

TIMING

Another important skill for a recording engineer to master is being able to tell if the timing is stable. Some people are born with perfect timing perception. However, most of us have to listen closely. Some people pat their leg. Others keep time with one finger in the air. Some just tilt their head in a funny way. Regardless of the technique, it takes serious concentration to hear variations in tempo.

There are certain points when timing typically varies in performances. Drummers commonly speed up when they do a tom roll, so it is critical to listen closely to tom rolls. Also, a band will often speed up at the end of a song as they get rocking.

Some people are fanatics about stable tempo and go out of their way to get tempos to be as stable as possible. Therefore, it is critical to find out if the band's values lie in this area, so that you can give the necessary added attention and focus to the timing. If a band doesn't care, work with them to get them to focus on it more. One interesting technique is to have them play to a click track for awhile. Only if the drummer has practiced with the click track for weeks can he or she actually play with one in a recording session, so take the click track out of their headphones when they are ready to record. They will now be more focused on timing.

Do what you can, but there is only so much you can do before they get irritated. Always try to calculate how far you can push them.

TECHNIQUE

There are specific techniques that musicians must learn for each instrument; these will vary depending on the style of music being played. Any tips or techniques you can offer to a musician can only help. Of course, you can't be expected to know the right thing to say to a musician for each and every instrument; but the more you work in the business, the more tricks you pick up.

For example, there are specific techniques for playing each of the drums in a drum set. The kick drum should be "popped" with the foot. For some styles of music, it is best to really whack the snare drum. For guitar players, there are many little things to watch out for, such as not causing any string buzz or not causing the strings to squeak as you move up and down the neck. All that is necessary is to point out the problems.

There is a wide range of comments that you can make to help singers (as well as a wide range of comments that don't help). Suggestions such as, "Sing out," or "Project more," can be helpful if given at the right moment and with sensitivity. Often it helps to get the singer to focus more on using their diaphragm. Some people will even have a vocal coach come into the studio during the recording session to really help out.

It is especially important to pay close attention

when an experienced producer or professional musician makes a comment or suggestion that works. After awhile, you will learn an entire range of tips and techniques that you can use to help musicians play better.

DYNAMICS

There are two main types of dynamics that you can critique and help refine. First, it is a good idea to keep an eye on simple changes in volume dynamics in a performance. You might find them to be too dynamic when they vary too much. Or you might find them to be too stable in volume, so that it sounds like a synthesizer or drum machine. It is important to make sure that the volume dynamics fluctuate in a way that is musical or appropriate for the song.

The second dynamic to critique is the level of emotional intensity at every moment in the song. Just as with volume dynamics, you might find them to vary too much, be too boring, or be inappropriate. For example, singers occasionally sing out too intensely at the beginning of a song when perhaps they should be saving it for the end of the song. On the other hand, maybe they need to put more emotion and feeling into the performance right up front.

Checking out the performance dynamics at each moment in the song can help you fashion it in exactly the way you want.

GREATNESS

This is the "goosebump" factor. You should never let a performance go . . . until it turns you on. There is a wide range of values that people hold. Common values include sincerity, heartfelt feelings, and emotions. Most likely, you are in this business because you know what you like. At the very least, don't let a performance that you don't like go by. If you make sure that every single performance is incredible, at least in your eyes, chances are that the overall performance of the song will be great.

The Limits of Perfection: The problem with perfection is that it has no limits. Normally, once you obtain perfection, you realize how it could be better.

There are a number of factors that contribute to the decision of how much time you spend trying to get a great performance. After all, it is the engineer's responsibility to gauge the amount of time spent on refining a particular performance. Regardless of the circumstances, everyone wants a basic level of quality. However, after obtaining this basic level of perfection, there is only so much you can do to get a perfect performance. This will be dependent on:

Budget
If the band can't afford the time to perfect a performance, there is nothing you can do unless you are rich or own the studio and are extremely generous. If the band is trying to do a ten-song demo for $100, you just might have to move the session along.

Deadlines
A deadline, such as a meeting with a record company, an appointment to have a project mastered or pressed, or even Christmas (especially when a project is rushed to be ready for holiday sales), is one of the primary destroyers of project quality. It can often help to point out to the band how detrimental deadlines can be. However, sometimes they cannot be avoided, so if a group has a limited amount of time, an engineer might have to accept a performance that is less than perfect.

Purpose of a Project
Obviously, if a project is destined to be a CD, much more refinement is in order. Vinyl is final, and every album is a part of your reputation. If the project is being done as a demo, then the engineer might let less-than-perfect performances pass as acceptable. Generally, an engineer will try to obtain perfect performances on drums because of the amount of setup time involved. If the demo is accepted by a record company, the drums could then be kept as basic tracks for the album.

Expertise of Musicians
The quality of musicianship makes a big difference in the amount of time it takes to get an acceptable performance. You would think that the worse the players are, the longer it would take. But this is often not the case. Many times great musicians take even longer because they know how good they can be. At some point, you might need to suggest hiring professional musicians (if you have a bulletproof vest). One good idea is to present this idea, then tell the band that if they like their own playing better than the professional's, you'll pay for it. I've never had to pay for it yet.

Apparent Musical Values
Different people hold different values for their music. For example, a punk band might focus on energy instead of perfect tuning. An R&B band might care about the spatiality of the sound. A rap group may be mostly concerned about the "boom." A jazz combo might emphasize the interaction between the players. Often, these values will determine whether a performance is acceptable or not. It is often fruitless to spend too much time on an aspect that the band could care less about. On the other hand, it is critical to pay extremely close attention to the aspects that the band obviously values the most.

Determination
The amount of determination that a band brings to a project affects the time spent working on a part and the quality of the final project. Often band members don't realize how much work it takes to get a performance perfect or great. Musicians can easily get frustrated or fatigued to the point where they say, "Good enough." You should always try to inspire everyone to work harder and longer until it is as good as possible, but you can only push musicians so far before they become irritable. It might help to simply point out that it is normal for it to take a long time to get things right and that professional musicians often take days to get a performance perfected. This can help to inspire people to push themselves to be great.

On the other hand, some musicians are so determined to get a performance perfect that they never stop. In the beginning, these people can make you nuts, but you'll soon realize that with this kind of perfectionist, you will end up with an incredible performance. Subsequently, when people listen to the project they will say, "Wow, you recorded that?" Therefore, you come to appreciate the obsessive ones.

Aspect #10: Quality of the Equipment and the Recording

The quality of the equipment refers to the recording equipment, as opposed to the instruments (which were covered under "Instrumentation"). The engineer should make sure that all of the equipment is of the best quality possible and, even more importantly, that it is in good working order.

The quality of the recording includes things like getting good levels on tape (not too low or too hot), good miking techniques, and no distortion or excessive noise. Obviously, these are the recording engineer's responsibility.

Newness is a positive value for equipment, while age is a negative value.

Positive values for recording quality can be that it is present and clean; therefore, negative values can be that it is noisy, distorted, and unclear.

Aspect #11: The Mix

The mix may only be one small part of everything that goes into creating a great overall recording; however, it is one of the most powerful aspects because the mix can be utilized to hide weaknesses in other areas.

The rest of this book is about the mix.

CHAPTER 2

Visual Representations of "Imaging"

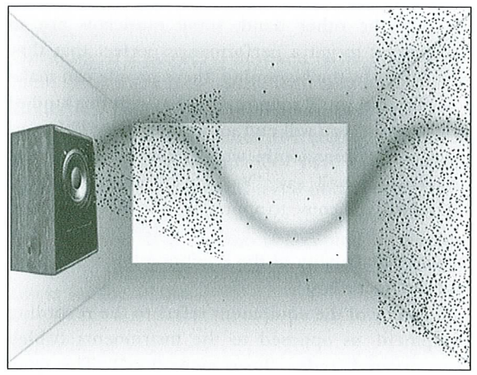
SECTION A

Physical Sound Waves vs. the Imagined Placement of Sounds Between the Speakers

We relate to sound in two ways: We feel (and hear) the physical sound waves that come out of the speakers, and we imagine the apparent placement of sounds between the speakers.

Physical Sound Waves

Whether in the control room or living room, sound first comes out of the speakers in sound waves and travels through every molecule in the room, hitting all parts of your body. Just as waves travel on water, sound waves travel through the air. When the speaker pushes out, it creates compressed air (denser air with a higher air pressure) in front of the speakers. This compressed air corresponds to the crest of a wave in water. When the speaker pulls back in and the sound doesn't return, it creates "spaced out" air (rarefied air). As we all know, when you have a water fight in the pool and you push the water and pull your hand back, the water doesn't come back. Instead, a trough is created. In the air, this trough corresponds to spaced out air. Therefore, sound travels in waves consisting of alternating compressed and rarefied air. This is one way that we perceive sound.

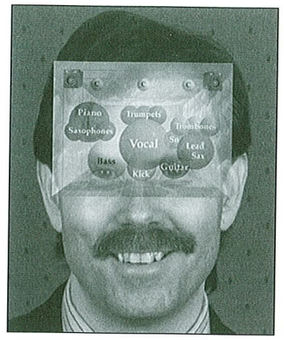


Visual 4. Sound Waves: Traveling Compressed and Spaced Out Air

"Imaging"

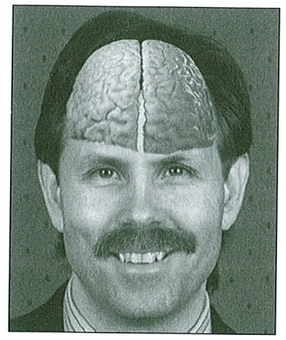
The second way we perceive sound is by imagining sounds between the speakers. The apparent placement of sounds between the speakers is called "imaging" because it is a figment of our imagination. So you see, we're not talking about reality here. When we imagine a sound, like a vocal, to be between the speakers, there is, in actuality, no sound there. The same sound is coming out of both speakers, traveling throughout the room, and we just imagine the sound to be between the speakers.

The same thing happens when you listen to headphones: When you hear a sound in the middle of your head . . .



Visual 5. Imaging in Head

. . . there's no sound there. Your brain's there!



Visual 6. Brain in Head

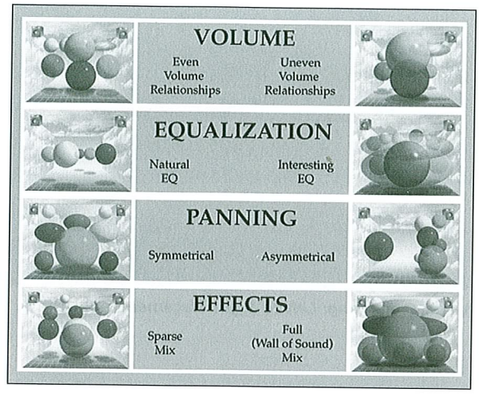
With no imagination process, such as when you are asleep, there's no imaging. If you aren't paying attention to a mix or if you are off to the side of the speakers, imaging does not exist. On the other hand, physical sound waves still hit your body when you are asleep. Even if you aren't paying attention, sound waves are still slapping every cell in your body. You feel sound waves even if you aren't listening.

Imaging requires active imagination to exist. Sound waves do not.

Some people do not hear imaging. There are those who are simply not conscious of it. But there are also people who don't hear imaging because the shape of their outer ears actually causes phase cancelation. This physical difference destroys their ability to place a sound between the speakers.

People relate to sound in two ways: they *feel* the sound waves and/or they *perceive* imaging. Although professional engineers utilize both modes of perception to gain as much information about the mix as possible, they are often more concerned with the dynamics that exist in this imaginary world of imaging.

A wide range of dynamics are created by different placements of sounds between the speakers, and these dynamics are utilized to create all the various styles of mixes that fit all types of music and songs.



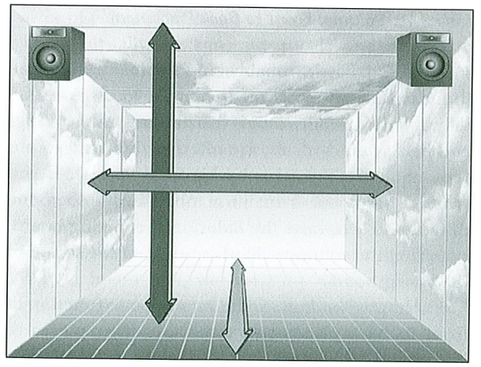
Visual 7. Dynamics Created With Studio Equipment

SECTION B

The Space Between the Speakers

Mapping Volume, Frequency, and Panning Visually

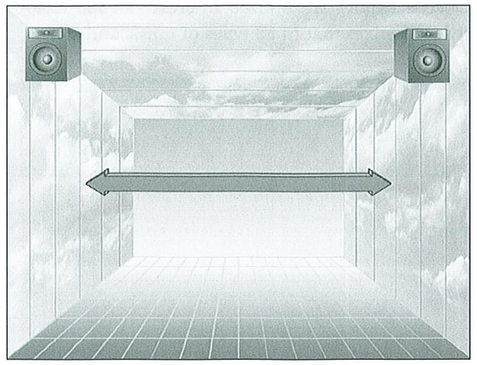
In order to explain different styles of mixes, let's map out how each piece of equipment affects imaging, the apparent placement of sound between the speakers. There are three basic parameters of sound corresponding to the X, Y, and Z visual axes.



Visual 8. Sound to Visuals: X, Y, Z Axes

Panning as Left to Right

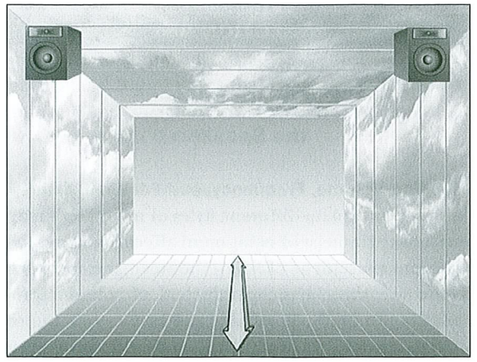
Panning, the left/right placement of sounds between the speakers, is shown as a left to right placement visually.



Visual 9. Panning: Left to Right Placement

Volume as Front to Back

Sounds that are closer to us are louder and distant sounds are softer, therefore the volume of a sound in the mix can be shown as front to back placement.



Visual 10. Volume: Front to Back Placement

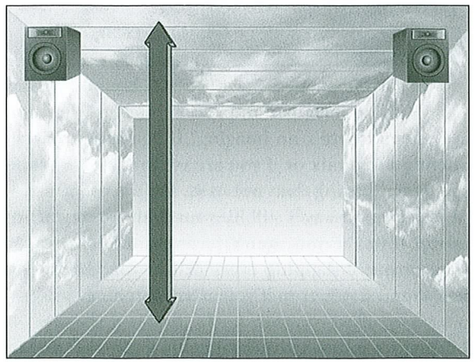
As you have probably noticed in mixes, some sounds are right out front (normally vocals and lead instruments), while other instruments, like strings and background vocals, are often in the background (consequently, the term background vocals). If you want a sound out front in a mix, the number one thing to do is to raise the fader on the mixing board. Lowering the volume will, of course, put the sound in the background.

Although volume is the number one function of front to back placement, there are other pieces of equipment or factors that can make sounds seem more out front, such as compressor/limiters, equalization boosted in the presence range, short delays less than 30 milliseconds (ms), and any effect that makes a sound seem "unusual" so that it sticks out. Reverb and long delay times tend to make sounds more distant. These effects are discussed further in Chapter 4, "Functions of Studio Equipment and Visual Representations of all Parameters."

NOTE: You need other cues, such as delays and reverb, to help gauge the distance a sound is from you. If you happen to be hanging out in an anechoic test chamber (a room that absorbs all sound so there are absolutely no reflections off the walls), you can't tell the distance of a sound by volume alone. However, for the purposes of this book, volume is still shown as front to back. After all, the louder the sound, the more out front it will appear in the world of imaging and mixing.

Pitch as Up and Down

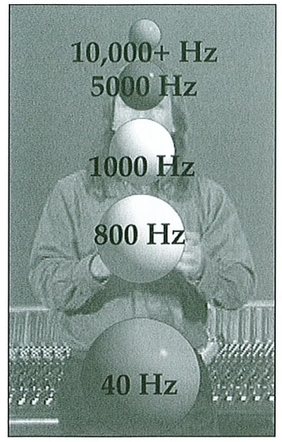
There is an interesting illusion that occurs with high and low frequencies in the world of imaging. Check it out on your own system. Play a song and listen to where high- and low-frequency sounds seem to be between the speakers. Most people agree that highs are higher and lows are lower. Instruments such as bells, cymbals, and high strings always seem to be much higher between the speakers than instruments such as bass guitars, kick drums, and rap booms.



Visual 11. Frequency: Low to High Placement

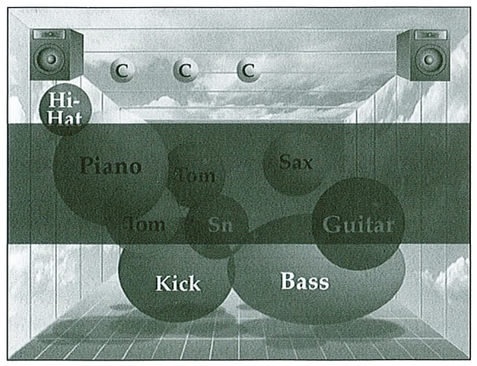
There are a number of reasons why this illusion exists. First of all, low frequencies come through the floor to your feet; high frequencies don't. No matter how much bass you add to a piccolo, it will never rumble the floor. In fact, professional studios are calibrated to exactly how many low frequencies travel along the floor to your feet. (This is why some engineers like to work barefoot!)

On a more esoteric level, there is a theory in the field of music psychology that maps out frequencies from low to high in the body, from the base of the spine to the top of the head, that respond to different frequencies.



Visual 12. Frequencies in Us

We're not here to argue the validity of such a system; however, it might contribute to our perception of highs and lows in the world of imaging. But regardless of why it happens, the truth is that high frequencies do seem to appear higher between the speakers than low frequencies. Therefore, we'll put the high frequencies up high and the low frequencies down low in all our visuals.



Visual 13. Song With Highs and Lows Highlighted

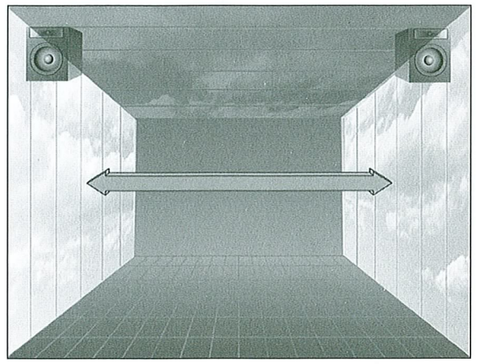
You can raise or lower the sound by changing the pitch with harmony processors and aural exciters or by having a musician play their instrument in a higher octave or chord inversion. Since equalization controls the volume of frequencies, with an EQ we can move a sound up and down . . . at least a little bit. Again, no matter how much bass we add to a piccolo, we will never be able to get it to rumble the floor, and we won't be able to put a bass guitar in the sky.

Defining the Boundaries of the 3D Stereo Field of Imaging

Consider this: The image of a sound never seems to appear further left than the left speaker or further right than the right speaker. Right? Right, unless the room is strange.

Because the exact placement is a figment of our imagination, different people see the left and right boundaries differently. Some say that it can't be further left or right than the speaker itself. Some people see sounds just a little bit further outside of the speakers, maybe an inch or two. Check it out for yourself. Pan a sound all the way to the left and listen to see how far left the image seems to be.

The left and right boundaries of imaging are shown like this:

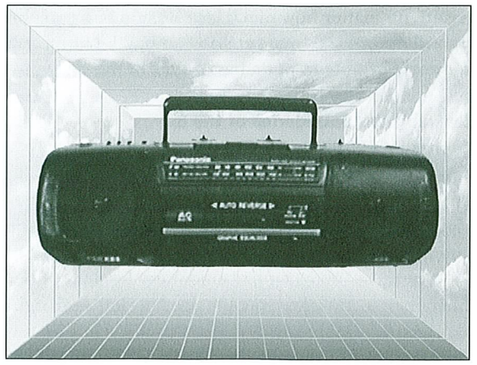


Visual 14. Left and Right Boundaries of Imaging

When you turn the panpot, it's as though you can "see" the sound moving left and right between the speakers. Now, what about front to back boundaries of volume levels?

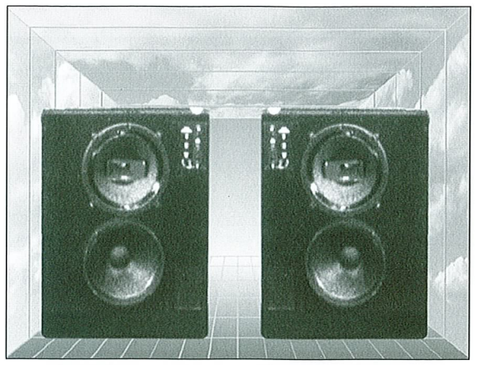
Normally, background vocals and strings are only a few inches behind the speakers. As you reduce the volume of a sound, it seems to recede into the distance. The question is, "How far behind the speakers is a sound before it disappears altogether?"

Most people seem to imagine sounds to be about six inches to two feet behind the speakers, depending on the size of the speakers. It is interesting to note how the speaker size affects the illusion. With a boom box, we normally don't hear sounds more than a couple of inches behind its speakers.



Visual 15. Imaging Limits Around Boom Box

Whereas, when listening to a huge PA at a large concert, the image seems to be as much as six feet behind the speakers.



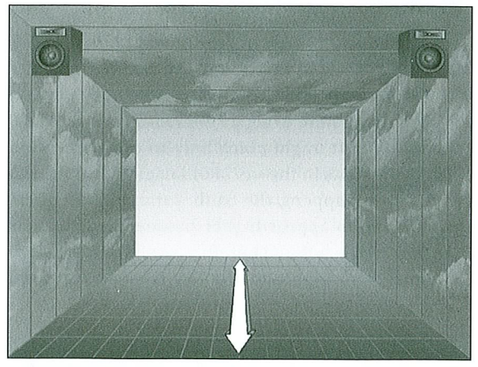
Visual 16. Imaging Limits Around Large PA

Check out how far back the sound seems to be around various speakers. Normally, sounds are only a short distance behind the speakers.

NOTE: There is a psychoacoustic phenomenon based on previous experience wherein certain sounds appear to be even further behind the speakers than the normal imagined limit. For example, if you place the sound of distant thunder between the speakers, it can seem to be miles behind the speakers. The sound of reverb in a large coliseum or a distant echo at the Grand Canyon might also seem to be way behind the speakers. This is a good illusion to remember when trying to create unusually expansive audio worlds between the speakers.

Now, as previously mentioned, when you turn a sound up, it appears to be more out front in a mix. But how far out front will it go? First, no matter how loudly you raise the volume of a sound, you can't make it come from behind you. In fact, sounds rarely seem to be more than a short distance in front of the speakers. Most people imagine sounds to be only about three inches to a foot in front of the speakers. Again, it depends on the size of the speakers. A loud sound in a boom box will appear only about two inches in front, whereas sounds in a huge PA might appear as far out front as six to ten feet. (Check it out on your own speakers.)

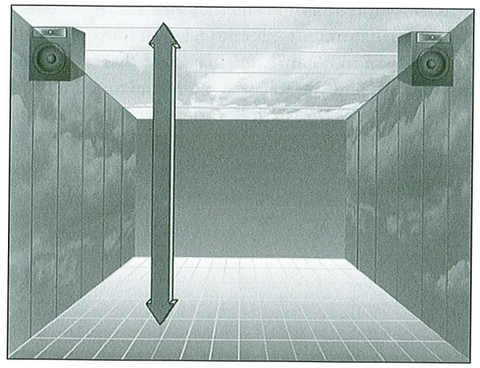
Regardless of our perception of the exact limits of imaging from front to back, it is easy to imagine the placement of sounds from front to back, with volume being the main factor that moves a sound. Therefore, *the normal stereo field is actually three-dimensional*! We'll show the rear boundaries of imaging like this (the front boundaries aren't shown because they would just get in the way):



Visual 17. Imaging Front and Back Boundaries

Finally, what about the upper and lower limits of imaging? As discussed earlier, high frequencies seem to be higher between the speakers than low frequencies. The questions are: How high are high frequencies? And how high do the very highest frequencies we hear seem to be between the speakers? Some people say sounds never seem any higher than the speakers themselves. Some say sounds seem to float a few inches above the speakers. Again, the exact limit depends on the size of the speakers and the imagination of the listener. Regardless of the exact limit, sounds never seem to come from the ceiling. Imaging is limited to somewhere around the top of the speakers.

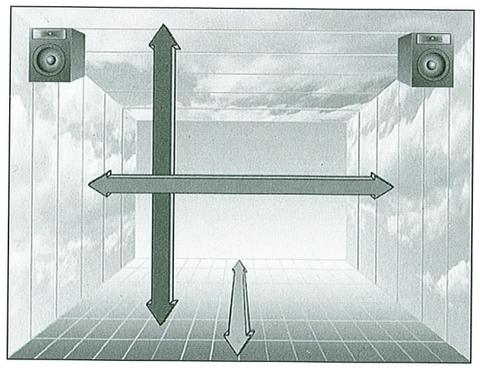
Now, what about the lower limit? Low frequencies commonly come through the floor to our feet. Therefore, the floor is the lower limit. The upper and lower limits can now be shown like this:



Visual 18. Imaging Top and Bottom Boundaries

No matter how far we pan a sound to the left, it will never sound like it is coming from much further left than the left speaker. Likewise on the right. We "see" sounds only a little bit in front of and behind the speakers. We don't hear sounds higher than the speakers, but they do come through the floor.

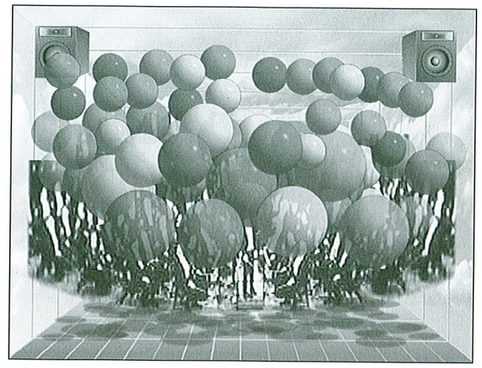
The limits of imaging can be shown with this one visual:



Visual 19. Only Place Mix Occurs

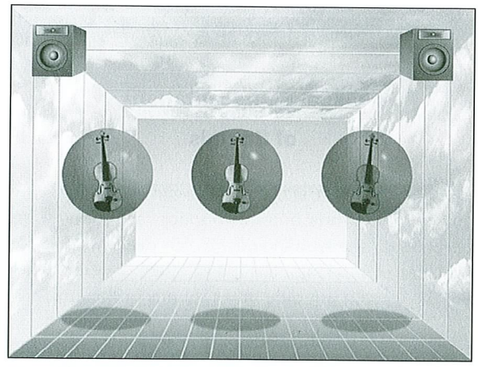
This is the space where a mix occurs. In the world of imaging, sounds do not occur anywhere else in the room. Most importantly, you must realize that this space is limited.

Therefore, If you have a 100-piece orchestra between the speakers, it's going to be crowded.



Visual 20. Large Orchestra Crowded Between Speakers (see color Visual 20C)

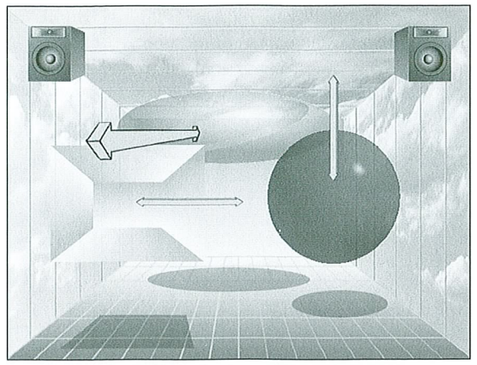
You can't hear each individual violin in the mix because it is too crowded; you only hear a violin section. Whereas, if you have only three violins, you can hear each one quite clearly.



Visual 21. 3 Violins With Plenty of Space in Between (see color Visual 21C)

Because the space between the speakers is limited and masking is a major problem in a mix, the whole issue of mixing becomes one of . . . *crowd control!*

As you can see, a sound can be moved around in the space between the speakers by changing the volume, panning, and pitch (equalization will make small changes). These same three parameters are used not only to move sounds around between the speakers, but also to place and move effects, including delay, flanging, and reverb.



Visual 22. Movement of Sounds With Volume, Panning, EQ

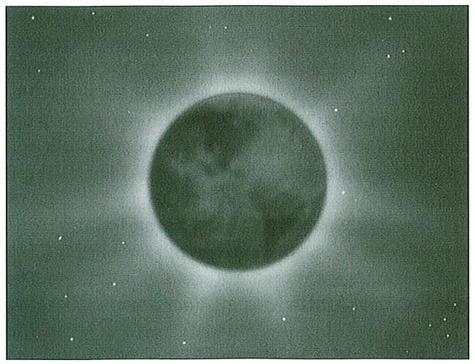
This limited space between the speakers where imaging occurs is the stage or pallet where we can create different structures of mixes. The trick is to creatively place the sound images.

Now, let's discuss the elements, instrument sounds, and effects that we can place between the speakers.

SECTION C

Visual Representations of Sounds

Just how big is each sound in this world of imaging? The goal here is to show how much space each sound takes up between the speakers, so we can deal with the big problem of masking. The more space a sound takes up, the more it will hide other sounds in the mix.

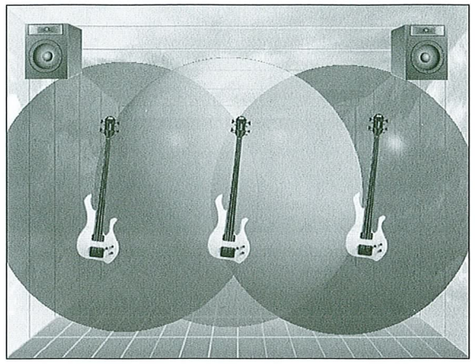


Visual 23. Solar Eclipse: Natural Masking

As there is a limited space between the speakers, we need to know the size of each member of the crowd. How much space does the image of a sound take up in the mix between the speakers?

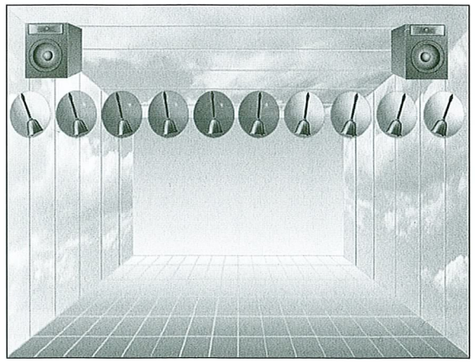
Size as a Function of Frequency Range

First, bass instruments seem to take up more space in the mix than treble instruments. Place three bass guitars in a mix and you'll have a muddy mix.



Visual 24. Mud City

Bass sounds take up a lot of space. Being bigger, they also mask other sounds more. However, place ten bells in a mix and you can still discern each and every bell distinctly from each other—even if they are all playing at the same time.



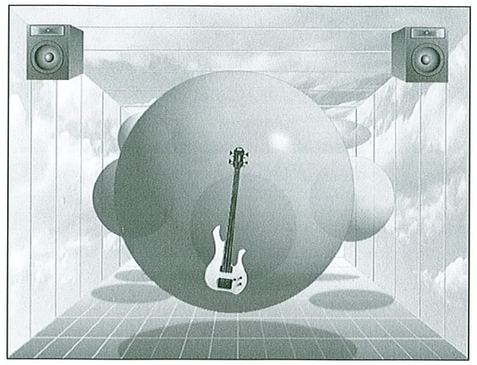
Visual 25. 10 Bells Playing at Same Time

High-frequency instruments will be placed higher and will be smaller than the low-frequency instruments, which will be represented by larger shapes and placed lower between the speakers.

NOTE: Technically, it is very difficult to tell exactly where low frequencies, below 400Hz, are coming from. Low frequencies are extremely difficult to localize between the speakers. Therefore, a more realistic visualization would have the low-frequency spheres less defined—they would spread out to cover the entire lower portion of the visual—creating even more masking. However, in order to be able to show the specific volume, panning, and EQ of bass, we will continue to use large, defined spheres.

Size as a Function of Volume

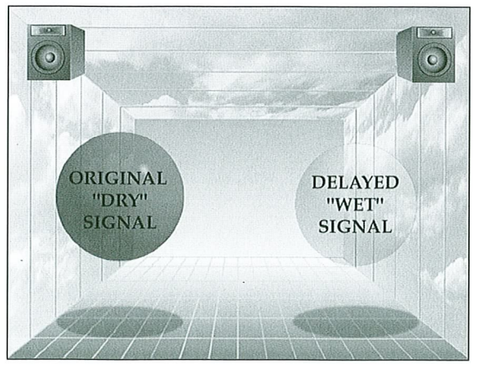
The louder a sound is in the mix, the more it will mask other sounds. Therefore, louder sounds are larger. A guitar that is extremely loud will tend to mask the other sounds a lot more than if it were soft. A bass guitar, already large, will hide other sounds even more when turned up loud.



Visual 26. Loud Bass Guitar Masking Rest of Mix

Size as a Function of Stereo Spread

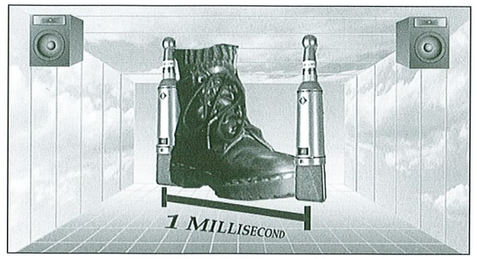
When you have a delay longer than 30ms, you hear an echo, which looks like this:



Visual 27. Delay Longer Than 30ms

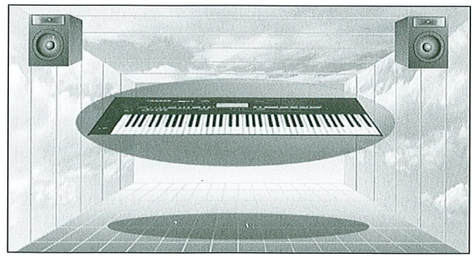
An unusual effect happens when we put a delay on a sound less than 30ms (1000ms = 1 second). Because our ears are not quick enough to hear the difference between delay times this fast, we only hear one fatter sound instead of an echo. When you place the original signal in the left speaker and the short delay in the right speaker, the effect is such that it "stretches" the sound between the speakers. It doesn't put the sound in a room (like reverb), it just makes it "omnipresent" between the speakers.

The same effect can be created by placing two microphones on one sound. Because sound is so slow (around 770 mph), you get about 1ms of delay time per foot. Therefore, two mics are commonly used to create a stereo sound.



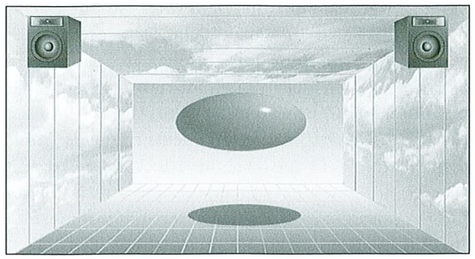
Visual 28. Close to 1ms Delay Time Per Foot

Additionally, sounds in synthesizers are commonly spread in stereo with these same short delay times.

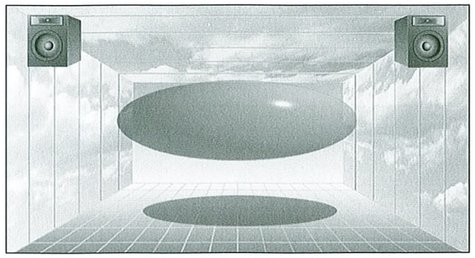


Visual 29. Fattening: <30ms Delay Time (see color Visual 29C)

Just as we can use volume, panning, and EQ to place and move spheres, we also have control over the placement of the oblong sphere, or "line," of sound created by fattening. We can place the line anywhere from left to right by panning the original signal and the delayed signal to a variety of positions. The wider the stereo spread, the more space the sound takes up and the more masking it causes.

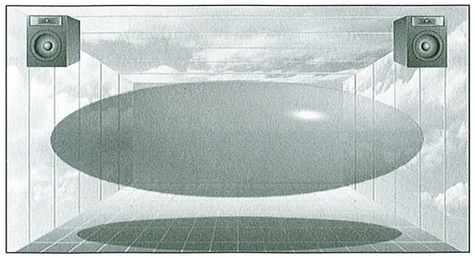


Visual 30. Fattening Panned 11:00-1:00



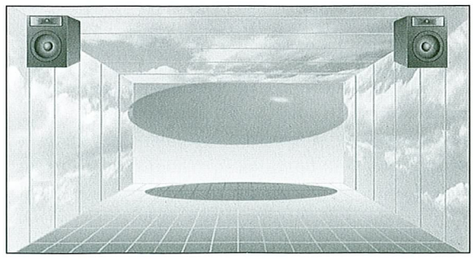
Visual 31. Fattening Panned 10:00-2:00

We can also bring this line of sound up front by turning the volume up . . .



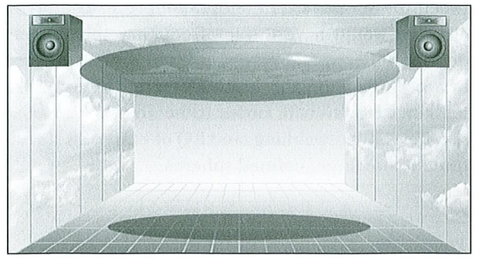
Visual 32. Loud Fattening Right Up Front

. . . or place it in the background by turning the volume down.

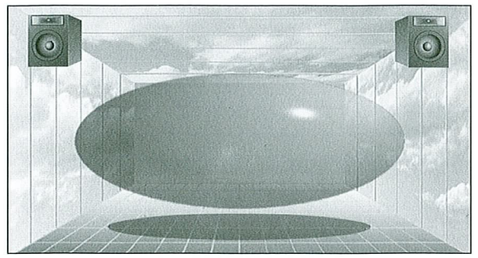


Visual 33. Low Volume Fattening in Background

We can also move it up or down a little bit with more treble or bass EQ.



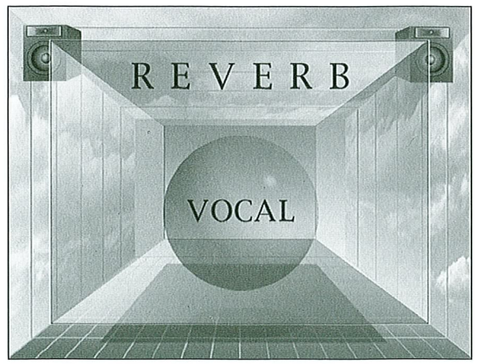
Visual 34. Fattening With High-Frequency EQ Boost



Visual 35. Fattening With Low-Frequency EQ Boost

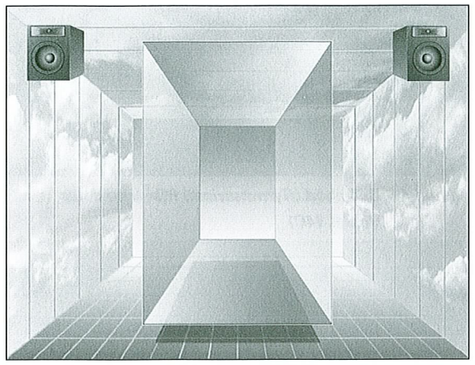
Size as a Function of Reverb

Placing reverb in a mix is like placing the sound of a room in the space between the speakers. A room, being three-dimensional, is shown as a 3D, see-through cube between the speakers. Because reverb is actually made up of hundreds of delays, it occupies a huge amount of space when panned in stereo. It is like placing hundreds of copies of the sound at hundreds of different places between the speakers. This is why reverb causes so much masking!

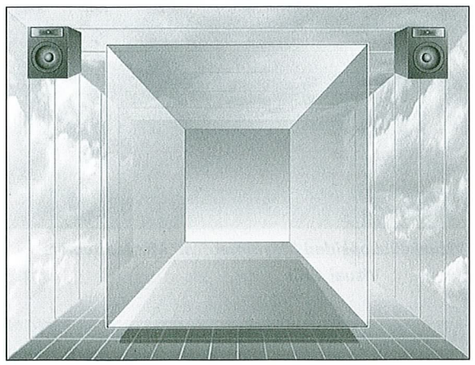


Visual 36. Stereo Reverb on Sound (see color Visual 36C)

Just as spheres and lines of sounds can be placed and moved around in a mix, we also have control over the placement and movement of reverb with panning, volume, and EQ. We can place reverb anywhere from left to right by panning the two stereo outputs of the reverb in a variety of positions. The wider the stereo spread, the more space reverb takes up and the more masking it causes.

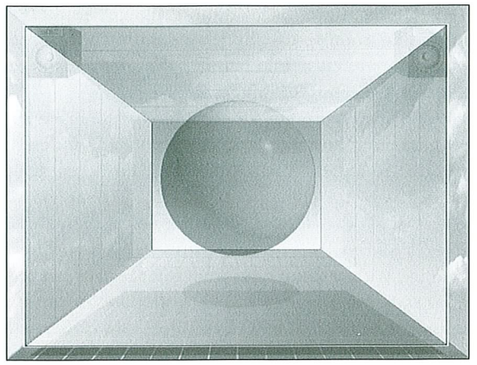


Visual 37. Reverb Panned 11:00-1:00



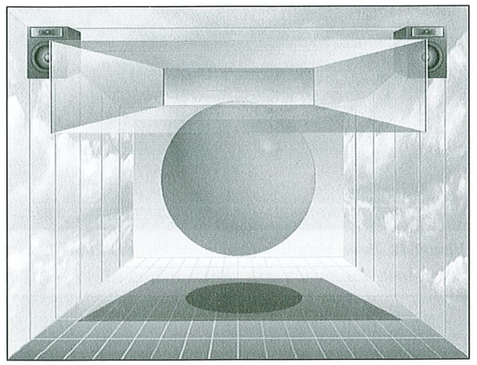
Visual 38. Reverb Panned 10:00-2:00

When we turn the volume level of the reverb up (normally done by turning up the auxiliary send on the sound going to the reverb), it comes out front in the mix.

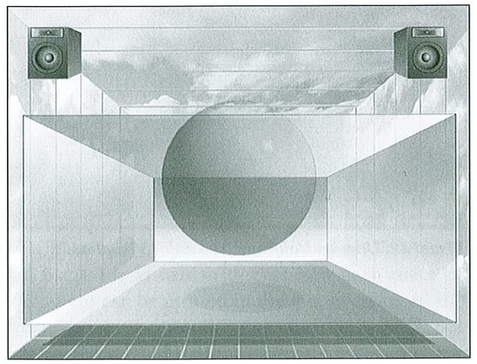


Visual 39. Loud Reverb

With EQ, we can raise or lower the placement of the reverb a little, which makes the reverb smaller (more trebly) or larger (bassier).



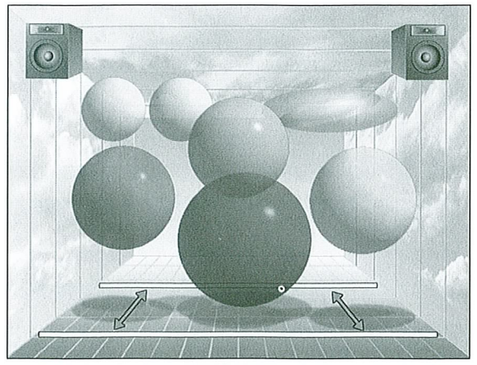
Visual 40. Reverb With High-Frequency EQ Boost



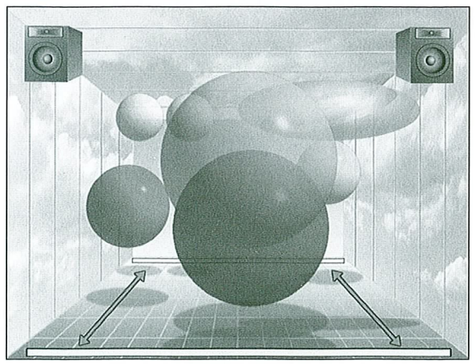
Visual 41. Reverb With Low-Frequency EQ Boost

These three basic sound images—spheres, lines, and rooms—can be placed within the three-dimensional stereo field between the speakers to create every structure of mix in the world.

Spheres represent sounds, oblong spheres represent fattening, and translucent cubes of light represent reverb. All other effects, including different delay times, flanging, chorusing, phasing, parameters of reverb, and other effects, are variations of these three images and will be described in detail in the next chapter. With these various sound images, we can create a wide range of mix styles appropriate for various music and song styles. For example, we can create even vs. uneven volumes . . .

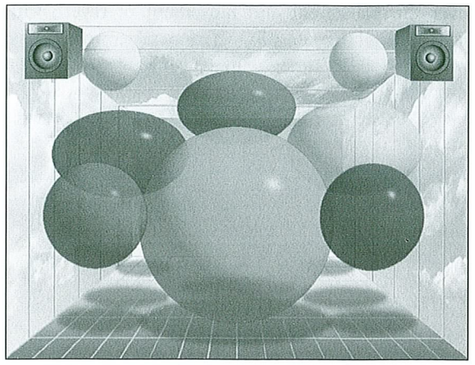


Visual 42. Even Volumes (see color Visual 42C)

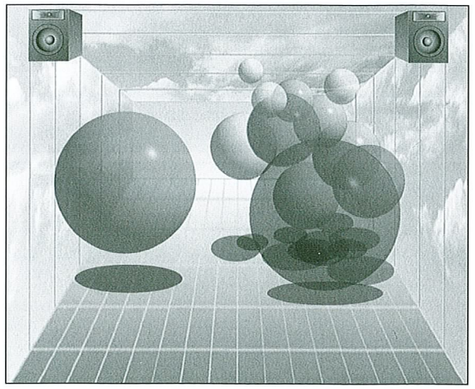


Visual 43. Uneven Volumes (see color Visual 43C)

. . . balanced vs. unbalanced mixes . . .

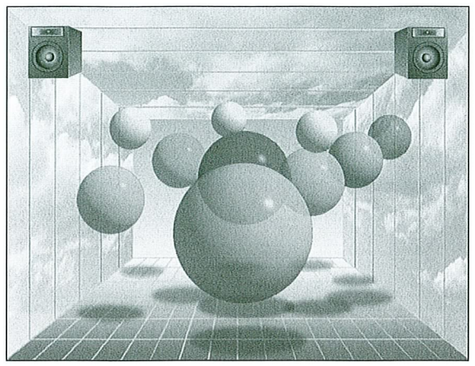


Visual 44. Balanced (Symmetrical) Mix (see color Visual 44C)

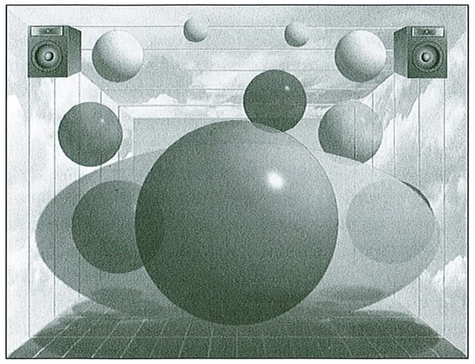


Visual 45. Lopsided (Asymmetrical) Mix (see color Visual 45C)

. . . natural vs. interesting EQ . . .

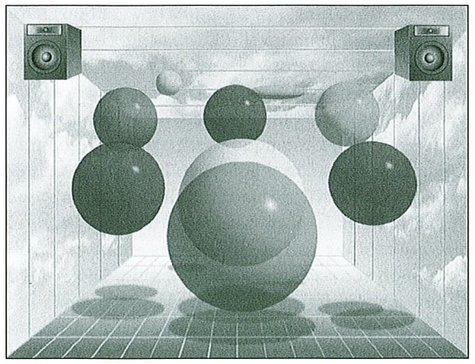


Visual 46. Natural EQ (see color Visual 46C)

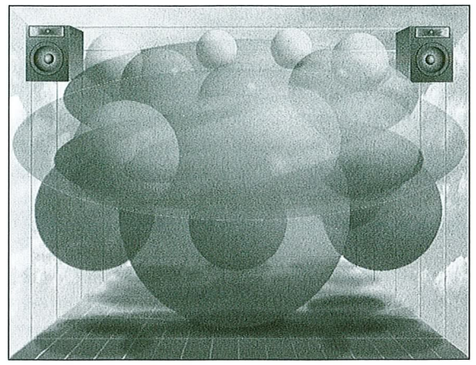


Visual 47. Interesting EQ (see color Visual 47C)

. . . and sparse vs. full (wall of sound) mixes with effects.



Visual 48. Sparse Mix (see color Visual 48C)



Visual 49. Full (Wall of Sound) Mix (see color Visual 49C)

The art of mixing is the creative placement and movement of these sound images. Just as a musician needs to explore and become thoroughly familiar with all the possibilities of his or her instrument, so must an engineer be aware of all possible dynamics that the equipment can create. And he or she must be adept at coming up with any of the structures and patterns that can be conceived.

NOTE: An engineer has the same range of control as the sculptor: Both are working in 3D. In sculpture, the artist deals with shaping the images in a three-dimensional space. In photography and painting, the artist deals with color tones and the way they relate to each other. In construction, the carpenter deals with first building a strong foundation. In Feng Shui, the consultant deals with placement of elements in a 3D space. Here we are dealing with the Feng Shui of mixing.

The mix can be made to fit the song, so that the mix becomes transparent or invisible. Or the mix can be used to create musical dynamics of its own. It can be a tool to enhance and highlight, or it can create tension or chaos. A great engineer uses the mix to push the limits of what has already been done.

We now have a framework with symbols for each parameter of sound. Chapter 4 will go into the details of each piece of equipment in the studio. Chapters 5 and 6 use the visuals to discuss how each piece of equipment can be utilized in the mix to create all the dynamics that the "engineer as musician" wields. But first, we'll explore all of the reasons for creating one style of a mix or another in Chapter 3.

Notes on Design of Visuals

SHAPE

At first thought, a dot between the speakers might seem appropriate. When a sound such as a vocal is panned to the left speaker, the dot would move to the left speaker; the dot would move right to represent panning to the right. This is a common representation used by many people when discussing left/right placement of sounds in the stereo field.

A round image is most appropriate, especially when we consider the way two sounds seem to meet when they are panned from left and right to the center. When they are brought together and start to overlap in the middle, the image suggests that the sounds should be round and symmetrical. If we were to use an image of a guitar, the neck of the guitar would puncture the adjacent sound first because they are both panned toward the center, unlike the way two sounds actually meet and then overlap.

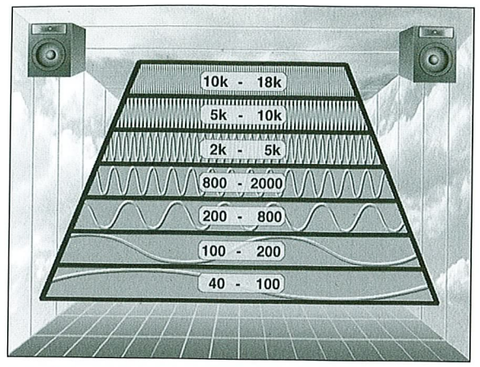
A solid dot has its faults, though. Two sounds can be in the same place in a mix yet still be heard distinctly. Therefore, it makes sense to make the sounds transparent or translucent. If we use transparent spheres to represent the sound field of the image as it appears between the speakers, then two sounds can be seen and heard in the same spot.

COLOR

People all over the world have tried to figure out which frequencies correspond to which colors. Of course, only psychics and space aliens really know. Any instrument can be any color. Therefore, you can assume the colors that we have chosen are perfect.

The primary function of color is to differentiate between different types of sounds. Different colors could be made to correspond to different sound colors, types of waveforms, or frequency ranges. But since I don't want to require people to learn such a system to be able to understand the visuals, I will only use color to help differentiate between sounds in the mix.

When harmonic structures and equalization are discussed, colors will be assigned to specific frequency ranges.



Visual 50. Virtual Mixer EQ (see color Visual 50C)

CHAPTER 3

Guides to a Great Mix
(Reasons for Creating One Style of Mix or Another)

So what makes a great mix? As a professional engineer, it is important to be able to answer this question. Many engineers—even great ones—simply fly by the seat of their pants. They know how to create great mixes, but they might not know how to explain them.

Knowing what makes a great mix has its advantages—some obvious, some not. First, when learning about recording, it is good to know where you are going. If you can define what you are trying to attain, it is easier to get there.

Second, it is helpful to be able to explain to a band what makes a good mix, especially when they are booking a session. This can be tricky. There is always the possibility that no matter what you come up with, the band might have opposite preferences.

There is very little that everyone agrees on when it comes to mixing. Everybody has their own ideas, and ideas seem to change daily. Even if you know what you like, you still need to please the people that you are working with. This is no small task. Often the people you are working with don't really know what they want. Even if they do know what they want, they often can't explain it because they don't know the terminology or what the equipment does. The whole world of music and recording is so incredibly complex and diverse that it is difficult to find any common ground. There are almost as many different styles of mixes as there are people in this world. However, there is one thing that just about everyone does agree on: *The mix should be appropriate for the style of music, the song and all of its details, and the people involved.*

It is difficult for the band to disagree if you tell them, "The mix should be appropriate for your style of music, especially the particular song and all of its details, but we will also take into consideration (ha, ha) what you want and all of your ideas."

These three aspects are valuable guides in choosing the type of emotional and musical dynamics that you create with the tools in the studio. Let's take a look at each of these guides in more detail.

SECTION A

The Style of Music

Most bands that come into the studio want the mix of their music to sound like the style of music they do. For some bands and some styles of music, the rules are very strict and tight. For example, if you turn up the kick drum too much or put flanging on a big band mix, you could go to jail. There are some bands who don't want their music to sound like any other. These are the ones who commonly end up having the most specific ideas of how they want the mix to be—even though at first, they say they don't care.

Additionally, within each type of music, there are often numerous styles. Country music is a good example. In country music, there are at least twenty different typical styles of mixes, ranging from Hank Williams Sr. to Hank Williams Jr. to Garth Brooks. Furthermore, people who are into country music have often been listening to country all their life, so they know when it doesn't sound exactly like what they are used to. Rock is the same way. There are probably a hundred different rock styles, and anyone into rock usually knows in their heart and soul exactly what it should sound like. But they can't necessarily tell you how to get the sound they want with the studio equipment.

Most bands do subscribe to having their music sound like a specific genre of music; however, there

are aliens out there. Your next session just might be a big band that wants the Pink Floyd mix (with lots of effects and mixing tricks). It is critical to know just how strictly the band subscribes to having their mix sound like their style of music. You then know how much you can play.

SECTION B

The Song and All of Its Details

Sometimes it is obvious to make a mix fit the style of music. But more commonly, engineers (and the band) forget to make sure that the mix fits the song and all of its details. The details include the concept, melody, rhythm, harmony, lyrics, arrangement, instrumentation, song structure, performance, and even the quality of the equipment. Each one of these aspects could provide the reason for structuring the mix in some particular manner or creating a certain type of mix. Each aspect might prompt you to use one of the four tools (volume, panning, equalization, or effects) in a certain way. The mix might be used to enhance each and every detail found in the song, or equipment can be used to create tension between the mix and the song. Regardless of how the mix interfaces with all of the components of the song, you should at least be aware of the relationship. It should be appropriate. Let's go through each aspect and see how it could affect the way a song is mixed.

Concept

The concept is a combination of the relationships of each of the other aspects, so it is one of the most important clues to the overall mix style. The multitude of various song concepts can create a wide range of different mix styles. For example, a song about chainsaw murders might be mixed with edgy EQ, some unusual cutting effects, and shocking dynamic volume and panning changes. Whereas, a song about stable love might be mixed with more natural EQ, balanced panning, even volumes, and nice, mushy effects.

Melody

The nature of the melody line can easily affect what the engineer does in the mix—overall and at any specific point in the song. For example, if the melody is a major component of the song, you might consider making it bigger and more appealing with various time-based effects, such as delay, flanging, or reverb. If the melody is simple (or boring, for that matter), it might be a good idea to make it stereo with some type of fattening (short delay time) or reverb. On the other hand, if the melody is extremely busy, it might be better to use fewer effects and turn it up more, so you can hear the detail. Occasionally, engineers will change panning or effects based on what happens in the melody line.

Rhythm

The nature of the rhythm has a direct effect on the mix. The busier the rhythm, the cleaner and clearer you make the mix, so you can hear more of the detail. You don't want to cloud the precision of an intricate rhythm.

Each of the tools in the control room can be used to make a cleaner and clearer mix when you have a busy rhythm. You would probably use fewer time-based effects because there is not enough room for the additional delays. Instruments are normally equalized a bit brighter so that the detail of the rhythm is more distinct. The volume of a complex rhythm part might be boosted just a bit in order to make the details clearer.

Of course, not all busy rhythms are mixed to be more present. A rhythm might be too busy to be mixed clearly and out front. It may be equalized a bit dull and placed in the background because it is too overwhelming for the song. (This might be a good time to ask if the musical part is appropriate in the first place.)

On the other hand, if a rhythm is more basic—slow and simple—there might be more room for effects and playing around with EQ, panning, and volume.

Harmony

The nature of the harmony parts and how they fit into the overall song also contributes to a different handling of the mix. Differences in the number of harmony parts and their chord structure can provide important clues as to what might be done in the mix. For example, the more harmony parts, the wider the sounds might be panned. Whereas, a single harmony part is rarely panned all the way to one side. The type of musical chords that are created with the harmony parts could affect their placement. A dissonant type of chord might be placed back in the mix; a sweet, angelic chord might be mixed with spacey delays and reverb. When the harmonies are not harmonies but simply the melody sung in unison, they might be spread wider in stereo to make them sound fuller and bigger. And the volume might be lowered because they might not be interesting enough to be put right out front. One way people decide how to mix the harmonies is based on how good the harmonies are. Many people will turn them up if they are really cool. None of these ideas are rules; they are simply reasons for creating one type of mix or another.

Lyrics

Lyrical content is a major guide to how a recording engineer mixes a song. The nature of the lyrics often affects the overall mix because they help set the tone of the song. Particular lyrics can often trigger the engineer to create and place various effects in the mix. A line such as "Living on the Edge" is just begging to be placed far left or right in a mix. A line about psychotic behavior might make you boost some irritating frequencies in an instrument. A line like "In the Halls of Love" might call for some sort of reverb effect. Effects might also be removed based on the lyrics. For example, it is common to take off effects (especially reverb) when the lyrics are more important and personal to make them sound more up front and close to your heart.

Arrangement

The density of the arrangement is often a valuable clue as to how to mix the song. If an arrangement is extremely full, then there are two different plans of attack: weed it out or fill it out even more.

The first plan would be to not make a full arrangement muddier by adding additional effects. The idea is to try and make the mix sound cleaner and clearer so that you can hear the busyness of the arrangement. Besides using fewer effects, sounds are commonly EQ'd brighter overall. When there are a large number of sounds and notes in the mix, the higher frequencies are masked more. As low frequencies take up more space between the speakers, brighter EQs will make the sounds appear to take up less space, so there is more room for each sound to be heard.

On the other hand, for some songs and styles of music, it might be appropriate to use the mix to help fill out the arrangement, making the massive "wall of sound" effect even more pronounced. Adding time-based effects (like delay, flanging, or reverb) actually adds more sounds to the mix. You might also pan things wider with a busy arrangement. With so much going on in this limited space between the speakers, it often becomes necessary to utilize the entire stereo field.

If an arrangement is very sparse, there are also two approaches. You could help keep the arrangement sparse by not adding effects or you could try and fill out the mix by adding various types of time-based effects. When there are fewer sounds, you have more room to play around with various effects.

Instrumentation

If the instrument sound is good, you might turn it up and you might make it into stereo with a time-based effect. If it sounds nice, interesting, unique, or complex, show it off. On the other hand, unique and interesting sounds can be quite intriguing when low in the mix so they just seep through. One cool effect is to make a sound stereo and then place it in the background.

If the sound is not happening, don't highlight it by turning it up too much. Instead you might put some sort of effect on it. If you can't polish it, bury it.

Song Structure

The structure of the song often affects what an engineer does in each section of the mix. Some bands will actually create a structure where each section of the song is completely different from the previous section. Frank Zappa, Pink Floyd, Mr. Bungle, and even The Beatles had songs where the mix was drastically different from one section to the next. It is a good idea to be on the lookout for bands who have created songs in which you could create different mixes to accent each section of the song—just because these types of mixes are so much fun to do.

Even when different sections of a song are not that different, you might accent each section a bit differently. For example, commonly a chorus will have a bit more reverb on the vocals. A lead break is often spiffed up by boosting the volume of the kick, snare, or bass and sometimes by adding more reverb to the snare. The same is commonly done in the vamp at the end of the song when the band is rocking out (or doing whatever they are doing). A bridge section might have a different type of reverb or a different type of panning on the instruments in order to create some variety.

Performance

The performance is often one of the most important aspects affecting the mix. For example, a particular type of guitar lick just might induce you to pan it from left to right in time to the lick. You might also consider adding an effect like reverb to correspond to the riff.

Most importantly, the quality of a performance will often affect how the song is mixed. If it is an incredible performance, you just might turn it up in the mix and bring it out front to show off the talent. On the other hand, if it isn't incredible, don't put it out front, especially without any effects on it. You don't want to highlight something that isn't incredible. At least turn it down a little in the mix or put a bit of reverb or some other time-based effect on it to smooth out (or hide) the rough edges. However,

don't bury a bad performance too much. Don't put too much reverb on it and don't turn it down too much. Bury it, but not too deep. You would then not only have a bad performance, but also a bad mix.

Quality of the Recording Equipment and the Recording

If you have cheap equipment, you shouldn't make the mix too bright and crispy because it will show off any noise and distortion. With better equipment, you can often make your mixes cleaner and clearer. Also, if you are careful with miking and levels to tape, you won't have to fix it in the mix later.

Commonly, it is the lyrics and the performance that play the biggest parts in determining what is done in a mix. However, this can vary drastically from song to song. Often, one aspect or another will dictate the mix more than the others. Perhaps the best type of mix is where all of these values play an equal part (more or less).

So, where do your own values lie? Which one of these ten aspects of the song would you think is the most important in determining the eleventh aspect: the mix?

SECTION C

The People Involved

The tricky part is to balance your own values with the rest of the people involved. Engineering is balancing the desires of the client with your own values in the music. The job of the engineer is to take the values, suggestions, and ideas of everyone involved and decide which ones are best for the project. The professional engineer listens to all ideas and compares them with his own values and the values of the mass audience. He or she then discusses those feelings about the idea, often does a test run on the idea, and then works with the client to make a final decision. This balancing act is one of the most difficult jobs of the recording engineer.

The problem arises when the band asks you to do something that will decimate the mix. They will often ask very nicely, "Could you please make the mix suck?" They might want their instrument louder or too low. They might want someone who is in the band (but who has bad pitch) to be louder: "They're in the band; they've got to be in the mix." Regardless of how obviously wrong they are, the problem is that they are paying for the session. When first starting out, it is much safer to go with whatever the band wants. Then the band can't blame you for a bad mix if it is their fault. The problem is that you end up with bad mixes, and you can't exactly put a disclaimer on the album!

Therefore, it is worth your while to go out on a limb and make suggestions to fix things for the good of the project, for the good of the band, and for your own good. The worst case is when the band tells you to do something that is obviously wrong, and then a couple of weeks later they come back to you and are unhappy, displeased, or even angry, having forgotten it was their request in the first place.

When you know you are right, you should try to make a case for it; but be sure you are right. The absolute worst thing that could happen is to convince the band that you are right when you aren't. The band is going to listen to the project hundreds of times after they leave the studio—in a wide range of places, with all different kinds of ears. Later, they will know for sure if something is not right. Therefore, if you are going to try and convince someone that you are right, you had better be right.

Once you have gained the experience to know you are right, you need to become skilled (and diplomatic) at explaining logically why one idea is better than another. This means knowing real reasons why something should be one way or another. Saying things like, "Trust me," or even worse, "I've been doing this for years," does just the opposite when trying to convince people that you are right.

The professional engineer develops a repertoire of realistic, logical reasons for the specific ways that sounds are placed in a mix. And if a situation happens when you can't think of the right thing to say to the band to make them understand . . . don't go to sleep that night until you figure out the thing that you could have said. Then, don't ever forget this reasoning because there is nothing worse than having the same situation happen again and still not be able to explain to the band why they might be wrong.

The ideal engineer is one who not only knows what is best for the project, but also knows how to explain why to the clients.

Here are some examples of explanations or reasoning that make sense. Say the band is asking you to turn up the kick drum too much. There is a wide range of levels that the kick could be at and still be within the realm of preference. The problem comes when it is obviously outside the realm of preference. You might say something like, "You know, for this style of music and this type of song, it is rare that a kick drum is ever this loud in the mix. Do you really want it to be that loud?"

Or let's say the singer wants you to turn up the vocals volume. Again, you might point out that for this style of music, it is almost abnormal to have the vocals that loud. You might also point out that when the vocals are turned up that loud, it dwarfs the rest of the band, making it sound wimpy. Ask them if that's what they really want.

When doing rap or hip hop, the band often wants the 808 rap boom sound to be so loud that it rumbles the windows. This is usually because they are used to listening with the bass EQ cranked all the way up (either in their car, at home, or at clubs). Therefore in the studio, the rap boom might not seem big enough to them without this bass boost. Just pointing out how it is going to be boosted more with EQ in the real world can make them realize that they shouldn't boost it too much in the studio—otherwise it could seriously blow up speakers later.

Another example involves the reverb level placement in a mix. The problem occurs when you listen to reverb in solo. Once you have heard it alone, your mind recognizes it better when it's in the mix. Therefore, it seems bigger in the mix than it did previously. Because of this psychoacoustic effect, the band often wants the reverb lower than what you commonly hear on the radio. Explaining this phenomenon to them can help you get reverb up to a more appropriate level and help them understand the reason why.

Here's one final example. Perhaps the band wants to put an effect like reverb or delay on a sound like a bass guitar or kick. You might explain that bass instruments already take up a lot of space in a mix. Because reverb is made up of hundreds of delays, it really takes up a lot of space. When reverb is extra bassy, it takes up even more space, thereby masking other sounds tremendously. Explaining this to the band will help them realize how much these sounds are masking the other sounds in the mix.

As you can see, it becomes critical to truly understand the dynamics that go on in a mix, so you can logically explain to a band why one move makes more sense than another. Of course, there are times when you just might be wrong. After all, it takes all types for the world to go 'round. Therefore, it is important to not be too attached to your ideas. If someone is still adamant about their ideas after you have discussed everything, then give it up. It's good to be confident about your opinions and present them strongly, but don't get too attached. It is important to remember that the band may not be able to explain why they want what they want, but their ideas are still cool. Often if they hear it, they will realize it doesn't work. Also, just as often, when you hear it, you might realize it is actually cool, or it might help you think of another idea that makes more sense. If they still want it after they have heard it, keep it. You can always make two mixes, one with your ideas and one with theirs, but do this only as a last resort. Not only does it take more time, but you are also putting yourself at odds with the client. It is good to be certain that it is necessary before you take the time to make two mixes.

Values of the Engineer

The experienced engineer must attain a highly developed set of values to justify making certain decisions. Once you have gained the experience to really know what is (probably) right, you can then command that respect.

Some engineers are more intense than others and are less prone to listen to someone else's ideas. The extreme case is the engineer who won't allow the band in the room during the mix. These engineers may be talented, but they don't understand their art enough to explain it to someone else. On the other hand, some engineers have paid their dues and are so experienced they have earned the right to be intense. The problem occurs when a recording engineer's ego or intensity is not backed up by experience.

Values of the Clients

The experienced engineer knows the importance of paying special attention to other people's ideas, even if they are out of the ordinary (or completely nutty). It is important for the client to realize that you care about their ideas. The trick is to get very quick and sharp at weeding out bad ideas (or less than great ideas) from good ones without hurting their feelings.

Usually, the client is not as experienced as the engineer. The client normally does not know all the capabilities of the studio equipment. This is not to say that they don't know what they like; they just don't know how to achieve it.

However, the band and the songwriter do have a major advantage over you as the engineer. First, they have already spent a lot more time with the song and know it much more intimately. Fresh ears on a song are nice, but intimacy helps. Second, the songwriter might have ideas that no one else could possibly come up with because he or she is so intimately involved with the creation of the song. If we think of a song as an extension of a person's personality—of his or her feelings and emotions—then it makes sense that the person who wrote the song would have more cohesive or holistic ideas for the mix.

It is the job of the engineer to pick up on the heart and soul of the song, the feel, in order to create a mix that is most appropriate for the song—whether that means sweetening it or creating tension. Paying close attention to the band and the songwriter's ideas can help you access this heart and soul.

It is, therefore, important to figure out the values and desires of the client. Engineers often ask the client about their values and then listen closely for any clues as to what kind of mix they might like. One of the trickiest predicaments occurs when you are working with someone who is extremely inexperienced or unclear about the recording and mixing process. The problem is that someone who knows nothing about recording can, out of the blue, come up with a completely ingenious idea. Often, bizarre requests, seemingly devoid of any reason, can be pure genius. In fact, I imagine that whoever first worked with David Byrne must have wondered about him at first.

On the other hand, you can't count on someone who is extremely experienced but has an incredible ear to always come up with ingenious ideas. You never know when the next thing that comes out of their mouth will be nonsense. To quote a few lines, "Don't judge a book by its cover," and "Out of the mouths of babes can come true wisdom." In other words, never judge someone based on preconceived ideas of who they are. Meet them on a creative level. Genius can easily be masked by nervousness. In fact, take it as a challenge. Remain on your toes at all times—ready to weed out the genius from the B.S. with one fell swoop of logic and aesthetic values. Actually, it is often more like a slow tug of war than a fell swoop.

The truth of the matter is that if you simply gather all of the ideas from everyone involved in the project, you will end up with a plethora of cool ideas. In fact, as the engineer, you should be gathering these ideas from the second the band walks in the door. Whenever anybody (including yourself) comes up with a good idea, store it in your creative bank. Write them down, so you don't forget any of them.

You should be on the lookout for any good ideas that pop up throughout the session no matter how small or off the cuff. You might overhear someone talking to someone else saying that they would like to put an echo at the end of one of the vocal lines. Snag it out of the air and put it in your creative bank. What commonly happens is that during mixdown, both you and the band will forget the idea. Then, a couple of weeks after you've mixed the song, the band member who had the idea will be listening to the project and say, "Dang it, the engineer forgot to put that effect on the vocal. I'm going to another studio next time." No matter how off the cuff, don't forget any idea. Of course, you don't have to use every one, but it's nice to have a bunch of them to choose from.

Most importantly, don't forget to gather your own ideas as well. Put them in your creative bank, so you can cash them in on the mix.

Values of the Mass Audience

Often a band comes into the studio, and they just want their music to sound like a hit. Some people see this as blasphemy, selling out, and the death of pure heart and feeling in music. This may be true for songwriting, but in mixing, this is not necessarily the case. Often the most creative types of mixes appeal to the largest audience. Some of us would be very happy to be able to create mixes similar to what is currently on the radio.

As an engineer, it is helpful to listen and stay on top of current music industry trends. The way that each style of music has been mixed throughout the history of recording often plays an important role in how a particular project should be treated. Therefore, it is important to check out how each specific style of music has been commonly mixed.

Whenever you hear a song, note everything that is going on in the mix (if you have the time and are actively listening). Note the volume, panning, EQ, and effects of every instrument in the song.

Ask yourself, "Why did the engineers do what they did? Why is the volume the level it is? Why was it panned where it is? Why that silly EQ? What caused them to use those effects in that way?" And even, "What were they thinking, anyway?" Then, most importantly, ask yourself, "Do I like where the engineer placed each sound? Would I have put it there?"

The first time you hear a sound, you may not have an opinion. But the next time you hear it, note how it is different. Once you hear the sound a third time, if you are listening closely, you will probably be able to tell which of the three sounds seems to be the best to you. After you have done this for a few years, you will gain an incredible perspective on what others are doing and you will know what your own values are! Then you can do whatever you want. When you go to do a mix, you will set each instrument exactly where you want it. And if anyone disagrees, you have the experience and confidence to tell them that you really think it should be this way. It could be argued that it is better for the engineer to use personal experience and intuition to set new trends instead of following them. And if you can feel it, go for it. But until then, it's a good idea to check out what others are doing, so that you can develop your own perspective.

NOTE: The equipment that the music will eventually play on is another minor but important factor that will influence the way it is mixed. If the project is going to play on a cheap car radio, it is important that there is enough bass in the low mids. It will do no good to boost the low bass; it won't be heard. Also, when mixing for movies, you might add more sub-bass at certain critical moments. When mixing techno music for a rave (or party), you might bump up the bass. You are locked to the container that the project will play on, so take it into consideration.

It is obvious that the mix should fit the style of music—in fact, it almost goes without saying. But in addition to the style of music, the more the people involved pay attention to the song as the primary guide in determining the mix, the more cohesive the mix will be. The mix is normally much better when everyone involved is basing their opinions on the song instead of their own personal desires. It's really great when everyone in the room is listening to what the song is telling them to do in the mix. Yet, you never know when a person might have some inspiration from another world—whether it comes from God, angels, or space aliens—that is pure genius. Such ideas might be more appropriate than basing the mix on the song itself. However, it is usually best to use the song with all of its details to determine what you do in the mix.