ABSTRACT

Title of Document: ENGINEER, PERFORMER, PRODUCER: NEGOTIATIONS OF CONSTRUCTED ELEMENTS OF SOUND AND PERFORMANCE OF A JAZZ RECORDING

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This dissertation investigates the relationship between the engineer, the performer, and the producer in the creation of a jazz CD, first by laying a foundation for the need to study how a commercial recording is made, then by defining, in historical context, the development of the work of the engineer and the producer. Concepts for defining the performer are also discussed. The roles of engineer, performer, and producer are compared according to the author's *modus operandi*, which is based on a thirty-year involvement in the recording industry in all of these positions.

The literature review examines how physics, psychology, aesthetics, and music relate to recording processes and personnel and shows how art and science intersect and become inexorably linked during the creation of a jazz CD.

An ethnographic analysis, from the time of the inception of a CD project through the first two days of recording, follows the processes, procedures, and interactions between the engineer, the performers, and the producer. Problems and

resolutions of session planning, studio logistics, musical goals, and personnel are discussed.

Problems and resolutions during the edit sessions are also covered. With experimental data, the limits of performance acceptability of time differentials between entrances are tested. Altering improvisations through pitch and time manipulation and complete phrase alteration are considered. Because this CD was constructed, issues of perspective are at the forefront of the discussion in the mix portion of the recording process. Perspective, both left to right and front to back, sonic quality, and perceived acoustic—the room—are discussed. Finally, events create unexpected twists, and necessary changes are made to resolve these circumstances.

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By

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Dedication

To my parents, now you can *kvell*.

…and to my wife, you deserve your own page.

Acknowledgements

I would like to thank a few people who have helped and supported me throughout my tenure at the University of Maryland. I feel extremely fortunate to have crossed paths with several faculty members who have guided me through the dissertation process.

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CHAPTER 1

CONCEPTS AND HISTORY

To paraphrase a title written by Howard Becker, do recordings tell the truth? (Becker 1978, 9). Perhaps the recording is not a matter of truth, but an expression of idealized truth. A recording might be the quintessential post-modern event where one takes a musical performance, deconstructs and analyzes it, then reconstructs it in an idealized concept, thus possibly redefining meaning and intent. Is an ethnographic recording the same as a studio recording—should it be? Should the purpose and method of the recording be the determining factor of truth, and if so, who should be the arbiter of truth?

Does a recording of jazz carry the same significance as its live performance counterpart? Even if one assumes a multitrack format and overdubs for the ensemble and the desired result is the same as a live performance, should the recording hold less cultural value? Would there be any change in cultural value if one performer played multiple parts—an achievement *only* possible in the recording studio? If the recording is "live" in the studio instead of the field as an ethnographic document, either in stereo or in surround, should that recording be a true exemplar of culture?

The seemingly simple process of documenting sound on semi-permanent physical media allows an audience (consumer) to listen to or analyze the recorded sound *ad infinitum*. Suppose the market receives a recording that is not recorded, performed, or produced as well as it should be. Would the audience enjoy the recording as much? Would audience understanding be an accurate representation of the true intent of performance and is there someone representing the best interest and expectations of the

audience? If one derives musical knowledge from recordings and the purpose of the recording is to fit within prevailing cultural norms, should not that example be an accurate musical representation of a genre or culture? One would not know without understanding the motivations of those involved in the recording process.

During the recording process, the engineer, the performer, and the producer discuss technical and musical aspects of sound and performance. They make decisions based on their individual expertise and aesthetic preferences, and they decide whether and how to fix perceived errors and imperfections. During this process, differing opinions create a situation where discussing the conflict and finding a solution is the only way to proceed, even if the final decision is to do nothing.

This dissertation will examine the process of making a recording, both from separate technical and musical standpoints and from the intersection of the technical and musical. It will also examine the discussions involved in recording creation. I will also discuss the negotiations between the engineer, the performer, and the producer as well as the subtle power shifts between the three. I will investigate the general relationship between any engineer, performer, and producer in the creation of a CD and, as a case study, their actions during the creation of one specific jazz CD. Social phenomenology, the experience of creating a recording, will not be addressed as such in this dissertation.

The specific jazz recording consisted of ten performers with John Jensen as leader, in various small group configurations; the smallest was a quartet, the largest was an octet.[1] Throughout multiple sessions having various configurations of size and personnel, fifteen compositions were recorded over a two-year period. Many of these

[1] See "Personnel" in the appendix for a list of engineers, performers and their instruments, and producer.

followed what I would consider "normal recording studio processes," although there are some that I have selected for closer examination because they are excellent examples of the negotiated processes or unusual occurrences.

Chapter 1 lays a foundation for understanding the process of commercial recording and the influences on that process. I also define, in historical context, the development of the roles of the engineer, the producer, and concepts for defining the performer.

Chapter 2 presents my understanding of the roles of engineer, performer, and producer by presenting my *modus operandi*, based on my thirty-year involvement in the recording industry in all three of these positions. This chapter gives a general description of recording situations, in contrast to the specific case study later in the dissertation. This chapter also exposes my biases and aesthetic preferences regarding recording procedures and process and serves as a partial comparative to the actions of other people in this process.

Chapter 3 examines the interdisciplinary nature of the recording studio. Through an examination of relevant literature, I argue there are four disciplines that have direct links to the recording, the recording studio, and the individual's perception: physics, psychology, aesthetics, and music. Their intersections demonstrate how art and science are inextricably linked in the process of recording.

Chapter 4 discusses the first part of the creation process in a specific case study, from my initial conceptualization and collaboration with John Jensen for his CD through the recording portions of these sessions. In this chapter, I analyze the development of getting the session planned and the first steps in the CD's construction including studio

logistics, musical goals, personnel, financial considerations, and the first two days of recording.

Chapter 5 looks at the problems and resolutions during the editing sessions, including exceptions to the general circumstances and expectations presented in Chapter 2. I also confirm, with experimental data, the limits of performance acceptability of time differentials between entrances. In this chapter, I also argue the acceptability of altering improvisations through pitch and time manipulation as well as altering complete phrases by manipulating multiple takes with a cut-and-paste process. Also in Chapter 5, I examine the mix sessions. Since an audio CD is usually constructed from materials outside the usual live-performance, issues such as perspective, altering sonic quality, and perceived acoustic—the room—are points of discussion.

The Room

"The studio is a medium unto itself" (Dresser, 2008). The rooms in the recording studio are multifaceted, ever-changing entities that can be a best friend–or not.[2] Every person in the recording process enters the room with a preconceived idea of a desired acoustic; the room either supports or interferes with that predetermined desire. Some performers over-compensate for the lack of a desired acoustic, resulting in mental and physical breaks in performance. Until all who are involved with the recording process adjust to the room, the session will be a challenge.

[2] The physical structure in which most recordings are made. See "Recording complex" in the Glossary for further details.

All the rooms in the recording complex, whether control room, main room (studio), or isolation booths are unique entities in both time and space.[3] Room size and shape, which can have significant influence on the sonic result, are designed to mitigate undesirable acoustic problems. All the rooms in the recording complex operate within known parameters such as reflections, refractions, reverberation, diffusion of sound, modal resonances, as well as other properties within the field of acoustics. The absorption and reflection characteristics of room materials–wood, concrete, stone, or a combination of any building materials–will change any or all of the properties listed above. To a lesser extent, but just as important, are factors such as barometric pressure, temperature, humidity, and the number of people in the room. Studio owners sometimes spend a significant amount of money in the design and implementation of what they hope will be an acoustically successful product. Unfortunately, there is no guarantee, and "… the best way to fix a bad room is with a wrecking ball" (Brown, 2001).

The Triumvirate of Recording

The first part of comprehending the recording process requires one to grasp intellectually the responsibilities of the engineer, the performer, and the producer. It is a mistake to think that engineers, performers, or producers can be placed in unchanging definable categories. Although one may extrapolate generalities from historical context, it is prudent to keep in mind that these are individuals, and individuals act and react to situations according to their strengths, weaknesses, and personal history.

[3] *Any* room or space can be used as a recording area.

The Engineer

> I've always described [engineering] as painting a picture with sounds; I think of microphones as lenses (Massey 2000, 84).

The role of the engineer has evolved into a position of blending technology and art, and those who aspire to excel in this pursuit must have many talents and abilities. The engineer is the person who has control over the technological aspects of the recording session, and he or she must possess artistic sense, technical competence, and interpersonal skills. The management of these attributes must often blend to meet the requirements of widely diverse and ever-changing situations.

> I have stressed the importance of rapport with the artiste [*sic*]. There must be a firm bond between the producer and the performer – as Quincy Jones puts it, a kind of loving trust that will shine in the final performance. Similarly, a bond must be forged with the recording engineer...for many years I have worked with Geoff Emerick… Of course, we like and trust each other so that occasionally we do overlap. I might question some of Geoff's equalization or ask him to alter the ambience [*sic*] of an instrument, and likewise he could bring to my attention to a dubious bass tuning or a 'froggy' vocal note (Martin 1983, 267).

Today's engineer needs to have a background in the sciences including physics, electronics, and computers, as well as an understanding of the history and styles of many kinds of music. Tasks an engineer might handle include choosing and placing the equipment, deciding if the session is going to be recorded on analog tape or on a computer, and interacting with the performer as needed. "The best friend the engineer has in the studio is the musician" (Martin, 29).

Besides having a good working relationship with the producer and the performers, the engineer should assist in all aspects of the artistic representation; that is, knowledge

of music is expected. A recording engineer needs to be able to communicate with the producer with the same comfort and clarity as he does the artist. While the engineer has the control of the acoustic choices such as microphones and pre-amps,[4] the producer will have the job of making aesthetic choices between the acoustic selections offered by the recording engineer. "Do you like the sound of the voice on that microphone?" or "in what kind of acoustical environment do you wish to present the artist?" are common engineer to producer questions.[5]

Although not required, some engineers do have a background in music. Some of the best engineers are highly skilled musicians who also might assume the role of producer (explanation of the role of the producer follows on page 18). Engineers such as Glen Ballard, Brian Wilson, Brian Eno, and Alan Parsons came from the performer side, while engineers like George Massenburg, Phil Ramone, Ed Cherney, and Chuck Ainlay are now also producers.

The Early Role of the Engineer

In the first few decades of the recording industry, early 1900s to around 1940, the audio engineer had the technical control in the recording session (Tobler 1982, 7). Technical and artistic control was part of the same job. The recording engineer decided what the final musical balance was going to be, not with any special talent or training, but because that was what personal taste dictated. The method of this acoustic balance was

[4] A first-stage voltage amplifier, which takes a low-level signal from a microphone and raises it to a standard line-level. See "Preamp" in the Glossary for more information.

[5] The advances in technology allow an engineer to make it sound as if an artist is in a venue of any size or shape, with or without an audience, even specific concert halls such as Carnegie Hall, London's Palladium Theatre, Avery Fischer Hall, or a small smoke-filled jazz club. See "Reverb unit" in the Glossary.

simply to move performers. By the simple movement of musicians closer to or farther from the microphone, the recording engineer could satisfy his concept of musical balance. During the early days of the recording industry, the multiple microphone techniques of stereo recording were not used, even though the ability to produce a recording in stereo existed as early as 1929 (Ballou 1998, 914). The amplified sound from the recording session was fed directly to the record lathe. Wax cylinders and flat recording disks were cut on the lathe with an all or nothing approach. This meant that one either accepted the performance with all of its imperfections or re-recorded it. The major break from this method came in 1947 when Bing Crosby and his engineers found the Ampex Model 200 Magnetophon tape recorder to be acceptable for pre-recording his radio performances (Daniels 1999, 87). The advances in the acoustic quality achieved by this Ampex provided the decisive edge to recording on analog tape. The greatest advantage for the engineer was the ability, for the first time, to overdub, re-record, or cut and splice a performance.[6] With the change in technology came the inevitable change in responsibilities. Now the role of the producer diverged from that of the engineer. The producer could now discuss the merits of each performance and choose which performance or take is best suited the overall musical concept he envisioned (Tobler 1982, 7).[7] The engineer's job now emphasized technology and hardware.

Evolution of the Engineer's Role.

Most of the people entering the profession of recording engineer from the 1940s to the early 1970s did so via accident or as an avocation.

[6] Laying newly recorded material next to or in place of previously recorded material. See "Overdub" in the Glossary for more details.

[7] Part or all of a selection, usually with everyone in the session at that time. See "Take" in the Glossary for more details.

> I started out majoring in Chemistry in college in 1939, but I also worked in the radio station. I'd go out and record the farm report for the station, then come back to edit it and send the tape to other stations in the state. After College, I went to work for the Agriculture Department doing the same things I did in college (Tower, 2004).

> I was in the AV [Audio-Visual] club in high school… I went into electrical engineering at college, but I wasn't learning what I wanted, so I dropped out. My [studio] partner and I built microphones and amplifiers in my basement, so we started to record there (Dawson, 2004).

> By the time I was fifteen years old [1952], I was working in a small basement recording studio in Minneapolis. My summer vacations from school were spent recording any willing musical group….I recorded everything from Minnesota-type polka bands to black gospel singing groups in the living room (Swedien 2003,19).

The engineers from this era found their educational avenues in either electrical engineering, music school, or a combination of both. "I studied electrical engineering with a minor in music at the University of Minnesota" (Swedien, 14). It should be noted that some these engineers were great fans of a given genre and thus had knowledge of the style. One such person was Rudy Van Gelder. Rudy spent time listening to many of the jazz giants of the late 30s and early 40s in the clubs of New York City (Skea 2001, 56). His path, like many others of this era, started recording as a hobby (ibid., 55-56) and evolved to a profession.

Another accepted entry into the recording industry was to spend several years as an assistant to a respected engineer who was already successful in the recording industry. This apprenticeship model has fallen out of favor because of the ever-changing needs of the industry, from the rapid technological advancement to the need for specialization. The replacements for the apprenticeship model are the trade schools and universities.

Today, there are nearly 200 programs in the United States and Canada that offer training in the field of audio (Lingle 2005, 54). Formal programs combining engineering

and music started with the *Tonmeister* degree in Europe in the middle 1960s and spread to the United States and Canada by the middle to late 1970s. The *Tonmeister* program fills the need to educate those with the theory and practice of music recording by balancing the art of music and the science of sound. Educational opportunities in the United States and Canada range now from programs at recording studios, where one receives a certificate of completion to universities that grant advanced degrees.[8] "At this time there is no global accrediting or certifying agency in audio, only individual or national accrediting agencies" (Pritts 1988, 89). Because there is no standardization of curricula, there is a disparity among the students entering the field. Some programs emphasize technology, others science, while music, especially Western classical music, is the predominant area of focus for many college and university programs. Without uniformity in the educational system, the result is often an engineer who is unable to participate fully in the musical and artistic creative process.

Domains of the Engineer.

During the recording process, the engineer makes decisions on technical aspects required for the successful completion a project. In addition, the engineer may participate in the musical aspects at various levels. Equipment, placement of microphones, and the recording format all fall within the margin of controllability for the engineer and are his primary responsibility.[9] The musical domain includes acoustical aesthetics, artistic interpretation, and performance accuracy, to name a few. The technical domain consists of the equipment used to capture the performance. This

[8] At this time, there are only a few programs granting the master's or doctoral degree.

[9] Format includes analog or digital tape and hard disk recording.

participation may overlap the domains of the producer, performer, or varying degrees of both.[10] Areas of overlap for the engineer fall into three main domains: not involved, partially involved, and fully involved in the musical domain. In the model below, the engineer only assumes responsibility for items or processes directly within his sphere of control (see Illustration 1-1).

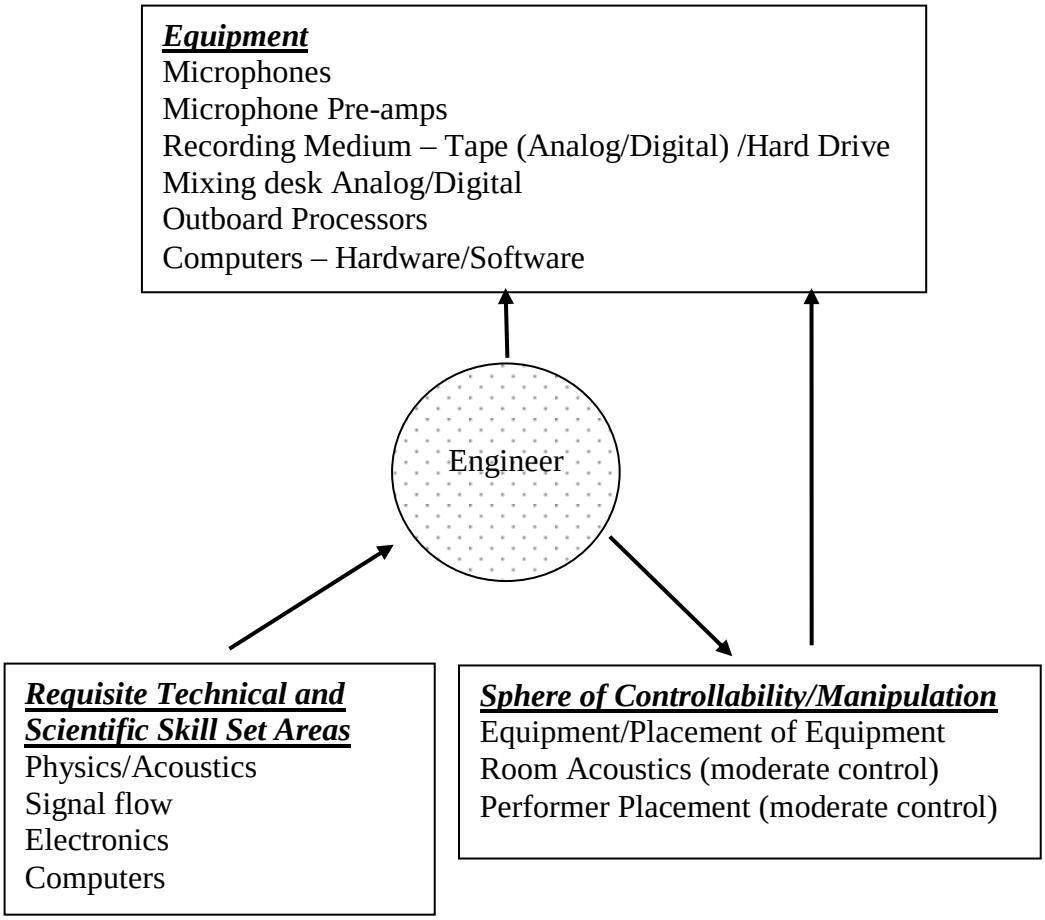

Illustration 1-1. Domain of the engineer.

[10] The overlap of domains includes participation with the performer and producer, as well as with the engineer/performer or the engineer/producer.

In some schools, the sole instruction is in how to make the equipment operate properly. There are also those, not in academia, who purchase the equipment and just read the manual—or not. Without concern for the musical aspects, these students are not prepared to involve themselves in artistic decisions. An engineer's musical ignorance places the total aesthetic responsibilities within the domain of the producer and/or performer, and there is no intersection of the engineering and musical domains.

The second possible model is a partial involvement by the engineer in the musical process because of musical training or background in the genre for the recording, for example classes in jazz, rock, Western art music, and World music. It is not an absolute necessity for formal training in the particular musical style, but with some understanding of the aesthetic or a broad background of experience, the engineer can comment on musical aspects, thus aiding the producer and performer while still maintaining the integrity of the engineer's domain.

The final model is a complete inclusion with the musical aspects of the recording process. Here the engineer acts as a partner, fully involved in the shaping of the musical content of the recording. For complete inclusion, the engineer's training must be at or near the performer's level of knowledge, from not only a technical or historical perspective, but to a cultural one as well. In order for the engineer to work at this level, he must have experience with critical listening for the subtleties between various combinations of equipment or education in the nuances imbedded in musical performance.[11] Coursework designed to train and develop critical listening moves the

[11] Any alteration of the signal path through exchange of equipment alters the electrical parameters of the sound wave; therefore, the pairing of microphone and preamp should be the first step in determining the sonic aesthetics.

engineer into a symbiotic relationship with the art of music. By being fully immersed in the cultural expectations and shared cultural values of sound, including performance practice, the engineer now supports the producer and performer in creating a product that is not only is sonically pristine, but musically beautiful.

The Performer

> Am I prepared? Yes, I've been preparing all my life for every gig I do…. What we do in any one moment as a performer is the culmination of the fifty, sixty, seventy, thirty [*sic*] years we've been on this planet and however many years we been playing our instruments, studying music, and figuring out how to communicate with an audience or communicate with other musicians (Jensen 2007).

When asked to define the term "performer," most of my informants answered this question with responses such as "anyone who performs," "someone attempting to communicate a thought or idea through action," or "the question is too vague."

In the world of business as well as sports, one hears of "top performers." Even the circus has performers, such as the dancing bears. I have not interviewed any "top performers" in the business world, or professional athletes, and I am certainly not going to get close enough to interview a bear, so it seems these choices may expand the definition of performer. Some might make a distinction between performer and entertainer, embedding a secondary meaning within their own definition of performer. Common usage or misusage of the word makes an understanding increasingly elusive as more people use, define, and redefine who or what a performer is. There are even those who might say that everyone is a performer, simply because one "performs life." This statement is so broad and all encompassing that it renders any definition meaningless.

Obviously any usable definition of performer must include qualifiers—but not just any qualifiers. Age, socioeconomic status, sex, gender, race, religion, or any such category by itself will not narrow the scope sufficiently to constitute a workable definition, nor will dividing the performer into a professional/non-professional category. Subjective decisions, such as failure or success of the musical transmission should not be included since they assume an understanding of context. Starting with the idea that a performer is trying to communicate or transmit information, we can proceed to a workable definition.

It seems that context is the key to a working definition of "performer" as understood by the individual or group. Context requires information, such as who is creating the definition and with what criteria—in short, the performer might best be defined by a set of skills, in part, idealized. To begin codifying the skill set, it is necessary to expand the idea of communicating information. The question may not be "who or what is a performer?" but rather, "is this person able to transmit culturally appropriate information acceptable to the insider; is this person an appropriate performer for this situation?" Criteria for such a decision may be based on knowledge and utilization of the musical language—are the words and syntax proper; is the language appropriate for, appreciated, understood, and respected by those involved; and does this person understand the role of this particular instrument within the historic/musical context.

In the jazz idiom, language and syntax correspond to acceptable note placement in the proper style (Berliner 1994, 95-97), which has evolved through time. Knowledge of style, acceptable note choices, and repertoire may be learned through formal education or

apprenticeship. Even recordings and record players aid in education in both public and private settings (Katz 2004, 73).

A performer, who has command of the language and syntax, also needs to function in a specified venue. Here, the venue is the recording studio, which is contextually removed from more commonly expected performance arenas and constitutes an artificial environment.

Except for a few culturally specific performance practices, such as monks in the shakuhachi tradition where there is no expectation of spectators, the performer might presume a human audience, even if that audience is noninteractive. For example, some jazz musicians perform at restaurants, where they function as background music. Even further removed from a noninteractive audience might be an imagined audience. An interesting dynamic occurs in the studio. The performer is also the audience as are the engineer and producer. In addition, fully involved engineers and producers also assume the role of critic.

Being able to choose the right note and put it in the right place at the right time assumes not only comprehension of the language and syntax of jazz, but skills in time/groove (Berliner 1994), technical and mechanical mastery of one's instrument, and the ability to dictate or match style and phrasing. In the recording studio, equally important factors are mental and physical stamina. Most studio performers understand the high cost of recording, and "getting it right the first time." Often a recording session means a full day of playing and emphasizes quantity—that is, getting the most done in the least time without sacrificing quality. Most musicians understand, either anecdotally or through experience, that high-level performance requires endurance and concentration.

One final performer factor must be mentioned—professionalism. Although there is room to interpret the exact definition, most would agree that professionalism includes, punctuality, bringing the proper equipment in proper operating condition, being prepared to alter previous instructions, and being able to cover all the requisites listed in the previous paragraphs—right notes, right time, etcetera.

One obvious point left from this description of a performer is that of personality, the ability to work well with others. Having an abrasive or difficult personality does not preclude working in the recording studio, but it might have an effect on getting or keeping a job. A further discussion on personalities is found in the section "Pre-recording" in Chapter 4.

By summing these requisite skill sets as criteria, a definition of "performer" takes shape that might be agreeable to individuals, or groups, inside or outside any given culture. A performer, therefore, is best defined situationally. The working definition of the performer for this dissertation is an individual who is proficient in jazz performance practice, possesses the ability to read and interpret jazz notation in an appropriate style, has the requisite mental and physical acuities and stamina, and, has the ability to play within the group and also act as leader of the group if necessary.

The Producer

> You're going in to represent what the artist is doing, to be as honest as you can, and hope for the best—hopefully make something where business and commerce and art meet, all at the same intersection (Cherney as quoted in Massey, 9).

> The producer is a cheerleader, a therapist, a manipulator, an asshole, a trickster, a translator, a sponge, a spy, a traitor, an explorer, a

> whore…it changes with every project (Street as quoted in de Barros, 2001).

The role of the producer has evolved into a position of great influence and power, and those who aspire to excel in this pursuit must have many talents and abilities. They must have artistic sense, technical competence, and interpersonal skills. The management of these attributes must also blend like those of the engineer. "A great artist makes a song better; a great producer makes an artist better; and a great artist makes a producer better" (Rodgers quoted in Massey, 56). In the studio, the producer is the audience representative.

Today's producer may be responsible for finding, developing, and packaging an artist. Many of the tasks a producer might handle include choosing the key for the tune, altering the lyrics or melody, and even deciding if this is the right composition for this group. "From coming up with a timeline and a budget, booking studio time, finding the right engineer, and hiring the right sidemen and arrangers to choosing repertoire, a piano, the right microphones and tape format" (de Barros 2001, 35).The producer is the one who will represent the integrity of the project and has the overall vision of the final product.

Besides having a good working relationship with the talent, the producer needs to be comfortable with the equipment and technology in the recording studio. Knowledge of equipment is desired because a producer needs to be able to communicate with the recording engineer with the same comfort and clarity as they do with the artist. While the engineer has the control of the acoustic choices, such as microphones and pre-amps, the producer will have the job of making aesthetic choices of those acoustic selections presented by the recording engineer.

Finally, the producer needs to be able to function as a coach, a mentor, and sometimes a therapist. "The primary role of the producer is to pull the most talent out of the artist, to inspire the very best performance, even to the point of frustration if necessary" (Emerick quoted in Massey, 97).

The Early Role of the Producer.

On the earliest recordings when producer credit was given on the label, the actual job description was the intermediary for the record label or the manager for the artist. The person from the record company usually came from the A & R department.12 He was the contact person who handled the creative process with the artist, the artist's manager, and record executives. The A & R person was also involved with the details of choosing musical works, booking studios, and making sure that the recording was an accurate representation of the artist's work. As previously stated, during the first few decades of the recording industry, the audio engineer had the technical control of the recording session, but in the mid to late 1940s, the role of the producer began its evolution (Tobler, 7).

1950 to 1970.

From the late 1940s to the middle 1950s, the producer gained more control over artistic content. It was in the middle 1950s that the new sounds of 'Rock 'n' Roll' and 'Do-Wop' began to emerge as a commercial entity. This new music brought new people

[12] Artist and Repertoire. In England, A & R stood for "Artistes & Recording" as stated in John Tobler and Stuart Grundy, *The Record Producers* (New York: St. Martin's Press, 1982), 108.

to the recording industry who had new ideas and concepts. Artists such as Elvis Presley, The Drifters, and The Coasters were, in part, recognized for their vocal performance style and how their producer packaged and promoted them. Composers, arrangers, and musicians also took on the role of the producer. The person who assumed the role of the producer now had a greater influence on the artistic and musical content in a recording. Composers like Jerry Leiber and Mike Stoller, writers of some music for The Drifters, The Coasters, and Elvis Presley, would undertake the position of producers for some of their recordings. Phil Spector, a protégé of Lieber and Stoller, was trying his new ideas with people like Ben E. King and his song *Save the Last Dance for Me.* Barry Gordy, producer for Diana Ross and the Supremes, Marvin Gaye, Stevie Wonder, and The Jackson Five created his own unique sound. Gordy's "Motown Sound" established him as a preeminent figure in the recording industry. In England, George Martin at EMI Records brought such artists as Peter Sellers and the Beatles into his creative process (Tobler, 109). The diversity of these new groups shaped the producers' ability to be creative in the studio. As George Martin said, "…I've said it before, but I don't think I would have done what I did on *Sergeant Pepper* unless I'd done Peter Sellers albums in the first place" (Tobler, 110).

The same changes affected jazz recordings. The bebop era had made its mark. The hard bop sound was established by the middle 1950s. The new sound of cool[13] brought new people to the forefront of the music scene. New artists brought forth the necessity for people like Norman Granz and Teo Macero, who were primarily known as managers and concert promoters, along with John Hammond, who was a writer and critic.

[13] The cool school was coined for the Miles Davis Nonet recording *Birth of the Cool* in 1948-1950.

Grantz, Macero, and Hammond now began getting producer credit on albums. John Hammond was beginning to receive producer credits on albums with artists such as Alberta Hunter, Count Basie, and Billie Holiday. Norman Granz, who promoted the *Jazz at the Philharmonic* concerts, received producer credits on the albums of the same name. Teo Macero was working at Colombia records as a composer, arranger, and producer for many artists (Tobler, 135-142).

Teo's most famous artist association was with the irascible[14] Miles Davis.

> Miles required a very special kind of person to produce his dates. Perhaps most important, he required a producer who knew what *not* to do…. Miles would ignore any such suggestions. A producer had to let Miles create his music in his own way …The producer also had to be a musician himself… He also had to be able to have the patience to deal with Miles's mercurial personality and iron will. Most of all, he had to know *how* to listen to the music and to truly understand it because Miles had a laser sharp bullshit detector (Nisenson 2000, 141-142).
>
> In 1959, Teo and Miles teamed up for the recording of the album *Kind of Blue*. Teo's style was to let Miles have his freedom much to the consternation of Miles. Teo would sit in the control room and just listen.[15] Miles would often get angry, but Teo understood the creative mind of Miles. He did not want to infringe "…on their freedom to create and explore" (Tobler, 142).

Sometimes Teo would sit next to Miles during recordings so he could hear the banter between tunes. This gave Teo a better understanding of the ideas Miles had for

[14] It is well documented that Miles Davis was one of the most difficult people to work for and with. He was notorious for cursing at his sidemen, turning his back on the audience at a performance, and not listening to any advice. Evidence is found in Miles Davis with Quincy Troupe, *Miles: The Autobiography* (New York: Simon and Schuster), Bill Crow *Jazz Anecdotes* (New York: Oxford University Press), 67, 88, 131, 142, 322-25 and in liner notes from Miles Davis *ESP*, Columbia CK 46863, and Miles Davis *Porgy and Bess*, Columbia CK 65141.

[15] The section of the recording studio where most of the recording hardware resides and the engineer and producer listen to the recorded acoustic information. See "Recording complex" in the Glossary.

the album project. Teo took total responsibility for the selection and editing choices for the tunes.

By this time, the record companies had assigned to the producer most of the tasks of take selection, editing, and musical aesthetics. The producer was becoming a recognized entity who could be an employee of the record company or hired as a freelance producer.[16] The A & R department now primarily dealt with the development and marketing of the artist, and would find, sign, and develop bands before handing them to a producer for the recording session.

1970 to the Present.

The continuation of the producer's influence is heard in the innovative styles brought to the public. Producer and engineer teams began to have a major impact. The concept of a team who knew each other's tendencies gave continuity to projects. This method also streamlined the time necessary to create an album. There was no need to ask about microphone, pre-amp, or reverb choices. This idea worked well because the collaboration on albums added to the creativity. "…I am old fashioned enough to believe that two heads are better than one, provided they work as one" (Martin 1983, 266). Two successful teams of producer/engineer included producer George Martin with engineer Geoff Emerick and producer Quincy Jones with engineer Bruce Swedien. Martin and Emerick collaborated on albums by Jeff Beck, Paul McCartney, and Ultravox. Jones and Swedien teamed up to record Sarah Vaughn, James Ingram, and Michael Jackson.

[16] A person who is hired on a "per-service" basis. See "Freelance (producer)" in the Glossary for more information.

During the same time, two other categories of people came on the scene. These individuals handled two roles of the recording process simultaneously. They are the producer/engineer and the producer/musician. Phil Ramone is probably the best known producer/engineer, and Bela Fleck is a well-known producer/musician. Both of these producers came to the same point from different perspectives, each with the ability and the vision to create.

By the late 1970s, technology was reaching the mass market. The home recording studio began to appear. A person with a four-track tape recorder, synthesizer, and a few microphones could create a recording of sufficient quality to market it to an independent record label. Producing an album now can fall into the domain of the amateur. "Nowadays it seems that every fourth person I meet is a record producer or at least aspiring to be one" (Martin, 266). After synthesizers and tape machines came the computer and the recordable CD. Complex editing, waveform shaping, and practically unlimited tracks have brought the million-dollar recording studio of thirty years ago to everyone for a few thousand dollars. Today a person can record a project, master it, and market the CD without large corporate backing.[17] Does this allow anyone with a home studio to adopt the title of producer?

Today's Definition.

The term "producer" can apply to anyone who was in a recording session and gave an opinion on any aspect of that process. That fact should not allow the casual observer to usurp the title earned on a daily basis by the men and women of the recording

[17] Mastering a CD is the optional final step in the recording process. See "Mastering" in the Glossary for additional details.

industry. A new definition is necessitated by history. The person who started as the studio representative and money person became one who influenced artistic style, and finally is the most powerful person for the entire recording process. Several factors, however, need to be in place before the title of record producer should be applied. Producers need to be involved with the total process. They need to have a long-term commitment to the project and the artist. They need to be creative. It is a rare producer who can set the trends for music, but a producer should always try to expand the envelope. Producers must be flexible, too. An advantage for the great producers is not to be locked into any preconceived ideas. Just as today's artist and engineer must have more knowledge of the styles that preceded them, the producer must place himself within the same historical context.

Successful modern producers understand what will be popular tomorrow and have a good business sense. They know "…where business and commerce and art meet, all at the same intersection" (Cherney quoted in Massey, 67). They are the artists behind the art, because it is the producer who is the one with the concept, the vision, and the skills to bring these ideals to fruition.

CHAPTER 2

WEARING THREE HATS

I have been an engineer, performer, and producer on various recording studio projects. My understanding of the recording process derives from both experience and education. This familiarity in these three areas allows me to empathize with engineers, performers, and producers, and helps me to better understand and address the difficulties of each duty in the recording process. These skill sets allow me to move freely—professionally, socially, and musically—between the operational spheres (spheres of influence) of the engineer, performer, and producer. Although somewhat unusual for a dissertation, I write this chapter as a cultural insider, that is, from the engineer's, the performer's, and the producer's viewpoint.

Because the recording process is unfamiliar to many, I have chosen to take this chapter of the dissertation to outline the progression for which an engineer, a performer, and a producer might follow during the course of a normal recording, from conceptualization to release of the product. A layperson has little concept of how much time it actually takes to record a CD. I have experienced clients wanting to record an hour-long CD, and they expect to take one hour, from start to finish. Clearly, few people understand the process or any of the procedures required of the engineer, the performer, or the producer. Although it *is* possible to record an hour-long CD in little more than one hour, this would only occur during a "live" performance—that is, one being recorded to the final medium (LP, tape, CD, etc.). Even then, this does not take into account time to set up equipment, set levels, or implement any extra processors such as EQ, compression,

or reverb.[18] Finally, without additional time to add external devices or real-time software plug-ins,[19] it is possible to record, process, and refine the raw acoustic information, but there is no chance to fix any errors on the part of the performer or engineer and no chance for the producer to accept or reject a musical concept or idea.

A few record companies and studios have taken the idea of the "live to 2-track" recording and have literally applied that concept to the recording process.[20] This recording method might be considered by some as a backlash to some overly processed recordings heard in today's market, and most of these companies imply that the "live" recording is a more honest representation of the performer's intent.

> CIMP records are produced to provide music to reward repeated and in-depth listenings. They are recorded live to two tracks. There is no compression, homogenization, eq-ing, post-recording, splicing, mixing, or electronic fiddling with the performance. Digital recordings allow for a vanishingly low noise floor and tremendous dynamic range. This compression of the dynamic range is what limits the "air" and the life of many recordings. These recordings capture the full dynamic range, one would experience in a live concert. We set our levels so that the maximum signal will not overload recorder… this is the way it sounded when it was recorded and was the dynamic intentions of the musicians.
>
> This method is demanding to not only the listener to the performer as well. Musicians must be able to play *together* [emphasis in the original] in real time. They must understand the dynamics of their instrument *and* [emphasis in the original], how it relates to the others around them. There is no fix-it and then makes safety; either it works or it does not. What you hear is exactly what was played.[21]

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[18] Whether the processors are external or virtual, the implementation, routing, and setting of parameters takes time. EQ is jargon for equalization, which is frequency-specific amplification or reduction. Compression is used to reduce dynamic range. Reverb is jargon for reverberation, which is the sequence of reflected sounds in a room. See "EQ", "Compressor", and "Reverb" in the Glossary for detailed definitions.

[19] Software-based tools used in the recording, editing, and mixing and/or processing of audio tracks. See "Plug-ins" in the Glossary.

[20] Also known as stereo. See "Two-track" in the Glossary.

[21] Mark Dresser and Ray Anderson, *Nine Songs Together*, Creative Improvised Music Projects, CIMP295, 2003, CD.

Even with a "live to 2-track" recording, there are still sound checks to set levels and multiple takes. Unlike a live performance, there may be extended breaks between each song being recorded.

There is no general rule of thumb concerning how long it will take to record a one-hour CD. My experience has shown me that if people have to ask, they do not have the experience, and it is going to take much longer than they thought. I tell them that they should plan on going over each song at least three times and add time to edit, mix, and master their product. It would be common for a one hour CD to take twenty hours or more of work to run through each song at least twelve times (three times each—record, edit, mix, and master) and time to overdub.[22] For amateurs, the recording studio itself causes psychological stress and may cause them to make additional musical errors. This increases the time, either in repeated takes or the greater number of necessary edits. I expect a professional-level player to be able to record three ten-minute tunes in one hour or less with little or no editing. Less time might also be necessary for the mixing and mastering[23] segments. However, fatigue can lead to performance inaccuracies.

To describe common protocols and procedures in the CD recording process, I will create three parallel timelines for the engineer's, performer's, and producer's processes. This will clarify the responsibilities and choices made before, during, and after the recording session. I am describing my personal preferences based on my real experience and education as an engineer, a performer, and a producer.

A quick word about the descriptive weight between the engineer, performer, and producer. Because the performer and producer enter the engineer's space, most of the

[22] See "Overdub" in the Glossary.
[23] See "Mastering" in the Glossary.

logistics and protocol belong within the engineer's purview. Even the jargon supports this viewpoint, because most engineers call the recording complex their "house." Using this terminology also creates the concept of ownership and dominance in this space.

Many performers and some producers still consider the recording studio to be a place filled with magic and mysticism. This is because the work done there is not well understood. Actually, the engineer and the studio have the same relationship as a craftsman and his tools. The following descriptions will help demystify the process of recording in the studio and the provinces of the engineer, the performer, and the producer.

The Recording Process

There are three formal stages of the recording process: preproduction, the recording session itself, and postproduction. For the purposes of this dissertation, only pre-production and the recording session itself are discussed for each of the three positions (engineer, performer, and producer) because we are only focusing only on the recording process itself, not what happens after the client takes the finished CD for mass production and marketing.[24] The recording session is broken down into subsets consisting of recording, editing, mixing, and final processing.[25] During the recording process, it is common to overlap recording, processing, and mixing because listening to the overall levels (the mix) and any acoustic alterations (processing) while recording or

[24] Mass production may not be desired if the client chooses direct or internet sales. Mastering *may* be included as part of the recording process as it was for this recording.

[25] Overdubbing is a subset that falls into the recording and/or editing category. Mixing is the process creating the final stereo or surround product. See "Overdub" and "Mix" in the Glossary.

overdubbing is standard practice in the recording studio. After the recording session, the client will have a CD ready for mass production.

The following hypothetical storyline is a fusion of my experience in many recording sessions over a twenty-five year time span. It covers as many of the common situations as possible, but in the recording studio, unplanned or uncommon events occur and are addressed as they arise.

The goal of this hypothetical recording project is a culturally acceptable CD for the mass market. Culturally acceptable in this case suggests that the CD's acoustic product and musical content is similar to other accepted CDs in the market. The group is a professional-level, eighteen-piece jazz ensemble of five trumpets, four trombones, two alto saxophones, two tenor saxophones, one baritone saxophone (collectively known as the horn section), and a rhythm section consisting of a piano, an acoustic bass, drums, and an electric guitar. To complete this recording, four eight-hour days have been scheduled, which should be sufficient to record, edit, mix, and master the CD.

Before the Recording

As the Engineer

During the pre-production phase, the client, usually the group's leader, calls the studio a few months in advance to book studio time for the project. I am the engineer in charge of this studio,[26] so I speak directly to the client about the project, including

[26] In many larger studios, a studio manager handles booking, billing, and other logistical necessities for the recording session.

budget, ensemble type, number of performers, and preference for analog tape or digital recording.[27]

If this client has not been to my studio before, I suggest he bring a copy of his favorite CD. This will allow the client to hear the room acoustics so, when the time comes, he will have a point of reference for hearing his recorded acoustic product. Having worked as a freelance engineer for many years, I know that it is imperative to understand how each room sounds so I can appropriately adjust my hearing. Every control room sounds different, and it is up to me as the engineer to understand the room, the monitors in the control room, and the microphones in the studio so I will not overcompensate for my perceived acoustics in this room. I, too, bring my favorite CDs to a new studio.

The client says there are ten songs to be recorded, and the name of the person who will assume the role of the producer. I tell the client that the cost of the studio, including my fee, is $100 per hour. We decide to start at 10:00 AM and finish each day by 6:00 PM. Further inquiry lets me know the preference of the leader for physical placement of the performers because my preference is to isolate the piano, bass, drums, and each horn section using baffles and isolation booths.[28] Some leaders insist that the ensemble be set up in the same configuration as a live performance and if so, I yield to the client's desire. Finally, I will ask the client if there is a preference on recording the solos, either with the ensemble or overdubbed. I tell the client that I prefer to record the improvised sections

[27] The debate of sonic superiority between analog tape and a digital format is beyond the scope of this dissertation. Digital tape machines are in the digital category.

[28] A baffle is a panel or other surface whose purpose is to prevent or mitigate the transmission of sound, while an isolation booth is a room that is structurally separated from the main recording room. See "Baffle" and "Isolation booth" in the Glossary.

after the ensemble has finished unless there is absolute isolation, because then the performer, producer, and I have the ability to listen to the solo and correct or re-record any or all of it. The problem with that method is the potential loss of spontaneity and interplay between the soloist and the rhythm section, so the client and I may defer this decision to the performer. If preferred, I can record the soloist with the whole ensemble. Another possibility lies with the musical arrangement because, if the soloist is only accompanied by the rhythm section and I have isolated the rhythm section, I can still redo any part as if it were done separately. As the engineer for this project, my job is finished until the day before the recording session.

As the Performer

I am a trumpet player schooled in jazz history and jazz performance practices with twenty-five years of big band experience, having played playing each of the five parts in the trumpet section at one time or another. For this recording session, I have been hired to play the third trumpet part. For this project, the leader wants to rehearse the music because the arrangements are difficult and he does not want to spend time rehearsing in the recording studio. If it takes only twenty minutes to learn each tune, the person paying for the studio time now must add over $325 to the total studio bill plus take into account the extra performer mental and physical fatigue.

As a professional trumpet player, I expect to be compensated for rehearsal time. My view on rehearsals and payment for those rehearsals are dependent on my association with the group's leader and the setting of the performance. If the performance is a show for someone I do not know, I will expect full compensation at a rate usually discussed at

the time of hire. If this session is for a friend, I usually ask for whatever he feels is fair or appropriate.

During the rehearsal, I and the other performers work out items such as phrasing, cutoffs, and solo forms. Because some of the arrangements are new, we make sure there are no errors and that all the parts have the same markings. The final piece of information given to the group is the recording start time of 10:00 AM, and I understand that to mean in the chair, ready to play.

As the Producer

When I am asked to produce a CD, I will get a call from the group's leader anywhere from two weeks to two months in advance. If I know the performer, I probably already know about possible musical selections such as style, instrument, or voice, and I have some idea of the desired acoustic objective. I come to the studio ready to discuss and implement ideas for the sound of the finished product. When I assume the role of the producer, I feel that my primary responsibilities are to protect the integrity of the music, help the performer create the best product, and act as the audience's representative. Integrity includes, but is not limited to, performance practice and history and also recognizes that each form of music has its own set of aesthetics, its own culturally specific sound, this way, acting as the audience representative, expectations for everyone, from the casual listener to the connoisseur, are met. When I get a call to produce a CD, I feel it is my job to comment or correct perceived stylistic or musical imprecision to everyone involved in the recording process, but this lies on a continuum depending on how much the performer *wants* to be involved in the decision-making process. In the case of our big band recording, I listen for possible note errors, interpretation of swing

between the sections (phrasing), attacks and cutoffs, intonation, and the *feel* of the music. For the soloist, I listen to note choice, structure, and overall coherence of the ideas in the improvised section. The interpretation of jazz is difficult because swing, or the feel, lies on a continuum of acceptability determined by tempo, style, or musical era.[29] This increases the difficulty in verbally transmitting the information that will correct the perceived problems, but the leader and I will discuss these matters if they arise. I also make sure I have copies of all the music, so if I hear a section that might be questionable, I can mark the score and, if possible, look for the elapsed time on the recording device. If some of the musicians are paid by the hour, this will save money for the client and allow us to accomplish more in the same amount of time.

Day of the Recording

As the Engineer

This is my domain because I understand the capabilities of this room. Nobody else is as familiar with tendencies and idiosyncrasies of all the equipment and the acoustic properties of this space; therefore, those who want to alter any of my choices, should have a good reason and be able to explain why my preferences are not acceptable. I probably will not change anything if a performer is not satisfied but will for the producer if he or she insists.

My preparation actually started yesterday after the close of business at 6:00 PM when I began the set-up for this session in the studio. I set up the music stands and chairs

[29] Several sources discuss the topic of swing, such as Berliner (1994, 246-247), Schuller, (1986, 6-8), and for a general discussion of jazz and swing, Ostransky (1977, 23-46).

in a triangle so the horns are pointing toward a center-point and put half-wall acoustic baffles in front of each section. This aids my goal of acoustic isolation. I also set up microphone stands and microphones for each saxophone, a stereo pair for the trumpet section, and a stereo pair for the trombone section. I have seven more microphones to mic each player individually if necessary. I choose my microphones based on three criteria: the instruments being recorded, the proximity of the other instruments, and my personal preference. In this case, the instruments all produce sufficient acoustic power, so the sensitivity[30] of the microphone is not a great concern. Because of the proximity of the other performers, the polar pattern[31] is an important choice. Because the horns are facing each other, I choose a microphone based on its polar response and ability to reject signal from behind the microphone. The need for a cardioid-type response characteristic eliminates an omni-directional microphone as a possible selection. Finally, because I have experienced the acoustic colorations and tendencies of these microphones for many years, I have developed a hierarchy of preferences for each microphone based on its expected acoustic result. I choose condenser microphones[32] for the saxophones that accurately transmit acoustic production from the instrument to microphone then to the mic pre-amp. My choices for the trumpets and trombones follow a different logic. Because I count these instruments as one section, the brass, I need the trumpets to predominate the hi-mid frequencies while the trombones cover the lo-mid part of the

[30] Sensitivity is a measurement of how much acoustic power is needed to produce a standardized output. See "Sensitivity" under "Microphone/mic" in the Glossary.

[31] Polar patterns are used to pictorially describe the response of a microphone in either two or three dimensions. See "Polar pattern" in the Glossary.

[32] A microphone that requires an external power source, usually supplied by either a battery or another voltage source. See "Condenser microphone" in the Glossary.

acoustic spectrum.[33] I select ribbon microphones for the trumpets and condenser microphones for the trombones.[34]

I feel that the most important issues for the rhythm section are musical and visual communication. Although physically separated by baffling and isolation booths, I strive to create a balance between the needs of the rhythm section and my desire for acoustic isolation. It seems everything that in the recording process is a compromise. The piano is open to the full stick and positioned so the lid opens away from the horn section, thus acting as a physical barrier that attenuates their sound pressure level at the piano microphones. I want the bass player between the piano and drums to have a good sight-line, because I believe the bassist carries the time for the rhythm section and, therefore, the whole band. Micing the bass requires two microphones, one in the bridge (if the bassist allows me to), one for the amplifier or, if an amp is not used, a direct box/DI,[35]which takes the signal from the pickup under the bassist's bridge.[36] The drums will go in the isolation booth where I will place eight microphones: kick drum, snare, hi-hat, hi, mid, and lo tom, and two overhead, but I cannot put them in their final position until the drummer sets up his drum kit.

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[33] I define hi-mid as 2.5-5kHz and lo-mid as 250-700Hz. The audio spectrum is usually defined as the range of frequencies between 20Hz and 20kHz. See "Audio spectrum" in the Glossary.

[34] If I have the choice of another brand of ribbon, I choose the second ribbon microphone. A dynamic microphone is a type of microphone that creates a voltage through electromagnetic principles. See "Dynamic microphone" in the Glossary.

[35] A DI is a small device containing a transformer designed to convert an unbalanced line level signal to a balanced microphone level signal. See "Direct box/DI or Direct inject/input" in the Glossary.

[36] For an illustrated view of micing the bridge, see Dickreitter 1989, 111, illustration B. A pickup is a term for an input transducer. See "Pickup" and "Direct inject" in the Glossary.

Finally, I set monitor headphones for each player and the director to allow everyone to hear each other despite the proximal distance and isolation. I have decided to create three different mixes for the band. One is specifically for the drummer and the other two will be determined by the needs of the players, but that is done in the control room.

Having finished in the studio, I move to the control room. Here the signal from each microphone connects to the patch bay, where access to the outboard microphone pre-amps, recording console, digital converters, signal processing equipment, and analog and digital tape machines are located. Since flexibility in signal routing is required, all junction points need a central location—the patch bay.[37]

Also in the control room are the audio monitors. In this case, I have the choice of three types—bookshelf, near-field, and far-field. The bookshelf monitors, which equate to small consumer-grade speakers, are positioned equidistant from each other at the ideal listening position,[38] which is approximately four feet from each other and four feet from me (an equilateral triangle). The near-field monitors are my main listening source, the placement of which is the same as the bookshelf type (the bookshelf speakers are either next to or on top of the near-field monitors). These speakers will accurately[39] represent

[37] The patch bay is A centralized location for interconnecting various input and output points, which connects or transports a signal to outside sources. See "Patch bay" in the Glossary.

[38] The ideal listening position places the listener in the middle of the soundfield. This allows one to hear the acoustic balance between the left and right stereo image and perceived placement of instruments, as well as how close or distant each instrument is in relationship to other instruments.

[39] All speakers color the acoustic output, and one must familiarize oneself with to the tendencies of any particular monitor. The engineer must be aware of those tendencies when making alterations in the acoustic spectrum with equalization as well as with the rest of the audio chain.

my desired acoustic results, including the details of stereo field with the use of panning and the perceived nearness or distance between sound sources by amplitude manipulation. The far-field monitors are the large monitors in the control room that are usually placed approximately ten to fifteen feet from the ideal listening position. These monitors allow me to listen farther away from the sound source in order to compare the details of the near-field with the far-field. For me, this is similar to seeing a pointillist painting up close, then farther away. Close, one might see individual dots in the painting: from a distance, the dots visually blend into a single object. In combination, these three monitor types allow me to compare the mix between three speakers systems. I believe a superior mix sounds enjoyable on all three types of monitors. If the product does not translate between the monitors, I need to correct the disagreeable aspect of the mix.

I want to access some of the outboard mic pre-amps because, as with the microphones, the mic pre-amps alter the audio spectrum. By matching microphone to mic pre-amp, I will have an acoustic product that corresponds to my personal preference. Thus far, I have sent the microphone signal from the studio to the patch bay, then to the mic pre-amp, and then the signal comes back to the patch bay. From this point, the signal flows from the input section of the channel strip. Microphones not going to an outboard mic pre-amp also arrive at the patch bay, but are electrically connected directly to the corresponding input section of the channel strip[40] on the console at the patch bay without

[40] A channel is an information pathway. For audio, the pathway is through an Input/Output channel. See "Channel/channel strip" in the Glossary.

the use of the patch cable.[41]

Now I want to route the signal to the tape machine, analog-to-digital converter or both, depending on my preference for the brand of digital converters. Like microphones and preamps, different converters sound different. There are no perfect transducers. This is true of the conversion from analog to digital and from digital to analog, so my choice is based on the quality of the converters. The routing through the tape machine might mitigate some of the undesirable transformation in the converters. If I have chosen to store the acoustic information on the tape machine, it is placed as magnetic information on a metal oxide tape. If I use the digital converters, the sound is stored as digital information on the computer, but this does not preclude routing the signal through the tape machine. Since 1995, I have preferred to work in the digital domain for the reason that working with and altering the individual tracks is easier because of the level of control I have over all the information.

My next task is to set all the headphones and the monitor matrix[42] (located on each channel of the recording console) so everyone can hear some semblance of a performance balance. My previous experience suggests that three or four separate headphone mixes (one for the drummer; one for the piano, bass, and guitar player; and two for all the horns) is adequate. In addition to the four headphone mixes, most performers prefer reverb[43] in the headphone mix, as this helps to imitate a live

[41] Routing and signal flow is a difficult concept. High-end recording consoles allow for many routing possibilities. Keeping track of complex routing might confuses the best engineers, even if only for a brief moment. Most engineers write the signal flow on a chart or notepad.

[42] This section of the console allows several discreet mixes. See "Monitor matrix" in the Glossary.

[43] See "Reverb" in the Glossary

performance setting. I have met some performers who are comfortable in the recording studio and are able to concentrate on the music, but most find the lack of acoustic information from the room a distraction.

The last task before I finish for the evening is to check each signal path from microphone, to recording desk, to recording medium, to monitor, as well as from microphone, to recording desk, to headphones (the same signal is duplicated within the electronics of the recording desk). Since my client is paying $100 per hour, I want to confirm the proper operation of all my electronics. Not having all the equipment operating properly reflects on my competence as an engineer and may result in loss of business.

I get to the studio at 9:00 A.M. because I asked the rhythm section to come early to set up and for a sound check. The drummer will set his equipment in the isolation booth while I prepare the bass by setting my preferred micing technique—a microphone in the bridge of the bass and connecting the pickup from the bass to a DI. By using these two sources, I can offer the producer several acoustic bass sounds to use individually or in combination to create an acceptable acoustic bass sound. The guitar gets a microphone on the amp and a DI. About 9:20 A.M., the drummer has sufficiently placed the drums so I can begin to set the microphones in their approximate places.[44] As previously stated, there are eight microphones—five for each of the individual drums in the set, one for the hi-hat, and two overhead. Each of the drum microphones is set at approximately a thirty-degree angle and one to two inches away from the drumhead. I will adjust each microphone to capture the sound I find most agreeable. The hi-hat microphone

[44] For micing a guitar amp, see Dickreiter, 121, Fig. B. For the basic setup on the drum set, ibid.117.

placement is similar to that of the drums, but I do not want too much mechanical or air noise as the hi-hat opens and closes. The two overhead microphones hang approximately three feet over the cymbals and three feet between the microphones. Because the microphones are not as close to the sound source as the ones on the drum heads, I am concerned with the sound pressure waves and the time difference between both microphones in the stereo field. The time-of-arrival difference creates summations and cancellations of frequencies known as phase differences. Sometimes I can use the phase differences to my advantage, but in this instance, I want to minimize the phasing. I listen, and then adjust the microphones to find the position with the best sound and the fewest phase problems between the microphones.

My last concern for the microphone placement on the drums is the perspective of the stereo field. The two possible perspectives are player's perspective and audience perspective.[45] I am assigning the overhead microphones to represent the audience perspective for the overhead microphones as well as for the rest of the group.[46]

By 9:45, I am back in the control room, as I expect the rest of the ensemble to be in their assigned places. As they play (tune-up, doodle, or warm-up) I will confirm that the microphones are working as expected and then position the mics for optimal aesthetic quality—far enough away to capture an accurate sound, yet close enough to minimize bleeding.[47]

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[45] This is the concept of listening position. See "Perspective, audience/performer" in the Glossary.

[46] My concepts on perspective are addressed in greater detail in the Edit/Mix section of this chapter.

[47] Owing to the radiating characteristics of each musical instrument, the placement of the microphones in relationship to the sound source captures different acoustic quality. See "Bleed" and "Proximity effect" in the Glossary.

I may add EQ to some of the instruments, but altering the sound might have profound effects. I consider EQ the same way I approach seasoning food. In some cultures, a highly seasoned dish is appropriate and expected, but once you have added the seasoning, it is hard to take out. Unless I am absolutely sure I need to alter the sound, I will wait until the mix part of the process to EQ. I have always preferred to match the microphone-preamp to achieve the desired acoustic product than to add EQ.

This is also the time I approximate desired recording and playback levels, pan positions,[48] as well as the headphone mixes in the control room. My primary concern for the signals going to the recording medium is a good level, but for the return signals in the control room, I want to adjust the playback levels to approximate a rough balance between the sections and the pan position in order to estimate the perceived playing position of the performers. The headphone mixes are also rough approximations of what the performers might want. I will adjust levels as necessary and add reverb to the headphone mix. My skills as an engineer come from knowing the idiosyncratic nature of my electronics, understanding of acceptable sound in recorded and live jazz music, and giving the performers and producer what they want during the recording session. I am now ready to record the main tracks and any overdubs.

As the Performer

Most performers would agree that besides a high skill level, professionalism is paramount for success. Key components of professionalism are punctuality, attitude, and

[48] A device that has the capability of continuous movement between far left and far right in the stereo field, allowing perceived placement of performers. See "Pan/panning" in the Glossary.

being prepared. During a recording session, I understand that there are many people involved in this process, and that the best method for success is to put my ego aside. For this recording session, "ensemble" is not only a word referring to a group of performers, but also the larger context–group effort toward a common goal.

I arrive at the recording studio 15 to 20 minutes early so I will not interfere with the timely completion of this project. Nobody cares why you are late, only that you are. My demeanor in the studio is friendly, calm, and focused on the task at hand. I acknowledge the other performers who are in this recording session and engage them in conversation. I am well rested, have had my cup of coffee, and have taken the time to properly warm up before coming to the recording studio. I take my instrument and mutes out of my case and have a pencil so I am prepared for any possible changes of notations. I take time to make sure that I am in tune and review the music. I see if there is anything that I need to practice and ask if there are any changes to the music including solo forms, deleted sections, and music order.

It is also important for me to know my position in this recording session. Because I am not the leader, my musical opinion is probably not desired. I also need to understand when to speak. If I am not happy with my performance during a particular take, I set aside my personal feelings in deference to the producer's professional opinion. That is not to say that I try to hide my errors but choose not to speak if the overall musical performance is acceptable. If I do make an error, I continue playing through the whole piece or until stopped by the leader or producer. After the completion of a tune or section, the producer usually asks if anyone has made any major errors, and this is when I will speak.

Today I am playing third trumpet part for this session. I am a performer who has played every chair in the trumpet section. My perspective on playing any part is that I want to play as if I am the lead player. When I do play the trumpet, I know that a good section player is worth his weight in gold. When a section player performs his part equal to me, he not only makes the sections sound good, but also makes my job easier. When I am playing the section parts, I carry that same concept to section performance. I play the inner part as if it were the lead part, but listen to the first trumpet player and match his style. If there is a stylistic question, such as attacks, releases, length of note, or phrasing, I will ask before we start. Knowing one's place in the recording session avoids possible conflicts and time wasting because it is the lead player's job to determine style and the producer's job to accept or reject the group's performance.

When it is time to play, I sit in my chair, put on my headphones, and wait for the sound check to begin. Consistency is the hallmark of a good studio musician, which includes intonation, sound production, and reading accuracy. I am conscious of the microphone position, because I know from experience that too much movement in relation to the microphone alters the consistency of sound production in the recording booth. Another skill studio musicians must master is performing with headphones. Having extra information such as a click track[49] and a mix of other performers while trying to listen to those within your section requires concentration, but this ability is crucial to my success as a studio musician. I prefer to have one earpiece of the headphone on and the other off, so I can hear everyone in my section as clearly as possible.

[49] A metronomic pulse usually heard in the headphone mix. See "Click track" in the Glossary.

As the Producer

Being an audio engineer and an accomplished musician makes me a better producer because I already know what is possible from a technical and artistic standpoint. I do not have to ask the engineer if it is *possible* to fix a problem, but only if he has the skills or capabilities to fix it. Recording technology, no matter whether analog or digital, obeys the same principles of physics. Therefore, the only variables are hardware idiosyncrasies, variations in software, and operators. Being a musician allows me to both understand the art of music and understand the needs of the performer, so I can make the job as easy as possible in the recording studio. Another benefit of being both an engineer and performer is that I know the jargon in both fields. I can speak to the technical aspects of engineering, such as EQ, polar patterns, decibels, and processing, as well as communicate with the musician about such subjective terminology of sound as heavy, sweet, bright, feel, or even "purple."[50]

Knowing the performer's needs allows me to concentrate on musical aspects both technical and artistic. My technical knowledge of the control room permit me to switch between and listen to any headphone mix, either through my headphones or by monitoring an individual headphone mix on the control room monitors. I want to concentrate on musical aspects such as time, intonation, and ensemble cohesiveness as well as artistic parameters such as phrasing and "swing" and, for improvised solos, note choices and overall conceptual execution. I am the eyes and ears of the musicians, especially the group leader. My job is to protect the integrity of the music and to

[50] "I want it to sound more purple" is attributed to Janis Joplin as told by a famous engineer during a seminar I attended in the late 1990s.

protecting the interests, both financial and musical, of the person who hired me. Time is money.

Since we already have discussed the possible advantages or disadvantages of recording order on this CD, I let the group leader choose the tune sequence. There are two strategies for the progression of recording tunes. First, get the most difficult selection out of the way while everyone is mentally and physically fresh, or second, record an easy selection to help everyone relax and have a sense of accomplishment. It is always a gamble which of these methods will work, therefore, because the leader hired the musicians, he knows their strengths and weakness better than I do and should make that choice himself.

As the recording session progresses, it is my job to make sure that the musical aspects are acceptable and that the project proceeds in a smooth and orderly fashion which includes the efficient use of time. Efficiency not only consists of making sure that the recording session progresses at an acceptable rate but also recognizing when it might be a good time to take a break. As noted in the performer section, the mental and physical challenge of striving for an error-free performance taxes endurance. As the producer, I might need to temper my critique of a performance if I note performer frustration and decide to move on to another section. As a producer, I must learn the idiosyncrasies in the performer's personality because some mask fatigue with humor, anger, or even withdrawal.

As I listen to the music and make decisions on the totality of performance (style, ensemble, intonation, etc.), I will let the performers complete one full take[51] before

[51] See "Take" in the Glossary.

commenting. I have discovered that interrupting a take disrupts the musical flow and therefore is counterproductive. The theoretical time saved by stopping a take does not return a comparable increase in musical capital. It is better to go back and re-record a section with an understanding of a starting and stopping point.

I strive for a two-take recording but will try a third if the performers feel the result justifies the extra time. After the third take, we have reached a point of diminishing returns, so I recommend punching[52] in sections as a better use of time and performer endurance. After completing everything except the final rendition of solos, I like to move to the next selection. That way, I can release those performers not involved in the process.

Another way I like to use personnel efficiently is to record the large ensemble works first. For me, there is a simple rule of thumb—fewer performers, fewer possible errors, assuming equivalent performance proficiency. Most performers do not want to sit around and wait unless it is absolutely necessary. Just like an athlete, a performer feels that once the warm-ups are over, it is time to work.

After the Recording: The Edit/Mix Session

As the Engineer

Now that I have finished recording all tracks for this recording session, including overdubs, I now turn my attention toward editing and mixing. During the recording session mistakes, inconsistencies, and inaccuracies were discussed. Decisions were made

[52] Audio jargon meaning the act of punching in a section requiring the engineer to hit the record button while other tracks were simultaneously being played. See "Punch" in the Glossary.

whether it was simpler to re-record the section or save it for the editing portion of the process. I want the editing portion to be as short and simple as possible. The producer and performer depend on my expertise to make the decision whether to overdub or edit. My preference is to overdub rather than edit even if there are many small sections. This is because it usually takes less time to overdub a section than to fix several mistakes through editing.

The editing process fixes two of three parameters, pitch and time.[53] The third topic, aural placement, which includes amplitude and panning, is fixed in the mix portion of the process. Pitch issues include intonation, wrong notes, and adding or removing notes. Time issues comprise the lengthening or shortening of notes or phrases or moving them forward or backward in linear time.

I use my ear to identify intonation problems. To correct these issues, I have several tools that are available to me, including analysis tools. These software tools show me precisely how far off the pitch any particular note is in relation to a culturally defined absolute.[54] These tools also track the pitch in graphical form showing me any variation of pitch within each note.[55] For wrong notes, I can either use these same pitch-shifting tools or find the correct note somewhere else in the performance and copy-and-paste it. If I use a note from somewhere else, I must make sure it has same timbre. If the note is not of the same length, I can expand or compress time to fit the replaced note. I need to

[53] Within the digital realm, editing tools have capabilities far-beyond the potential of human perception. Alteration in pitch can be less than one cent and time can be shifted by 1/96,000th of a second. See "Cent" and "Sample rate" in the Glossary. Further discussion of the physical limits of perception occurs in Chapter 3.

[54] Frequency is absolute and measureable while pitch is relative and culturally defined.

[55] See "Transcriptions" in Chapter 5 for graphical representations.

make sure changes, whether pitch shifting or cut-and-paste replacement, sound seamless—both technically and musically.

Problems in the time domain involve inaccurate entrances, releases, and rushing or dragging. Because each person's recorded information is on its own track, aligning everyone needs micro-second precision. Another option is to stretch or compress a section to match the others on the section.[56] The goal of ensemble work is cohesive movement, that is, each player executes his part as if one unit. If there are irregularities, I can select a region and align it vertically with the other parts, using either process.

During the mixing part of this session, I have three objectives: to place each performer front-to-back, left-to-right (aural placement), and in an appropriate-sounding room. During the recording and overdub portion, I have continually made small adjustments to the amplitude levels of each player. As previously stated, I have already placed each player (through panning) in a general location according to my understanding of the live-performance standard. I present my acoustic preferences to the performer and producer for them to accept or reject my choices. I also confirm the left-to-right placement of each player and make any adjustments as requested.

Sometimes it is difficult choosing a virtual venue. Room modeling and emulators are sufficiently advanced to allow the user to select specific performance locations. After selecting the space, I can alter a number of parameters such as early reflections, diffusion, and decay time.[57] My aural knowledge of famous jazz venues and recordings are fundamental to understanding the possible choices available in today's room emulation

[56] Sometimes precision to that degree works against the musical product. An experiment using this concept is discussed in Chapter 5. See "Transcriptions" in Chapter 5 for graphical representations.

[57] See "Reverb unit" in the Glossary.

hardware/software. I also need to understand subjective descriptors of these locations to find and alter an acceptable algorithm. If my client wants to play at the Blue Note in New York City, but with a warmer sound, I can comply with that request.

After everyone accepts the edits, mix, and processing, I want to bounce the mix to 2-track,[58] with or without mastering. I leave that choice to the client. As before, with plug-ins, mastering is a simpler process. If the client wants to hear the difference, I will play the tracks with and without the mastering tools inserted in the mix.

As the Performer

For this section, I must alter my role. As the third trumpet player, I would have no input during this part of the recording session. As the band leader, I would include myself in the process for two reasons. First, because my name is on the CD, I want to be represented with the best possible product, and second, I am paying for the session. Money grants access, and access yields influence.

Technology affords me the possibility of sounding better than I can in a live situation. In the digital realm, I am told that a "perfect" performance is possible. I have to decide how much time, and therefore money, I want to spend to create this "perfect" performance—not only for me, but for the other performers as well. I listen to the recording and stop the playback when I hear something undesirable and ask how long it will take to correct, then determine if it is worth the time and money. I want to sound as good as possible, but not better than I can possibly play. I want to feel as if there is truth to the recorded performance.

[58] Bounce is a term used in analog days to describe the process of combining several tracks to fewer tracks. See "Bounce" in the Glossary.

When I construct my performance, any edit must sound as if it were an uninterrupted and intended idea captured in real-time. For the mix, I want as close to a live performance sound as possible, including ensemble balance, perspective, and place, with little alteration of the acoustic product. I want to sound like me playing with a great band in a believable venue, even if I have never been there.

As the Producer

This final process should be a "meeting of the minds." No longer are the disagreements of *should we*—now my approach is how to best represent this recording within the accepted cultural norms of this genre. I also want to give the performer what he requests. I want to meet the sonic and musical expectations of my client as well as of the consumer; therefore, I will not experiment with perspective or processing but will direct the engineer to make any adjustments I deem necessary. If my client disagrees with my decision, I will present a logical defense and explain my aesthetic values. Ultimately, it is the client who must accept responsibility if the product is not acceptable.

I suggest alterations to the mix if I cannot hear each instrument within a section or if one instrumental group is too loud or not loud enough. I also listen for placement across the stereo field, making sure each group has the correct aural placement within the whole ensemble, as well as taking up the correct width. I find it is disconcerting to hear drums extending far beyond the physical setup of the drum kit.[59] The final parameter for the mix is the soloists. I want the soloist *perceptually* in front of the band, which means

[59] Some engineers pan the drum kit overhead mics hard-left and hard-right. This places the sound from overhead microphones only in the left (hard-left) and right (hard-right) speakers.

center-panned and *slightly* louder. In a live situation, the performers, especially rhythm section players, will adjust their volume to accommodate the soloist, somewhat softer for horn players or piano and really soft for the bassist.

I have specific preferences when it comes to rooms. I like my large jazz ensembles in a small concert hall and small ensembles in "intimate clubs"—neither having a long reverberation time.[60] As the producer, I sometimes find it difficult getting the performer to describe his acoustic preference. With some negotiation on the meaning of subjective sound, I translate that information to the engineer in a technical language. I always want the performer to have the last word, as long as the integrity of the music is protected.

[60] Reverberation time is measured in second, but defining a long, medium, or short reverberation time is subjective. My preference for reverberation time is ensemble dependent, but usually lies between 0.7 seconds to 1.25 seconds.

CHAPTER 3

REVIEW OF LITERATURE: INTERSECTIONS

"To be a good engineer, you need to be 50% scientist and 50% artist." When I speak to young audio engineers, I usually begin the seminar with this statement to emphasize that the profession of audio engineer is not about technology or art (in broader terms, the humanities), but is a combination of both. Whether one is working as a live-sound engineer or in the recording studio, the study of both humanities and science is the basis of an audio engineer's skill sets.[61] There are similar issues regarding the skill set for the performer and the producer. Do these jobs fall exclusively within the discipline of music? Are there other requisite skill sets outside of music? I believe it is important to explore the topics within the fields of science and the humanities that are relevant to the jobs of the engineer, the performer, and the producer.

Audio technology and the practice of recording sound have their own histories and traditions. Audio technologies also influence culture by either emulating historic musical practice or by carving new sonic territory. The engineers, the performers, and the producers interpret music and its practice, which is then judged by the listening public. "In this approach, technology is seen not just as a tool, but as a critical means of social practice" (Porcello 1995, 269).

I would argue there are four academic disciplines that affect the study of the engineer, the performer, and the producer in the recording studio: physics, psychology, aesthetics, and music. These four fields of study constitute the foundation for an

[61] There are many parallels between being a recording engineer and a live-sound engineer. Since this dissertation concerns the recording engineer, I will not analyze or discuss in detail the live-sound engineer. See Chapter 6 for suggested areas of research concerning the live-sound engineer.

understanding of the *how* and *why* processes of a recording. By reviewing the literature for these four seemingly disparate fields of study, I intend to show that their intersection *is* the nature of recording technologies. Many of the books themselves are either interdisciplinary or have interdisciplinary sections such as the physics-music intersection in *Fundamentals of Musical Acoustics* (Benade 1976) and physics-psychoacoustics or, more specifically, acoustics in *Acoustics and Psychoacoustics* (Howard and Angus 2009). The introduction to *The Psychology of Music* begins with a discussion of the music-psychology intersection revealing, "The relationship between the topics is sometimes obscure" (Davies 1978, 13). *Music in the Moment* encompasses both music and aesthetics (Levinson 1997). Other books combine more than just two disciplines by dividing, at least conceptually, the major areas of study: music, sound (physics, psychological acoustics, organology), and technology. One such text, *Music, Sound, and Technology* emphasizes "The relation between instruments and players,… acoustics,… sound production,… ensembles and space, and technologies" (Eargle 1990, xi-xii).

I contend that not all topics within the broader areas of interest are of equal importance and for that reason, I will focus on applicable specialties that might aid the understanding of the recording process. Within the field of physics, focus is specific to acoustics and the physical properties of sound, while psychology yields psychoacoustics and psychophysics. Interestingly, the study of music creates a schism between academic needs and professional needs. I would argue that ear training and music history should have different tracks for the engineer, performer, and producer. While it might be important, for example, for a performer to hear and identify a Neapolitan 6^{th} chord or identify an unknown piece of music in its proper historical timeline, the engineer works

in a non-music-theory sonic environment. It would be more important for the engineer to say, "I need to balance the levels of the bassoons in that chord" or "I need to EQ these microphones to create an acceptable orchestral sound." Ideally, the engineer should have musical proficiency at least as good as the performer, thus saying, "I need to raise the level of the third in that Neapolitan 6^{th} chord, and the pitch is flat."

Also of significance is that some disciplines have different effects on one or two of the entities (engineer, performer, or producer) involved in this recording process. For example, when considering room acoustics, the performer's acoustical concern is how he hears himself and others. The engineer's concern is how the room interacts with the microphones, the projection patterns of the instruments, and the ability to control the acoustic product.

Up to this point, I have kept discussions of the recording triumvirate in the order engineer, performer, and producer. Now I will divide the topics by discipline (physics, psychology, aesthetics, and music) to add coherence to understanding the interdisciplinary nature of the recording studio. Some interdisciplinary topics have only peripheral influence on one or two of the three entities within the recording studio; therefore, I will only divide these topics, and how they shape the individual's reaction or interaction, *if specific* to the engineer, the performer, or the producer. In addition, some of the literature is of major importance, others are supporting works, but they may shift categories depending on the subject matter. Works and ideas of major importance to the current topic are named but when in support of the topic, are cited inline.

The last subject, arguably the most important because it is omnipresent in the recording process, is the recording technology itself. Technology can be viewed as an

intersection of art and science. For example, the operational theory of the microphone, electromagnetic or capacitance principles,[62] falls within the realm of physics. However, the *choice* of microphone, i.e., brand, might be classified as an aesthetic choice, preference of sonic colorations of various microphones. The basis for choosing the polar pattern might be either physics or aesthetics. The engineer may choose the polar pattern because of the need to mitigate bleed[63] or the desire for the acoustic product to come closer to his or the producer's ideal. Another consideration specific to microphones is their placement in relation to the performer. There is the intersection of projection patterns of musical instruments (science) along with the imagined ideal of sound (art)—again a combination of physics and aesthetics.

With an ever-increasing dependence on technology in the digital age, the use or misuse of hardware and software for the creation or manipulation of sonic material becomes paramount for understanding the recording process and its influence on culture.[64] Summarizing the introduction to *Magnetic Recording: The First 100 Years*, with more than 100 years of recording history, technology has played, and will continue to play a critical role in the music industry (Daniel, Mee, and Clark 1999).

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[62] There are many textbooks available that describe the operational principles of microphones in detail, including, but not limited to *Sound System Engineering* (Davis and Patronis) 2006, 221-252; *The Microphone Book* (Eargle) 2004; *Handbook for Sound Engineers* Ballou (1998), 393-495; and *Sound Recording Handbook* (Woram) 1989, 61-155.

[63] The tendency of one acoustic signal to be picked up by other microphones. See "Bleed" in the Glossary.

[64] I use the term "misuse" to mean a result other than intended through design or common usage. For an example, listen to Cher, *Believe*, Warner Brothers 9 47121-2. The auto tune program causes the pitch to "step" from note to note instead of pitch correction.

Physics

Whether overtly or subtly, physics affects everyone. For our recording studio triumvirate, the engineer must directly confront the realm of physics. The performer and producer might only peripherally be aware of physics through interaction with the room's acoustics, the timber of instruments, or the control room's monitor system.[65] Since the engineer is the only individual directly concerned with physics, review of the literature specific to the engineer follows the general discussion.

I would suggest, however, that all those involved in the recording process, not just the engineer, should have some understanding of physics as it relates to music. A useful starting text, *The Physics of Sound* "[is] written [as] an introductory course in acoustics for nonscientists" (Berg 1995, xiii). Additionally, there are books written for those with knowledge of music as in the *Fundamentals of Musical Acoustics*, "…who would like to learn something of the ways in which music as an art form intertwines itself with our understanding of vibrating objects," (Benade 1990, 3). Perhaps written for the engineer working with instruments outside Western classical art music or the ethnomusicologist who might desire a better understanding of technology and recording, *Music, Sound, and Technology* (Eargle 1990) presents musical instruments in four categories familiar to ethnomusicologists: chordophones, aerophones, membranophones, and idiophones. First using the Sachs-Hornbostel classifications (Eargle, 63-80), Eargle then reverts to the familiar divisions of string, percussion, brass, and woodwind (99-167). They are

[65] The part of the audio chain that reproduces acoustic information for the listener. See "Monitor system" in the Glossary.

discussed as science with an overview of their sound generation once energy is introduced.

The Engineer and Physics

In the field of science, one can easily see how physics, specifically acoustics, would be a highly relevant topic. The engineer must know and understand the physical properties of sound, the transmission of sound, and even the sound production and projection patterns of musical instruments.

Acoustics also includes the properties of physical recording spaces. Industry-standard textbooks such as *Master Handbook of Acoustics* (Everett and Pohlmann 2009), and *Sound System Engineering* (Davis and Patronis 2006) are examples of works that cover acoustics and acoustic design in the audio industry. Interestingly, the preface to the Davis and Patronis book states "there are two worlds in audio—one of wave equations…and the other of Ohm's law" (Davis and Patronis 2006, xiii). To them, it seems as if music is divorced from audio, and only math and science have importance. The engineer, for the most part, records music,[66] but in this statement, there is no mention of music and certainly no recognition of the art of music. This schism between science/technology and music is typical of most books used to educate the engineer.

[66] The vast majority of recordings have culturally-defined music content in some form. Other recordings might use only the spoken word. Spoken word examples might include voice-overs for commercials or books-on-tape. Some audio programs in the United States do not require any proficiency or understanding of music for acceptance to, or graduation from the program. For an overview of this subject, see David H. Sanders, "The Professional Preparation of the Audio Engineer: A Survey of Studio Personnel and Recommendations for School Curricula Design" (Ph.D. diss., New York University, 1993). For the purposes of this dissertation, recordings of only the spoken word are not considered.

The room's size, shape, and construction material all have an influence on the acoustic product. In the book *Recording Studio Design* (Newell 2006), the author includes standard topics in studio design and acoustics, a chapter on objective measurements and subjective evaluations (457-496), and a chapter on human factors (573-579), but still little or no mention of music. Construction material, size and shape have an influence on sound. A room that sounds good aids in the production of better recordings. Newell, when speaking about good acoustics states, "those who do know tend to produce better recordings" (Newell, 176). Some authors do recognize music and performance space, but approach the topic from a singular view. "Problems of noise and acoustical isolation…and [the] compromises that acoustical designers have grappled with over the years" (Eargle, 186). Integration of individual topics falls to the reader. The final book, although not specifically utilized in this dissertation, is *Architectural Acoustics* (Kundsen 1963, 78-92) which looks at the management of sound through design of the room or space. Understanding the acoustic tendencies of a recording space as stated before, has influence on the final product. The designing of that room is beyond the scope of this dissertation.

Materials that encompass the physics of musical instruments should have a prominent place in the training of the engineer. *The Physics of Music*, a volume of reprints of articles published in *Scientific American*, is an overview of Western classical musical instruments and voice, written towards an audience who might desire a concise, yet in-depth view of these instruments and how they create, sustain, and project sound. The writings include a general article, "Physics and Music" (Saunders 1948, 7-15) outlining topics such as frequency, harmonics, frequency ranges, and hearing. Sundberg

writes on the structure and mechanics of the voice in the "Acoustics of the Singing Voice"(Sundberg 1977, 16-23). Blackham discloses the complex nature of the piano in "The Physics of the Piano"(Blackham 1965, 24-33). Arthur Benade is the only author with two articles: "The Physics of Wood Winds" (Benade 1960, 34-43), and "The Physics of Brasses" (1973, 44-55). The article on woodwinds has ethnomusicological application because the acoustic principles of an edge-blown instrument are the same, regardless of culture. An interesting side point for the article on brasses, although written almost forty years ago, the understanding of the interaction of a standing wave and the brass player's lips. Music educators still tell young trumpet players to "buzz their lips," which is contrary to the production of sound according to this article. The important corollary applied is that engineers need to know how instruments produce sound to avoid conflict between production, transmission, and reception of sound. The article "The Physics of the Violin" (Hutchins 1962, 56-68) examines the construction, loudness, and resonance of violins as a family of instruments that include violas, cellos, and basses. Also important to ethnomusicologists is an article on "The Physics of the Bowed String" (Schelleng 1974, 69-77). This article dissects the mechanics of the frictional forces between bow and string and the relationship between bow position, bow pressure, frequency, and volume. Ethnomusicologists need to understand *what* is happening *if* a sonic transcription is part of the analysis.

After examining the physics of instruments, one should seek an understanding of the projection patterns of instruments. The engineer needs to understand that the instrument's radiating characteristics are not constant through the range of the instrument. A well-written, comprehensive, but relatively short book, *Tonmeister Technology*

(Dickreiter 1989) has diagrams of the radiating characteristics of strings (46), woodwinds (50), brasses (54), and piano (58). This is also one of the few text books that discuss formants, in particular for woodwinds (49) and brasses (53). Understanding formants is of particular importance to engineers if they use pitch-shifting software. If the engineer wants to learn how to differentiate the sound of these instruments through the study of physics, there are charts showing the spectrum response ranges with formant positions (ibid. 45, 49, 53).

Several years ago, I was asked by a musical director to resolve some engineering issues during a rehearsal for that evening's performance. The guest conductor for this event was a world-renowned composer-producer from the Los Angeles area. After the problems were fixed, the musical director, the guest conductor, and I discussed the skills and training engineers receive. The guest conductor said he had asked several top engineers to come to the studio to listen to some music. During that time, he asked the engineers to identify the instrument being played. He told us how surprised he was when several engineers could not identify instruments common to the Western classical art form.

There are only a few ear-training sources for the engineer and fewer still on sound identification of musical instruments. Two better-known examples of ear-training CDs are *From Tin to Gold in 74 Minutes* (Gehman Music1996) and the eight-CD set *Golden Ears* (www.moultonlabs.com/full/product01/). *From Tin to Gold* has several tracks demonstrating various EQ ranges, mic patterns (omni and cardioid), and stereo micing

techniques.[67] The *Golden Ears* CD set begins with frequency ranges, followed by effects and processing, delays and decays, and finally master frequencies. Neither product has any examples concerning musical instrument identification. If engineers want to learn musical instrument sounds, they must search sample libraries such as *Synthogy Ivory* (www.synthogy.com) for various brands of grand piano, *Vienna Symphonic Library* (http://vsl.co.at/en) for orchestral instruments, or *East West/Quantum Leap* (www.soundsonline.com/Products/PLA/Silk/) for instruments common in China, Persia, and India. I argue that even with these resources, a recorded example of a musical instrument should never substitute for live performance. Even better would be a seminar-type situation where the engineer could assume the position of the microphone in order to hear what the microphone should capture.

Psychology

"Psychoacoustics is the study of how humans perceive sound" (Howard and Angus 1998, 65). What one hears and how it is perceived becomes important when trying to describe sound as well as interact with it. In the context of the recording studio, the sound of the room, the sound of the speakers in the room, and the ability to control those acoustics all interrelate to the triumvirate's ability to create an acceptable product. "Good recording spaces, good monitoring conditions, good sound isolation…are still basic requirements for any recording[s]" (Newell 2008, xxi).

[67] The microphone type and configuration for stereo micing techniques are beyond the scope of this dissertation. For information on eight common stereo micing techniques, see Dickreitter 1989, 82-109 and Woram 1989, 113-136.

The two areas within the discipline of psychology that influence the recording triumvirate are psychophysics and psychoacoustics—both interdisciplinary. As Juan G. Roederer states in his introduction to *Introduction to the Physics and Psychophysics of Music*, "We shall try to weave a rather close mesh between physics and psychophysics—or, more precisely, psychoacoustics." "…After all, they appear naturally interwoven in music itself…" (Roederer 1979, viii).

Since psychoacoustics concerns the perception of sound, it is useful to hear examples. Physically hearing and cognitively processing sound might require years of training to understand and correctly identify sound. In *Music, Cognition, and Computerized Sound: An Introduction to Psychoacoustics* (Cook 1999), several authors discuss various topics relevant to psychoacoustics for those in the recording process along with several components of the hearing process. Topics such as perceptual completion found in "Cognitive Psychology and Music" (Shepard, 29-32), "Introduction to Pitch Perception" (Pierce, 57-70), "What is Loudness" and "Introduction to Timbre" (Mathews, 71-87) and "Perceptual Fusion and Auditory Perspective" (Chowning, 261-275) all provide fundamental information for those in the recording process. It is fortunate the text has an accompanying CD that provides aural examples.

The Performer

Topics within psychology affecting the performer include the composition-improvisation continuum, constraints and collaboration in musical performance, and the affective response to hearing. "Given the primacy of composition in Western music, the silence of psychology in this respect is deafening" (Sloboda 1985, 106). He also

observed "that composition is the least studied and least well understood of all musical processes, and that there is no substantial literature to review" (Sloboda 1985, 103).

Most accept the idea that improvisation is the act of spontaneous composition, and "assuming that Wolterstorff is right in maintaining that composing is the act of *selecting* [emphasis in original] the properties that are to form the work" (Benson 2003, 1), improvisation is an instantaneous selection of musical properties placed in time. Benson continues, "contrary to Wolterstorff's claim that 'to improvise is not to compose,'… the process by which a work comes into existence is *best* [emphasis in original] described as improvisatory at its very core, not merely the act of composing, but also the acts of performing and listening" (Benson, 2). *In the Course of Performance,* a compilation of essays on "musical improvisation in a number of cultures and repertories using a variety of approaches" focuses on improvisation through the musician's understanding of their behavior as opposed to just composition (Nettl and Russell 1998, 1).

One book, *The Oxford Handbook of Music Psychology* (Hallam 2009), covers several themes important to understanding improvisation. The technology of recording may also aid in the tracing and tracking of improvisational ideas. "As recording technologies evolved from being simply the documentation of a performance, a new situation developed in which compositional exploration may be audibly inscribed" (Impett 2009, 409). An example of compositional improvisation, i.e., recurring constructed ideas in the improvisation, may be found by comparing multiple takes of a particular composition such as heard in *Clifford Brown Memorial Album*. Several compositional ideas reappear in Clifford Brown's three different solos of "Carvin' the

Rock" (Clifford Brown, *Clifford Brown Memorial Album*, Blue Note reissue CDP 7 81526 2, 1989).

Richard Ashley notes three constraints on musical improvisation in his article "Musical Improvisation": the body, real-time, and limits on what we know (Ashley 2009, 414). When Ashley uses the term "real time," he implies the relationship between performers and tempo. Even though some of the concepts fall under the category of psychology, I contend that "real-time" is mostly a musical issue. Discussion of this topic and of relevant literature on "limits on what we know" is in the Music section later in this chapter.

Physical limitations of muscles restrict the implementation speed of a musical idea, but if a musical idea is a kinesthetic representation of the action, speed and accuracy may increase (Jeannerod 1995, 1419-1420). One may practice technique in order to forget technique, and pre-hearing the musical idea may increase speed and accuracy. "Any perceivable effect of an action is automatically processed and cognitively coded, integrated into an action concept, and associated with the motor program that produces both the action and its effects" (Hommel 1996, 185). "Aural memory (i.e., auditory memory) enables individuals to imagine the sound of a piece, including anticipation of upcoming events in the score and concurrent evaluations of a performance's progress (Parncutt and McPherson 2002, 167). The imagined sound of some jazz players is exemplified through vocalization. A performer such as Bud Powell can be heard

vocalizing an idea before he plays it (Powell 2006). "If you can't sing it, you can't play it" (Harbison 1988, nn).[68]

Some in neuroscience contend that "Accurate representations of time are crucial for a wide range of brain functions such as speech recognition and the planning and execution of coordinated movements" (Haß et al. 2009, 87). This seems especially important because the act of improvisation, especially at the highest levels of proficiency, often draws on the ability to place notes and inflections at a micro-timing level (Iyer 2002, especially 21-25). These micro-timings are "often in the range of $1/25^{th}$ of a second (40 msec or less)" (Ashley, 414).

Those in the field of psychology might consider the performers to be a team; in fact one might consider *everyone* in the recording session as a team because there is a common goal. In "Team Composition, Cognition, and Effectiveness: Examining Mental Model Similarity and Accuracy," Christian Resick, et al. state:

> Working in teams is fundamentally different than working alone because of the interdependencies that exist among members (Guzzo & Dickson, 1996; Salas, Dickinson, Converse, & Tannenbaum, 1992). Therefore, team members must devote attention to completing the task at hand as well as to coordinating their efforts with other members (Stevens & Campion, 1994) (Resick 2010, 174).

Headphones and performing with headphones can affect the performer. Headphones are usually required for the studio performer[69] but can interfere with performance. "A good [headphone balance] can't be stressed enough, as they can either help or hinder a musician's overall performance" (Hepworth-Sawyer 2009, 81). The

[68] My trumpet teacher at Indiana University had all his students sing their etudes. This helped the student transfer the mechanics of performance to a kinesthetic response. My jazz teacher at Cincinnati, also a student of the same teacher at Indiana, applied that method to improvisation. Both used the same quote.

[69] See "CIMP philosophy" in Chapter 2.

headphones solve one problem and cause another; the performer can hear a mix of the ensemble, yet that signal is an unfamiliar representation of his own sound. For many performers, this unfamiliar sound causes them to alter their playing method to compensate for what they do not hear. One might apply schizophonia, a term coined by R. Murray Schafer (Schafer 1969, 43-47), to performers and their headphone mix because they are removed from the natural environment of the ensemble. Headphones "can be made to seem as though they [the sounds] originate from sources outside the head" (Semple 1998, 721). Although firmly convinced of this through anecdotal evidence, I have not found any literature specifically addressing the effects on the performer or alterations of the acoustic product because of the use of headphones.[70]

There are some limitations of an analog recording system, such as a sometimes-inadequate number of headphone mixes for the performer, but the digital system usually does not have such restrictions. With the advent of digital monitoring systems, the performer can create an acceptable headphone mix independent of the engineer,[71] but the alteration of the acoustic product and isolation from the natural ensemble sound still affect the performer.[72]

The Producer

Chapter 1 of this dissertation emphasized that the producer needs to be a counselor or leader, a goal-oriented person, and one who might need to resolve conflicts.

[70] See Chapter 6 and suggested areas of future research.

[71] With the advent of audio networking, any incoming signal can be sent to multiple recording/monitoring stations. On the market are several 16-channel personal monitor mixers that allow the performer to create his or her discreet headphone mix.

[72] Further discussion of the performer and headphones follow in Chapter 4.

The producer, through an almost constantly shifting dynamic, juggles the needs and wants of the performer and engineer, as well as his own, during the recording process. Kenneth De Meuse, et al. agree with this position by stating in their article "Learning Agility: A Construct Whose Time has Come":

> To be effective, leaders must demonstrate the flexibility and agility to adapt their behaviors as situations change. The willingness and capability to learn from experience and subsequently to apply that learning to perform successfully under new or first-time conditions becomes one of the most critical success factors for managers and executives (De Meuse 2010, 119).

Aesthetics

"Psychology and aesthetics are interlinked" (Impett 2009, 407). It is generally accepted that:

> A symphonic work sounds different in different halls on different nights, a painting looks different in different settings and under a different light, the effect of a literary work is influenced by the typography and paper it is composed of. And works will be different for people of different ages, genders, classes, emotional states. The "work itself" may not be different, but the work the viewer takes in may well be (Becker 2006, 24).

In *Art from Start to Finish*, Becker's approach to the sociology of art is what he calls a "genetic approach, since it focuses on how the work is made" (Becker, 25). He continues to explain the genetic approach as one in which process and changes are analyzed, but there is no reason to complicate issues with word choices. The same confusion exists now between biology and music with the term "organology."[73]

[73] Derived from the Greek *organon* or "instrument." Confusion arises because most use the biological definition from *Stedman's Medical Dictionary*: "The branch of

One can also consider the study of improvisation with the same approach, especially with a studio recording and the performer's multiple takes as a source for understanding the process, the structure, and any changes. With the ability for multiple takes *ad infinitum*, understanding the performer's improvisational structure, or tendencies of structure, become more evident. As the recording session progresses, the producer now has more information from which choices may be made.

The Producer

Howard Becker speaks of control, power, and decisions made in the creation of the "final product." "Others may not like their decision, but recognize that when the [movie] studio that has ultimate control, or the director, whose contract gives him that power, says this is the final version, that *is* [emphasis in the original] the final version, though other versions may exist in fact, or potentially" (Becker 2006, 24).

Because I am suggesting that the producer's role is to protect the integrity of the music, understanding the improvisational tendencies of the performer allows the producer to guide the performer toward a successful take. For the genre of recorded jazz, the ideal is to sound like the live performance. "Because you want to capture the spontaneity and magic of what jazz is, on record. And fundamentally, it's a live music" (Wolf quoted in Chinen 2010, 41).

Protecting the integrity of the music moves the role of the producer to that of a critic. Spontaneity is not a factor in the recording studio as it is in a live situation because

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science that deals with the anatomy, physiology, development and function of the various organs."

the performer can repeatedly produce spontaneity—a revisionist spontaneity. In *Art and Ethical Criticism*, Garry Hagberg's article "Jazz Improvisation and Ethical Interaction: A Sketch of the Connections" suggests several varieties of ethical interaction within improvised jazz. Varieties of interaction specific to the producer include, but are not limited to; attentiveness, awareness of the circumstance of action, acknowledging the autonomy of others, respecting complexity, respecting individuality, genuineness and insight, sensitivity to the context of discourse, excessive attentiveness, and the diversity of intentional action (Hagberg 2008, 259-285).

Of these interactions, the last two are especially important. Excessive attentiveness is taking "a musical idea that possesses its aesthetic identity *oppositionally* [sic] and converts it, in a sense against its will or certainly in a manner inconsistent with its character, to its opposite, i.e., a gesture that has its identity *co-operatively* (Hagberg, 277-278). A producer can usurp the performer's intent as well, either through suggestion of note selection or, in the case of the recording studio, editing. The diversity of intentional action has special significance for the performer and producer in the recording studio since "The fundamental issue here concerns the dangers of—in prior to that the very possibility of—the retrospective falsification of intentional action" (Hagberg, 279). For the performer, it is "what I meant to play," while the producer asks "did you really mean to play?"

> David Smith, the sculptor, spoke of the great significance of what he called "the direct deed" and sculptural creativity. That direct deed, one imagines, is one that *actually* happened, and not the retrospective re-description of that deed that is tailored, after the fact, to conform to a simplified dualistic intentional template (Hagberg, 281).

These two items specifically, bring us to the point where we might ask, does this recording tell the truth if any of it has been altered from what actually happened?

To close this section, I feel it necessary to mention the topic of phenomenology, not to explain its significance, but to make clear why it is not necessary in this dissertation. This is not to say phenomenology is unimportant. Several sources, in part or wholly, address musical meaning or phenomenology with jazz as the genre: Berger (1999), Benson (2003), and Cook (2007). There are writings specific to phenomenology and recording such as (Porcello 1998) and (Zak 1997), and even some who suggest the opposite, that there is no data specific to the engineer (Hecht 1996). However, I am not writing about my experience "directed toward an object by virtue of its content or meaning (which represents the object) together with appropriate enabling conditions" (Smith 2008). For the purposes of this dissertation, it is not how any of the other informants or I experience an object, usually sound, but how we discuss the differences between our experiences, and it is those differences that are the concern of this dissertation.

Music

Ethnomusicology and jazz are the two disciplines within the topic of music that are the subject of this dissertation. The duality of my roles, producer for the recording and author, required both an *etic* and an *emic* view. "There is no substitute in ethnomusicological fieldwork for intimacy born of shared musical experiences" (Myers quoted in Bartz 1997, 200). "The participant observer comes to a social situation with

two purposes: (1) to engage in activities appropriate to the situation and (2) to observe the activities, people, and physical aspects of the situation" (Spradley 1980, 54).

While the recording studio is not commonly identified as a location of "field," there are ethnographies that recognize the recording studio as "place." Several ethnographic studies involve the recording studio or its participants: the engineer, the performer, and the producer. *Sounds of Africa!* (Meintjes, 2003) discusses the process of recording Zulu music in a South African recording studio. She discusses the process of recording and the mediation of sound between the engineer, the performer, and the producer. It is unfortunate that a well-written ethnography falls into the trap of using subjective terminology. "The auditory acuity and *atomic* [emphasis mine] listening of the sound engineers and producer are phenomenal" (Meintjes, 12). I can assume by context the meaning of atomic, but it might have been better to say that the engineer has good ears. I find her description of EQ alteration troubling. "Peter boosts the mids to *fatten* [emphasis mine] the sound, thereby exacerbating the distortion" (Meintjes, 123). There are several problems with this statement. There is no agreed- upon definition for the word "fatten," the word "exacerbating" implies an undesirable effect, and "distortion" may be desirable. Finally, without information on the types of distortion, it is not possible to understand the meaning through context.[74]

Several dissertations have looked at recording and the recording process, but most of these use rock music as the idiom. Albin Zak III investigated multitrack recording as a

[74] See "Distortion" in the Glossary. For a discussion on the audible distortion characteristics of tube amplifiers, see Russell O. Hamm, "Tubes Versus Transistors—Is There an Audible Difference?" in *Journal of the Audio Engineering Society: Proceedings of the 43rd Convention of the Audio Engineering Society in New York City, September 14, 1972.*

compositional practice (Zak 1997); Susan Horning examined culture and technology in the recording studio (Horning, 2002); and basing his ideas mostly on social phenomenology, Thomas Porcello looked at the intersection of music, discourse, and technology in the recording studio (Porcello1996).

Peter Hollerbach (1994) tries to define common professional practices using a single subject, a jazz performer. In this study, Hollerbach traces his informant through several performance spaces such as jazz clubs and recording studios to identify, in a broader sense, "real" jazz performers. Hollerbach defines the recording practice "as the primary source for research—superseding the score, transcription, or arrangement—the recorded performance of jazz has come to define the history of the music" (Hollerbach, 307).

The Engineer

Many have spoken on the level of control the engineer has in the recording studio over almost every aspect of sound (Théberge 1997 and Taylor 2001). Paul D. Greene states, "recording studios have become, among other things, spongelike centers, where the world's sounds are quickly and continually absorbed, reworked, and reincorporated into new musics" (Greene and Porcello 2005, 2). When speaking of the broader sense of agency, Greene states:

> …"sound engineering" defined as the practice – by individuals, groups, institutions, corporations, or governments – of using sound technologies to engineer meanings, functions, and social strategies in musical cultures and in the world at large for strategic cultural, aesthetic, political, and economic ends (ibid., 4).

The engineer, for the most part, records music, and as previously discussed, utilizes a great deal of technology, specifically electronics in the form of recording

equipment and computers, all within the space of the recording complex. Most people probably believe that a school of music program should concern itself solely with the art of music. However, defining the "art" of music entails understanding performance history, music theory, and performance practice—from both a technical and acoustic standpoint. Students study for years in order to master the technical aspects of their instruments and to develop a music-appropriate sound, what I call *culturally specific sound*. One might even argue that courses in ethnomusicology, which intersect the topics of cultural anthropology and sociology, should be included in the engineer's coursework because the engineer works in a sonic environment that has culturally specific sounds.

In some sonic cultures (a term used in popular music studies), the aesthetic sound ideal leads to an easily recognizable sound quality. Steve Jones, writing about rock music in *Technology, Sound, and Popular Music* states, "The sound of recording has become its identifying characteristic. One can refer to the 'Phil Spector' sound or the 'Motown sound' " (Jones 1990, 5).

Of course, the young engineer must also understand the art of music: culturally specific sound; musical cultures and idioms such as pop, rock, classical, jazz, and if possible, the sonic characteristics of some of the non-Western musics of the world—ideally at the same level of competence as the performer. Yet for the engineer, the comprehension of musical culture must also include an understanding of sonic qualities, acoustic proportionalities, and the balance of each instrument as an individual component of the total sound. Technical knowledge must also fit within cultural acceptability including acoustic processing (compression and EQ), standard practice placement of performers within the stereo field, and placement in an appropriate venue using artificial

reverberation. David Griesinger writes on concepts of reverberation and perception with emphasis on concert halls (2010). Downloadable PowerPoint presentations such as "The Importance of the Direct to Reverberant Ratio in the Perception of Distance, Localization, Clarity, and Envelopment" (2009) intersect music, physics, and psychoacoustics topics related to the recording studio and live concert halls.

Charles Seeger asked, "What does music communicate?" (Seeger 1977, 16). In the discipline of audio technology, most understand that a microphone is a transducer that changes the transmission of acoustic energy into electrical energy. Not as well known, but just as important, is the fact that there is no such thing as a perfect transducer. There will always be loss when transforming one type of energy into another. The same is true for communication; when one is speaking in subjective terms in order to describe sound, there is no guarantee that the transmission and reception of information are equivalent.

Steven Feld, attempts to simplify the awareness of communication by placing it "relationally, in between, at unions and intersections" (Feld 1994, 78). He continues by saying that communication "rightly evokes process and activity, …meaning and interpretation" (78).

The same problem occurs when one is trying to change music into speech about music. Even as early as the 1930s, Kate Hevner showed, using Western classical art music, that there are descriptors of music that use subjective words and culturally-constructed understandings of music. I suggest, therefore, that it is not possible to transmit an equivalent verbal understanding of sound without negotiating an agreed upon meaning (Hevner 1936, 246-268).

Idealized recordings have now altered the expectation of most audiences from a "good" performance to a "perfect" performance. "But the ethical, aesthetic, moral, political, and all the larger value dimensions of Western through-composed music are towards the perfect performance ideal….I think the Western perfection preoccupation is embodied in the recording studios" (Keil 2005, 157). Thomas Porcello argues that overdubbing and multi-tracking removes participatory discrepancies (PDs) of live performances (Greene and Porcello, 2005, 107), while Beverly Diamond argues that the rationale for production decisions is a complex mix of many factors such as genre, concepts of modernity or tradition, and sound emulation (Diamond 2005, 129).

"Recording technology is the dominant mode of musical reception" (Gracyk 1997, 139). How should the listener perceive the musical event? Should it be as an audience member, as a performer, or should the perception depend on cultural context? The literature lacks sources that speak directly to the audience versus performer perspective,[75] but an article written by Edward L. Schieffelin speaks to performance as a social event. Therefore, "a performance works only because it has a relationship with (and an effect upon) others: in effect, an 'audience'" (Schieffelin 2005, 81). He continues with the idea of the boundaries of performance, "for if performance is a responsive (rather than purely presentational) genre, must the audience be considered part of the performance?" (ibid., 81). This is an interesting consideration for an ethnomusicologist. If the audience is part of the recording, as in the case of most religious or other participatory events (such as call and response) and is part of the performance practice, where is the ideal representational placement for the microphones?

[75] See "Perspective, audience/performer" in the Glossary.

Using this concept of a religious setting as an example, one could make the case for a positional change in standard recording perspective and practice or at least the recognition of two possible positions: the audience (congregation) and the performer (prayer leader).[76]

There are only a few sources, either in ethnomusicological journals or textbooks on recording techniques, that recognize the issue of microphone placement in cultural contexts (an in-depth discussion of that literature follows below, under "Ethnomusicology"). Furthermore, these sources rarely address perspective as a topic for concern. Hood calls for "thorough knowledge of performance practice" (Hood 1982, 262). With performance practice in mind, can the recording be misunderstood or misrepresented if the microphone is placed in the incorrect perspective? Is there a historical bias toward the audience perspective? A suitable example is traditional Japanese *shakuhachi* performance practice. Would it be appropriate to record *shakuhachi* from the player's perspective? To answer that question one only needs to look at the cultural use of the instrument: "It is not meant to be listened to. But it is a tool to develop one's spirit" (Gutzwiller 1983, 250). "*Shakuhachi* and its music are designed for introspection" (Malm 2001, 176).

Because *shakuhachi* is *hoki* (an instrument used as a religious tool), and the performance aesthetic of playing *shakuhachi* has "sound valued for its own sake" (Rowell 1985, 195). It is therefore consistent to record *performance* from the player's perspective because the player's interest does not depend on acceptance by an audience.

[76] The standard perspective in ethnomusicological field recordings is a stereo pair of microphones placed in the audience pointing towards the performers. This is, by definition, is the audience perspective. Using a surround format, the ethnomusicologist would place himself between the performer and audience, thus capturing both.

Even with the understanding that the performer's perspective is correct, the audience's expectation will not be fulfilled. The recording may not be acceptable to the public without their understanding of the cultural context, therefore the meaning of the music may be misunderstood and deemed unacceptable. "Without an understanding of concepts, there is no real understanding of music" (Merriam 1964, 84).

"Recording has changed the way we listen to music and the way music is performed" (Day 2000, ix).We should not think of documenting only performance, but of also recording history. If we are recording history, are we being selective, giving an incomplete account without awareness of the cultural perspective? Even though there are no studies yet of the specific methodology used in early recordings of ethnic music, the technical nature of recording technology seemed to take precedence over any cultural concerns.

Pioneering ethnomusicologists such as Alice Fletcher had Native Americans come to her home to record songs when they had business in Washington, D.C. (Sterne 2003, 321). Frances Densmore also understood that it was sometimes necessary to move the performance place in deference to the recording. Although she went to the field to do research, her recordings were in a sonically isolated location as much as possible. "The ideal place for recording Indian songs is a detached building" (Densmore in Sterne, 123).

One of the most important skills in early recording was knowing where to place voices and instruments in front of the recording horn and being able to convince artists, who were accustomed to freedom of movement, to stand where they were told. Because of the weak acoustical power of stringed instruments, they had to be played directly into the horn and performers were sometimes placed on risers to achieve this (Horning 2004,

706). Densmore altered performance practice when recording by intentionally positioning the performer for optimal acoustic results. "The singer is shown how to sit in front of the horn, and to sing in it from the proper distance….He is also told that he must sing in a steady tone and not introduce the yells and other sounds that are customary to Indian singers" (Densmore in Sterne 2003, 323-324).

As early as 1956, there were those who insisted that the placement of microphones had as much influence on the aesthetic qualities as the performers themselves (Kealy 1979, 217). The science of recording was beginning to have an influence on the art of recording. Multi-microphone techniques and multi-track recording allowed the engineer to have more control over the acoustic environment, but no attention was paid to perspective (Cunningham 1998, 34). If the engineer has control over technical aspects that affect the product, should not the recordist have the necessary cultural information on which to base aesthetic or technical decisions?[77] For the recording studio, the producer should have and be able to transmit that information to the engineer, but the ethnomusicologist must have that information because they *are* the engineer and producer (and roadie).

The idea that the engineer or recordist should know the music genre, the score, and performance practice links comfortably with ethnomusicological canons. From the earliest field recordings, ethnomusicologists have assumed the audience perspective, whether documenting the music from an *emic* or *etic* position. Accepting John Baily's thesis that [one must challenge] "traditional Western epistemological categories as too

[77] Extrapolation of this idea is from Nettl (1983), "I Can't Say a Thing Until I've Seen the Score."

arbitrary and culture-bound" (Baily 1988, 115), we now have the theoretical framework to challenge the assumption of audience perspective as the standard of recording practice.

Leonardo da Vinci solved the problems of perspective nearly five centuries ago by insisting on four or six planes of reference of a single object.[78] By recording four to six reference points, one can extrapolate almost any position within the acoustic event.[79] Placement of the microphones (views) depends on the desired result, but the ethnomusicologist has many combinations of acoustic views, depending on placement. This is not to say that there will *always* be the need for multiple reference points, but there are immediate advantages for including these techniques. First, having the data available allows research flexibility. Second, transcribing events away from the traditional audience perspective becomes easier. Third, because we are creating a historical document, a closer approximation of the spatial accuracy of the actual event (more data) can be captured. The problem with the multi-microphone technique has to do with the mixing of each signal in order to create a spherical representation of the event. In order to prevent enormous phase cancellation problems in downmixing,[80] the microphone capsules need to be as close together as possible.[81] Using these techniques

[78] Four reference points of audio are front, back, and both sides; six includes top and bottom.

[79] Techniques of surround mixing allow the engineer (or ethnomusicologist) to vary the placement of the performer. See "Pan" in the Glossary for further explanation.

[80] A term used to describe the action of taking multiple audio channels and mixing them to fewer channels. See "Downmixing" in the Glossary.

[81] A capsule is the transducer part of the microphone. Using the four reference points from a *single point* microphone setup produces a FLRB (Front, Left, Right, Back) array. Technical execution of the FLRB array is beyond the scope of this dissertation. See Mikkel Nymand "Introduction to Microphone Techniques for 5.1 Surround Sound." Banff: AES 24th International Conference, 2003 for explanation.

addresses many of the concerns raised by Ruth Davis, such as the natural balance and interaction between musicians and their audiences (Davis 1992, 9).

The next difficulty is the placement of the microphone array, which is also dependent on the desired perspective, so one must ask a series of questions. What is the purpose of this recording? Is it for public release? Is the accepted aesthetic an audience representation? The choice of perspective (either of the audience or the player) needs to be included in the predetermined technical checklist for any field recording. This issue will take on greater significance for field recordings with the expectation, acceptance, and demand for products recorded in surround formats.[82]

One who listens to a recording perceives the music based on someone else's aesthetic ideal. Because the listener does not choose the ideal, perception is once removed from the listener's experience. Likewise, if a performer plays a live concert with sound reinforcement, the listener again is once removed from the listener–constructed ideal.

The Performer

Performers in the jazz idiom know that performance is a:

> "Collective action, concerted work that couples these elements, both within players as they solo with other musicians, and between players as they immediately respond to one another on the bandstand, in the recording studio, or where ever they perform. The musical activity is simultaneously deliberate *and* spontaneous, imitative *and* experimental, routinized [*sic*] *and* innovation [*sic*] (Faulkner in Becker 2006, 92).

[82] Name given to the multiple-speaker or microphone configurations or set up. See "Surround" in the Glossary.

In the recording studio as well as live performance, the repertoire is usually preselected. Robert Faulkner and Howard Becker suggest there are at least four characteristics for the group's working repertoire: size, diversity, capaciousness, and variability (Faulkner and Becker 2009, 170-171). In the context suggested by Faulkner and Becker, size refers to the number of available tunes the group is able to perform. In the recording studio, size is a secondary meaning, that is, the variability of the number of performers in the group. Diversity, capaciousness, and variety seem especially important for jazz recordings because of time limitations of the recording medium and the space necessary for improvisation, although diversity may be limited due to the intentional choice of one specific musical type, such as a bossa nova recording.

As stated in the psychology section, "real time" constraints are a musical as well as a psychological concern, but for this dissertation, musical issues are of greater importance. The note itself may not be the only criterion determining "correctness" in an improvised solo. Charles Keil in *Music Grooves* (Keil and Feld 1994) suggests that besides a language analogy, such as that presented by Meyer (1956, 45), "A kinesthetic analogy can readily be made." There also needs to be the inclusion of what Meyer calls "sound term" (Meyer cited in Keil and Feld 1994, 72). Keil goes on to suggest, "When a jazz saxophonist comes up with a triple forte screech, is it reed trouble, or is it the climax of the solo? "Only the gesture's place in the overall process can determine the answer" (Keil, 72). If this is true, a recording should never be accepted as musical truth because the listener does not have the visual information necessary to determine the true intent of the performer even if the performer *actually* knew. It is true that the visual information will get you closer, but this is where the role of the producer in the overall recording

process must be considered. Because the producer is supposed to protect the musical integrity and the performer's intent, a recording still holds the potential to be a culturally acceptable sound product. Perhaps the listener should be observed to see if musical gestures are being transmitted.

Listening to a studio recording, the audience may not understand or realize that the process is an idealized performance based on constructed elements such as perspective, dynamic level, artificial room (ambient sound), and the performance itself.

The ability to manipulate "real-time" is a concern for everyone in the recording studio. Technology allows not only careful control over the sound, multiple attempts at the same material, but also levels of editing and alteration beyond that of human hearing. Software tools for pitch shifting, sound shaping, and time alteration create interesting aesthetic and moral dilemmas for the engineer, the performer, and the producer.

The Producer

For cultural recordings, one concept intersects the disciplines of music as well as philosophy. Authenticity is a word that is used and abused. Peter Kivy in the first few pages of *Authenticities: Philosophical Reflections on Musical Performance* outlines the problems of using the word "authentic," then outlines and discusses those who have tried to redefine its meaning (Kivy 1995, 5-8). Through four notions of authenticity (6-7), Kivy divides the book into two parts: 1) the nonnormative "Authenticity as…" in chapters two through five and 2) the normative "The Authority of…" in chapters six through nine (Kivy).

The postmodern tendency to redefine meaning is discussed by Edward M. Bruner in his article "Abraham Lincoln as Authentic Reproduction: A Critique of Postmodernism" (Bruner 1994). Although writing about a tourist attraction, his conclusions might apply to recordings that tout "authentic" in the description or those that claim to represent a "true" picture of performance.

> …tend to be described in ways that replicate elements of the theory of postmodernism, emphasizing the inauthentic constructed nature of the site, their appeal to the masses, their imitation of the past, and their efforts to present a perfected version of themselves (Bruner, 412).

One only needs to substitute the word "recording" for "site" to see the possibility for abuse in the recording studio. These issues are of importance to the producer if protecting the integrity of the music and being the audience representative is to be successful.

Ethnomusicology

A review of some of the literature specific to recording and the recording studio in ethnomusicology is appropriate. Several issues within the recording process seem to be subject to ethnomusicological consideration: technology, physical setup, micing technique, overdubs, editing, and authority. In contrast to the recording studio are the concerns of field recordings: technology, physical setup, micing technique, repeated takes, editing, and authority.

In moving between cultures, technology might be the only parameter where there is consistency because the technology itself does not change as a function of local, only as a function of advancements and possible improvements through time. A 24-track tape machine operates the same in South Africa as it does in Washington, D.C. Pro Tools

software records, edits, and processes sound in Turkey the same way as it does at this author's house.

In 1991, Louise Meintjes documented the studio processes of the procedures and practices in a South African recording studio. In the book *Sound of Africa! Making Music Zulu in a South African Studio* (2003), Meintjes examines the constructs of sound as "an essential ingredient in linking politics to aesthetics" (13). Her goal is to "link issues of power and ideology at multiple levels…" (ibid.). In chapters 3-6, Meintjes focuses on the sonic qualities produced by the instrumental and vocal components and how each are manipulated through mediation to create a particular *mbaqanga* sound.

Throughout her book, the use of technology plays a prominent role in the creation and alterations of the sonic information in this particular recording session. In Chapter 3, Meintjes discusses the concept of "liveness" [sic] in that "to sound authentically African is to sound live" (112). However, this is not a marker exclusive to African authenticity and in this dissertation, I argue that *all* recordings that purport to be "authentic" should sound as one would hear at a live performance.

To differentiate Meintjes' pioneering work and its contribution to ethnomusicology from the approach of this dissertation, I point to a passage in which she acknowledges her status outside of the recording studio and its processes. "…I cannot necessarily anticipate or explain his choices" (94), and a quote from the engineer to Meintjes: "…that however much you watched you'd never know what's *really* [emphasis in the original] going on" (Kuny, quoted in Meintjes, 93). This however is not true for this dissertation. As an insider to both the recording procedure and jazz, I have close experience with the various aspects of the recording process: the personnel (the engineer,

the performer, and the producer), the difference between typical problems or atypical problems that arise, and any alterations that might occur, as presented in the general discussion in Chapter 2 above.

One item that requires inquiry is that of the continuum of what one may consider to be the processes of recordings and how one might categorize a specific product. Framing his text around social theory and phenomenology, Thomas Turino, in his book *Music as Social Life* (2008), presents topics relevant to the processes within the recording studio. Within the two divisions of live performance and recorded music, Turino suggests the categories of participatory, presentational, high fidelity, and studio audio art and, within each category, the topics of goals, conception, rules/mediation, time and attention, and continua (90-91). Topics such as participatory and presentational performance cover the participation in musical events as well as values and goals of the performer-audience relationship (23-65). In Chapter 3, Turino suggests dividing music recordings into "…two distinct fields of making music recordings—*high fidelity* and *studio audio art*" (67). By "high fidelity," he means "…recordings that index or are iconic of live performance" (67) and by "studio audio art" as "…recorded music that is patently a studio form with no suggestion or expectation that it should or even could be performed live in real time" (78).

Although Turino states "The four fields [participatory, presentational, high fidelity, and studio audio art]…are not meant to be airtight rubrics for neatly categorizing styles of music" (88), and I suggest there are overlaps that need either a separate category or recognition of their significance. An example would be the live, "on-location," multi

track recording that is taken subsequently to a recording studio for remixing and/or mastering. In this instance, several of the four fields may apply to the recorded product.

Distinctions also need to be drawn between "ethnographic" recordings and all other types of recording. In this author's strict definition, an ethnographic recording is an unaltered document; however, there are those who might consider the removal of "unwanted or undesirable" material to be ethnographic as well. Individual bias or ignorance may lead to the removal of extraneous sounds in order to create a "better product," or a truer representation of the idealized performance. As Anthony Seeger discovered and documented in his book *Why Suyá Sing*, however, there might be a cultural difference in the concept of "undesirable." Seeger relates a cautionary tale concerning a recording from 1982 where he attempts to isolate the "music" and de-emphasize the "extraneous" sounds, and how the *Suyá* found the result objectionable by saying "It wasn't beautiful" and "It wasn't euphoric" and insisted he re-record the performance (77).

Feld created an idealized version of the *Kaluli* soundscape with the recording "Voices of the Rainforest" where he compresses a day in the rainforest into a one-hour recording (Rykodisc 1991). In this case, it is obvious that there has been editing; Feld frames this recording as "An un-abashedly commercial product meant to attract as large a listening audience as possible, through the appeal of both superb audio reproduction and extraordinary musical and natural sounds" (1991, 134).

Still another example of cultural expectation and recording are comments concerning Robert E. Brown's recording: "Javanese Court Gamelan from the Pura Paku Alaman." Ernst Heins, in his 1975 review in *Ethnomusicology*, states: "The recording

balance as well as the presentation is somewhat careless" (324). He continues by describing the specific problems of balance in the ensemble and states: "Ambiance (too much echo) could have been avoided" (325). Notably absent from the review are comments on the "extraneous" sounds such as the sparrows and other naturally occurring events simply because there might be an expectation of this type of natural ambience in a recording space that, as stated in the review, is open on three sides (ibid.). Whereas knowledge of the inverse square law might have helped, I believe this statement assumes facts not in evidence such as microphone type and placement.[83] Perhaps Brown used omnidirectional microphones, which would pick up more "room sound" at that distance than any of the directional mics.[84]

René T. A. Lysloff in his article "Mozart in Mirrorshades: Ethnomusicology, Technology, and the Politics of Representation" (1997), suggests, "What we need is an ethnomusicology of technoculture, the ethnomusicological study of such reconfigured cultures" (218). He also states "The technologically privileged position of the ethnomusicologist is largely assumed in the literature. After all, the history of ethnomusicology is closely linked to the history of audio recording" (209). While this is an accurate representation of the literature *about* recording, the description of "closely linked" no longer seems to be as close as Lysloff suggests, considering the most recent advances in audio recording techniques. Ethnomusicology's use of modern recording

[83] The inverse square law states that for every doubling of distance from the source, there is a 6 dB drop. See "Inverse square law" in the Glossary for an in-depth definition.

[84] See Dickreitter for an explanation of direct to reverberant ratio (28).

techniques is behind the recording technology curve. Two examples will clarify this position: first, recording in surround sound and second, micing techniques.

Ten years ago, this author had the opportunity to speak with a group of ethnomusicologists and archivists at a seminar where I asked their opinion on the use of documenting in surround recording in the field. None of them saw the advantage or relevance of documenting in surround, and a few actually argued *against* recording in surround because of the extra equipment and expense. To extend the argument of Helen Myers "…opting for convenience" (Meyers 1992, 84), the aforementioned ethnomusicologists and archivist may by now have changed their position. Today, I applaud Lysloff's melding of past and future while asking whether there is still such a monetary price on "ethnographic truth" (210), and I suggest a partial resolution of the conflict. Today, one can purchase a surround-recording device for under $150 or a HD video recorder with surround capabilities for under $300. With the availability of these inexpensive and road-worthy devices, ethnomusicologists can, at least from a technological standpoint, move closer to acoustic reality.

As a historical matter, the concepts and technology for surround recording have actually existed since 1940. That year is significant because the engineers working on the sound track to "Fantasia" created a recording and playback system that made sound seemingly move around the auditorium. Although it did not appear in the final version, the concept for "Flight of the Bumblebee" was to have the sound move around in the auditorium (Holman 2008, 4).

Even if stereo recording would suffice, there is the matter of the variety of stereo micing techniques. Most formally-trained engineers know of six stereo micing

techniques, and many are aware of nine "classic" techniques. The ethnomusicological literature has not yet gone into details about the differences, merits, and pitfalls of each technique or carefully consider that each technique has a specific sound that may help capture the desired aesthetic.

Recording technology has advanced rapidly in recent years, and it would certainly benefit ethnomusicologists to have updates to publications like the second edition of "A Manual for Documentation Fieldwork & Preservation for Ethnomusicologists" (2001), where the technology section is no longer up-to-date. For a third edition, an expanded microphone technique section that explains the possibilities and situational variations in stereo and surround microphone practice, along with an overview of available software, would be helpful. If ethnographic recording is to find the best way through the "…web of conflicting notions of aesthetics, ethnographic truth, acoustical reality, cultural legitimacy, and specific intellectual interests" (Lysloff, 210), then knowledge of microphone techniques and surround recording might help eliminate the acoustic reality problem and, if done correctly, move closer to an ethnographic truth (see "Conclusions" for more analysis and definition of an ethnographic recording).

Eliot Bates, in his 2008 dissertation "Social Interactions, Musical Arrangement, and the Production of Digital Audio in Istanbul Recording Studios" and a subsequent article in *Ethnomusicology* "Mixing for *Parlak* and Bowing for a *Büyük Ses*: The Aesthetics of Arranged Traditional Music in Turkey" (2010, 81-105), discusses the social interactions of "institutional culture of record labels, studios and temporary production networks and … interactions between arrangers, audio engineers, and studio musicians that comprise most of the work of recording production" (2008,1).

In his dissertation, Bates discusses the use of technology, technological manipulation, and musical practice in creating Turkish popular music using traditional forms. Parallels of recording space and technologies draw similarities between the construction of Turkish popular music and, of particular concern here, traditional recording practices in the jazz idiom. Bates presents what he calls "technologies of hearing," which involves microphones, speakers, and headphones and "technologies of connections," enabling the sharing between multiple spaces (95).

Bates's primary focus is the interactions of the arranger, the engineer, and the studio musician (183-214) and the discussions of the two important aesthetic goals: "big sound" and "shine" (260-265). In his role comparison, Bates suggests that the arranger occupies the same role as I suggest as the producer role in the triumvirate model used in this dissertation. He states "As a result, a situation has developed in which the arranger is typically the only person the engineer communicates with regarding anything technical" (199) and "After recordings are done, the arranger-engineer team decides on the necessary edits to recorded parts" (204). A key difference between his model and the one presented in this dissertation, is that his description of the domain of the arranger includes overlaps of the performer and producer-type decisions and the possibility that the producer might have technical knowledge. Bates also compares the relationship between the arranger-engineer and the studio musician (205). In this dynamic, Bates discusses the circumstance where the musician might have a direct effect on the content of the recording if the arrangement is "weak" (205-207). In my study, that dynamic of performer involvement is direct and has a greater influence on the final product.

In his discussion of "big sound and shine," Bates discusses the three primary ways to achieve this aesthetic: doubling,[85] multiple microphones, and through orchestration for "big sound," as well as the use of EQ and specific plug-ins for "shine" (260). Also in his discussion are the sonic characteristics of some of the microphones used in the recording process, which the engineer chooses to aid in "shine." Engineers choose these microphones for their ability to emphasize specific areas of the acoustic spectrum (263).

As previously stated, the technology does not differentiate locale, nor does the technology itself identify culture. What does identify both of these topics is the application of technology. A key difference between Bates's study and mine is the differentiation between the arranger and producer and the power shifts in their respective idioms. Perhaps the key difference is that of the acceptability of constructed recordings—what is expected during the recording process. For some of the examples examined by Bates, it seems quite acceptable to construct most of the product, from recording to click tracks, synthesizer tracks, doubling, and altering sonic information, while for the jazz idiom, recording as an ensemble is expected and constructing solos is discouraged.

A recent case study of contemporary Native American music examines the intersections of the performer and producer in the recording studio and the "…perceived levels of cultural knowledge, musical authenticity, and socioeconomic power" (Scales 2002, 41). Of particular interest are the similarities and differences of recording

[85] Doubling is the term used by engineers to describe the recording of the same material on new tracks at least one time, thus "doubling" the desired line. The goal is to come as close to the original as possible while still having minute differences in pitch, time, and amplitude. Employment of this technique occurs almost exclusively in the popular music idiom. This technique should not be confused with copying and pasting the original musical line.

approaches between the sessions mentioned in Scales's article and the one in this author's study, such as the similar use of technology, the seemingly autonomous choices of the engineer, and the producer's interaction with everyone. Differences include the performer's level of cultural expertise in the music and the method of recording—overdubs for Native American music versus an all-at-once ideal for jazz. Scales highlights three points of interest: "…the piecemeal nature of these sessions," the choice of musicians, and the role of the producer (46). The interesting comparison is within the producer role.

> I don't interfere with any of their songs…because it's like producing a classical guitar album. That classical guitarist is just going to interpret that piece in the way he does it (Friesen, quoted in Scales, 47).

While not strictly true because commenting at least has the potential to alter the performer's approach and execution, the essence of what this author interprets from the quote is that cultural performance should lie, in large part, in the performer's realm.

CHAPTER 4

PRE-RECORDING AND RECORDING SESSIONS

In Chapter 2, I discussed my experiences during the pre-recording and recording phase of the total process. In this chapter, I will again focus on this same segment of the process in a specific case, from inception through the first two days of recording for the creation of John Jensen's fourth CD project. It is the recording process that illustrates degrees of success from smooth sailing to a perfect storm. As an informed insider in both the jazz idiom and the recording process, I am confident of the words, concepts, and "translation" that I present. With that in mind, following the pre-recording portion of this chapter is a highly detailed description of the events at Bias Studios.

On most Sundays during the calendar year, a jazz trio plays at The Inn at Glen Echo just off MacArthur Boulevard, near the District of Columbia, Maryland state line. It is a place for local jazz musicians to "jam."[86] The usual trio consists of the band's leader Brooks Tegler on drums, Robert Redd on piano, and Tommy Cecil on bass. I was there to discuss with Brooks a mutually agreeable time for an interview as part of my project for the second field methods course. The working jazz community in the Washington metropolitan area is relatively small, and I am familiar with most of these performers through my wife, Chris Kosky, who is a professional bassist. Most of the audience on any given Sunday consists of local jazz performers who connect and network with each other, mostly through informal performance. Almost everyone else in the audience is a jazz aficionado, friend, or spouse. As I was talking to other people about

[86] A jam session is an informal gathering for young players to learn through performance with experienced players and for seasoned performers to network, hone skills, and socialize. For a formal definition, see Gridley (2000), 403, or for a more detailed account, see Berliner (1994), especially 41-43.

my project with Brooks, the conversation moved to the recording of jazz and the ability for multiple takes. I was quick to suggest that I, as an engineer, have control over most aspects of sound beyond the abilities of normal human hearing: specifically, infinitesimal pitch, amplitude, and time changes. I continued to explain that this affords one the ability to create a constructed, composite performance. Everyone seemed interested in the idea of the engineer having that much control over someone else's performance, and I started to talk to other jazz performers who might have an upcoming project.

One of the people I asked was John Jensen, who was planning to record a CD. At first, I proposed just being an observer during the recording process, but later John suggested that I step into the producer's role, even though I expressed apprehension about the difficulty separating the roles of participant and observer. Over time, several musical topics became the focus of our discussions, including the language musicians and engineers use to talk about sound, control over the sound product, and the acceptability of altering the improvisational section in a recorded performance. To get the data for this dissertation, I explained to John that I would need a significant amount of his time to discuss the information gathered on the recording process and the interactions between the engineer, him, and me as the producer. In exchange, I would assume half of the expenses to complete the recording, which included paying for studio time and performer wages. The results of our conversations left most of the pre-planning to John because the CD was to be his product, even though it was now a joint project. John would have the responsibility for hiring performers, selecting the repertoire, scheduling rehearsals, and setting the recording dates.

Choosing the appropriate performers is paramount for any successful performance. Beyond mere technical competence, they must have similar concepts of music and work as a cohesive unit. John had the luxury of selecting from among many highly qualified jazz performers for his group. When speaking of his requirements for the performers he said:

> ... competence in reading the music, having the technical skills necessary on their instrument, understanding the jazz language, being able to play with other people, playing in tune, phrase[ing appropriately], coming with the proper attitude and [the performer's] reliability…when it's time for them to solo, for them to be creative, that they've got something important to say.
>
> I picked this rhythm section, which initially was Tommy Williams on drums, Robert Redd on piano, both Chris [Kosky] playing bass, or Tommy Cecil playing bass, and I picked all those people because of their proficiency, and because of their attitude, and the attitude they would bring to this session… because of their experience, because of their competency [sic], because of their [rhythmic sense of] time, all that stuff. The rhythm section lays down the feel, and without that feel, ya ain't got nothing (smiles)…. But really, the way I see it, everybody is part of that rhythm section, they should be. If you've got brass figures, they're supposed to be part of... fit with what the rhythm section is doing.
>
> Some of those [other] recording sessions [I played]… had players who could read anything…that did not have anything…anything visceral to say when it came time for them to play… to improvise. Part of this has to do with my musical sensibilities. I'd still rather hear a band that does not phrase perfectly.
>
> Looking at the players though, I had Leigh Pilzer, who wrote some charts and played baritone sax. She has a great bari player, she has got that attitude that is so positive… and music is *foremost* [emphasis in spoken original] in her list of priorities… she's a team player, and she is serious about it—she commits everything to it. We had Chris Battistone… he's the same way about trumpet… great jazz player who understands music, has a great ear. Bruce Swaim…doesn't get the recognition I think he should. Bruce is one of my favorite tenor players in the world….There are some great tenor players in this town who get lots of work and get lots of recognition. Bruce gets lots of work, but there are jobs that I do not see him on near as much as he should be—he brings something very special to the gig (Jensen 2008).

The performers John chose were: Tommy Williams, drums; Robert Redd, piano; Tommy Cecil and Chris Kosky, bass; Leigh Pilzer, baritone sax; Chris Battistone, trumpet; and Bruce Swaim, tenor sax.

For this CD, John chose his tunes as he would for a concert.

> The concept of this band was to have a record with a large band and a smaller band; different sized ensembles. I approached it that way, and I also approached it the way I might approach programming a concert. I would like to have something that has a deep groove and a blues usually, that's where "Junction" came from... good tune... I needed a tune that had the kind of groove, feel, and harmonic filament that [that] tune has. I needed some ballads, and that is why I chose "Nina Never Knew…" The idea I had for "Nina Never Knew" lent itself to the larger band and the kind of stretching of the first phrase that I talked to Chris [Battistone] about doing in his arrangement. "Baubles, Bangles and Beads" is normally done as a waltz, I like it as a Latin; I wanted to do it as a Latin; I like the changes. I chose that because at that time I was playing that tune a little bit, and I wanted to play it some more. The two tunes that Leigh did… "Broadway," a tune I used that I knew she would have a good concept for a larger band, and the same thing for "Thaddish," which she wrote… an original tune by her… each one of those pieces is… quite different from each other, and I thought that would be some interesting variety. "Strange" is a nice tune, we did it as a slow bossa [nova]…. and it doesn't get played that often…and I wanted to hear Bruce on it. I made those tune choices based on a combination of programming,… the luxury of taking a group this size,… varying the size…. I selected the tunes, the tempos, and the feels, for a performance… the same way I would put any [live] performance together that would have varying tunes, tempos, different keys, and feels (Jensen 2008).

Rehearsal scheduling became a problem because of schedule conflicts between performers, and even though John tried several times to find a mutually agreeable time for everyone, nothing worked. If I were to sit in on the rehearsal, I would not have altered or influenced the product because it would be highly unusual for the producer to sit in on a rehearsal. My request to John was if he could schedule a rehearsal, that he record it so I could listen and document the performers' discussions regarding form, keys, solo order, and any other specifics germane to the recording session. At that time, both

John and I were of the opinion that rehearsing the music would have been nice, but not necessary because everyone was a top performer in the Washington, D.C. area. With everything as prepared as possible, John called Bias Studio. The recording first session was set for July 10, 2007 starting at 10:00 AM.

One may ask, why was this particular recording session chosen? When conceptualizing the data sources for this dissertation, there were two possibilities, the first, to analyze several sessions to discover generalities of similarities and differences between sessions or the second, an in-depth analysis of a single session. Choosing the multi-session option would produce comparative information, each revealing information about the negotiations, practice, and procedures of the engineer, the performer, and the producer within the jazz idiom. This however, would give no clear consensus because each session is unique and assessing differences might be due in part to one component of the recording triumvirate and an influence outside the experimental parameters. Also, there would be too many variables, discussed below, and therefore the scope of this dissertation could well have been broadened to an unmanageable size (see "Areas for Further Study" in Chapter 6 for a discussion on this topic). Another reason for not selecting the multiple session option is that there are not that very many jazz recording sessions in the Washington, D.C. area, and documenting a session in another major metropolitan area such as New York City, would introduce variables such as those outlined by Mantle Hood (1980, 145-153), specifically improvisation levels 7-9.[87]

My choice in the end was to document and discuss one session at one studio with a finite number of performers in a site-based study, as also used by Meintjes (2003) or as

[87] I refer to the nine levels of improvisation, level seven through nine being "Local style," "Group empathy," and "Personal style" respectively.

Porcello used to describe the musical experiences at the Fire Station in his dissertation (1996). With this method, direct comparisons between my "normative" description in Chapter 2 (Wearing Three Hats) and a complete single session are possible. This method also eliminates many the variables of location and group dynamic, along with the additional variables of comparing personal styles of multiple triumvirates. When attempting to isolate and discover the details of any unknown, I have my "normative" experience as outlined in Chapter 2 to highlight and draw out special features described in Chapters 4-6.

Another possibility was to do a survey of previous sessions from my extensive experience, both as a participant and observer, and draw information from those other engineers, performers, and producers. This however, would have created both problems and a paradox. A dissertation should contain primary source information, but because these sessions were not documented, my informants and I would have had to create detailed facts from memory, which is subject to revisionist history. This dissertation needed to be *about* the details. Second, many of these sessions restricted access to all or part of the proceedings, and this author, as an outsider, would not have gained entry to the complete sessions. In addition, if someone had wanted to close the session (restrict access), data would have been lost, which would weaken the validity of the study. The paradox arises from the IRB requirement that advance written permission be sought from everyone involved with the recording session, not allowing retroactive approval for earlier data. Because I needed primary sources to have any validity for material that might have seemed "unusual," if those sources did not want to divulge all the necessary

information, I would not be able to illicit memories without subjecting the data to unknown bias and revisions.

Recording Session—Day One.[88]

I arrived at Bias Studio at 9:40 in the morning planning to get in a few minutes early to set up my portable Pro Tools system, take notes, and document the session with a few pictures; I was the first one there. When the others arrived, everyone unpacked their instruments and Tommy Williams began to set up his drums in studio A.[89]

I followed Bob, co-owner and engineer, into the control room and began to set up my system to document the recording session. He readied the control room by turning on the computer and the monitor and then went into the studio to begin placing microphones for this session. All the recording equipment in the studio was already on. Many studio owners such as Bob and Jim (the other co-owner and engineer) feel there is less wear and tear on the equipment and a more consistent audio product by leaving it on twenty-four hours a day rather than cycling through a power up and down sequence on a daily basis.[90] Although this practice is not universal, there is a tradeoff between time and money. Time is saved because the equipment does not need to reach operating temperature, but the utility bills are higher. The control room is a cool 69°. "We use air-conditioning all year

[88] Please refer to "Personnel" in the Appendix for full names of everyone involved in this recording. Only surnames are used in quotes. All quotes for Chapter 4 and 5 occur during 2007 except where noted.

[89] We also used studio B with Jim Robeson. Details on that part of the recording session appear later in Chapter 6 in this dissertation.

[90] The characteristics of many electronic components change with temperature; therefore, the audio product will have an inconsistent result until the temperature stabilizes. Refer to the *Handbook for Sound Engineers*, pages 227-228, 230, and 275-310, specifically the sections on resisters, transistors, and tubes as they relate to temperature and voltage-current stability.

round. The heat has never been on in here since 1979 ….It's both the insulation and the amount of heat the gear puts out …we never turn the gear off" (Dawson 2007). Much of the control room's insulation is due to the acoustic dampening in the control room.

Illustration 4-1. Floor plan of Studio A at Bias Studios. Note in Illustration 4-8 that the floor of the isolation portion of the studio is lower than the rhythm section floor. Floor plan copied from www.biasrecording.com and used with permission. Red arrows are hyperlinks active on the website.

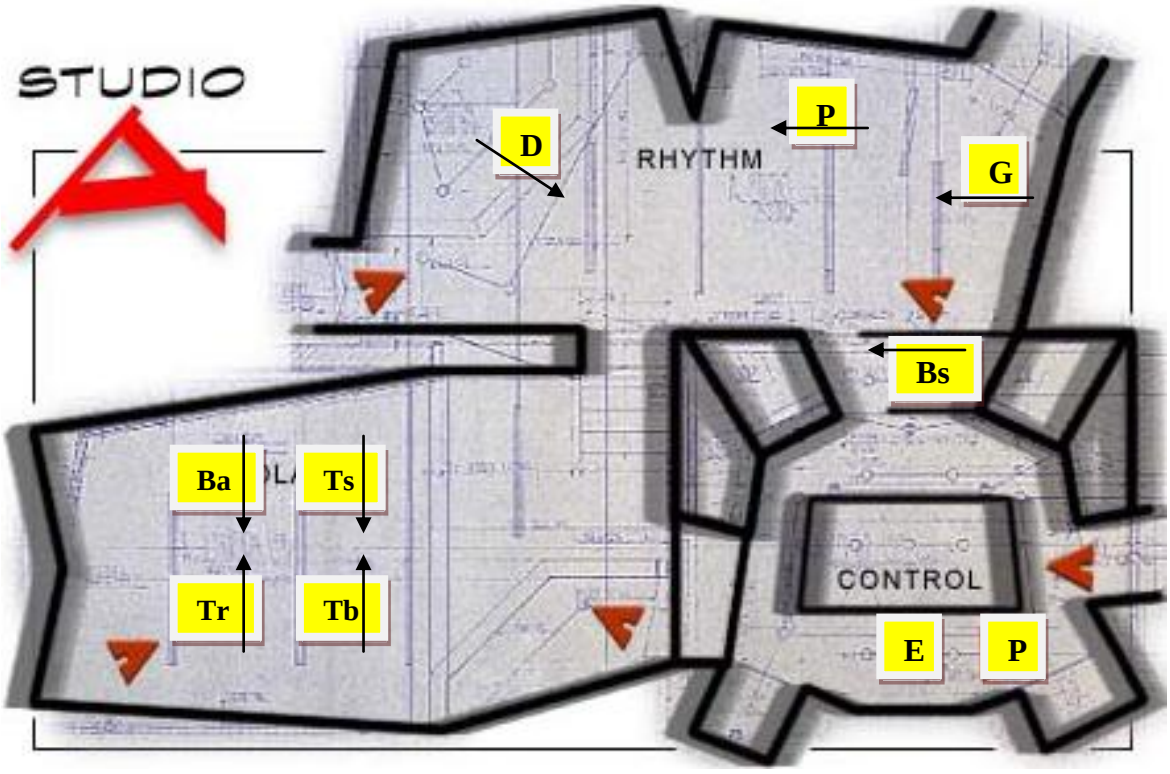


Illustration 4-2. Location of instruments and personnel in the large ensemble.
Top row left to right: **D**—Drums, Tommy Williams or Brooks Tegler; **P**—Piano, Robert Redd; **G**—Guitar, Paul Wingo.
Middle row left to right: **Ba**—Baritone sax (also Flute and Clarinet), Leigh Pilzer; **Ts**—Tenor sax (also flute), Bruce Swaim; **Bs**—Bass, Tommy Cecil or Chris Kosky.
Bottom row left to right: **Tr**—Trumpet, Chris Battistone; **Tb**—Trombone, John Jensen; **E**—Engineer, Bob Dawson or Jim Robeson; **P**—Producer, Author.
Arrows indicate the direction the performers faced.

Illustration 4-3. Upper isolation room—piano, drums, and guitar. Note the placement of the microphones in the piano (circled).

Bob chose his microphones based on experience, not physics. "I don't know anything about physics…I base my choice on what sounds good to me" (Dawson 2007). He had left several microphones set up on mic stands in the lower studio in order to decrease the setup time, so all he needed to do was connect the microphone cord into a tie line.[91] Bob asked each person if he or she was going to sit or stand when playing. He then placed a cardioid microphone and stand in a position he felt would best serve his recording concept. In this case, there were four performers in the lower studio: John, Leigh, Bruce, and Chris Battistone. He placed them as in four corners of a rectangle with the trumpet/trombone facing the woodwind players and confirmed that those

[91] A tie line is wiring that connects pieces of equipment in rooms separated by walls. See "Tie line" in the Glossary for more information.

microphones with selectable patterns were set to "cardioid"[92] (see Illustration 4-2). Bob also left microphones pre-positioned in the piano because most of his recording sessions use the same recording technique (see Illustration 4-3).

Bob's intern had set the drum microphones in accordance with Bob's usual setup protocol. The snare, hi-hat, hi-tom, mid-tom, and low-tom received one cardioid microphone each, two overhead microphones (left and right), and two microphones for the kick drum, one on the beater side and one facing the front head. After the intern's initial placement, Bob adjusted each microphone in the spot he felt would get the best sound (see Illustration 4-4).

Illustration 4-4. Drum setup for recording.

[92] Some microphones have selectable patterns.

The bass and guitar were the last instruments requiring attention. Bob wrapped a microphone, set in an omnidirectional pattern, in a piece of foam and placed it in the bridge of the bass (Illustration 4-5). Bob felt he would get the best balance of attack or "pluck" and the resonance from the body of the bass with this technique. Bob chose to use two separate sources from the guitar, a microphone on the amplifier and one through a direct box (DI).[93] With two sound sources, we would be able to decide during the mixing phase of the recording process, whether to use one or both guitar sounds. Sometimes it is necessary to blend the direct sound, which tends to have a greater concentration of higher harmonics, with the amplified sound to help it "stand out" without too much volume.[94]

At about 10:15, Bob was ready to start getting a sound check for recording levels as well as for the headphone mix. As the rhythm section played, Bob changed the recording and playback levels and adjusted the EQ. As Bob has been recording in this room for over twenty-five years and has intimate knowledge of the sonic tendencies within the studio and control room, I did not question his choice of microphones, signal routing, or use of the EQ, especially on the drums. There needs to be a level of trust between engineer and producer, and because I had not worked at Bias Studios, I had to trust the engineer's choices. I looked at the drum channel strips so I could note his EQ settings. I told him that I wanted to write down the EQ settings, to which he jokingly replied, "I don't know about that [expletive]" (Dawson). As Bob continued setting up for

[93] See "Direct box" in the Glossary.

[94] Human hearing has its greatest sensitivity around 3kHz. For further information on loudness perception and frequency, see Howard and Angus (2009), 91-94.

the session, he walked over to the patch bay, unplugged, then plugged several cables into different places.

Illustration 4-5. Microphone placed in the bass bridge.

Bob has a strong sense of pride and ownership to the studio, its content, and reputation. On a previous occasion, Bob and I had talked about signal routing in the studio through their hand-build API consoles. We agreed that API is sonically the best analog board on the market. Certain equipment alters the sonic characteristics of sound, which adds desirable traits to the overall product.

> We built this board…we built this in Gloria's [Bob's wife and office manager] office…we installed it in [19]87…took us two years to build it (long pause and a smile)…can't believe we did it…it was really stupid." He continues in a yokel-like voice "Well let's build a board" (Dawson).

Bob sits back and smiles while he continues with the trials and tribulations of putting together such a massive piece of electronics; all the wiring, engraving, learned by trial and error, and asking the bank for a $200,000 dollar loan. Bob continued discussing the signal flow for recording by telling me that the mics came into the API console, then to the Ampex 24-track tape recorder, and finally to the digital converters of the Pro Tools system. For playback, the routing would be reversed, thus using the API as the mixing console instead of the computer.[95] The benefit of this routing, for Bob, is sonic superiority "I don't ever 'mix in the box' " (Dawson), which refers to using the computer as the playback interface.

As we continued with the setup, Bob returned to the control room and began to get appropriate recording and monitoring levels. Bob adjusted the mic preamps, watched his input levels on the API, and confirmed a good signal to the digital converters. He then set the monitor return level and set it where he thought it would be appropriate to hear an approximation of the final product, a rough mix.

After setting levels for a rough mix, Bob approximated a headphone mix for the performers. The headphone mix is an important aspect of the recording session, because that is the only way the performers can hear themselves and the others in order to perform as an ensemble. For this recording session, Bob had set up two discrete headphone mixes, one for the rhythm section and one for the horns. First, Bob tried to get an adequate headphone mix for Tommy Williams, the drummer. Tommy wanted to hear the overhead microphones, the ride cymbal, and a high hat in his headphone mix. Bob and Tommy experimented until Tommy said, "I'll try that for now" (Williams).

[95] The channel strips on an API console are Input/Output. See Input/Output in the Glossary.

Bob turned his attention back to getting his preferred sound on the drum set by taping a piece of foam to the drum head, thus limiting the amount of decay or, in audio jargon, "ring" (Illustration 4-6). There is a fine line between controlling natural acoustic activity and altering the sound of the drums. Fortunately, Bob had done so many recording sessions that he understood the sonic expectation of jazz drummers.

Illustration 4-6. Taped foam on the kick drum head.

The time was now 10:30. We had not yet begun to record because Bob was in the studio still taping foam on the drums, adjusting microphones for the horn players, and addressing other headphone problems. At 10:40, Bob came back in the control room and wanted to know which tune they would play first. I answered that John and I had discussed doing one of the quartet tunes first because it would be nice to "get one down." However, because all the horns were ready and mic levels were set for everyone, John and I decided that it might be appropriate to start with "Thaddish," one of the arrangements with the four horns (trumpet, trombone, tenor, and baritone sax). We could

not start yet because Paul was out smoking a cigarette. Bob passed the time by referring to the Monty Python sketch where one of the characters is named "Smokes-Too-Much."[96] After Paul returned, Bob asked the horn section to play the loudest spot in the arrangement. John chose to play the shout chorus of the tune "Broadway."[97] As the horn section played, Bob checked the levels on the meters and soloed each instrument to check its sonic quality, as well as the isolation between each instrument. As Bob checked the recording levels, everyone else had the opportunity to experience the headphone mix. John told Bob that he wanted the whole mix in one ear, because he was going to monitor the headphone mix in only one ear. This would allow him to hear his own playing. Leigh and Tommy Williams expressed a desire for more bass in their headphone mix, while Bruce expresses a need for more volume.

Because each performer desired something different in the headphone mix, this presented some challenges for Bob. The configuration of the room's wiring and the API console limited the number of discrete headphone mixes. As previously mentioned, Bob was only sending two separate stereo headphone mixes, so the performers had to compromise. Leigh, in an e-mail correspondence to the author (2008), expressed several thoughts on the need for and the problems with headphones.

> Unless we are going to go back to the days of everyone gathered around giant megaphone or some such, headphones are a necessary evil. That is, with current recording techniques involving separation, there's got to be a way for everyone to hear everyone else…. If we are accepting that separation is desirable (I, at least, am accepting that), then headphones are in fact a necessary evil…. But why are they evil? For one thing, what you

[96] *Monty Python's Flying Circus*. Episode 31, "The All-England Summarize Proust Competition."

[97] Usually the last chorus of an arrangement after the solos, but before the melody line's final restatement characterized by the ensemble's loudest and most active section. See "Shout chorus" in the Glossary.

> hear in the headphones is dependent on what the engineer puts in the headphones….For the most part, the decision on what goes into cans [headphones] is a result of general consensus.
>
> Another problem is that hearing directly in the ear is not the same as hearing in the air….We figure out how to make it work [in live performances]. …But in headphones, it can all start to sound like a swirling mass—or mess—of sound.
>
> Then there's aural fatigue. After a number of hours, my ears get tired…. With a jazz group, there's a certain volume level you need in the phones to offset the sound of your own instrument…..After a couple of hours, I start to feel that I can't really hear the cans well, so I try to turn it up, but that just makes for more mass/mess. I think it's a combination of [ear fatigue] and the tension of hours of trying to listen to the cans, to myself, to translate what I am hearing through the phones…into what I'd usually hear through air (Pilzer 2008).

After another round of headphone adjustments Bob asked if we were going to start recording. There was a little confusion as to which tune would be played first. John had originally suggested "Thaddish," but they were using "Broadway" for the headphone and level check. Although not the large expenditure of time if the appropriate templates had already been created, it does takes about three minutes to close one session file, open another, and reset the appropriate configuration for recording. John said he wanted to play about twenty-four bars of "Broadway" and have a final level check before starting in earnest. There seemed to be many headphone problems. Bruce could hear the rhythm section but could not hear himself or any of the other horn players. Bob went out into the studio, checked all the connections for the headphones, and after ten minutes was ready to try again. "We're doing the final headphone check—we hope" (Dawson).

Leigh decided to alter her arrangement and had Robert play a four-bar introduction to the tune "Broadway." Even though Leigh had spent a great deal of time writing this arrangement, there seemed to be a lot of fluidity between what was on the

printed page and what was actually performed. Leigh, John, Tommy Cecil, and Robert discussed the matter:

> (R) Hey, Leigh?...I have not heard the beginning of this chart… is there something else that you think would be more… (L) Yes, Yes, John has something to say….(J) I'm thinking that what we should do is add a whole chorus of just rhythm section blowin'[sic] on the top of this and then go into that intro…, does that work for you? (R) [After a thoughtful pause] I guess so, it just seems… [Interruption by Tommy Cecil] (T) Why are we not doing it as written? (R) Yeah, it seems that there are a lot in the chart… what about four bars of drums? (L) Well, that was John's suggestion, but "Thaddish" starts with four bars of drums, but we could change the beginning of "Thaddish." (J) At the same time, the tunes aren't going to be listened to one right after the other… and Tom [Williams] could like turn his sticks around or something— do it differently [laughter from others in the group]… let's try eight bars of drums.

Tempo is another issue that required negotiation. In the jazz idiom, playing to a click track would be highly unusual.[98] Tommy Williams asked about the tempo, because there was no clear consensus as to where the time was supposed to be. When Leigh had originally counted off, her tempo was approximately 216 BPM (beats per minute) but ended up around 205 BPM. Tommy Williams adjusted his metronome and suggested 198 BPM, but Robert asked Leigh to play the tempo she is wanted. As Leigh played, Tommy Williams adjusted his metronome until he found the tempo, 204 BPM.

John wanted to try the new tempo and suggested they start with the newly agreed upon eight bars of drums at the beginning of the tune, but Bob interrupted, and suggested they first settle on a headphone mix. After another run-through of the first sixteen bars of "Broadway," Bob asked the performers if their individual headphone mixes would work. Tommy Williams was the only person who expressed concern over his headphone mix,

[98] See "Click track" in the Glossary.

because he was still not getting enough bass. In response, Bob exchanged Tommy's headphones for a pair with a better bass response.

The group spent the next fifteen minutes discussing the arrangement, form, and previous alterations to ensure that no problems arose during the recording. During this time, Leigh discussed a rhythmic figure that was causing problems for a couple of the performers. She explained it as the "Seven Come Eleven" rhythm.[99] Her use of an example familiar to the performers yielded an immediate understanding of the rhythmic figure.

After an hour and twenty minutes from the time that we first started, we finally recorded the first take. This was a full hour longer than I had wanted to take to get the headphone mix and microphone check complete. Even with all that time, we were still having headphone problems because the horn section complained about static and headphones cutting out during the recording. After a bit of troubleshooting, Bob found the cause of the problem and explained that it was "…crud in the switch" (Dawson).

At the last minute, John decided to alter the solos in the arrangement again and gave Tommy Williams the solo sections where Leigh and John were trading fours.[100] In the original arrangement, Leigh had written the ensemble section, known in jazz arranging terms as the "shout," as an exchange of fours between John and her. John and Leigh spent the next ten minutes making sure everyone in the group understood the new

[99] Listen to Seven Come Eleven, *The Benny Goodman Story*, Capitol Records CDP 7243, 1995, reissue CD.

[100] Jazz jargon describing the action of two or more soloists dividing and alternating between each soloist, the musical form during the solo section. See "Trading fours" in the Glossary. For other concepts on "trading," see Berliner (1994) under the topics of "trading phrases," "call and response," and "imitating ideas."

form and then rehearsed it a few times to make sure everybody was comfortable with the alterations.

It was now noon—two hours since this session started, and we still had not gotten an acceptable recording of any tune. I was concerned because, at that rate, we might get only three of the ten tunes finished, leaving too many for the next day's session. I contemplated talking to John during the lunch break but decided to let the performers pace themselves. Two situations led to this: first, a lack of rehearsal and second, Bob's difficulty with the headphone mix. When John and I spoke away from everyone else, he assured me that Bob's problem with the headphones was an anomaly and that he (John) was not concerned with the time—yet.

Robert and Tommy Williams discussed how his comping fit into the rhythmic structure of the drums.[101] I questioned Tommy Cecil on what he had played in the bar before "N" because it did not sound correct.[102] Tommy asked Leigh who answered, "How did I know that's what you were going to ask….Bass players always seem not to want to do that" (Pilzer). The problem turned out to be that I had not correctly heard the intent of what Leigh had written because of some intonation problems. She explained that the harmonic function of that bar was to set up the key change at letter "N." Because I did not have a score and I had not heard the key change the first time, the harmonic function of that bar had not registered.

After that discussion, Bob suggested that everyone take a "five minute break" (which turned into fifteen) because the arrangement and tempo had gotten to the point

[101] Jazz jargon describing the action of "accompanying" using chords, rhythmic figures, or melodic filler. See "Comping" in the Glossary.

[102] Letters or bar numbers are standard notations for printed music that aids the performer in locating a specific spot during rehearsals or recording sessions.

where everything was settled. During that break, Tommy Williams came into the control room to listen to how his cymbals sounded on the recording. Tommy was very particular about how his drum set and, specifically, how his ride cymbals sounded. "I would love to hear…that last take…or part of any take, 'cause [sic] I'm curious about my ride cymbal." [Author] "You mean the sound?" [Tommy] "Yeah, whether it's for a larger ensemble… whether it makes a concept -wise... I just bought it... I can't really hear it" (Williams). Bob reset the playback to the last eight bars of John's solo. During the playback, we listened to the ride cymbal on Tommy's left side (audience perspective right side). Tommy had changed cymbals for Leigh's solo by playing the ride on his right side (audience perspective left side). I asked him what he was looking for, to which he responded, "As to whether… it's too 'wet' sounding of a cymbal…. And I do not think so 'cause [sic] I can hear the attack coming through" (Williams). Bob explained to Tommy that he had also added equalization to the overhead microphones. "I had to take some middle out of it…. that way you get more of the 'ping' " (Dawson).

Translating subjective terms into an agreed-upon meaning is a particular interest of mine. Those who engage in the sonic arts sometimes need to translate subjective words describing the sonic characteristics into an objective language, thus avoiding confusion. The words both Tommy and Bob used exemplify language in the studio. It is easy to understand the possibility for confusion and misunderstanding of intent. Tommy's use of the word "wet" has several possible meanings. It might refer to the amount of decay in the cymbal (a dampening factor or the resonance of the cymbal), the total frequency, the ability to be heard over other sounds, or unfortunately even trying to describe something completely different. In recording jargon, however, most engineers

understand "wet" as referring to the amount of room sound, real or artificial, in the totality of the acoustic example. Longer decay time of the room reverberation produces a "wetter" sound. Although there is no universal equivalence between room decay time and degrees of "wetness," a small group might agree upon a continuum between degrees of "wetness" for their unique purposes. Later, I asked Tommy to clarify what he meant by "wet" when speaking about the sonic characteristics of his cymbals. His concern was that the cymbals did not have enough definition and might get lost in the wash of sound from the other instruments. Bob's onomatopoeic "ping" might be understood through context. During the playback of Tommy's drums, Bob referred to the attack of the drumstick on the cymbal by using the word "ping." Even if there was no pre-agreed upon definition of "ping," the audio example and Bob's imitation of playing a ride cymbal would give those unfamiliar with recording studio jargon a conceptual understanding of the term.

When everyone returned, we recorded two takes of "Broadway" with no technical or musical difficulties in the ensemble parts. John and Leigh were not completely satisfied with their improvisations, but everyone decided to move on to "Thaddish." There is always time between recording tunes, and Leigh talked through the tune with everyone. Leigh was quick to point out the perils and pitfalls of this tune, noting that instruments are rhythmically independent. Robert has always impressed me with his encyclopedic knowledge of the standard jazz repertoire; he will question anything that seems unusual or different from generally accepted chord changes. Robert asked Leigh about the chord changes in a specific spot. "Leigh, I am looking at the changes at letter "D" …it's a little different from what I am used to playing on this tune … usually that

b minor seven flat five ($Bmi^{7\,b5}$) to the E seven (E^{7}) comes in later than that" (Redd). Leigh assured Robert that he was correct and pointed out that those changes were for the last eight bars of the tune.

As the group played, Bob asked if the tempo dropped when the swing section began. I stated that it did drop a little, but the tempo had picked back up. However, it seemed that it settled below where Tommy had counted it off. After they finished the first take, Tommy Cecil enthusiastically commented on what a great chart Leigh had written. Although no one was dissatisfied with the performance, we decide to do another one just for safety's sake. Before we recorded another take, we discussed the possibility that the tempo might have slowed down. Tommy Williams listened to his metronome and stated that we had started at 144 BPM. After listening to the beginning of John's solo, Tommy Williams said that the tempo was about 134 BPM. This latter was agreed upon.

The group completed a second take, which had very few problems. John expressed satisfaction over this particular take but suggested listening to a section where he said he had dropped a note. Bob stated that was not necessary to go back and fix that particular note because even if the error existed, we could replace that note with the one from the previous take. Bob and I discussed one section that seemed to have performance errors and did not sound like a cohesive ensemble. After a second listening, we decided to fix the missed entrances, note errors, and inaccurate ensemble sections during the editing session. I felt it was better to move to the next selection for two reasons. First, everyone was in good spirits and even suggesting a third take might have dampened the enthusiasm gained from an agreeable performance. Second, and perhaps

of greater concern, time was getting short. We had spent almost four hours thus far and had only completed the recording process for one other tune. We broke for lunch.

During the one-hour lunch break, John and I discussed the order for the rest of the day's recording. Our goal was to finish Paul's participation because he was going to play on only two more tunes, "Baubles, Bangles, and Beads" and "Nina Never Knew." Completing everything with Paul would avoid any possible scheduling conflict, and we would not have to pay him for another day's service. No one expressed any preference, so John decided on "Nina Never Knew."

Chris informed Bob that the instrumentation on his arrangement had Leigh playing clarinet and Bruce playing flute. Bob plugged in two new microphones for the flutes because he liked the sound of flute on small diaphragm microphones.[103] He then adjusted the height and distance for each of them to approximately eighteen inches above and slightly in front of the middle of the flute. I was pleased to see that Bob used the same micing technique as I would have (Illustration 4-7a). Some engineers place the microphone in front of the flutist in the jazz idiom as would be done in a sound reinforcement situation, thus capturing a lot of breath and air along with the desired flute sound.[104] Another factor was the orchestration. Because the trumpet was in a cup mute, the total acoustic energy was sufficiently mitigated and allowed the preferred micing

[103] Large and small diaphragm refers to the physical size of the structure within the microphone. There are large and small diaphragm microphones of both the dynamic and capacitor type microphones.

[104] There are several jazz recordings where the flutist's microphone is in front of the performer such as Herbie Mann-Chick Corea, *The Complete Latin Band Sessions*, Gambit Records 69278, 2007, CD. Sometimes it is necessary to place the microphone in front of the flutist because of the relatively low acoustic energy output as compared with surrounding instruments. See "Inverse-square law" in the Glossary.

technique. If Bob had felt there was too much bleed, he stated he would have placed baffles between the brass and woodwinds for more isolation (see Illustration 4-7b).

a)

b)

Illustration 4-7. (a) Microphone position for the flute and (b) John and Chris Battistone with a baffle placed between them.

Bob continued to set new microphones for the flute and clarinet while the horn section continued to rehearse. Bob was having difficulty getting the flute signal properly routed. He asked his helper to confirm that the mic cable was plugged into the correct tie line. Because there was no input, Bob began troubleshooting, starting with the simplest item first, which was replacing the mic cable. There was still no signal, so he changed the patch cables and inserts, and then pulled the cable out several times. This action would clean the contacts in the patch bay if they were dirty. Bob had previously lamented over the amount of time necessary for simple maintenance, especially on the older machines. After about twenty minutes, Bob was successful in getting the flute signal routed. "…probably just the humidity causing condensation on the contacts…blame it on the summers in Washington" (Dawson).

The group was really struggling with this arrangement, not because it was technically difficult, but because there were rubato sections. In addition, the lack of sight-lines between everyone created communication difficulties. Everyone in the group tried to think of ways to keep the ensemble together, from John conducting, to recording the piece in two parts—first with the rhythm section, then the horns. There was a video camera, so the rhythm section could see the performers in the lower part of the studio. The consensus was that Chris' position placed him in the best position to conduct his arrangement.

I was not pleased with studio time used to rehearse this piece, but I had no choice because John was resolute on this point. John and I had discussed the potential problems with not rehearsing new arrangements, but as previously stated, there was no convenient time for everyone to get together and rehearse. It was not until after we finished the

recording that I learned that some of the performers do not read music very well. This came as a surprise because I had assumed that every performer in this recording session had years of experience in the studio and performing live, including the ability to read music. This also explained why "Thaddish" took longer to rehearse than expected. If I had known that some of the performers did not read well, I might have insisted either on a pre-production rehearsal or on saving the arrangement for a later CD.

"Sometimes ballads are the most difficult to play" (Jensen). This sentiment expressed what most jazz performers seem to understand, that is, there is a fine line between the relaxed feel of a slow tune and a sloppy or stilted performance. There was nothing wrong with Chris Battistone's arrangement. The difficulty seemed to come from two distinct challenges: first, the liberties John wanted to take with the time and second, the lack of visual communication between the rhythm section and the horns.

Illustration 4-8. View from the isolation room toward the control room in the back. Note the stairs going up to the upper isolation room for rhythm section. There is a window between the upper and lower isolation rooms.

It was now 3:45 PM because one hour and fifteen minutes had been used to rehearse and fix technical problems. Everyone was ready to attempt the first recording pass of "Nina Never Knew." The first take was rough. There were still many ensemble problems, and John's playing sounded fatigued. I suggested to John that he play in a bucket mute for two reasons. First, I thought the timbre of the bucket mute might fit with the sound of the flute, clarinet, and muted trumpet. Second, if John could play louder, it might help his physical endurance because it takes more effort to play softly without overshadowing the ensemble sound.

The second take began better, but there still were difficulties. In the time domain, there were entrance and release differences as well as small, but noticeable pitch problems. As the group continued, Bob and I discussed the editing possibilities and if it was worth the time to go note-by-note to correct the various time and pitch discrepancies. As the group played, I heard a buzzing emanating from the speaker. Bob and I discussed the possible sources. When we heard the buzz again, Bob and I thought it might be John's mute, so John bent the brackets on his mute and tried again. Several performers expressed their frustration, offering suggestions to Bob and John from recording separately to removing the mute, but John liked the sound of the mute.

We spent the next fifteen minutes using extra foam and tape to reinforce any possible crack in the mute, and the ensemble tried a third take. John's fatigue was becoming more evident. I still heard the buzz and I was starting to doubt that John's mute was the problem, but there were several other issues that had to be addressed in order to fix all the concerns. Both the flute and clarinet pitches were inconsistent, but in order to have more control over those two parts, John could not play at the same time

because his sound would bleed into the flute and clarinet microphones. The problem with John not playing was that there were several spots where the ensemble needed to take their cue from what John played. The best solution was to record individual parts, but John pointed out that Tommy Cecil's entrance needed to coincide with the rubato opening, so he had to play at the same time as John. The agreed-upon solution was to have John, Chris, and the rhythm section play together and record the flute and clarinet individually.

As that portion of the group played, a new problem arose. Tommy Williams had expressed a concern that his drum seat squeaked, so Bob went into the studio to place duct tape on the joints of the drum seat. The woodwinds discussed the possibility of trying again, but this time without vibrato on the flute parts. They rehearsed, and it did sound better, so they decided to try it with everyone. As John continued to play, I still heard the buzz, so I went into the studio to see if I could find its source. John played notes between C4 and G4, but I did not hear any problems that would cause buzzing. We had spent a total of fifteen minutes readjusting the mics and trying to find the source of the buzzing, and there was only one hour left in which to finish an acceptable rendition of "Nina Never Knew." The group finally made it all the way through the piece, but John wanted to redo his part, starting after the piano solo. Although Bob and I talked freely, I had not expressed my opinion on the performance quality of "Nina Never Knew" to the group because I had to be careful how I critiqued performances. I am perhaps too blunt, which might be construed as being abrasive. I tried to think of how I might tactfully tell John that I did not think he would be happy with any of his playing on this tune or

comment on the intonation or the overall inconsistencies of the others. Bob had been doing most of this sort of communication because his delivery is more tactful.

I told Bob and John, that I wanted them to take a five-minute break, but John felt there were too many chipped and weak notes and he wanted to redo the ending again before a break. He re-recorded the ending, but the performance was, as previously, not up to his usual standards. We took a break, and John and I talked about how he felt. Chris, Bob, John, and I discussed the possibility of finishing this tune the next day, but John said that Paul would not be in the studio then and was adamant about completing it.

Everyone came back from the break in good spirits, ready to try one last time. John still sounded tired, but Bob and I discussed letting the rhythm section complete one good take, then bringing John back on another day. The final attempt of the day worked except for a single wrong note in the introduction. After re-recording the introduction, Bob informed the group that we were finished and that he needed to back up the session files and create a CD of the work already done. Bob and I discussed whether there was enough material to create an acceptable product from all the attempts. I did not think there was anything worth keeping of John's performance because he sounds tired and there was instability in his sound that I had not heard before. I wanted to discuss this with John away from everyone else. I preferred to re-record him under different circumstances to get a good performance able to withstand repeated listenings and the judgments of any critics.

Recording Session—Day Two

We began this day with the same setup as before. As the performers settled into their places, I went into the studio to record each instrument separately in order to analyze the sonic differences between the signal with and without EQ.[105] As I completed this task, John announced the first tune, "Junction," and discussed its form and what he envisioned as the "feel." The group started playing from the beginning of the tune to the solo break and then jumped to the end to confirm that everyone understood the form, the solo order, and length of each solo. "Now, something to keep in mind, and I'm fine with this being loose, I don't want anybody being uptight or worried about this being perfect or anything, I want us to feel like we're going to eat pork chops and bacon… I want this to have a live feel…kinda greasy" (Jensen). The first take went well, but everyone expected to do a second take. During the discussion, John decided to add background rhythmic figures behind some of the solos. After completing the second take, we discussed the result:

> Author: what do ya think, John? John: How does it sound to you all in there? (A) Pretty good. (J) Do we need to do anything with it? We could put in some backgrounds behind the horn thing. (A) Yeah, I know you were talking about that before… honestly, I do not think it's necessary. (J) Okay, I am fine with it…not putting in there.

I spoke with Bob concerning John's chipped note at the very top of the tune. Bob said, "I think he chipped it on the other one too, but I think we can snip it out"[106] (Dawson). Everyone seemed satisfied with the result, so I suggested a five-minute break while Bob

[105] See Chapter 6 for more details and areas for further study.

[106] Bob referred to capabilities in the editing process of manipulating the note through trimming or replacement. There is further discussion of this process in Chapter 5.

backed up data from that take. John's choice of a "fun and easy" tune had set a good mood; everyone seemed in good spirits.

During this break between tunes, I took the time to write down the EQ settings on the drum channels. Bob joked, "I don't know about that… those are my secrets" (Dawson). Many engineers are very protective of what they perceive as "their sound," but in reality, "their sound" comes from understanding the unique characteristics of their room through years of experience. I assured him that I would protect his secrets.

The group started to rehearse "Baubles, Bangles, and Beads" while Bob reset the computer. While I took pictures and wrote notes on his settings, he worked on importing the data and parameters from the previous tune. My actions reminded Bob of carrying out these same activities before computers, so he told a story of how he used to get track settings from session to session and day to day.

> We used to have a Bob-o-mation…that's what we called it. I had a little video camera in here, and I'd video the channel strip—each channel strip so you see the pan and all that; what the sends and EQ was [sic] and all that, then I'd walk over to the patch bay, video [tape] the cables and go to the outboard devices and rattle all the crap off [settings and parameters]—it'd be like a half-hour worth of crap. But then, man you'd come back and put that thing [the tape] on the [television] monitor, set the [mixing] board up and play it, and it was just like that (points to the computer monitor), I mean it was right there (Dawson 2007).

During the rehearsal for "Baubles, Bangles, and Beads," Bob and I discussed the use of John's mute and if he had done anything different to it because we did not hear a buzz. We also discussed the possibility of re-recording "Nina Never Knew." John's sound was weak and unstable again, but the day before was physically and mentally exhausting, so I hoped his sound would stabilize after he warmed up. As Bruce asked for more flute in his headphone and John tried alternate phrasings with the melody, I heard

the buzz again. I pointed to the speaker and stated with more emphasis that it sounded as though the sound emanated from the speaker, not John's mute. Bob asked John to play, directing John's pitch choices higher or lower, as he tried to isolate which note caused the buzz. I identified the note as F4, but it also seemed to happen on Eb4. Bob asked John to play and sustain the note and moved closer to the speaker. He reached out and grabbed his plastic duck sitting on top of the speaker—no more buzz. I was angry at all the wasted time and effort.

John came into the control room, and we discussed the timetable and logistics for this tune and the rest of the morning session. We agreed to finish by twelve-thirty but, more importantly, decided to record just the trombone and rhythm section parts without the woodwinds. There was no technical reason to have the woodwinds playing at the same moment; in fact, this method was better for everyone because there was better isolation for correcting errors. Musical considerations were set aside because the woodwinds, for the most part, were playing background parts and could follow the trombone when they were playing soli parts with John. For the next ten minutes, John and Chris Battistone discussed the new changes. Bob pulled up a video on YouTube to entertain the rhythm section.

John and the rhythm section began to play. Bob commented that the "feel" was not as good as it was before; he called it "itchy" and "antsy." I questioned him to ascertain his meaning, but he could not pinpoint any specific parameters. To my ears, the tempo was slightly faster. The rhythm section seemed to be on top of the time[107] and was not together on some of the rhythmic hits going into the bridge, but nothing was beyond

[107] See Berliner 1994, page 151 for a graphical representation of ahead (on top of), on, or behind (laid back) the beat.

repair. The group finished, and I asked John for his impression on how that take was for him. He stated he did not have a good perspective, so he asked us to make a decision. I suggested another take. Bob called attention to the perceived quicker tempo, and Chris Battistone rehearsed the rhythmic figures with the rhythm section. For the next five minutes, the rhythm section worked on tightening those rhythmic figures. Chris suggested that if Tommy Cecil wants, he can play all eight notes if it helps him to improve his accuracy. Tommy stated that figure could "be punched in" (Cecil).[108]

Tommy Williams listened to his metronome and counted off, but this time both Bob and I immediately recognized the tempo was slower. Some of the performers still had the tempo from the previous take in mind; the result was no agreement on tempo. All the rhythm section performers recognized this irregularity and stopped playing by bar two. When Tommy Williams repeated the count off, the rhythm section locked into the tempo. This take was acceptable to John, the rhythm section, Bob, and I, so we had the other performers go into the studio to add the other parts. There was some confusion as to when John would and would not play because the original intent was to have the woodwinds and muted trumpet record their parts alone. Bob explained that he could add and delete John as needed, so there was no need for him to play with the other three. The muted trumpet and flutes overdubbing continued one section at a time. To save time, we decided to let the recording run and assess each background ensemble part in real-time, either accepting it by continuing to record or stopping and re-recording that section. My knowledge of the technical capabilities of the software saved time because I did not have to ask, "Is it possible to…" and I knew that Bob's skills with the technology were

[108] See "Punch" in the Glossary.

superior. We finished overdubbing the woodwind and trumpet background parts, but I wanted to listen to a few specific spots. When Bob cued those spots, I heard a few intonation problems and differences in note placement, but I thought it is a better use of time to fix those problems during the editing phase. During the playback, two of the performers commented how rough their performance was but understood how easy it would be to fix these performance irregularities with Pro Tools. John wanted to get back to his idea of concert-like playing "…just to get everybody's head back into where it swings and nobody is thinking too hard" (Jensen).

Bob and John discuss the next few tunes: "Cherokee," a blues, and a "simple tune." I suggested to John that because the backup data was in progress, he discuss the form and solo order with Chris Battistone and the rhythm section. John informed the group that he wanted to play "Cherokee" in 3/4 and wanted Chris to take the first solo. Chris would play, and the rhythm section would decide for themselves who soloed. John wanted to end the tune with the same rhythm as "Up Jumped Spring" (Illustration 4-9).

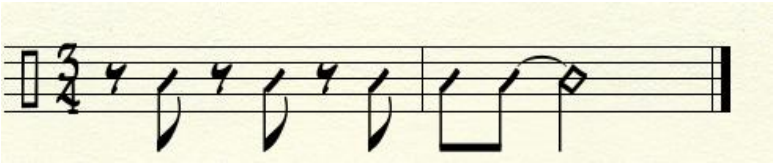


Illustration 4-9. "Up Jumped Spring" ending rhythm. The tempo may range from 90 BPM to 270 BPM. See Grachten (2006) for details.

In the jazz idiom, quoting other tunes either rhythmically or melodically, shows an understanding of the musical language and is a convenient source of material for improvisation and beginning or ending a tune.[109] This style of playing seemed to align

[109] For further information on the many possibilities and uses of musical quotations, see Berliner, 1994.

with John's original concept, so I was confident that the high stressors were over for John and that his playing would be relaxed and the quiver in his sound would cease.

Chris Battistone told Bob that he wanted to play standing. The group was now down to a quintet—trumpet, trombone, piano, bass, and drums, Bob went into the studio to reposition the microphones and set a baffle between Chris and John. During this time, Robert started to play "Cherokee" and the others joined in. Robert had chosen a tempo based on John's description of "feel" and the desired use of the "Up Jumped Spring" ending. Everybody played at the same time, a sort of improvisational free-for-all format rather than an organized effort. Bob continued the resetting and placement of personnel, equipment, and the necessary changes to the headphones. After a few minutes of "Cherokee" cacophony, everyone stopped; it was quiet for a change. Tommy Cecil started to tap with his hands on his bass and John, always spontaneous, chimed in, "Is that Tommy Cecil or Tommy Williams?" Someone answered Tommy Cecil. "Tom Cecil? How about if you do that for eight bars, then Tommy Williams comes in for eight bars joining you with that, and then we're at the top of the tune?" Tommy Cecil asked, "But then when I drop out, because I will *have* to drop out, then it's [the time lag between the position for tapping and the position for playing] going to be gaping." John disappointed, jokingly said, "so much for brilliant ideas."

After the first recording pass, the group talked about the form again because not everyone was confident of the solo order. John restated his concept, making sure that everyone was in agreement with the form. Tommy Williams expressed concern with a section where he had stopped playing and thought the gap might not sound good. We listened to that part, and everyone felt there was nothing distracting about his

performance. Chris Battistone was not pleased with his improvisation. John discussed the possibility of punching the last half of the tune but stated a preference for doing the whole tune once again because it was only five and a half minutes long. As the producer, I still had my one-hour-per song target, but we were only at the fifty-minute mark, so I thought another take would be acceptable.

The third take sounded better because everyone felt confident with the form and feel of the tune. Unfortunately, John's headphones had slipped off his head, and even though he continued to play, Tommy Williams had thought John was going to stop. The group discussed salvaging that take, but Tommy Williams thought his playing might have been "unsteady" because he thought John was going to stop. We all listened to that section, and agreed that there was no interruption in the overall time, even though Tommy perceived a large gap.

John made the decision to play "Cherokee" one more time, but wanted to slow the tempo from 208 BPM to 190 BPM. Even though the other takes were acceptable, the slower tempo seemed to lend an overall calm to the ensemble's performance. Everyone seemed to lock into the time quicker, and the solos seemed less "panicked." Everyone seemed satisfied, but Tommy Williams expressed his dissatisfaction with the section where he was "trading fours" with Tommy Cecil. Tommy Cecil, expressing surprise, said, "What are you talking about?! You people are mental" (Cecil). Bob located the two spots Tommy Williams found objectionable and explained the difficulty with "knitting that together" (Dawson), meaning Bob would have to take each track and adjust the punch points to match the attack and decay of each track along with the bleed from

the previous takes.[110] I went back after Bob finished the overdubs and listened to the original tracks so I could try to hear the problem. I asked Tommy Williams what had happened, and he stated, "My stick got caught on the rim of the snare drum, and I didn't play what I was trying to play" (Williams). I reiterated that I felt there was nothing *wrong* with what he had played, although it was perhaps not as solid time-wise as he might have liked. Because this particular software is set to record non-destructively, all the audio files were accessible.[111]

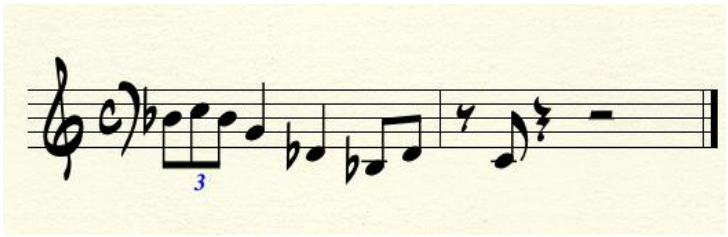
The original plan was to break for lunch, but Robert reminded me that Tommy Cecil needed to leave by two-thirty. I went out and asked the others if they would get something quick so we could finish the tunes that Tommy Cecil played. John had decided to play "Good Queen Bess," which was a departure from his tune list.

> [Good Queen Bess] was a spontaneous decision in the recording session. It was a good choice, I think…because the rhythm section was just playing it during one of those times when nothing was happening in the studio, and people were getting kind of restless, and they played, and it was a nice groove, and I thought 'let's play that' (Jensen 2008).

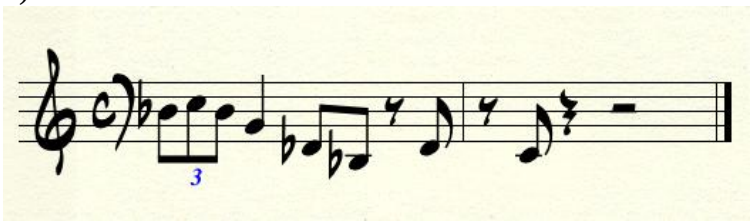
Robert, John, Tommy Cecil, and Tommy Williams gathered around the piano to discuss the rhythmic possibilities of this tune. Robert played through several rhythms shown in Illustration 4-10:

[110] The details of this process, along with other editing processes, are addressed in Chapter 5.

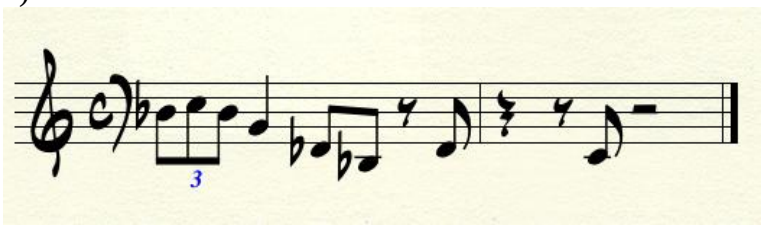
[111] Non-destructive recording keeps all the audio files intact on the hard drive. Destructive recording overwrites the previous data.



1)



2)



3)

Illustration 4-10. Rhythmic variation 1, 2, and 3.

After Robert played through the rhythms, John asked my opinion as to which mute sounded the best for this tune. We agreed on a cup mute pushed tightly into the bell. John wanted Robert to play the head by himself.[112] "Robert, I'd like you to play the melody by yourself, and I'm going to play fills around the melody, because of where it lays [sic]…because of range things on the horn and the sound" (Jensen). I thought to myself that John was trying to exert himself less in order to preserve what physical stamina he had left. John also confirmed the solo order with him playing first; Robert and Tommy Cecil were to, at the end, trade fours with Tommy Williams. While John explained the solo order, Tommy Williams and Robert decided to simplify the rhythm by

[112] "Head" is jargon for "melody."

only using the first rhythm (Illustration 11a). Bob jumped in and asked if they had a plan for the ending. Robert suggested a two-bar tag played three times and then an intro of a four-bar walking bass solo.[113] John asked Robert to count it off. Only John and Tommy Williams played, so they stopped, but Tommy Cecil suggested they start that way with just trombone and drums for the introduction.

The first take was as a live performance, that is, everyone played well, but not exactly as planned.

> (John) You guys swing. We didn't do the fours with the drums we talked about… (Robert) I'm sorry…I had in my mind to start the melody. (John) That's alright, it swung nice that way…I'd like to take advantage of you all, individually, or as a group [laughter] no, I'd like to do it just one more time, and this time, I'd like to do fours with the drums.

John told Bob that his microphone might have slipped down because he had to point the bell of his horn toward the ground more than before. John waffled between trading fours and not but decided to do the original plan of trading with Tommy Williams. Everyone commented on how well that particular take went, but I hoped they would do a second take because it might be better than the previous one. I was happy that John did not object.

> (John) Maybe we shouldn't do the fours with the drums because if we [trails off]…no, I want to do fours with the drums. (Williams) The way we just did it was kind of cool, I thought. (John) What do you prefer, Tom? (Williams) Just redo it like that. (John) Ok, we'll do it…the same arrangement we just played. (Williams) But, if you want the fours, that's fine, too. (John) No, let's do it like we just did it…that's organic.

The second take started without problems, but just after the intro, Tommy Williams stopped because he had accidently started his metronome and was afraid it

[113] A walking bass solo is the term used to describe a solo where a note is placed on every beat as opposed to one with varied rhythmic figures.

might be heard. The restart was not as good as the previous takes, but Bob said we could splice the first take with this one. We continued listening, and just before John's solo, the time differences between all the performers became too great to ignore or fix, so Bob stopped the recording. "One more for us in here?" (Dawson). Tommy Cecil asked what happened. "It was just a little squirrely in the intro, and then it got a little squirrely again, and rather than have a take that's good with two squirrely spots, we thought we'd start over" (Dawson). In this instance, taking the blame for stopping and glossing over the problems probably kept the performers from thinking about the mechanics of performance instead of the desired musical result.

The third take went well except for the ending. I thought it was conceptually disjunct because each performer had a different idea on how to end, and therefore there was no common musical thread. The lack of a common thread does not, by itself, negate an ending; I wanted to call attention to that and see if the performers agreed. Robert suggested a different way to end; John suggested they re-record starting after the drum solo to the end. This ending was better, but there were still some timing difficulties between the performers. Fortunately, the individual entrances could be aligned in the edit session. Even after multiple takes and punching several places, most of the performers thought the first take was the best.

Tommy Cecil left to play another job, and Chris Kosky came to replace him. John informed the group he wanted to play "Strange" and "Fit as a Fiddle." During the changeover, Bob, Tommy Williams, and I discussed the evolution of digital recording and the problems, both sonically and mechanically, with the early formats. He was still amazed by the capabilities of digital audio. Tommy has taken a stab at recording in his

spare time, having done so for about ten years, so he is as familiar with the capabilities and problems in the digital realm as Bob and I. We trade stories concerning poor recording spaces; him at his house with a barking dog, and me at a church with a small airplane flying overhead. I ask Tommy if he was doing any recording at his house, unfortunately, just as Bob walked in:

> I can't…well I guess I could, but I…. [Bob interrupts] No, no, no, no, you need to come to the studio…everybody's hobby is my job. [Sarcastic voice] Hey, I got a studio in my house, let's go there. [Tommy, uncomfortable and almost apologetic] It's never been a real studio, I just dabble…I don't really know what I'm doing, it's trial and error.

The turnaround time to start the next tune was thirty minutes. This was a bit excessive, but Bob had several configurations to change, and everyone seemed in need of a break. John had decided to record "Come Rain or Come Shine." Robert wanted to rehearse the ending of his arrangement because he was going to use a head bob as a visual cue to play the last note. John suggested that the rhythm section play it without the horns, so they all started four bars before the coda, just to see if they could get to the last note simultaneously. After a few tries, Bob said they were close enough and that he could move the parts so they would come out together.

Robert, Chris, and John talked about the tempo: (Robert) "Does that tempo feel right? (Chris) "We did it the first time at about 190 [BPM] and then we took it down. (John) And you know, actually it felt better to me when we did it at 190 [BPM]. That was fast, faster than it needed to be, but it felt better fast than it did at the slower tempo." Robert counted off the tune at the faster tempo. John's accuracy seemed to be slipping again. He was chipping and missing more notes than was acceptable. When I looked into the studio, he seemed a little distressed. I was sure he was not happy with that solo,

but the ensemble continued because it was always better to start with one complete take. John apologized to the group. I suggested we immediately try another take instead of dwelling on the mistakes.

The second take was slightly slower, and several other things changed. This take did not have the same "excitement" or energy. On the previous take, the rhythm section seemed to be on top of the time, but this take had settled into a comfortable or "safe" feel. John was not taking the musical risks he did before, such as playing in his upper register or making large changes in register. Although there was nothing wrong with this take, most expressed a preference for the first take. Everyone decided to move on because John could overdub his solo on a later date, and we had only two hours left.

John wanted to record "Strange" as the next selection. My understanding of John's concept was that he wants to have the tune "float," what I interpreted as an ethereal quality. John wanted the ending to be a four-bar vamp alternating between two chords, a Db minor 9 (Db mi^9) to C^7 alt. The ending would have significant length: "I think we should build it. I think when we hit that vamp, we should hit it way down and we should build it" (Jensen). Bruce played soprano saxophone for this tune, and he and John played a unison line with no vibrato. Robert and John discussed the form, but John had not really decided. John asked for other opinions because John was afraid the tune would be too long if he, Bruce, and Robert each played a full chorus. Chris suggested John and Robert split a chorus. John liked the idea, but Robert suggested no piano solo. John wanted Robert to play, so they agreed that Robert should play both "A" sections of this AABA form and then the melody of the bridge (B). Finally, John and Bruce would play the melody on the last "A" section, followed by the vamp.

I agreed with John's conception of his unison and no-vibrato approach to the melody line, but he was having difficulty keeping the interval jumps smooth. There were irregularities in his sound that detracted from the overall effect. I was not worried about the small intonation differences of a few cents; those could be fixed in the editing session, but smoothing and lining up the intervals would require more time.[114] With all the solos and the extended vamp at the end, "Strange" lasted seven minutes and forty-five seconds. In the jazz idiom, this is not a particularly long track, but it seemed longer.

Unfortunately, the solos reminded me of a three-minute speech where the person has only two minutes of material; the content was fine, but it just needed more expansion and development of the thematic ideas. John asks if anyone else thought the tune was too long. (Robert) "I think it's too long …" (John) "Doesn't move a lot." (Robert) "I think it would be better shorter" (Redd and Jensen). This expressed all of our sentiments. John decided to keep Bruce playing a whole chorus, but this time John and Robert split the second solo. John decided to play the first two "A" sections, Robert played the bridge, and he and Bruce played the melody together on the last "A" before the extended vamp. I questioned John on what he envisioned as the length of the fade, but he stated he wanted to decide that during the editing part of the session. I also suggested that they raise the activity level sooner in the vamp; I liked the interplay towards the end of the vamp, and I did not want to lose anything in the fade out. Everyone seemed in agreement on the form and level of activity during the final vamp, but then John suggested to Robert that he might want to consider being busier during the introductory vamp as well.

[114] $1/100^{th}$ of an equal semitone. See "Cent" in the Glossary for further information.

The unison melody line of the second take was much as desired: smooth, connected, and with almost simultaneous note-to-note movement. The shortened solo section was improved because there did not seem to be as much effort to fill the time by each soloist, and I got what I asked for on the vamp. During the discussion, Chris asked if we could punch the vamp section because she had made a mistake. Neither Bob nor I had caught the mistake, but John asked if we wanted to record another take because Bruce was not happy with his solo. Before the next attempt, we took a break, and during that time, Bob, wanting to keep things lighthearted, started to play with some of the plug-ins. Bob used a pitch shifter while John was talking which raises his voice by an octave giving it an "Alvin and the Chipmunks" sound.[115] John was amused by this, smiled, and started to play his trombone, which was also an octave higher. Bob, always wanting to have fun, added a portamento effect, or slide, between notes, but through several octaves. Bob then started to play with the drum sound by putting an echo on the snare. Tommy reacted almost immediately by playing figures that fit into the echo pattern Bob had chosen.

Ten minutes later, the break ended. Chris retuned her bass, and Robert counted off the third take. John had a little "fuzz" in his sound, a tone that is less than ideal, but the previous take could easily be substituted. Bob and I discussed that possibility, to which Bob replied, "As long as we use the same [corresponding] rhythm [section] parts" (Dawson).

[115] Alvin and the Chipmunks cartoon ran from 1983-1991. The chipmunk characters had high-pitched voices. Using analog methods, one would record on a tape machine at normal speed and then play it back at twice the speed, resulting in a one-octave jump in pitch.

John announced “Fit as a Fiddle” for the next tune, and Bob said it would take ten minutes to back up the data. All the performers were showing some fatigue; we had been recording for about seven hours. Bob asked John how many more tunes he wanted to record. John restated “Fit as a Fiddle,” and “…if we’ve got time, I’d like to do “Do Nothing Till You Hear from Me,” and we may have enough for a record… but if we need more, we’ll do something simple… with just Robert and me” (Jensen).

While the group discusses the form, I unwrapped a mint, which reminded me of a story. I told John’s wife that people used to mess with the engineer by crunching candy wrappers near a microphone and blow a dog whistle. Blowing a dog whistle caused the meters in the control room to peg to the maximum input level, and the crunching of the wrapper sounded like a microphone going bad. Bob told a similar story: “The original cellophane, you know like was on cigarette [wrapping]… that [stuff] sounded absolutely perfect; like static, and Gary Hall, trombone player in the [Airmen of] Note, he used to [mess] with me. They’d be in there, and I’d be chasing it [the microphone problem] down, and he’d pass [the wrapping] to other people, so it would be on a different mic, and I’d be chasing it down there, and they’d be [makes a snickering sound]” (Dawson). Bob then pulled out a plug-in that did the same thing, and sent the signal to the performers just to mess with them; I saw that the performers are confused. Bob laughed.

The performers played through several transition sections to confirm rhythm and harmonies, and then said they were ready to start. They began, but there was a misunderstanding on the opening modulation; Robert played a half-step higher, while Chris played a whole step. They restarted the tune, this time in agreement. The performers settled into a nice feel and sounded as though they were having fun, so much

so that John did not stop at the end of his predetermined spot. John was apologetic, and Robert joked that on this take he will start four bars early to make up the difference. After a minute, the group was ready to try again. This take had a nice feel, everyone played well, but there were a few minor mistakes. The group decided to redo the complete last section after the bass and drum solos. This take did not have the same musical cohesion, which Bob and I mentioned at the same time. We discussed using the previous take and inserting as much of it as possible into this final section.

We had about forty-five minutes left in the recording session, and John discussed the possibility that he and Robert play "Do Nothing Till You Hear from Me." Everyone left except Robert, who plays a little improvisation on "Do Nothing Till You Hear from Me," which he morphed into the ending credits theme from "All in the Family." Robert left to take a break. I asked Bob if the EQ settings he had on the drums were his starting points:

> They're pretty standard, direction-wise [amount of boost or cut]. It always depends, particularly when guys bring in their own drum sets. [Speaking specifically about Tommy Williams' set] I've got a little more top on his cymbals because they're pretty dark, and I'm taking a little more out of the middle. Like guys who bring in "A" Zildjians as opposed to "K"s, you don't have to do as much. And the thing about a "K," you know, it's dark, and it's great, but if you leave it dark, it disappears…and you still want to have that crisp—that definition.

We also discussed his usage of compression on the bass track. "I just twist them [the parameter knobs] until I like it…somewhere between 2 and 4 [on the compression ratio] sounds about right…I usually don't want to hit anything that hard" (Dawson).

John's wife came into the control room and informed Bob and me that John has decided to do one more fast tune, "It Don't Mean a Thing if it Ain't Got that Swing" with the quintet and then do the duo tune. Bob said it would take him a few seconds to add the

extra tracks for the drums, bass, and tenor sax. Tommy began to play time, and Chris finished checking the intonation on her bass. John said, "I want to play it like this" and started to demonstrate. Bruce jumped in, and they all started playing the tune. Bob pressed the talkback button and said, "Don't waste it" and to us in the control room, "When they start playing cool [stuff], you've got to stop them" (Dawson). Very often, the first take is the best because there is spontaneity and excitement, not reproduced on a second or third take.

Bob finished setting the other tracks, and Robert asked John if he wanted to talk about solo orders. John asked each performer if he or she wanted to play and suggested the solo order as "horn solos, piano solo, drum solo" (Jensen). After the trombone and saxophone solos, there seemed to be some confusion as to who should be playing. Chris continued to play a walking solo, and Tommy's drumming activity increased, but it seemed as though each had different expectation from the other person. Each apologized to the other: "I should have kept walking" (Kosky), "I got way off" (Williams), but even in a live performance situation, there might be a miscue. We saved that take and decided to start again, but John wanted to alter the solos. He first decided to have a piano solo, but then changed his mind.

> Robert? Bruce just suggested maybe we should do a piano solo first, then we could go into the horns and do horn fours. (Robert) I'm willing if you want. But, I don't need to do a solo, really. [John ponders] Well, OK, in the interest of how long the tune is, I'm going to say, no piano solo. (Robert) [Under his breath] [Expletive].

Everyone laughed at Robert's response, that knowing Robert jokes a lot because he always has the best interest of the group in mind when he plays, so his expression of disappointment and the accompanying expletive brought chuckles instead of tension.

While Tommy asked Bob to turn up the bass in his headphones, John decided he wanted Robert to solo: "Robert? There's got to be a piano solo. (Robert) No, there doesn't, really. (John) Yes, there does. Yeah, we voted in here. So, piano solo first. Just nod at us when you're done, nod at the camera" (Jensen and Redd).

During the second take, John and Bruce played background figures during Chris' solo; John will spontaneously add background figures if he hears something that will add to the arrangement.[116] The group finished and came into the control room. This take was not the best as far as solos. The performers complimented each other, but downplayed their own performances. I wanted everyone to try a third take, but we were running out of time for the final tune with just John and Robert playing. John made the decision to do another a take, returning to the original form. "We do it, no piano solo, we do horns,…then a walking bass solo, but Tommy, for my ears, once again, I don't want to tell anybody how to play, but I think, while she's doing that, you can be a lot busier. (Tommy) Just go hog wild [laughs]. (John) Yeah, throw stuff in there, so rather than bass solo, bridge [drum solo] bass solo, I'd like you both to be blowin' together" (Jensen and Williams).

The third take started slower than the previous two, but it was not worth stopping and restarting. Bob and I discussed how good the first take was and how to take the first part of take one and time-compress this take to try to match tempos.[117] There were no difficulties with this take, so we thanked everyone and they started to pack up. Bob duplicated the audio files on the backup hard drive and set the rough mix files to burn a

[116] "Background figures" describe rhythmic or chordal additions meant to support the melody line or soloist.

[117] A detailed definition and description of time compression follows in Chapter 5.

CD of today's work. John left this recording session with 141 minutes worth of takes, so we needed to put it on two CDs. Over the next few weeks, he and I would listen independently to all the material, then get together and decide which takes or parts of takes we like for each tune.

There would be several possible results of our next meeting. First, we might agree on a take and not want to alter any of the performances. Second, we might want minor changes such as small pitch corrections or note replacements. Third, we might agree to make significant changes requiring replacement of large sections. The choices became more difficult because of multiple layers within each take.[118] If we are not able find an acceptable take or cannot successfully edit the performance, we still can re-record a part. However, that would require the performer to come back, which would cost us more money in studio time.

I also discussed the "duck" incident, how much time and effort had been expended during that fiasco, and how Bob had ignored my suggestion regarding the location of the problem by dismissing it. I discussed this with John to see if he would mind working with Jim Robeson, the other owner/engineer at Bias Studios. I knew my request put John in an awkward spot because he likes Bob as a person and engineer (as do I) and does not want to alienate himself with the personnel at Bias Studios. John wanted me to wait and reconsider after a few weeks.

Besides the "duck," one issue stood out as a contributing factor in the deviation from what I would consider a normal session. Because of the lack of rehearsal time, I would estimate that over the two-day recording portion, four hours was lost. The lack of rehearsal interfered with the pacing of recording, added stress to the performers and

[118] Discussion of layers and this process follows in Chapter 5.

producer, and decreased overall productivity. I consider problems with the headphone mix, equipment problems, and breaks that exceed the agreed upon length to be normal and expected, not desirable, but well within the boundaries of "normal" as outlined in Chapter 2.

During these two days of recording, John and I spent almost $4500 on studio time and performer payments, and we still had several days of editing and mixing to go. Our diligence and ability to preplan the editing session material should help us keep our costs down.

CHAPTER 5

AUDIO ALCHEMY

Many people unfamiliar with recording find the editing and mixing portion of the process to be "magic." Most use this or a similar term to describe the ability of the engineer to hide or eliminate performance errors or create an environment where the performer sounds better than his skill level. This chapter concerns the editing and mixing discussions John and I had with each other and with the engineer, either Bob Dawson or Jim Robeson. Jim's entry into and contributions to the process are discussed in Chapter 6. As explained in Chapter 2, the three processes of recording, editing, and mixing can occur contemporaneously. All of the overdubs required an immediate trial to see if they fit with the previous material before we could move to the next tune.

The first portion of this chapter examines the editing process, including replacement, manipulation of pitch, time, or any combination of these three elements. Replacement involves selecting all or part of an audio segment, either within a single track or across multiple tracks, and replacing it, most of the time, with audio from another take. For the purposes of this dissertation, I define pitch manipulation as the alteration of a frequency (pitch) either by a half-step or more or within a half-step using pitch-shifting tools. I make this distinction because some programs seem to accomplish the desired task better than others do. Time manipulation encompasses three possibilities: first, movement of the selected sound example forward or backward with no manipulation of the relative time frame; second, time compression or expansion of relative time; and

third, a combination of the first two.[119] Multiple examples of each of these processes occur throughout the description and analysis portion of this chapter.

The second component of this chapter concerns the mixing process, which concerns two topics: perspective and space. Psychoacoustic elements of perspective include relative amplitude (volume), which a listener might identify as a single performer's front-to-back placement; perspective across the stereo field or left-to-right placement, and the perceived acoustic space. Most of the discussion concerns the acoustic space because setting of amplitude and approximate placement of the performers across the stereo field occurred during the setup and rough mix stage of the recording process. All other discussions within the mixing process concern the use of processors such as compressors and EQ.[120]

A detailed account in the previous chapter presented an ethnographic view of the problems, discussions, and real-time solutions in the recording process. In this chapter, the processes and discussions are in the forefront, and because there are a limited number of processes, I have selected two tunes for analysis, "It Don't Mean a Thing"[121] and "Broadway." These two tunes illustrate all the possible editing processes: replacement and manipulation of pitch and time.

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[119] Detailed descriptions and examples occur later in this chapter. Unlike analog time compression or expansion, there is no change of pitch in the digital realm.

[120] The use of processors, virtual or an external stand-alone piece of hardware, happen more in the pop/rock genre than in jazz. Discussion of processors is beyond the scope of this dissertation and is too involved for a short list. There are several manufacturers of software plug-ins. To see an example of processor types from a single brand, see the description from *Waves Mercury Collection* at http://www.waves.com/Content.aspx?id=1685. Many engineers also use these processors as sound-shaping tools, either through spectral or temporal manipulation.

[121] In the jazz idiom, "It Don't Mean a Thing" is the usual shorthand name that refers to "It Don't Mean a Thing if it Ain't Got That Swing." For the remainder of this dissertation, I will use the shorthand nomenclature.

The Editing Process

"It Don't Mean a Thing"

During the first take of "It Don't Mean a Thing," the miscommunication (mentioned in Chapter 4) between Tommy Williams and Chris Kosky forced two more takes. This resulted in the first half of the aborted take, which had no errors and one overdub, and the last half of the third take, which was considered the best back portion. In the days of analog tape, the engineer would take a razor blade, cut the unwanted parts, and tape the useable sections together.[122] Using Pro Tools, Bob copied and pasted the first part of "take one" on the first part of "take three" (see Illustration 5-1 for identifying labels and descriptions).

Visually, Pro Tools records in "layers." Analogous to "layers" might be "pages," as in a journal, where one can turn to a new, blank page to write new data. Bob copied "layer one" and pasted it on "layer three," moving "layer three" so the edit points were close together. There are two methods for approximating editing points: time and visual. Switching between both layers, Bob could note the time where the first take joins the third. Bob used a "copy and paste" method to place the first take over the third, then moved the third take to make up any difference in tempo between the first and third take. Because the tempo of the third take was slower, the edit point occurred later in time. In this particular operation, there were about ten seconds of possible overlap, any of which might have worked as the main edit point. We listened to that section of "take one," and selected a point where Tommy Williams played the same drum figures. The criterion for

[122] There are other ways to accomplish the same result, but the point is the overwriting or elimination of the previous audio.

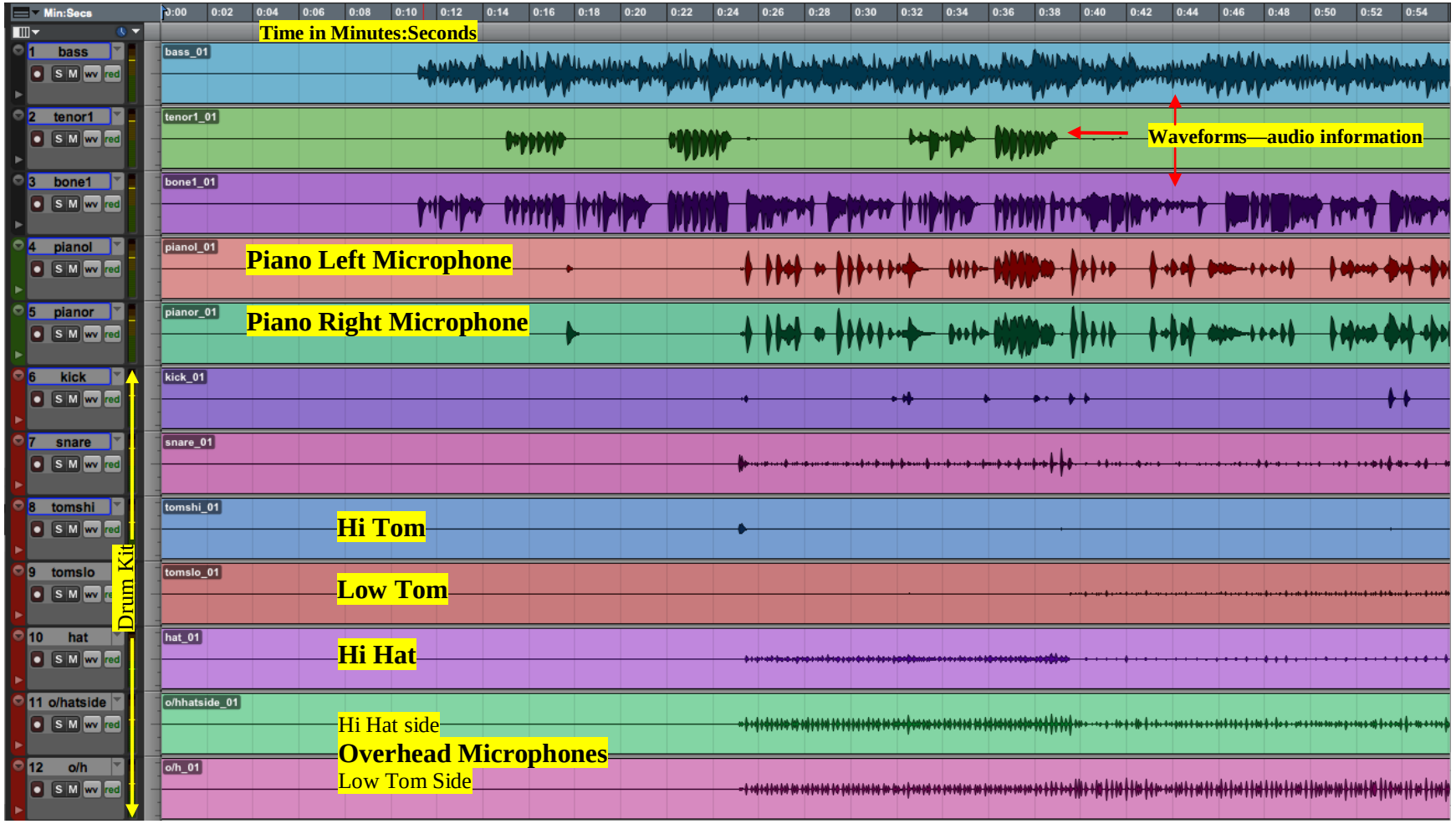


Illustration 5-1. Visual information, or score, of "It Don't Mean a Thing," first take. Piano Left Microphone captured the left portion (lower strings), and Piano Right Microphone captured the right portion (higher strings). Groups are indicated by color, as seen on the left edge; Drums are in maroon, piano is in green. Bass, trombone, and tenor were not assigned to any group.

selecting the edit point is at first, "best guess." We listened for several things: playing the same rhythmic figures on the same parts of the drum kit, consistency of attacks, and any "clean" entrances. Bob pasted "take one" at the "best guess" point, which happened to be the top of a chorus, and we listened for the transition point. We were not concerned with a perfect fit, only for the aforementioned parameters. This process was trial and error, but our experience in combining the visual and aural aspects eliminated many possibilities.

Once identified, edit points were joined, and Bob said he could "weave it together" (Dawson). A "clean" entrance is an important part of the selection process because a new attack acoustically masks the decay of the previous attack, as in the snare drum attack and the kick drum decay shown in Illustration 5-2. The concept of weaving is nicely metaphorical because different transition points are overlapped, woven together, trimmed, and then stitched together.

As stated before, Bob copied more than needed from "take one." This became important because Pro Tools usually operates in a nondestructive mode (an engineer's decision), therefore keeping all waveform information in order to create data *about* each audio track. The picture of the waveforms, edits, and fades is metadata, or data about each waveform and any alterations.[123] Bob accomplished the weaving task by selecting the trimmer tool and either dragging the audio file from the "take one" side towards the "take three" side or dragging from the "take three" side towards the "take one" side.

[123] There are addendums to this statement that are covered in the "Transcription" portion of this chapter.

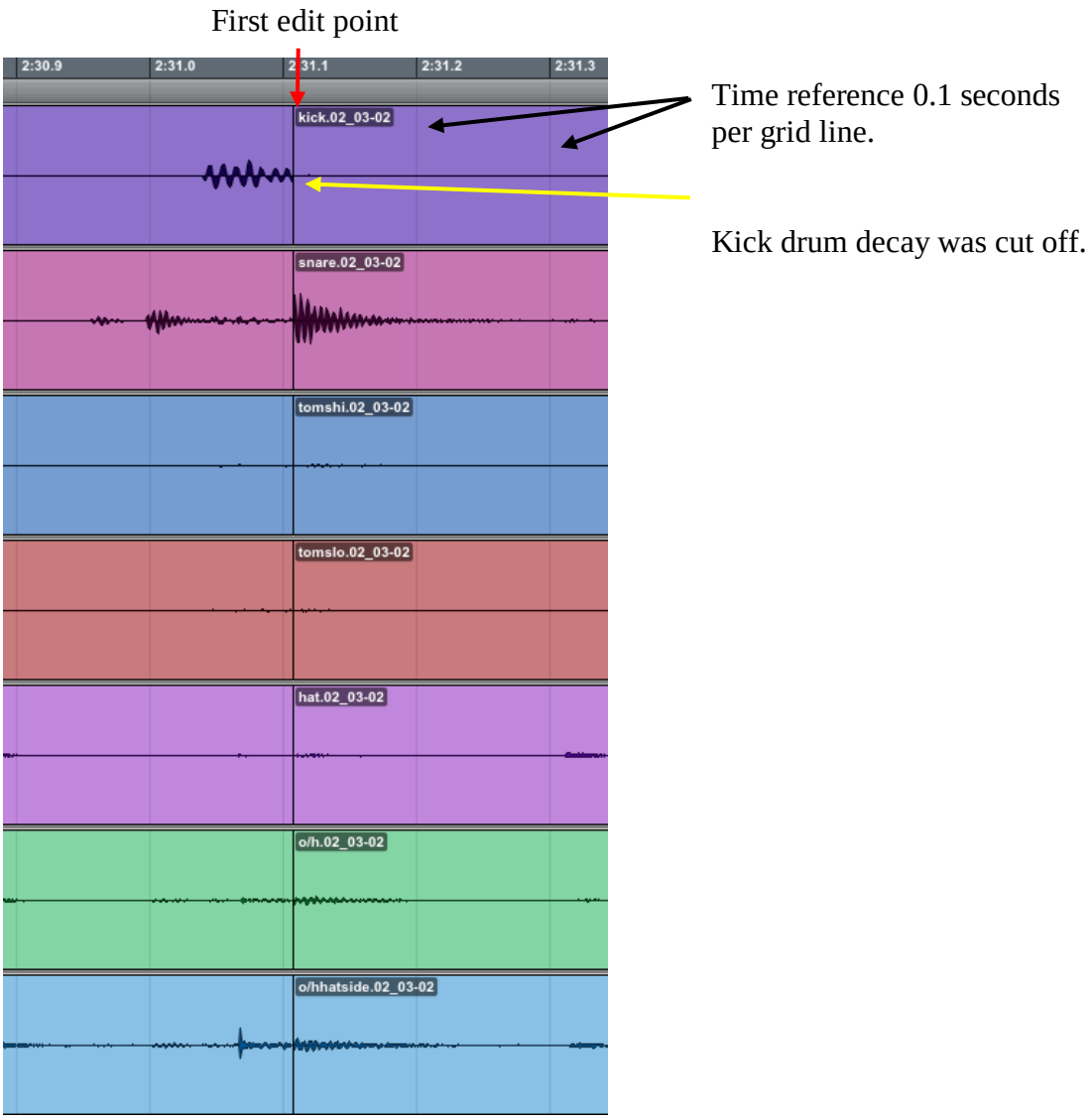


Illustration 5-2. Insertion of the drum parts of the first take of "It Don't Mean a Thing." Note the waveform of the snare attack and the relative time position of the edit (red arrow).

Before we moved to the fades and cross fades, we discussed how the overlapping sections should weave together. Because we desired a seamless edit, Bob looked for a spot that followed the aforementioned criteria for each instrument's edit point. For the bass, the downbeat of a measure usually worked because there was a high probability of finding a functional chord tone. Bob put the edit point close to the attack and selected a cross fade he thought would hide any irregularities between the first and third take. For the tenor, we had to use the previous material because it was part of his original solo. John and I did not think it made musical sense to replace the few bars of his old solo with the new material because that would alter the continuity and logic of Bruce's improvisational ideas. Because the edit was at the top of a chorus, it made sense to use John's new material, so Bob placed John's edit point before the bass, piano, and drum edit points. It was easy to place Robert's edit point because there was plenty of silence between his comping, but we still wanted it close to an entrance to eliminate any bleeding from other sound sources such as the drums (Illustration 5-3).

After each edit point was set, Bob created an appropriate fade or cross fade that connected one region with another.[124] The length of the fade depended on other acoustic events (Illustration 5-3). Bruce's fade was quick because we did not want to hear any of John's first solo. To find the best edit point and create an appropriate cross fade required a few trials. Bob favored the curves shown in Illustration 5-4 for most edits, but when he used that cross fade for the drums, we all agreed that the transition was not appropriate. The cross fades for the drums were an interesting case because of their length. Bob

[124] A region is the visual portion of any audio track but, more specifically, is a portion of an audio track altered and constructed to create a complete track. See Illustration 5-7 for a visual representation.

selected an area of about 200 milliseconds, which is rather long for a cross fade. His reasoning was to try to "blend" the decay of the previous drum parts to make a "natural" transition. Bob and I both heard changes in the amplitude between the edit points. He then tried two other combinations, neither of which worked. He then tried another combination, one I had never before tried on sessions I had engineered, but the sonic result was a seamless transition between "take one" and "take three" (Illustrations 5-3).

Sometimes, trying something unconventional can yield a new method, and because Pro Tools is such a complex program, one can always experiment, learn, or exchange information. While this cross fade pattern was something new for me, I showed Bob a few keyboard shortcuts he did not know; we both added something to our engineering "bag of tricks."

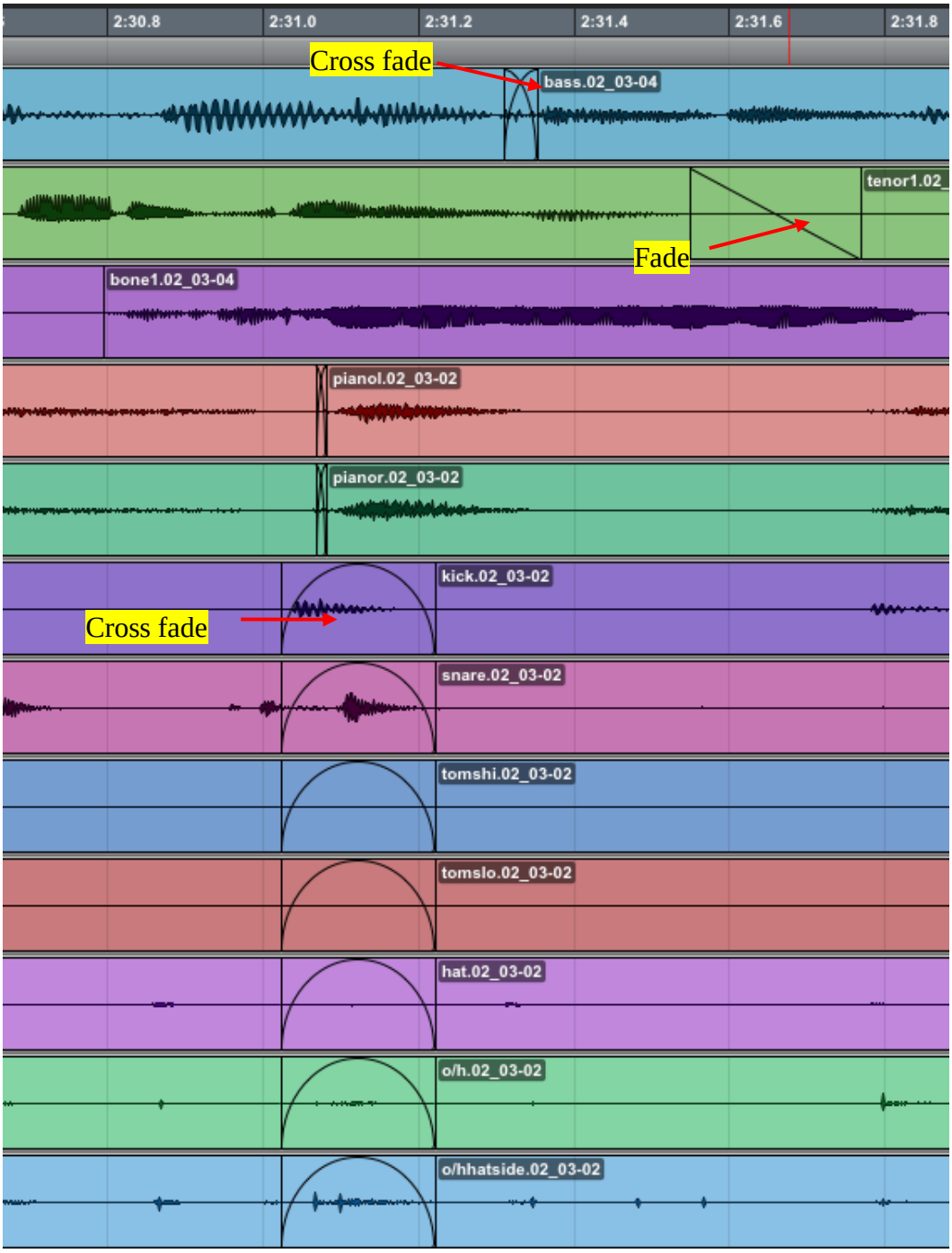


Illustration 5-3. Final edits and fades for "It Don't Mean a Thing," "take one" into "take three." Note the placement of the edits, fade, and cross fades for the bass, tenor, trombone, and piano away from the drum edit and cross fades.

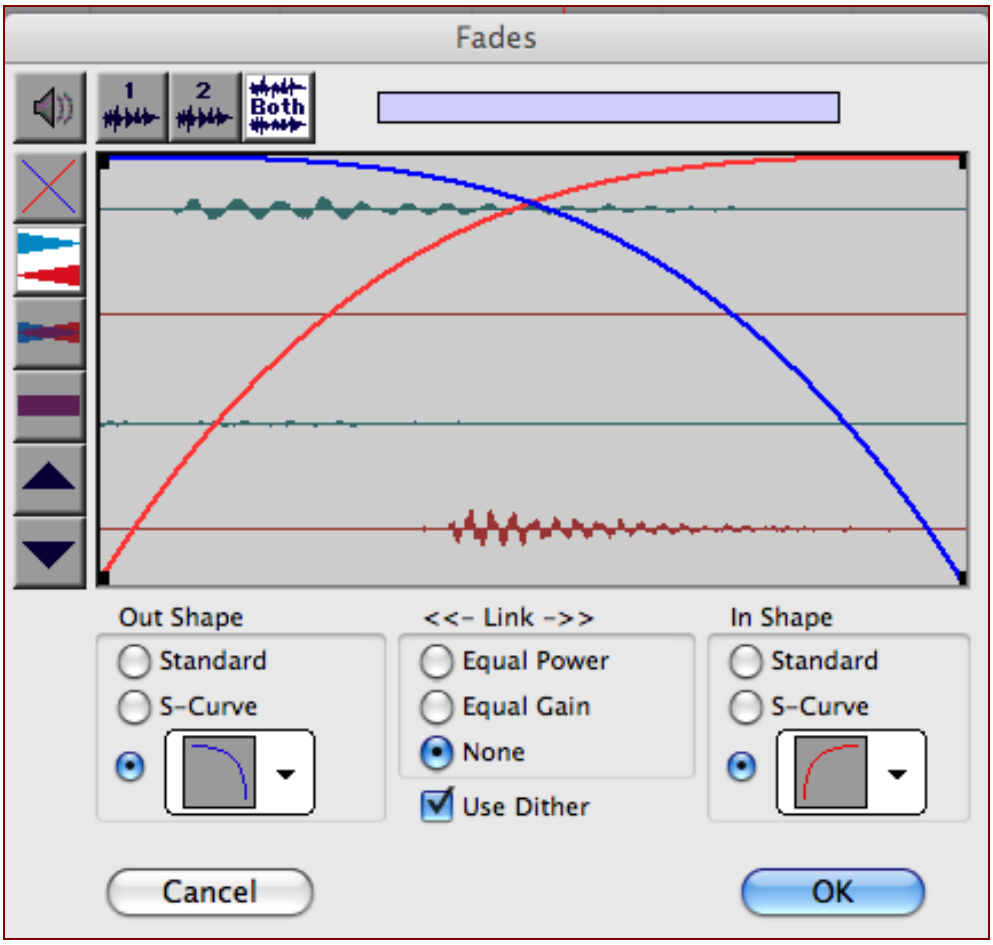


Illustration 5-4. Cross fade curves used for bass, tenor, trombone, and piano. When the link button is used, equal power is for non-phase coherent material, while equal gain is for audio loops and other phase coherent material.[125] See "Dither" in the Glossary.

[125] A loop is a term used to describe a segment of audio that is repeated through technical means, such as software, drum machines, tape machines, and delay units or as represented by the colotomic musical structure in Gamelan.

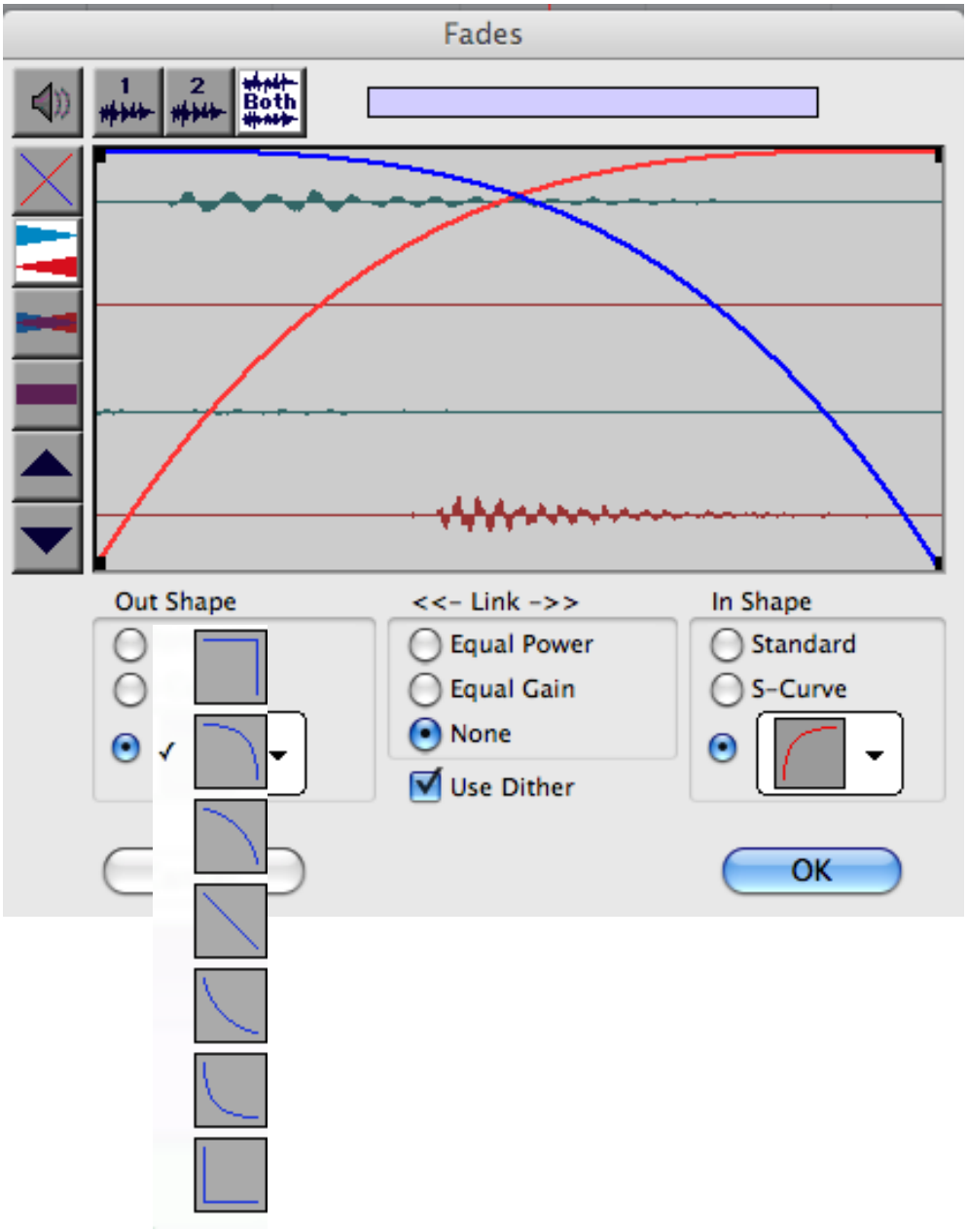


Illustration 5-5. Cross fade screen with pull-down menu and possible curve choices. In shape and out shape have the same possibilities, which one can mix-and-match.

The last analysis of the replacement parameter for "It Don't Mean a Thing" is on the bass track. During the mixing process, John decided he wanted the drums to solo instead of the drums and bass together, so Bob replaced Chris's two bars with silence (Illustration 5-6).

The muting procedure followed the same process as finding the appropriate spot for editing except that the mute comes as close to the attacks as possible, both on the front and back end, thus allowing as much of the note decay as possible (see Illustration 5-2), the kick drum part, to see the decay cut off). Cutting off the natural decay in this instance was not a problem for three reasons: first, the attack of the drum kit masked the abrupt cutoff of the bass; second, the bass player could mute the strings, "If I need to stop for a solo break, I'll just put my right hand over the strings" (Kosky); and third, artificial reverberation on the other tracks fooled the ear into hearing a natural decay.[126]

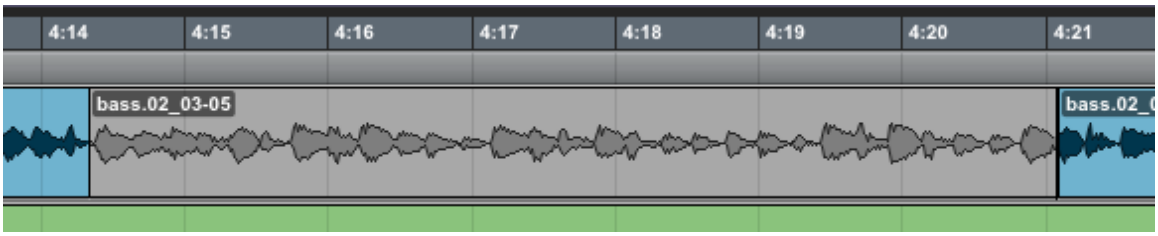


Illustration 5-6. Replacing sound with silence. The grayed area indicates "mute" in Pro Tools. An absence of a waveform is also silence. See "Broadway" for examples of blank areas indicating silence.

[126] Discussion of reverberation follows in the "Mixing" section later in this chapter.

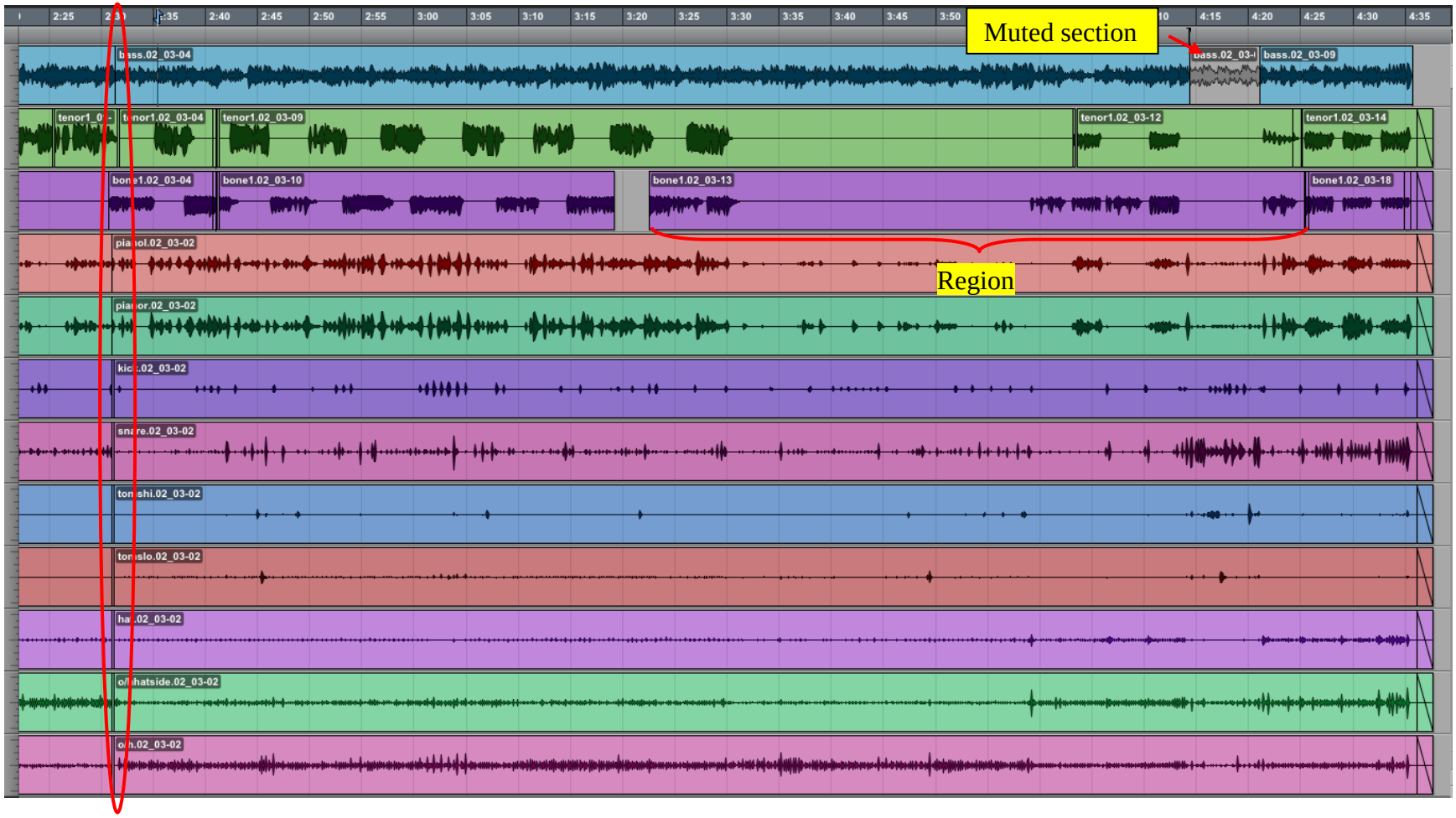


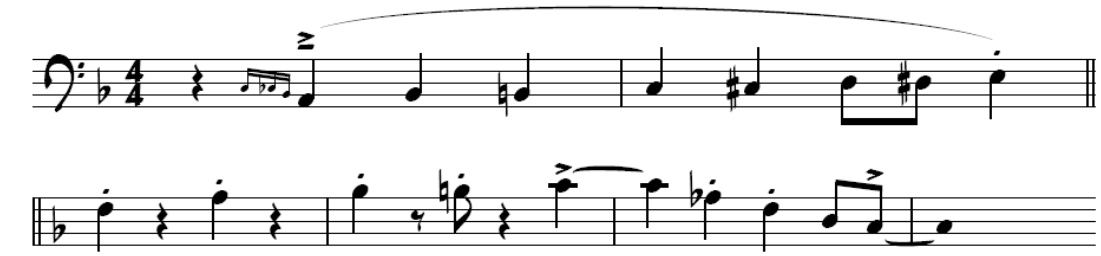
Illustration 5-7. Complete view of “It Don’t Mean a Thing” with all alterations. Edit points between “take one” and “take three” are circled.

Transcription

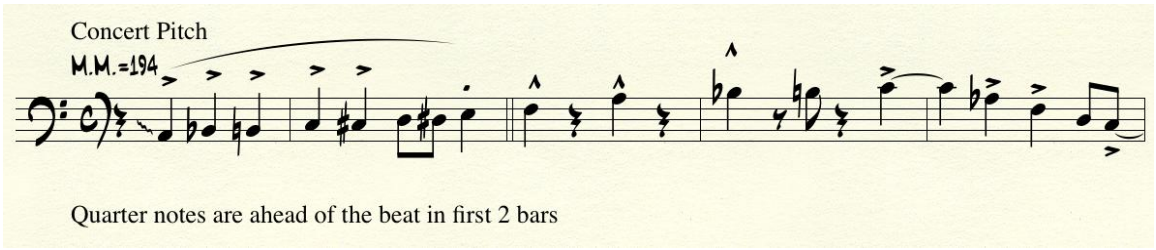
Before I discuss "Broadway," other issues require consideration. In the previous section, I labeled Illustration 1 as a score or "visual information," but is it a transcription? When engineers, performers, or producers alter the original performance, one can track and "transcribe" the alterations.

I have taken the solo break and the first few bars of Leigh's and John's solos in "Broadway" to show the differences between their transcription of their solo, my transcription of both of their solos, and two "automatic" (melograph-type) transcriptions. I suggest that all four of the transcriptions in Western notation are "insider" results because of several factors. First, the eighth notes do not visually represent "swing"; second, articulations, where notated, are open to interpretation; third, inflections are not written; and finally, shorthand notation needs no explanation. I would argue that transcription should give relevant information, and in the case of recording, those changes happen within the parameters of frequency, time, and amplitude.

Comparing the transcriptions, one finds several similarities between Leigh's transcription and mine as well as between John's transcription and mine. Both of my transcriptions have the same rhythmic and pitch notation as each of theirs, but there are also some differences. (Illustrations 5-8 and 5-9).



a)



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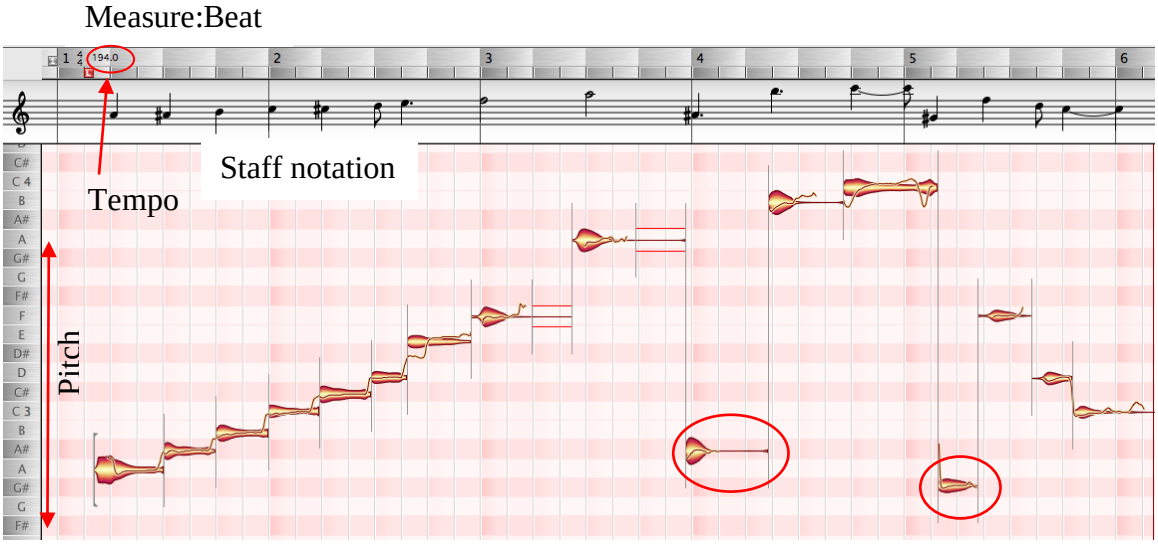
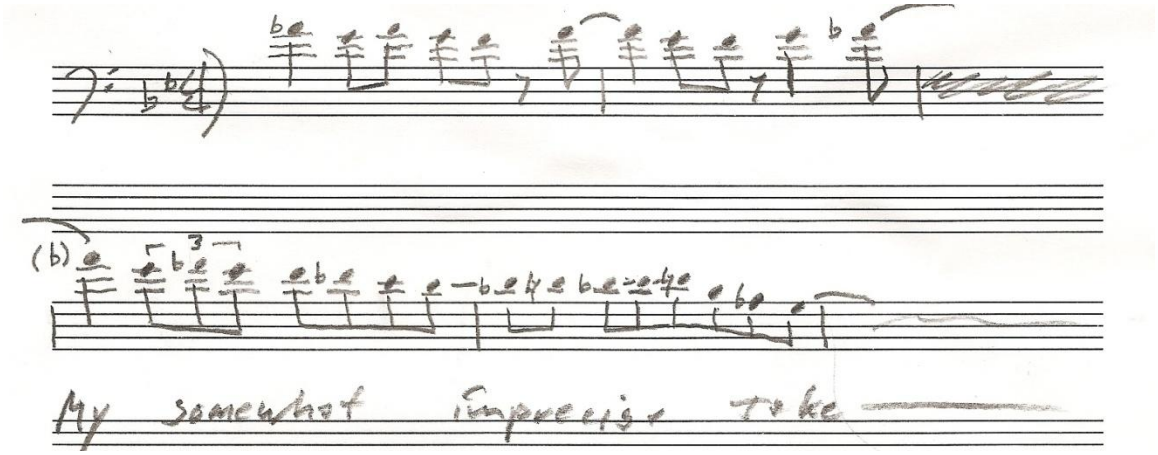
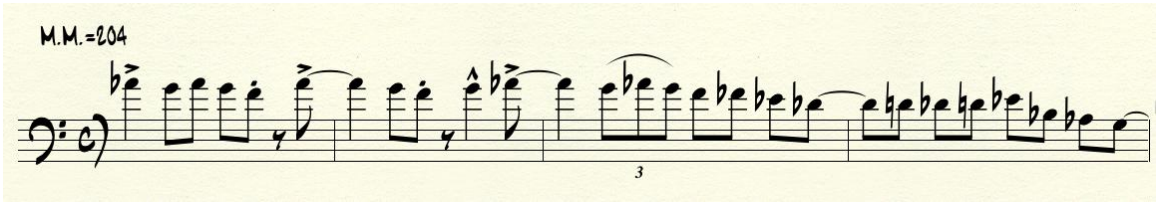


c)

Illustration 5-8. (a) Leigh's transcription, (b) the author's transcription, and (c) the software transcription of her solo break on "Broadway." Note the staff notation errors, tempo at the top, and the octave displacements (circled).



a)



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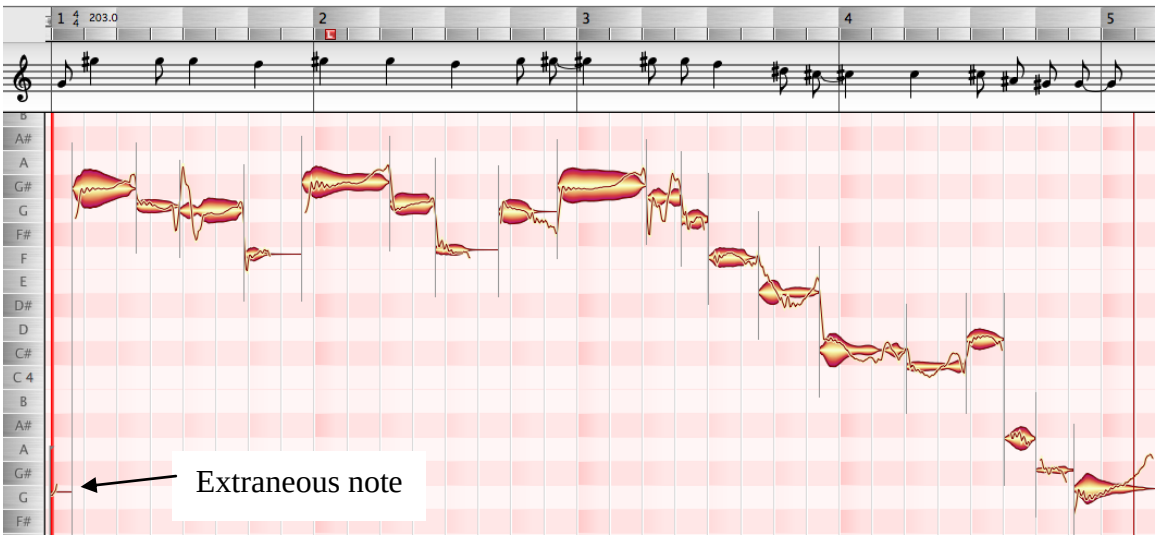

c)

Illustration 5-9. (a) John's transcription, (b) the author's transcription, and (c) the software transcription of the first four bars of his solo on "Broadway." No effort was made to "correct" the automatic transcription.

In the first notated measure, Leigh's transcription has three "grace notes" before the downbeat, while mine uses a shorthand symbol understood by most jazz performers as a "rip," quickly sliding from, in this case, a higher note or harmonic, to the target note. The second difference is the articulations over the notes; because there is no agreement on interpretation among jazz performers, both may be correct.[127] The same is true with the similarities and differences between John's transcription and mine; our note and rhythm results coincide, but the articulation differs. This may be due to my request because I did not set any parameters for John's transcription, telling him that I wanted to compare his results with mine. Therefore, John may not have deemed the articulation a necessary inclusion.

The "automatic transcription" in the recommended default setting yielded results that are quite different. The software shows the pitch tracking results inside the wave "blob" (Illustration 5-10a).[128] Although the pitch tracking "blobs" do not accurately represent John's note choices, the software did accurately transcribe John's pitch and amplitude performance as shown by the pitch tracking line. Interpreting this transcription requires the same aural acuity as the "human" result. Additional parameters derived by other automatic transcription tools might produce more performance information. Transforming the audio file to MIDI would result in numeric comparison of amplitude, but one must realign the amplitude waveforms to correspond with the aural interpretation (Illustration 5-11b).

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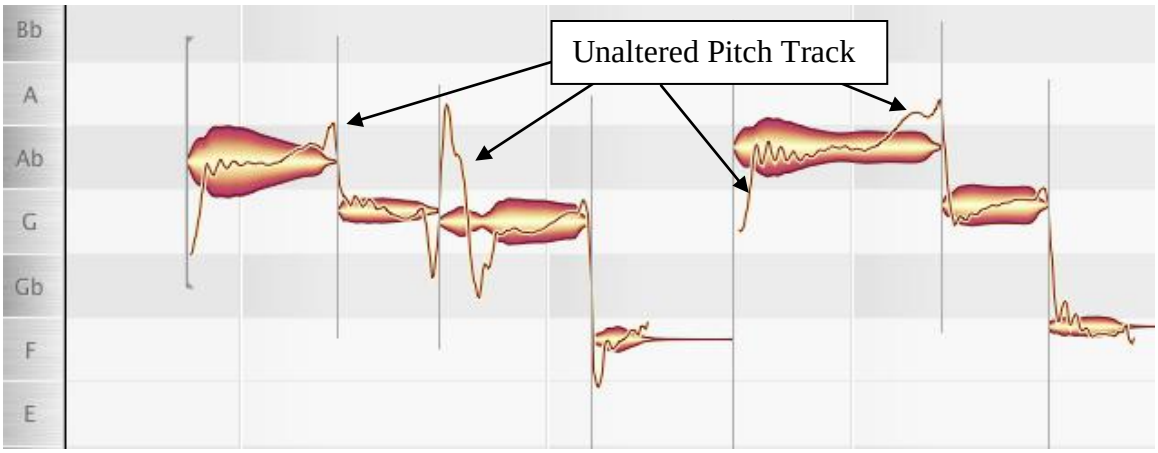
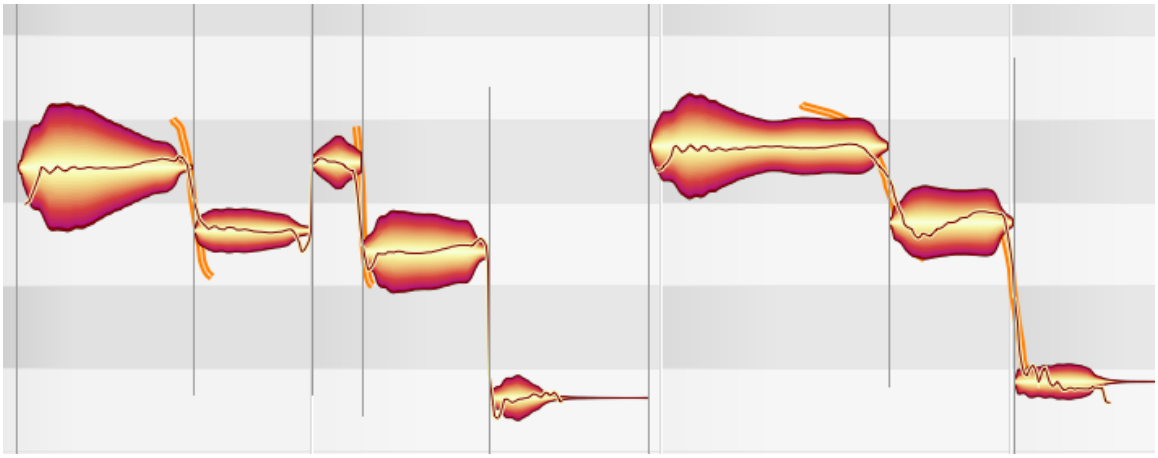
[127] For a discussion on expressive notation for brass and woodwinds common in the jazz idiom, see Berliner (1994), 513.

[11] "Blob" is the term used by the software maker. I call it an amplitude envelope or waveform.



a)



b)

Illustration 5-10. First eight notes of John's solo on "Broadway" (a) before and (b) after pitch correction. Note the recognition of the "new" note in Illustration b.

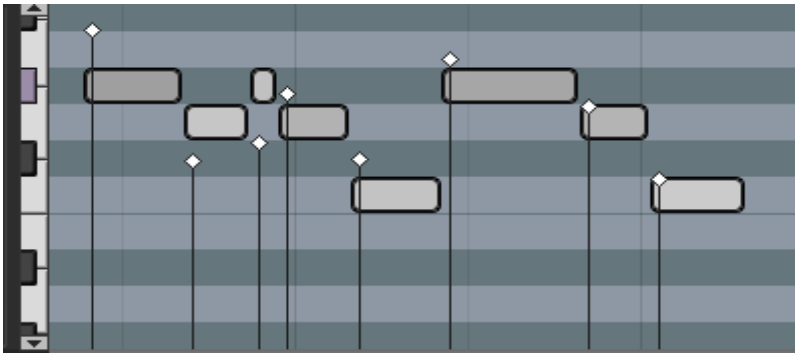


Illustration 5-11. MIDI notes and velocities of the first eight notes of John's solo on "Broadway." The rectangles are notes and their relative durations. The diamonds indicate relative velocity.

Time Note Velocity Total note length

Start	Event		Length/Info
0:02.390	G#3	119	0:00.283
0:02.679	G3	69	0:00.187
0:02.872	G#3	76	0:00.078
0:02.956	G3	95	0:00.200
0:03.163	F3	70	0:00.259
0:03.427	G#3	108	0:00.390
0:03.822	G3	90	0:00.201
0:04.027	F3	62	0:00.275

Illustration 5-12. Midi data. Time is in hours:minutes:seconds. Velocity is on a scale from zero to 127, and total note length is a time parameter.

For the recording process, the *changes* require transcription, but some of those alterations do not result in a corresponding change in the Western notational transcription. The case in point (Illustration 5-10) shows how there were noticeable changes in the frequency parameter, but if rewritten, there would be no change in the Western transcriptions. If I had changed the amplitude parameter, the increase might not have been great enough to recognize, although with a MIDI transcription, one can note the numerical differences. It would also be difficult to transcribe differences in the time parameter, because writing "ahead of the beat" (Illustration 5-8b), only acknowledges a relative distance, not an absolute one.[129]

"Broadway"

Thus far, I have used the word "transcription" with a traditional meaning when looking at a score, examples of Western notation (Illustrations 5-8a, b and 5-9a,b), or a software-based transcription (Illustrations 5-8c and 5-9c). I now want to examine alterations to the visual score on "Broadway," henceforth called "the score," and the

[129] Visual illustrations of the time parameter and associated changes are discussed later in this chapter.

results, both as a prescriptive and descriptive score. A prescriptive score literally tells the software how to alter the files and where to place them in real-time. It is also descriptive because one can look at the new score and determine where and what type of alterations occurred, or the transcription of the alterations.

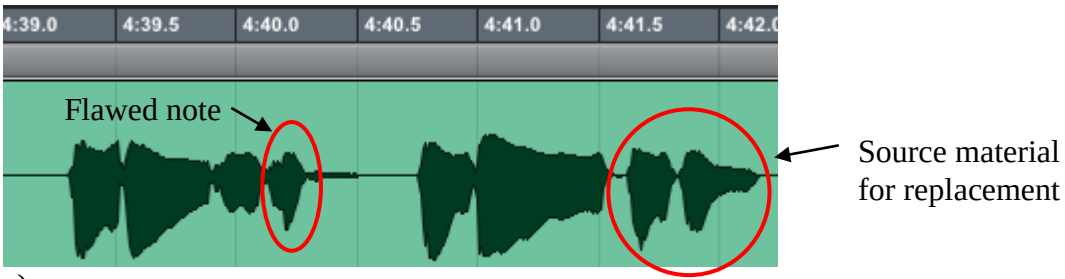
The score for "Broadway" started as one contiguous layer with individual waveforms for each instrument in the following order: bass, baritone sax (bari), trombone (bone), tenor, and trumpet (tpt). The piano and drums remained in the same order as they were for "It Don't Mean a Thing." Although there were very few obvious "errors," Bob, John, and I paid particular attention to the solos and the ensemble "hits" for pitch accuracy and rhythmic uniformity.[130] As we listened to the playback, John or I could ask Bob to stop if we thought there was a "less than ideal" note or phrase, and Bob, would of course, also stop the playback if he thought he heard something amiss. However, there were several occasions where John missed or chipped a note because, I thought, he was either fatigued or simply not as accurate as usual.[131]

The process for replacing a note was to find another with the same, or as close to the same, parameters of pitch, amplitude, and time. If the chipped note occurred in the melody section, there was a good chance of finding the same note, copying it, and then pasting the note in place of the chipped one. If not, we listened for other possible candidates. During take three of the recording, John had two such occurrences, one during his solo and one in the tag section of the out chorus.

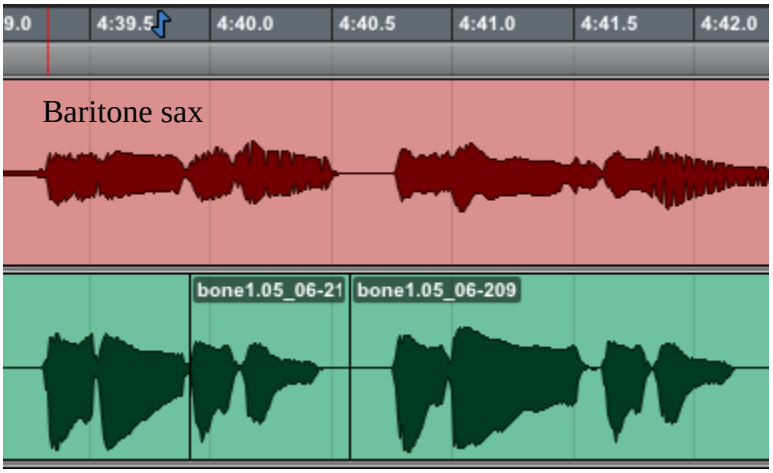
[130] A "hit" is a note, chord, series of notes ("hits"), or series of chords played *tutti*.

[131] A chipped note is jargon used to describe where one plays a very short higher or lower harmonic before the intended note. A "cracked" note is jargon used to describe falling off an established note, usually to a lower harmonic.

During the tag section, one note did not speak, but fortunately, it was during a sequential pattern, and therefore the same rhythmic structure was not an issue. Bob's process was to copy and paste the good sequence over the bad, align it to the baritone sax part, stretch the new audio to match the baritone sax length, and finally, pitch shift (Illustrations 5-13 and 5-14).

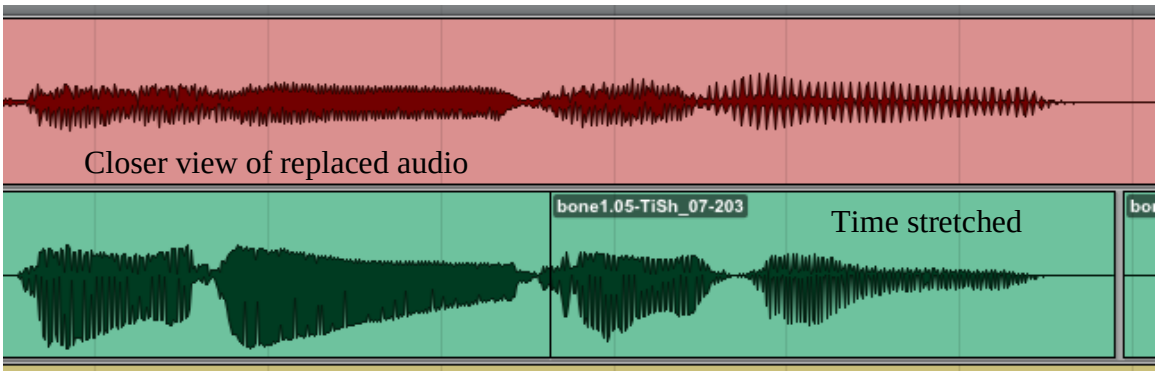


a)

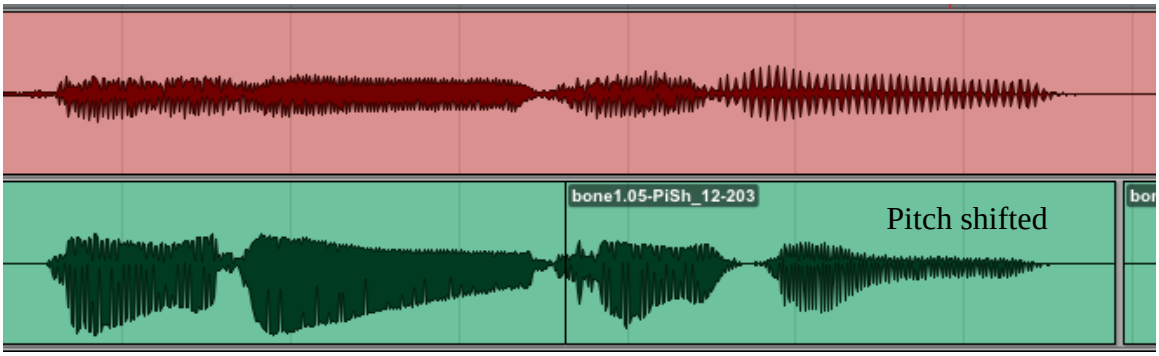


b)

Illustrations 5-13. (a) Identify source material and (b) copy and paste. Illustration b includes baritone sax waveform before time stretching and pitch shifting the trombone waveform as shown in Illustration 5-14a.



a)



b)

Illustration 5-14. (a) time stretch and (b) pitch shift. Time shift is notated on the region with the initials "TiSh" and pitch shift is "PiSh."

Throughout the selection process, we discussed the viability of each possibility as to whether there might be a better choice or a better fit, but in this case, we all agreed that the musical sequence of a semitone with the same rhythm was the best option. Each step of the process required us to listen for incongruities such as amplitude change, change of timbre, or mismatched attacks or releases. Our goal was to make this edit sound as if it was the original performance.

With that in mind, correcting the chipped note in John's solo was a little more difficult. Even though we had the option to re-record that one note, a search through the audio files was preferable because recreating the same note (pitch, articulation, timbre, and other subtleties imbedded in sound) out of context sometimes takes more time.

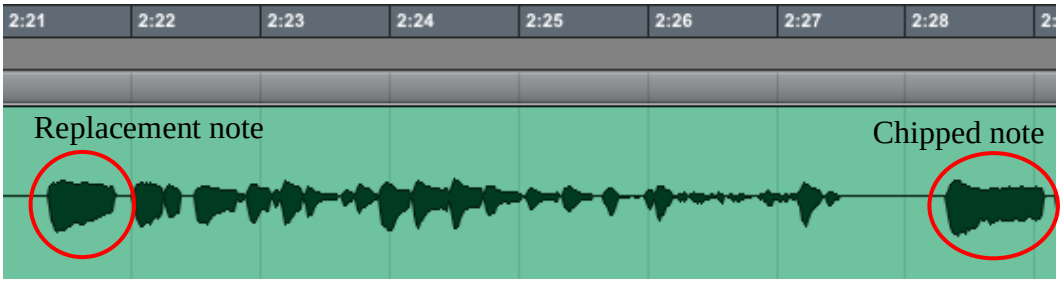
Working in our favor were factors such as note isolation and a note played several times during the multiple takes of "Broadway." Because the note we wanted to replace was in the solo, our replacement note had to come from one of John's three solos. We began listening to the third take and found several possibilities, none of which were exact matches. The first possible note choice was the same pitch, but we rejected it because it did not have the same timbre as the surrounding notes. The second choice was a minor third lower and shorter in duration. This note did not work because altering the pitch and stretching the time created a "grainy" quality.[132] Finally, we settled on a note John had played in the beginning of the previous phrase. This note was shorter in duration and a whole step above the cracked note (Illustration 5-15a-c).

There were no complications for this edit because Bob used the same techniques as in the previous example, but we did have a discussion on the length of the replacement note. I suggested to John that we should try to extend the length of the replacement note. I thought that extending it would be true to his original intent because the shorter note seemed "abrupt and cut off" (Illustration 5-15d). I asked Bob to stretch the source note to see if John would agree with my assessment. Bob stretched the note to a total length of 0.692 seconds, aligned it with the rhythm section, and started the playback at 2:21, which was the beginning of the new phrase. John said he liked the space between the fixed note and the continuation of his solo, but I then pointed out that someone might hear the repeated note, even though the new note was a different pitch. John was not concerned

[132] The descriptive term "grainy" is common to the jargon of engineers. The word describes the sound product after manipulating the selected audio region. "Grainy" may be described as raspy, rough, or ragged, but these are also subjective terms. The exact process of manipulation is dependent on the software's algorithm.

with that, even joking about "consistency," but Bob commented that nobody would notice. I did not press the point and let this be a performer decision.

Even though John did not choose to implement my suggestion in this case, time manipulation can aid in the accomplishment of several goals. Expanding or compressing a segment might make it fit more readily into a musical phrase, and moving individual parts in time can create the illusion of a well-rehearsed ensemble.



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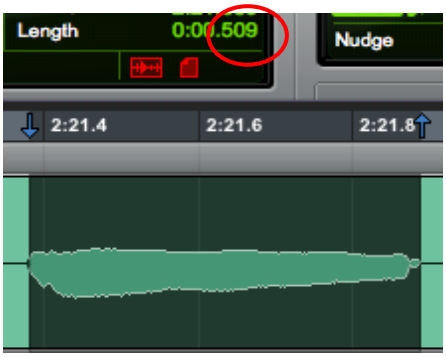

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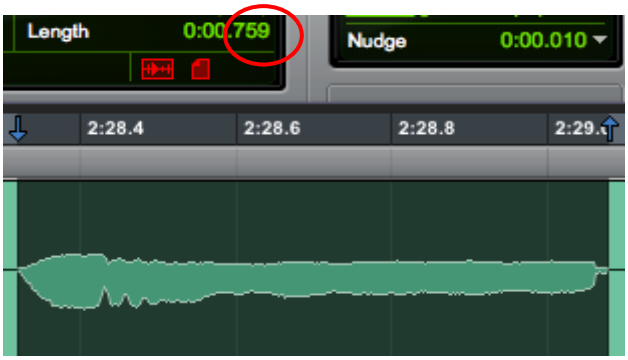

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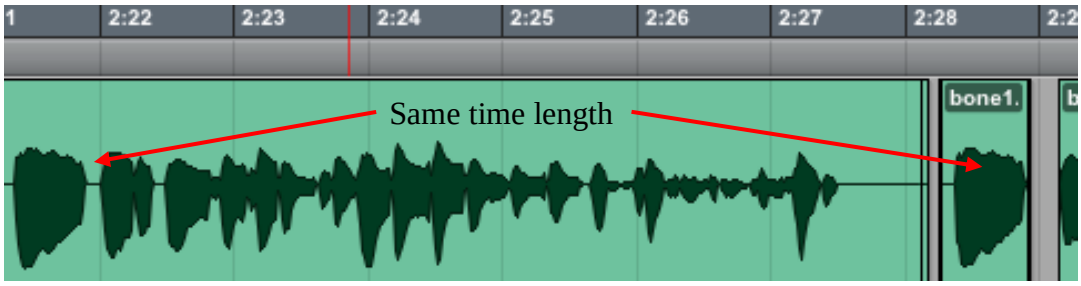


d)

Illustration 5-15. Replacement of the chipped note in John's solo on "Broadway." (a) Unedited track with notes circled, (b) length of source note in seconds, (c) length of chipped note in seconds, and (d) finished region.

Testing the Limits of Acceptability

I wanted to work on "Broadway" in the role of engineer. This would be advantageous for several reasons. First, and perhaps foremost, there would be no monetary expenditure because we would not have to pay for studio time. Second, I was more than qualified, both musically and technically, to do any work on the files, and I also had the necessary hardware and software to accomplish any editing tasks. Third, this would be an ideal time to discuss technical, musical, and decision-making processes with John and Leigh. It was important to me to be able to alter anything Leigh felt was not to her satisfaction without time constraints. Finally, I could spend as much time as necessary to focus on the smallest detail that might detract from the overall musical success of these tunes.

There is an axiom within the sphere of the recordist that more microphones means more problems. This might also be said of performers, because there can be differing interpretations of the descriptive writing on the music page. The lack of rehearsals before the recording session may create several problems that need to be fixed during the editing session. In an idiom such as jazz, where microtimings make-or-break a performance, one hopes that the proper placement of notes results in an exclamation of "that really swung."[133] In a large ensemble, differences between note placements create an impression of sloppiness, or as one of my jazz band directors called it, "buckshot through a harp" (Harbison 1988).

One of the differences between the studio processes of jazz and other musical genres is the click track. The main reason for this difference is that other genres might be

[133] See Berliner (1994) for various discussions of the aesthetic and technical features of swing. Also, see Keil and Feld (1994) for dialogues on music grooves.

created in pieces, that is, first the rhythm section plays, then the instrumentalists, and finally a soloist or vocalist. This recording process might be spread over days, weeks, or even longer, and a click track ensures an even time through the entire tune. Jazz recording, however, depends on interaction between performers, creating a constant push-pull; therefore, the beats per minute might shift up or down "Recording with a click track is like trying to drive a truck with the parking brake on" (Jensen 2008).[134]

Because John and I had discussed my working on the tracks, I felt there was no conflict with changing hats from producer to engineer. In fact, when I was altering the tracks, I still wore the producer hat because I had the integrity of the music as my goal. I would not alter the tracks to the point where they were "unmusical." My first task was to align the rhythm section "hits" in the shout chorus (Illustration 5-16).

[134] This is an oversimplification of both this process and the other reasons to use a click track, but the point is that playing separately requires a constant time base, but playing together allows a more fluid tempo.

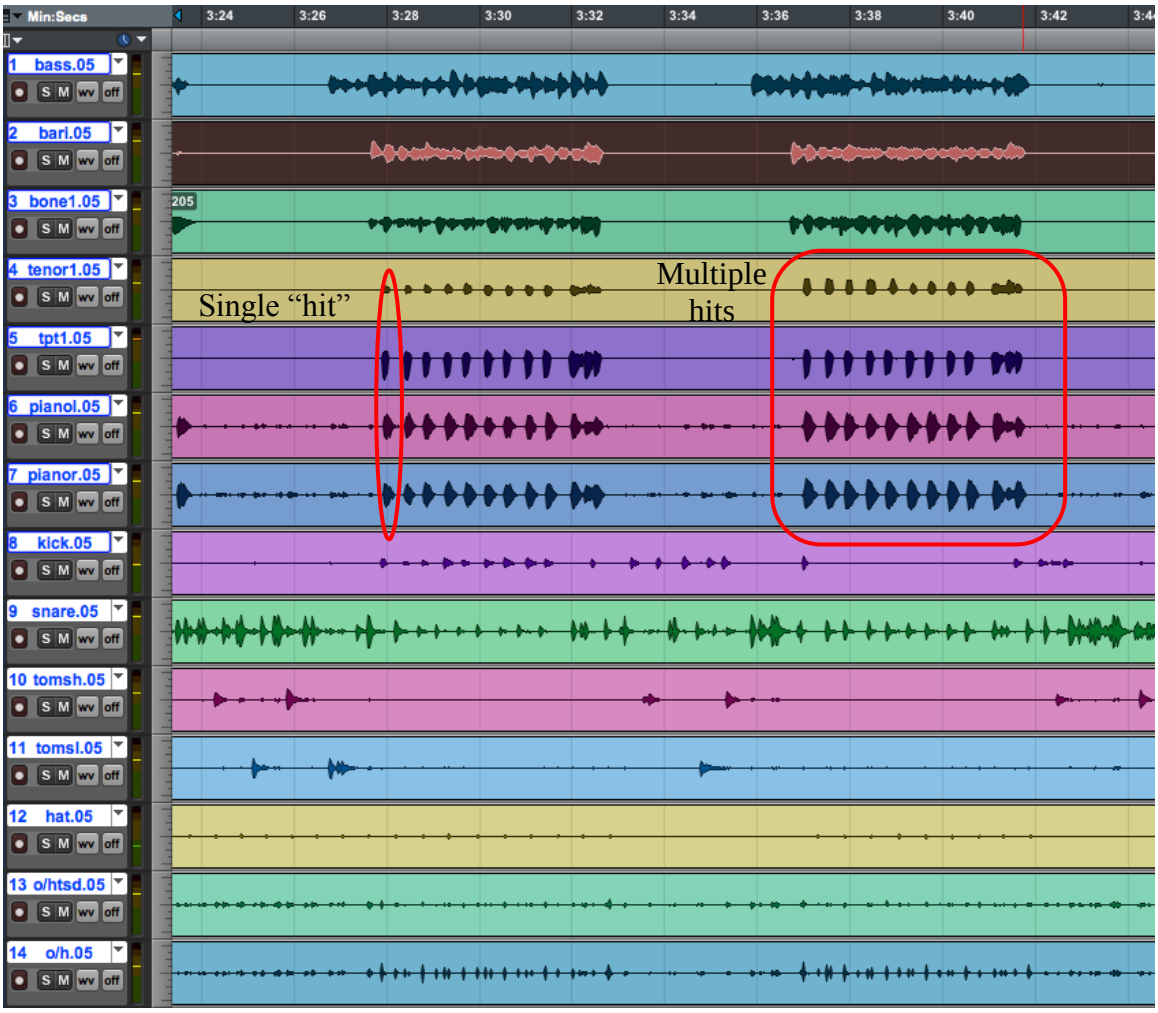
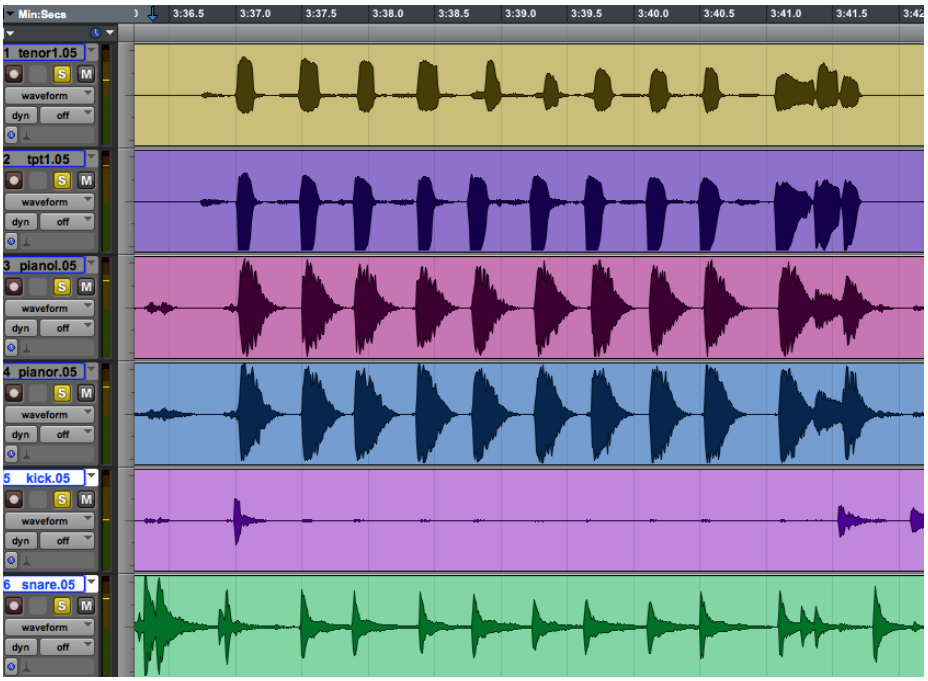


Illustration 5-16. Overview of everyone during a portion of the shout chorus with "hits." Baritone sax and trombone are playing a melodic line, not hits. Tenor, trumpet, piano, and drums play the rhythmic hits.

At first, the hits seem accurate, and if this were a live performance, the listener would probably not disapprove. However, upon closer visual inspection or repeated listening, one can both see and hear the differences in entrances and measure the time differential (Illustrations 5-17 and 5-18).



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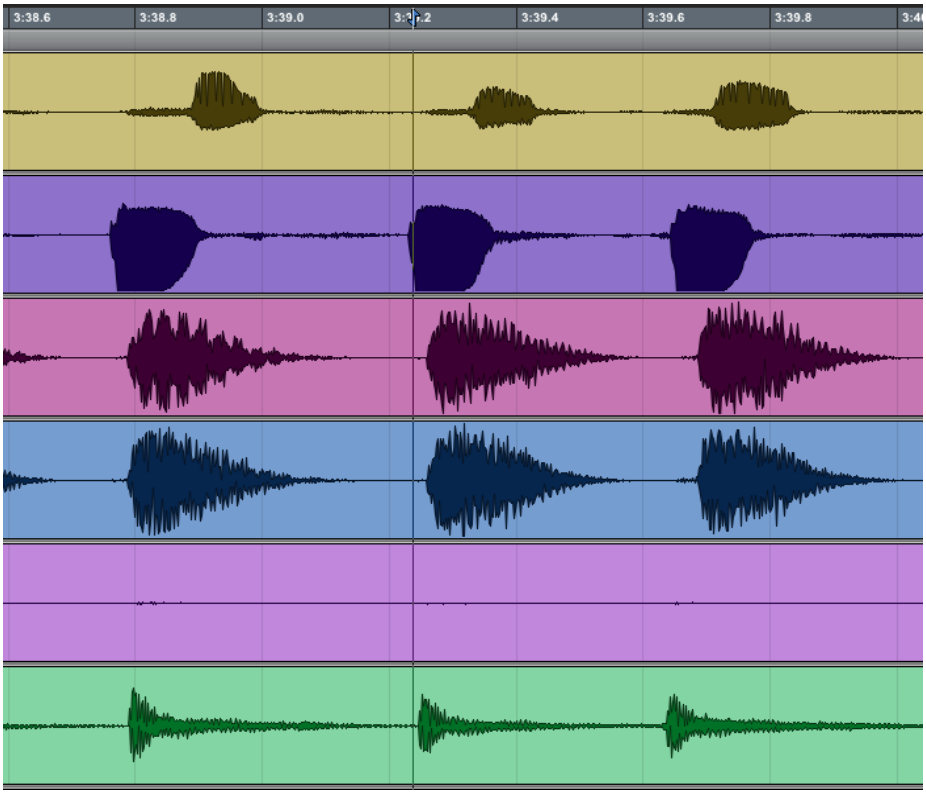
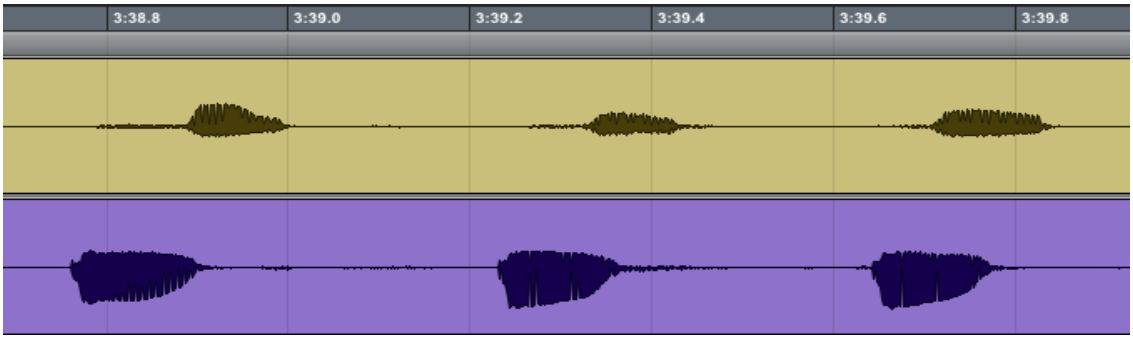


b)

Illustration 5-17. (a) Time discrepancies between the entrances of the tenor, trumpet, piano, and drums. (b) Closer view of time differences with vertical reference line.



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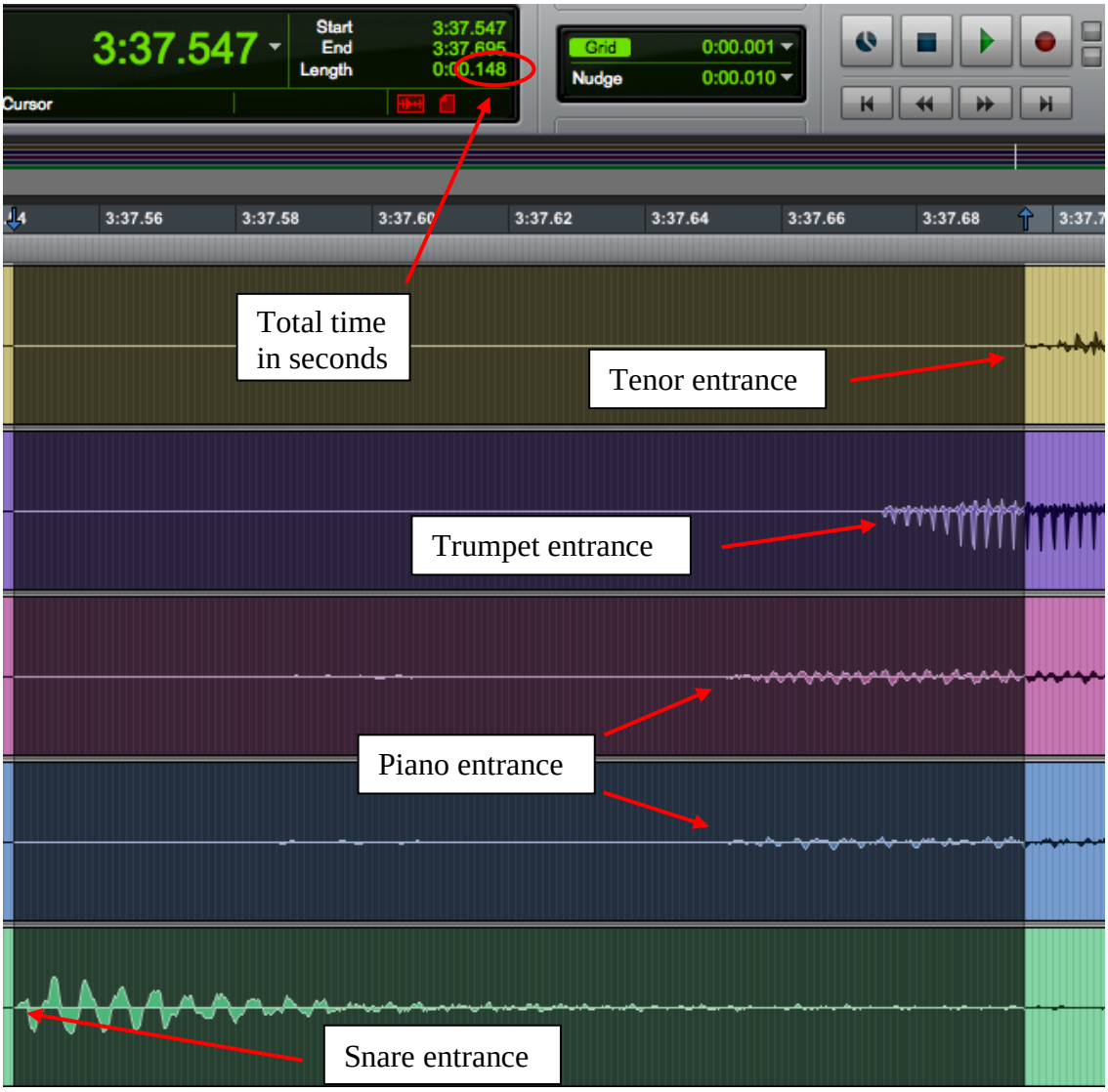

b)

Illustration 5-18. (a) Time discrepancies between tenor and trumpet. (b) Measurement of the time differential between the first entrance (snare), and the last (tenor) in the darker area.

As I began to time-align the individual instruments, I thought about how close these entrances should be to each other and about my usual process for genres other than jazz. Outside the jazz idiom, clients usually want precision, so when moving the individual regions for vertical alignment, I use the click track as my reference; therefore, I move the parts to align vertically as closely as possible to the click. "As close as possible" is an interesting concept in the digital realm because I use a sample rate of 96,000 samples per second and can, in theory, place every entrance within 96,000th of a second. While technically possible, it is ridiculous to force that kind of precision on a human system that can, at best, distinguish separate events only in the fifteen to twenty millisecond range.[135]

I chose to experiment with the limits of recognizing distinct events and the acceptability of that level of precision in the jazz idiom. My hypothesis was, the closer the simultaneous event, the better the ensemble sound, or to use a phrase from the jazz jargon, "the tighter it will sound, and the harder it will swing." I chose to place each attack no more than ten milliseconds from the first entrance to the last because that was below the fifteen millisecond threshold of hearing but still offered some possibility of perceiving different entrances. I began by placing the aforementioned instruments in a near-perfect vertical alignment, using the snare drum as the key position and altering which instrument came in first for each "hit" (Illustration 5-19).

In non-experimental circumstances, I might not have altered so many of the piano positions in relation to the snare attacks and altered just one snare attack because I thought it was early and the piano was correct. The tenor and trumpet were outside my

[135] Twenty milliseconds equates to 1920 samples.

tolerance for attacks and releases that were supposed to be near-simultaneous events. What added to the time differential between the tenor and trumpet was the slow-starting reed vibration on the tenor part (Illustration 5-19b, the smaller waveform before the larger).

Illustration 5-19. All entrances starting within ten milliseconds (with time length circled). All waveforms are magnified to show the entrance point.

After finishing the alignments, I listened to them, first as a unit of tenor, trumpet, piano, kick, and snare and then with all the instruments together. I was surprised how

accurate the ensemble sounded; in fact, it sounded too good. Having played in jazz ensembles for twenty years, I know there are times when the group has "locked in,"[136] but there are always small differences in timing and placement between each individual. So to have twenty-four, for all practical purposes, perfect placements, sounded wrong. It is not likely that an ensemble, even one that has performed together for years, to place every attack with psychoacoustically perfect timing, but before I reset the positions, I wanted John to hear the results.

John came over the next day to hear the alterations to Leigh's solo, his solo, and the rhythmic "hits." Leigh and I had discussed her solo. I told John that we had worked on several parts, and had she said she was happy with my work but was disappointed in the overall content of her solo, even though I told her how creative it was. John then also expressed some dissatisfaction with his own performance but was willing to accept the final product because our only other option was to go back and re-record their solos.

As the "hits" in the shout chorus went by, I hoped for an immediate reaction or exclamation of approval or disapproval, but John just sat there with a quizzical look on his face. Because I had not told him what to expect, he did not have an answer at the ready. John sat back, and I could tell he was thinking of a response. John, being a kind and considerate person, would probably not use the words "terrible" or "awful"; he would probably use humor as he did throughout the recording process. I surmised that he did not like the result but was afraid to say anything negative, because I had spent time fixing these "hits," and he thought that I liked the result. Finally, when I told him I did not like

[136] "Locked in" is a term in the jazz jargon, and I consider it to have the same meaning as "performing as one." This does not mean everyone is at the exact same place at the exact same time, but there is a consistency of time and phrasing. For examples, see Berliner (1994) under the topics of "Timing" and "Groove."

the results and that this was an experiment, a smile and a look of relief replaced the concerned and quizzical one on his face. I wanted to know what he did not like. In his explanation, he used words and phrases like "mechanical," "…lined up to a click [track]," and best of all, "It sounds like all the human was taken out" (Jensen 2007).

I wiped out all the timing edits of the "hits" so John and I could listen and make timing edits that would give the impression of a rehearsed group, but not so radical as to "remove the human." We spent the next fifteen minutes moving the various parts around and although John was only concerned with the sonic result, I noted the differences in timing, which averaged around forty milliseconds from first entrance to last. We also used the bass part to compare the drums and piano to see if there was a consensus of time between those in the rhythm section. John and I chose a consistent time differential between the bass, piano, and drums, which resulted in little change in the rhythm section.

John and I then looked at the timing differences between his part and Leigh's. They had the melody line when the tenor, trumpet, piano, and drums had "hits," and minor adjustments were needed. I had already altered their parts using John's part as the guide, making small adjustments to Leigh's part where necessary. For these two parts, it was not that John was always "correct" but that John and Leigh should sound as if they had the same concept of time derived from pre-recording rehearsals and discussions. Altering one part instead of both made the process straightforward and uncomplicated.

John and I finished listening to "Broadway" and then listened to the rest of the adjustments I had made. For each tune, John and I decided if there were any issues and how much adjustment was necessary. We continued our discussions and corrections while ensuring that the "human" was evident, but not too obvious.

Mixing

The mixing process is the final part of this recording session.[137] This is the phase where we "build" the ensemble and place it in an appropriate venue. Consequently, the only issue is perception: perception of placement and space. The perception of placement involves several factors, including front-to-back amplitude placement, left-to-right stereo placement, and the consistency of instruments in the acoustic soundfield, both within the tune and from tune to tune.[138] Perception of space, while conceptually simple, can be the source of confusion and overwhelming choices. The simple question of "In what kind of room would you like to play?" leads to "What do you have?"

Change in front-to-back amplitude alters the perception of distance, that is, how far away any individual performer is; louder seems closer, and softer seems further away. For this recording session, the performers knew how to play at a consistent distance, so there were no problems with movement around the microphone, which could have caused amplitude changes. Evenness of perceived distance can be accomplished in two ways. The first is to change the amplitude as necessary. However, this might override the performer's desired dynamic movement, so the second choice is to use a dynamic compressor to smooth large swings of amplitude.

The amplitude relationship is of greater concern when two or more performers need to occupy the same front-to-back space, that is, when the left-to-right placement, or panning, is important. Besides the rhythm section, John had several other performers in

[137] Mastering a recording may be a separate process, but for this recording, the mastering was included as part of the software processing during the mixing. See "Mastering" in the Glossary.

[138] This is expanded to front, left, right, and back (FLRB) for surround recording. This front/back is a separate topic from the amplitude front-to-back.

various tunes, and the perceived distance from each other was a topic for discussion. With each additional performer, there was a need to create a perceived "space." Therefore, the left-to-right placement was different when John was alone with the rhythm section; with either Bruce, Chris Battistone, or Leigh; or with John, Leigh, Chris, and Bruce. Throughout the mixing process, it was my intent to keep John in the same relative space, either center-to-left or center-to-right because he was to be the named performer on the disk jacket and should be centered as much as possible.

John and I discussed the placement of the rhythm section because there were several acceptable configurations. From the audience view, one such configuration has the piano on the right side, the bass in the middle, and the drums on the left side. Some bassists prefer that configuration in live performance, "Because I like to lock-in with the high hat, but I've also played in trios where that's reversed. I also like [that configuration] because of the way the piano [lid] opens and I can hear both [high hat and piano]. Either is fine because we're supposed to be playing sensitively enough to hear each other anyway" (Kosky). One problem with this configuration is that the piano player's back is usually toward the audience, and the lid opens toward the right. Therefore, if one placed the piano on the right, the sound is directed *away* from the other performers. A second problem is that the left microphone (Illustration 4-3) captures the lower strings, making the piano sound "backward."

Bob created a rough placement during the recording process that was our starting point. John and I both have experience recording with the piano on either the left or the right side. John did not state a preference, but I tend to favor piano on the left because most of my live performance work was in the big band setting where the rhythm section

was on the left side (audience perspective). Because John did not state a preference, I chose to have the piano *mostly* on the left, the bass in the middle, and the drums spread across the entire stereo field. The individual drums required placement in the stereo field, and I placed them in the audience perspective. Difficulties arise in drum panning because first, you do not want the drummer to sound as if he has an eight-foot reach, and second, many of the drum components might aurally line up with each other but require their own acoustic space. From the audience perspective (Illustration 4-4), many engineers place the kick drum and snare drum in the middle, even though they do not actually align. The high tom and high hat are toward the right side, while the low tom is toward the left. The two ride cymbals occupy the far-left and far-right of the drum set, and therefore will coincide to the far left and right of the drum panning. As stated before, there are seven microphones, one each on the kick, snare, hi-hat, high and low tom, and two overheads, which pick up the overall drum sound and specifically the cymbals.

My next discussion with John concerned the perceived placement of each performer. John had not thought about the concept of placement and found it interesting to switch listening positions between his placement as a performer and as an audience member. After a discussion on the differences between audience perspective and performer perspective, I asked him if he had any preferences. John stated that he could think of several configurations that would work, but I wanted to eliminate some of the possibilities. I told him he should be centered or as close to center as allowable because he was the leader and the named performer. My first suggestion was that with one other performer, either tenor or trumpet, he stand on the right side with the other performer on the left. John rejected this suggestion because he wanted to hear the other horn player, so

he wanted to stand on the left. I had not considered this placement in any of my previous recordings and now began to think of the physical impediments of all performers. Because of the structure of the trombone and common performance practice, a trombonist's left ear is partially blocked by the instrument. To recreate a performance configuration, John needed to be placed on *his* left-side of center. I had not asked his perspective when I asked the question, and John had assumed that I was speaking of the performer perspective, while I had assumed the audience perspective. After I realized this, I told John that we agreed on his position but were looking at it from different viewpoints. I confirmed the perspective as the audience's perspective before I set the pans so John would sound as if he were slightly right of center.

To be consistent, John's position would always be right of center except when the group was a quartet, when he would appear centered. For the septet, we discussed the possibilities of where to place the tenor, baritone sax, and trumpet. Again, we discussed several acceptable configurations such as, looking from left-to-right (audience perspective), baritone sax, tenor, trombone, trumpet, or trumpet, tenor, trombone, baritone sax, as well as other possibilities. We wanted the trumpet, which usually had the melody line, toward the center and with as much separation as possible between the baritone sax and trombone because their lower range made them more difficult to distinguish. We decided on baritone sax, trumpet, trombone, and tenor sax as our final configuration (Illustration 5-20).

Illustration 5-20. Final pan position of the horns on "Broadway."

Adding Dynamic Processors

Because Bob had recorded many jazz LPs and CDs, he understood that the use of processors should be kept to a minimum. For each tune, Bob placed a compressor plug-in only when necessary, such as in "Broadway" when John's attack was not the same as Leigh's. This is not to say that John's attack was unmusical or inappropriate, only that it was stronger; so to create matching attacks, as one would hear from a rehearsed ensemble, Bob set the compressor plug-in to activate and shape John's note to resemble Leigh's without the plug-in itself being heard.[139]

[139] See "Compressor" in the Glossary.

Bob did use compression on the bass track during the recording process, partially for safety to prevent any digital overloads and partially for his sonic preference because he had used the compressor on the API console. Although he had not said so, Bob demonstrated that he did not want to hear the processor. One might call the settings he used "gentle" because of the low compression ratio and the high threshold, and so it was not obvious to the listener.

Bob also used the EQ on the API console, but as stated in Chapter 4, this was only on the overhead microphones on drums during the recording process. Because Bob altered the sonic characteristics during the recording, there was no need to add any more EQ to any part.

Finishing the Mix

For this recording, the last part of the process involved the imagined space and any desired adjustments to the overall level and sonic spectrum. As previously mentioned, there were too many possibilities for us to go through each one. Therefore, our discussions centered around those choices where one might find a small jazz group such as clubs and other smaller, intimate venues.

Through my discussions with John, I already knew most of the locations where he had played, and because I had also been to most of those spots, I was familiar with their acoustic tendencies. As a performer, John wanted to hear everyone equally. He felt the same as an audience member, stating a preference for a seat close to the group. He, like most people familiar with jazz, did not want to hear the amplified group sound from

sound reinforcement, but rather the acoustic sound.[140] The sonic characteristics of John's preferred room suggested a small to medium-sized room that seats between 50 to 125 people. Because I knew John would like to play in a famous venue, I asked Bob to see what jazz clubs the software had. I suggested he look for "The Blue Note" or "Birdland" as possible choices. John and I selected "Birdland," and Bob chose to take some of the high-end frequency out (Illustration 5-21). At the time, I accepted his choice because I did not want to spend a lot of time fine-tuning the room sound. Assuming the largest of these rooms with a full house and John sitting approximately fifteen to twenty feet from the stage, I estimated the desired reverberation time for our imagined room to be between 0.7 and 1.25 seconds.[141] When I decided on the decay time for reverberation, I did not look at the numbers because that might have influenced my decision. For this recording, I could just listen and ask Bob for a longer or shorter decay time. If I was unsure of the decay, Bob had the ability to solo the reverberation, thus allowing me to hear the length of time and quality of the decay (see Illustration 5-22, channel 17 labeled "club").[142]

[140] While most bass players use an amplifier in a small group situation, for the purposes of this discussion, I included the bass player with other acoustic instruments. The sound of the bassist's amplifier is a point of discussion and sometimes contention among jazz performers and, in particular, other bassists. The category of "acoustic" applies to electric guitars as well.

[141] I base this guess on my experience with rooms and room emulators as a recording engineer and a live sound engineer, as well as on my understanding of the decay times of small, medium, and large spaces. See Dickreiter (1989), 24 or Berg and Stork (1995), 221 for an illustration of favorable reverberation times for various rooms. The decay time estimate is *not* the full decay time, only the point at which the level has dropped by 60 dB. Reverberation time is a separate parameter from reverberation level.

[142] Soloing allows one to hear just the selected material by itself. One has the ability to manipulate many of the parameters of the room reverberation such as decay time, room size, and overall room sound with EQ.

Illustration 5-21. Preliminary settings for the room emulator. Note the high-end damping.

Bob set Pro Tools to "automate" the mix, which meant that the computer would record the movement of the virtual faders in order to recreate the starting, stopping, and speed of the fader movement. When asked about his philosophy of mixing, Bob answered in the vein of, "I like what I like, and I mix as I would like to hear it" (Dawson). As we proceeded to listen, John would state that he wanted more of one instrument or less of another, and Bob would make the necessary adjustments. John and I discussed the relative balance between him and the rhythm section or between other performers, him, and the rhythm section. This process was amicable because John and I had the same concept of performer balance. One should be able to shift listening focus between the individual performer or instrument and the ensemble without distraction.

After an adjustment to the level was made, Bob would replay that section to confirm his adjustments to the dynamic level. If John or I did not like the adjustment, either because it was too much or not enough, Bob would replay that section and fine-tune the adjustment while updating the automation data on that pass.

Having finished the process of recording, editing, and mixing both of these tunes, one might want to take the time to consider if this process adds value to the product as compared to a "live" recording. We have created a polished recording by removing the ensemble and musical product from its intended purpose and venue, then reconstructed it. In Chapter 4, the recording part of the process, technology interfered with productivity, physical difficulties as well as separating the ensemble led to mistakes, and some personalities were not in accord. However, none of these difficulties stopped the process. Overdubs and editing allowed errors to be fixed. In Chapter 5, the selection of material from one take was used to "fix" another, and individual notes were altered, either through pitch, time, or pitch-and-time manipulation to conform to the performer's intent, producer's preference, or both. Finally, the individual tracks came together in the mix process to a preselected position, then placed in a virtual room in order to create an idealized, and hopefully, culturally acceptable product for the audience—the consumer of jazz recordings.

Illustration 5-22. Final pan settings and starting mix position for “Broadway.

CHAPTER 6

AN OVERDUB BEFORE CONCLUDING

Sometimes expectations are not met and, where things should conclude, they do not. In Chapters 4 and 5, I presented the processes, discussions, and resolutions during the recording, the editing, and the mixing process, and during that time, two events seemed unresolved. First was the difficulty John was having with the physical aspects of his performance, and second were the interactions between Bob and me. After finishing the recording, editing, and mixing, one could have considered the process complete, but in the recording studio, it is still possible to revise and redo. In audio, if this were a single tune, this would be an overdub in the sense that one would keep the basic material but alter one portion by replacing old acoustic information with new material. At the end of the process with Bob, there should have been enough tunes to fill one CD, but because of events in and out of John's and my control, there were not enough that were acceptable. With some of the tunes, performers were not happy with their efforts, while with others, the amount of work to repair all the small inadequacies would have required too much time and effort. Finally, there was John and a situation out of his control.

John and I discussed all of these problems. With some of the tunes, we decided to respect the performers' wishes and not release them. Because John was the leader and still active in this process, returning to the studio and having him replay parts was still an option, but I did not want to work with Bob anymore. I still considered Bob a top engineer—his technical skills excel, and even without a formal education, he has a good understanding of jazz, or at least its generally accepted musical characteristics.

However, in the recording studio, technical ability and understanding of musical characteristics is not sufficient.

At the end of Chapter 4, I stated that I would talk to John about certain events other than his performance difficulties throughout the recording, editing, and mixing process.[143] He and I discussed the situation and options because I felt I was not communicating or working efficiently or productively with Bob. I presented John with a few reasonable options. I could resign my position as producer and allow John to hire someone else or work without a producer, but I would still document the process. If a new producer were hired, he or she would need to review everything accomplished up to this point and accept or reject each finished product. The other possibility for the producer replacement was for John to assume the producer role. This, of course would make John's dual role of performer-producer difficult because he would have to make critical assessments of performance, which would distract him and split his focus. John did not want anything interfering with his concentration during his musical creative process and rejected both of those options. Because John likes to work at Bias Studios and his staying there has maintained a consistent sonic product, the only reasonable alternative was to switch engineers.

I was very concerned with the appearance of dismissing Bob in favor of Jim, but John stated, "It's important how the three of us work together" (Jensen). From this point forward, John and I worked with Jim Robeson, the other owner-engineer at Bias Studios. Although Jim's procedures were similar to Bob's, he had a different method of

[143] Divisions of the Chapters between recording, editing, and mixing are for convenience. As previously stated, editing occurs during the recording portion, and adjusting the mix is a continuous process.

creating the internal routing of Pro Tools. Because it was as if we were starting over, I made most of the technical decisions. I chose to continue to route the signal from the studio through the API, the Ampex tape machine, to the digital converters of the Pro Tools system, but this time, I set up a template that would provide consistency from mix-to-mix. With this method, I could continue to mix any session while either at home or at John's house and still utilize the full capabilities of the analog equipment when we returned to Bias.

John and I had listened, discussed, and assessed the result from each mix and decided we had five acceptable selections: "Broadway," "Good Queen Bess," "It Don't Mean a Thing," "Junction," and "Thaddish." There were two possible additions that might need extra work: "Come Rain or Come Shine" and "Fit as a Fiddle." This left four that were not usable in their current form: "Baubles, Bangles, and Beads," "Cherokee," "Strange," and "Nina Never Knew." During our initial meeting, I told John that we would need about sixty-five minutes worth of music, but with five acceptable and two possible tunes, we needed to go back into the studio and record new material.

With the major conflict settled and the selection of acceptable tunes for the CD completed, we still had one issue left to resolve, John's uncharacteristically weak and inaccurate performance. While we were together, listening and discussing the relative merits of each tune, John disclosed the reason he was having difficulties.

> For a couple of years I had occasionally dealt with a sudden and unexpected lack of embouchure control when playing the horn. Missed notes, unclear articulations, a wavering unsteady sound, and sudden weakness. Gradually these happenings were becoming more frequent.
>
> I attributed the phenomenon to the aging process or to subtle changes in my approach to the horn and worked harder. I examined my

> practice regimen and reworked it. I developed very careful routines regarding diet, rest, mental, and physical preparation prior to a job, but to my chagrin, I was ambushed by the same demon during the first two days of this recording session. I was puzzled, to say the least.
>
> It wasn't until many months later while undergoing a routine physical examination that my doctor detected symptoms indicating a common condition that was the culprit. The cause of my chop problem was in fact a physical ailment that could be treated. I'm now playing better than I ever have thanks to a good doctor and effective treatment (Jensen 2008).

Recording with Jim Robeson

It was now almost three months later than the first recording session with Bob, and having to go back into the studio was not part of the original plan. Besides the need to record about six new tunes, both John and Leigh expressed dissatisfaction with their individual solos in "Broadway." This dissatisfaction was not a result of any alterations, but both felt their solos did not represent what they considered their usual product. On this matter, I did not want to disagree. While their performances were both technically and musically sufficient and I did not hear anything awkward or problematic, I wanted both of them to have a product that represented the best of their improvisational skills and not something constructed to represent their best ideas.

Jim works in studio "B" most of the time, and this is where we replaced the solos on "Broadway." The only significant difference between studio A and studio B was the size and shape of the room, but we needed to match the sonic characteristics from studio "A" with the microphones we used in the previous recording sessions with Bob: a Neumann U87 for John and a Neumann U47 for Leigh. Jim and I listened to John and Leigh play and decided that the sonic differences were too noticeable. Even using the same microphones, differences between the rooms' acoustic properties, the

way they played (or a combination of both), and the sound differences between this recording and the previous one were too great. As a result, Jim applied EQ from the API channel strip to match their sound from the recording session with Bob.[144]

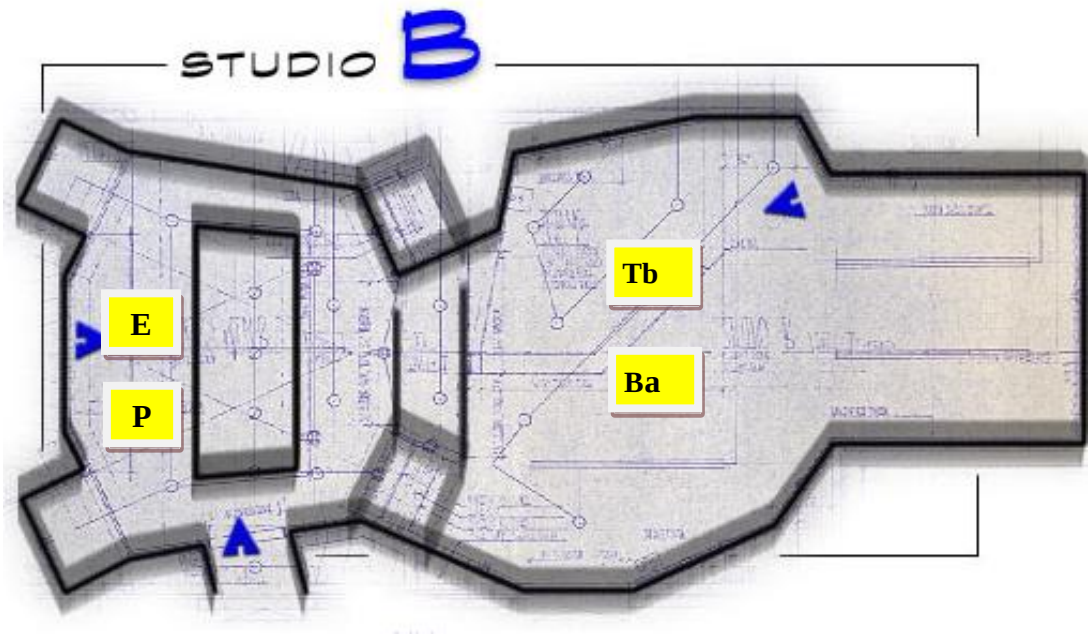

Illustration 34. Bias Studio, room "B."
Tb, Trombone, John Jensen; **Ba**, Baritone sax, Leigh Pilzer; **E**, Engineer, Jim Robeson; **P**, Producer, author.

While Jim and I discussed the EQ for both John and Leigh, they discussed the solo form of this AABA tune. John wanted to change the solos where each of them played two choruses. He wanted them to play one chorus each, trading eights for the second chorus, trading fours for the AAB section on the last chorus, and finally playing together on the last A. This conflicted with the original arrangement. During the second chorus, Leigh had written background figures during the second time through

[144] This event is a prime example of the need for specialized ear training for the engineer. Both Jim and I needed to find the center frequency, bandwidth, and the amount of frequency-specific amplification. Jim had gained this knowledge from twenty-five years in the recording industry. See "EQ" in the Glossary for further details.

both solos, but with this new suggested solo format, the background figures would sound out of place. Leigh thought it might be worth a try, so Jim muted the background figures behind the solos in the original arrangement, using the same method as explained for "It Don't Mean a Thing."

During the first attempt with the new solo format, John began, and the others followed the form as discussed. There were no problems, but the performers did not think their solos were outstanding, so we tried again. After a few false starts, we got a second complete take, but again, everyone felt it could be better. John suggested that Leigh start this time because altering the solo order might "be worth a try" (Jensen 2007).

With Leigh starting, the solos did have a different characteristic. To me, they both seemed to feed into each other ideas, resulting in more interplay, an obvious marker of jazz improvisation. I also began to hear musical and structural ideas recurring in both performers. On the fourth attempt, there was an obvious excitement in both of their performances because, during the trading section beginning on the third chorus, the boundaries between the exchanges became less evident. Each was extending into the other's "eight-bar" phrases until they both were playing simultaneously, but a full chorus ahead of where they had planned.

We immediately tried another run-through. Leigh, then John, played a full chorus and, on the third chorus, began to trade eights but employed musical ideas from some of the previous attempts. This time they both played together by the last chorus. This take had everything I wanted in an improvisational solo section: creativity of musical ideas, interplay with the other performer, excitement, drive, momentum, and

musical shape. There were a few imperfections, but this take was the best so far. John and Leigh made three more attempts, but none as good as the fifth complete take.

Having worked with both John and Leigh on their previous solos, I knew they preferred to keep their solos intact, but I asked them if they wanted to fix anything. Of particular interest was one note of John's where the attack was not as clean as he might have wanted. John decided to keep the solo "as is" because this represented an accurate portrayal of his playing at that point in time. I would have fixed this single note, but instead of trying to convince John that fixing the note was best for the musical product, I let this correction be performer-driven.[145]

After finishing the solos for "Broadway," John, Jim, and I discussed when to come back to record more tunes for this CD. John wanted to wait a few months because he said he wanted to prepare, but looking back, I surmised that John wanted to wait a little longer for his health to stabilize and not affect the recording sessions. We booked a day in mid-December to return and record more tunes.

John expressed his frustrations with the first two days of recording:

> There are things that I would not do the same way again and I would be prepared in a different and more consistent way. I regret that I didn't go in there with a working group…what I should have done… is get together over the period of several months…whether we do it…at a restaurant or my house, but we play together until we become a cohesive unit.

For our December recording, John chose to record with Robert Redd on piano, Tommy Cecil on bass, and Brooks Tegler on drums. The performers in this rhythm section may seem familiar, because it is the trio that has played together for more than

[145] The idea of performer-driven alterations is explored in the conclusions below.

twenty years, some of that time at the Inn at Glen Echo mentioned at the beginning of Chapter 4.

> Tommy [Cecil], Robert, and I have worked together many, many times…I've worked with those two more than any other rhythm section in town and usually with Brooks…and we know how each other plays and we can go in and just play tunes (Jensen 2008).

"Go[ing] in and just playing tunes" was part of John's original concept, and now with this rhythm section he could. However, John made other changes regarding studio performance. Although John was comfortable playing with this rhythm section, this time he rehearsed some of the tunes at his house. "It was difficult getting everyone together, but we found some free time" (Jensen 2008). John did not formalize a list of tunes, but did rehearse five tunes he wanted to play: "A Pretty Girl is Like a Melody," "I'm Putting All my Eggs in One Basket," "Everything I Love," "Purple Gazelle" (also known as "Angelica"), and an original tune, "Happy Sam."

There were a few small differences in the recording and protocols between Jim and Bob. We recorded the quartet in studio A, so the routing and studio equipment was the same. Jim, however, used a DI in addition to a microphone on the bass. The other difference between the first sessions and this was the drums. Because Brooks played a larger drum set than Tommy Williams, that is, the kick drum and low tom were physically larger and the cymbal sizes were different, the acoustic product was different. Jim, however, did not alter any microphone technique to compensate for this difference. I found it desirable that different performers have different sounds.

During the recording session, John also asked for the other performers' input and added "I've Got it Bad (and that ain't Good)," "Sweet Georgia Brown," and "Swingin' the Blues." This session met my expectations on several levels. First, each

tune was recorded, with any necessary overdubs, in an hour or less. It was evident that there was musical communication by the melodic, harmonic, and rhythmic fragments being traded. Finally, Jim was all business. Of these eight tunes, only one had difficulties. Toward the end of the day, John thought he needed another ballad, but when he played "I've Got it Bad," even though the rhythm section played well, his fatigue prevented a successful rendition.

Now that we were finished recording and editing with Jim, I wanted to create a perspective and processor template. I wanted to save time and created a template that started each mix with the same audience perspective and the same acoustic sound. The only change was moving John to the appropriate virtual position instead of resetting everyone else. Several weeks later, Jim and I discussed the parameters for the template and my desire to use the sonic characteristics of the analog equipment. I had expressed my desire to route the signal through the API because I preferred the sound of the analog equipment. During our discussion of sonic preferences, Jim told me of a pseudo "blindfold test" comparing "mixing in the box" with mixing on the API.[146] He stated that the listeners split on which sounded better; Bob and Jim thought the result was better through the API, and the two guests, both in their late twenties, thought routing through the Pro Tools software sounded better. Although it was non-scientific, I found this demonstration interesting because their preferences seemed to follow age

[146] It is common for engineers to compare the sonic characteristics of studio equipment in "blindfold tests," but because these are not scientific, they are, at best, opinions. "Mixing in the box" means using the internal routing and processing from the software and computer hardware.

categories, and I wondered if their sonic preferences coincided with the availability of analog equipment or with their individual mixing preferences.[147]

I told Jim that John and I would first mix all the tunes using my hardware and software, then come in and use the studio's hardware and software because there was a better selection of what I felt were sonically superior plug-ins as well as the API analog mixing desk. I told Jim that all the mixes would be automated, so if any minor adjustments were needed, we could make those changes and update the automation data.[148] Jim agreed to this, but I also asked him if there would be any difficulties with finishing all twelve of our tunes in one day. We agreed this was possible because we would be listening for the final time, adding the virtual room, and bouncing the tune to a stereo track. However, we would need to be efficient to finish everything in one day.[149]

Conclusion

When I finished other graduate research projects, my mentor always asked, "What did you learn?" and "How does this add to the pool of knowledge in Ethnomusicology"? To answer those questions for this dissertation, I must return to the rhetorical questions I posed in Chapter 1.

In this dissertation, several topics are discussed that add to the general knowledge base of ethnomusicology in general and specifically provide insight to the recording processes and methods of constructing culturally acceptable jazz recordings.

[147] See "Areas for Future Research" later in this chapter.

[148] Automation data contains information primarily about level, level change, and speed of level change, but can be programmed to effect mutes, pans, and parameters within processor plug-ins.

[149] See the Appendix for the final tune list. See "Bounce" in the Glossary.

Difficulties are added to the recording process when rehearsals are omitted and the method for fixing those problems through manipulations in the time domain are examined. It was shown that creating improvisatory "perfection" through pitch manipulation, note replacement, and time adjustment, does not have as much value as spontaneity and creative interplay—the basic tenets of jazz improvisation.

Recommendations are made regarding movement toward understanding the "normative" processes in the recording studio and the roles of the engineer, the performer, and the producer that are not only *specific* to the session analyzed in this dissertation, but are also a model for understanding these interactions, in general.

Also important to ethnomusicology is an analytical method for discovering the limits of acceptability for the performer, and by extrapolation, the audience and the culture, in the microtimings of the ensemble sections as well as the movement towards "automatic transcription." In this process, various software programs produced a descriptive representation of pitch, time, and amplitude and any alterations to create a measureable difference in them. With these tools, one can document differences well beyond the capabilities of human hearing and create performances beyond human accuracy and potential.

Perhaps the greatest value of this dissertation is the deciphering of the process of recording from an insider's view—both in recording jazz performance practice in the recording studio and from the standpoints of the engineer, the performer, and the producer. A research approach for studying the recording practices employed in one specific recording studio divulged the processes, both successful and not, in the creation of an idealized, culturally acceptable recording.

The Ethnographic Recording and the Studio Recording

The first question was whether an ethnographic recording is the same as a studio recording, and to answer this, one must consider the purpose of the recording. One differentiation is between commercial-only products versus one whose goal is documentation. That is not to say that a documentary recording cannot be a commercial product, so an additional distinction is needed. If the recording is to document an event as is, without any outside influence, then it may be considered ethnographic. But is a studio recording ethnographic? In this instance, the answer is in the process itself. Even though listeners expect studio recordings to be perfect, errors do not negate performance significance. If the recording has been adjusted, it is no longer ethnographic, and neither is any recording where there has been an external interference (from outside people, for example) from such influences as mixing or processing. Another situation is multiple takes, each without alterations. As separate entities devoid of external influence, they may be considered ethnographic, but not if one performance is selected as preferable to the others. A final possibility is a recording where the performer plays several parts. If one accepts the possibility of an ethnographic recording with multiple takes, then one player recording multiple parts should be considered ethnographic as well, so long as all the previous parameters still apply. It is the process of recording that determines an ethnographic product.

The second question concerns comparing the significance of live recording and studio recording and their respective cultural value in the jazz idiom. To discuss these differences, I make a distinction between the improvisational sections and the ensemble

sections. As shown in the recording and editing discussion as well as in the analysis of the creation process, in this particular instance there was a distinction made between the acceptability of altering the solos and the ensemble sections. During the editing process, no one had any objection to realigning the ensemble parts. Doing so created the illusion of a well-rehearsed section. Although I maintain that the best of the unaltered ensemble section's performance would have been acceptable if heard live, all of us who had input on this—John, Leigh, Bob, and I—wanted to realign the parts. For the solos, however, the desire of both Leigh and John to have solos that adhered to the ideals of improvisation overrode any concern to "fix" perceived mistakes, even with my urging to do so.

Because of my respect for John's abilities and his strong convictions during these recording sessions, musical decisions were a partnership of choice. This is an example of the flexibility needed between the performer and producer. The decision *not* to alter the perceived mistake indicated how much influence the performer had on his product in this case.

This brings us to the issue of performer-driven alterations. On the surface, one might think this would eliminate the need for a producer if the performer is to make all the artistic/musical decisions: acceptability or, if desired, what to replace as well as artistic/technical decisions such as the acceptability of note replacement or correcting intonation. In fact, I would argue that this makes the role of the producer more important. I contend that the role of the producer is to protect the integrity of the music, represent the knowledgeable audience, and to protect the performer as well.

There are two parts to the idea of protecting the performer. First, the producer alleviates the responsibility of the real-time decisions of acceptability by hearing the whole product. In performance, the producer has the ability to shift focus from one performer to the next without having to stop the recording process or being distracted from his own product. If the performer does this, the performer-product suffers. Second, the producer acts as an advisor to aid the performer in the decision-making process. In this situation, the producer can recall those spots where the performer might not be satisfied and suggest alterations. It is then up to the performer to accept or reject the suggestions because, ultimately, it is the performer who is judged by the performance product.

Perspectives in Recording

One of the concepts discussed in the mixing process was that of perspective. In the recording studio, it is possible to create impossible perspectives such as a drummer with an incredible reach or an instrument seemingly closer than possible.[150] However, the idea of perspective also has ethnomusicological implications that are further complicated when considering surround recording.

In this dissertation, a distinction was made between the performer and audience perspective. If the audio source is reproduced in stereo, two speakers reproducing the left and right side, a single listener assumes the role of an entire audience. However in

[150] This impossible perspective usually occurs in the pop music idiom and many times with drums. It is not difficult to find an example where the kick drum or snare is acoustically dominant in the mix perspective. A second example is he piano. The recording technique use in this recording would place the listener's head inside the piano.

the simplest surround mode—left, center, right, left-surround (behind), and right-surround (behind)—more acoustic information is gained and the listener's place becomes more important to perspective. This has ethnomusicological implications because for most performances, an audience is present, and sometimes the acoustic product from the performer's perspective differs from the audience perspective.

Two examples may help to clarify the importance of perspective in a surround format. The first example considers a culture where there is both officiant and congregant participation. Assuming that the recordist or ethnomusicologist placed himself or herself centered (left-to-right), there are two possible primary sources, that of the officiant and that of the congregation. The "front" or primary perspective, therefore, is a matter of choice, and that decision depends on the purpose of the recording. The second example illustrates both performer perspective and audience perspective as well as the differences between stereo and surround. Consider the possibilities of recording the bullroarer.[151] Assuming that the performer faces the audience and there is a counterclockwise rotation, in a stereo performance, the performer hears the aerofoil move from right to left, while the audience hears movement from left to right, both with the Doppler Effect. However, from the performer perspective and with surround recording, one would hear the instrument's rotational speed and pitch and be able to pinpoint the aerofoil position at any time without Doppler. I make no assertions as to the importance of the primary position, only that position and, therefore, perspective

[151] See Klaus Wachsmann, "Bullroarer," in *Grove Music Online*, http://www.oxfordmusiconline.com/subscriber/article/grove/music/04305 accessed 28 February, 2011.

might alter meaning. If one seeks to discover meaning from the performer, then one might want to record from the performer's perspective.

The Purpose of the Recording

Besides deciding whether a recording is ethnographic, one can divide the "purpose" of the recording into two categories: to provide entertainment and/or to provide knowledge. If only entertainment is desired, one may only want the best possible product without regard for process. However, if one seeks knowledge, the product should be accompanied by disclosure of information and perhaps all of the source material.[152] Disclosure of information involves two categories: technical information and audio source material. As examples, consider technical information relevant to insiders, which might also inform outsiders as to the subject matter and concerns of, in this case, the engineer. Data such as microphone brand, type, pattern, and position can yield information on the engineer's aesthetic preferences. Audio source material can provide both students and educators with multiple examples in order to analyze the development of an improvised solo through multiple takes, performances specific to a time and place, or drawing extra meaning from multiple performances of an ethnographic recording.

For those recordings that strive to fit cultural norms, the idealized version should be acceptable if those involved in the process present true and accurate representations of sound from the engineer, performer intent, and protection by the producer. For this

[152] I make this statement with the following caveat. First, the files would be in standard mp3 format (128 kbps), which makes the file size about 1MB (.9375 MB) per minute, as opposed to10.584 MB per minute for a .wav file. Second, memory is cheap (at the time of this dissertation, 1 TB sells for under $100). Finally, there are several free audio editors available.

jazz recording, understanding the process, discussions, and decisions created an idealized version without redefining meaning or intent.

Areas for Future Research

Several areas of study might derive from this dissertation. The following topics are logical offshoots and might be considered for future research in one or several of the four intersecting disciplines of physics, psychology, aesthetics, and music.

The spectral analysis of an acoustic signal with different microphones, the analysis of any single microphone with and without EQ, and the physical placement of microphones would add to a culturally-based understanding and aid the decision-making process of aesthetic preferences in the recording studio. These aesthetic choices then move those involved in the recording process towards my concept of culturally specific sound. If one understands that the microphone's proximity to the sound source has an audible effect on the sonic result, a study of microphone placement within a framework of aesthetics that would compare engineer, performer, producer, *and* audience choices merits consideration.

Similar to that study would be one on sonic preferences. Either through a survey or experimental data, one may choose to examine microphone choice, microphone position, signal routing, and processor selection, all within cultural context. An example would be the difference between micing jazz and classical piano. For the jazz piano, close micing yields clarity of attack, while classical piano recordings need the homogeneous sound achieved with distance.

The intersection between music performance and psychology has several possible areas for research. Although anecdotal, most performers seem to perform differently in the studio than in other performance situations. The observed phenomena of performer and performance anxiety that seems to occur more frequently in the recording studio might be of interest. In this dissertation, one topic seemed to recur throughout the recording process in various forms: the headphones. Either within the context of balance between other performers, the inability to hear oneself, or aural fatigue, headphones alter performer's perception by delivering "schizophonic" information. This split between the original sound source, the performer or performers, and the reproduced headphone sound sometimes creates performance difficulties. As of the writing of this dissertation, I know of no studies that examine the use of headphones and the physical and psychological consequences for the performer.

A final suggestion is an ethnographic study of the live sound engineer. An interesting twist would be a cross-cultural examination. As one who has worked as a live sound engineer with performers representing diverse cultures, I have experienced differences between cultural expectations of sound and interactions with sound equipment. This could yield opportunities for research in cultural expectation and the interaction with technology.

APPENDIX 1

Personnel (in alphabetical order)

Session 1 was July 10 and 11, 2007 and Session 2 was December 12, 2007 and June 23, 2008.

Chris Battistone	Trumpet/Arranger	Session 1
Tommy Cecil	Bass	Session 1 & 2
Bob Dawson	Engineer	Session 1
John Jensen	Trombone/Leader	Session 1 & 2
Chris Kosky	Bass	Session 1
Leigh Pilzer	Baritone Sax/Flute/Clarinet/Arranger	Session 1
Robert Redd	Piano	Session 1 & 2
Jim Robeson	Engineer	Session 2
Bruce Swaim	Tenor Sax/Flute	Session 1
Brooks Tegler	Drums	Session 2
Tommy Williams	Drums	Session 1
Paul Wingo	Guitar	Session 1

APPENDIX 2

Personnel Biographies

All Biographies were taken from publically available documents and websites. There is no alteration of information and only the font was changed for consistency between documents.

Jazz bassist **Tommy Cecil** has been active in the Washington, DC jazz scene since 1976 when he moved from his hometown Baltimore, MD. He has established himself as one of the most in-demand players in the area.

Tommy has had long associations with many of DC's favorite jazz sons, including John Eaton, Buck Hill, Charlie Byrd, Dick Morgan, Shirley Horn, Brooks Tegler, and the Redd Brothers. As a freelancer, Tommy has worked with Mose Allison, Tommy Flanagan, Joe Henderson, and many other star artists. Concert appearances have taken Tommy throughout the U.S. and overseas.

Tommy is featured on dozens of recordings as a sideman. As a leader, he released his album "Samba for Felix" featuring Tommy Flanagan, Billy Hart, Gary Bartz, Paul Bollenback, and Cyro Baptista. He released two albums with pianist Louis Scherr, including "The Song Is You" and "Warm Valley featuring Joe Henderson."

The driving force behind Bias, **Bob Dawson** guides the studio's focus with his incredibly high standards. He has been praised by the best, earned many honors, and has a long and impressive list of credits. He's an expert, an artist in his own right, and loads of fun.

In his home region, Bob has been honored five years with Wammie Awards for Best Recording Engineer, and one year as Best Producer. He has received Grammy nominations 5 years in a row for his co-production work with John McCutcheon. He has recorded seven Mary Chapin Carpenter albums, which have received outstanding reviews both musically and sonically, selling millions worldwide.

His following in the jazz world has attracted projects with the Airmen of Note, Bruce Gates' Jazz Consortium Big Band, Blues Alley Big Band, The Howland Ensemble, Marty Nau Quartet, Pam Bricker, The Navy Commodores, Tim Eyermann, Vaughn Nark, Mike Crotty and Deater O'Neill, Robert Jospe, Alan Baylock Jazz Orchestra, The Capitol Bones Big Band, Army Blues, The Taylor/Fidyk Big Band and more. He has recorded Dizzy Gillespie, Benny Carter, Joe Williams, Joe Kennedy, Jon Faddis, Phil Woods, Slide Hampton, Jimmy Heath, Kenny Werner and Tommy Newsom.

His career started in his mom's basement as a teenager, recording fellow-teen Nils Lofgren. In those early days Nils and Bob worked together on his first major label release "Grin," and later on "Cry Tough", "I Came to Dance" and "Wonderland". Bob also had a decades-long working relationship with the legendary Danny Gatton, recording him live at Cellar Door in the 70's, recording and mixing "Red Neck Jazz" and later "Unfinished Business." So blues, rock, and roots rock credits are in his pocket,

too. These days Nils says of Bob, "The first thing that comes to mind - besides the given that he is a great engineer - is his ability as a person to hang with any crowd and contribute in a comfortable manner. It's really something that sets Bob apart from most people, period."

Bob's gift extends beyond his ability to capture the purity of a performance. Whether the session needs a push in the direction of working harder to get 'where it needs to be' or a laugh to defuse the tension, Bob has become famous for being able to help deliver that special atmosphere.

An on-the road Mary Chapin Carpenter says, "Bob is one of the most talented people I have ever had the privilege to know, much less work with." She adds that his contributions to the recording and production process of her projects "have been invaluable."

John Jennings, producer for Mary Chapin Carpenter, John Gorka and many others, says of Bob, He does every kind of music and he does them all well. He's got incredible ears and he's incredibly thorough, very meticulous and insanely fast. It sounds like the ideal situation, and it is. Pete BarenBregge, director of the Airmen of Note, on why they have recorded at Bias for 20 years says Relaxed environment, personalized attention and proactive engineers are just a few reasons the Airmen of Note record at Bias. Bob Dawson is like a member of the band - he knows big bands and how they sound. David McGee, writing for Pro Sound News terms Bob, ...one of the class acts of the recording industry.

All apt praise for the extreme talents of this man behind the board.

John Jensen performs with the Smithsonian Jazz Masterworks Orchestra and recently made a historic tour to Egypt, which included performances at the Giza Pyramids and at both the Cairo and Alexandria Opera Houses. John has been a featured performer at the White House, the Corcoran Art Gallery in Washington DC, and the Kennedy Center. John has performed with the McCoy Tyner Big Band and has been featured alongside Urbie Green, Milt Hinton, Stephanie Nakasian, Hod O'Brien and Danny Gatton to name just a few. He performs frequently with his quartet for concerts, clubs and private parties in the metropolitan DC area and throughout the East Coast. He has been featured at jazz parties throughout the USA. Additionally, he was lead trombonist and a featured soloist with the United States Navy Band Commodores for 12 years. John played for 10 years with John Previti's "Mingus/Monk Tribute Band" and also is featured with the group Chaise Lounge.

Shifting Views is the name of John's most recent recording. Recorded on the Patuxent Records label this CD features a sterling rhythm section and the saxophone of Bruce Swaim.

Homecoming is an earlier recording of John's. In the tradition of a "blowing date" Jensen and bandmates Hod O'Brien on piano and bassist Steve Gilmore play great tunes from the American songbook. Additional players on this recording include drummer Brooks Tegler, percussionist Seguito Turner and guitarist Steve Abshire.

John maintains a busy schedule as a performer and teacher. He conducts clinics on the trombone, improvisation and careers in the business of music.

John has been involved with a number of recording projects, including multi-percussionist Tom Teasley's latest CD entitled "Painting Time" featuring John on Double bell euphonium, conch shells, didgeridoo as well as trombone.

Chris Kosky is a bassist in the United States Air Force Band in Washington, D.C. In this capacity she has entertained dignitaries at the White House, Pentagon and the State Department, in addition to public performances on TNN's *Prime Time Country* and NBC's *Today* show. Outside of the Air Force, she enjoys an active freelancing and teaching schedule. Besides more than a half dozen recordings with The Air Force Band, Chris can be heard on the soundtrack of the PBS documentary *The Appalachians*, Travis James Humphrey's *Yellow Cat Blues* and the Tom Cunningham Orchestra's *All The Cats Join In* and *One O'Clock Boogie, Two O'Clock Jump*. She is currently serving on the Board of Directors for the International Society of Bassists.

Leigh Pilzer is a native of the Washington, DC metropolitan area. She began her musical studies on piano and cello, switching to saxophone after hearing the music of the Count Basie Orchestra. She attended Berklee College of Music where she majored in Jazz Composition and Arranging. At Berklee her teachers included Greg Hopkins, Herb Pomeroy, Joe Viola, and Jimmy Mosher.

After graduating from Berklee Leigh returned to Washington. She works in DC and Baltimore with many large and small ensembles. Other performing experience includes national and international tours with the Smithsonian Jazz Masterworks Orchestra, the National Symphony Orchestra, Sherrie Maricle & The DIVA Jazz Orchestra, and the Jen Krupa - Leigh Pilzer Quintet (www.jlqjazz.com).

Leigh's big band arrangements have been played by professional and college bands in the US, Germany, and Brazil, and by many of the DC-based premier military big bands. Her arrangement of "Pennies From Heaven" was recently recorded by Sherrie Maricle & The DIVA Jazz Orchestra for a CD scheduled for release in 2011. Her brass quintet arrangements have been included in Baltimore's annual Holiday Brass concert, and recorded by the United States Army Field Band Embassy Brass Quintet. Other writing credits include horn section arrangements for recordings by Chuck Brown and Eva Cassidy.

Leigh holds the degrees of Master of Music in Jazz Studies and in Saxophone Performance, both earned at the University of Maryland in College Park, and is currently working on a doctoral degree in music theory at the Catholic University of America. She is a member of the Jazz Studies faculty at UMCP, where she teaches Jazz Theory and Jazz Arranging.

Robert Redd, born and raised in the Washington, D.C. area, began playing music as a trumpet player at the age of twelve, and began performing professionally while still in high school. While continuing to perform and study the trumpet, he began to develop a serious interest in the piano and decided to make the switch at age twenty-three. He re-established himself as a piano player and was soon very much in demand.

Robert was a member of the Keter Betts trio for 13 years, until Betts' death in 2005. The trio performed many concerts and festivals and could frequently be heard at venues such as the Kennedy Center and Blues Alley. They performed regularly throughout the school year at Wolf Trap as part of Early Learning Through the Arts, a program which Betts helped start and develop, presenting live music to young audiences. Robert is a member of the Wolf Trap Jazz Trio which continues to present this program.

From 1995-1998, Robert was pianist and musical director for singer/songwriter Kenny Rankin. While touring with Rankin, he performed with Michael Moore, Oscar Castro-Neves, Roy McCurdy and John B. Williams, among others. They appeared regularly at venues in New York City such as The Rainbow and Stars and The Bottom Line, and performed in the guest artist series with the U.S. Air Force Band at DAR-Constitution Hall, in Washington, D.C.

Robert worked often as a member of the Charlie Byrd Trio, and can be heard on Charlie Byrd's last recording, "For Louis". Other recent recordings include "Bouquet Chorale" (Summit Records) featuring Marty Nau and legendary saxophonist Phil Woods, and "When Redd is Blue", co-led with his brother, Chuck. Robert is also a QRS recording artist and has recorded two Pianomation CDs with fellow pianist Michael T. Jones for the New York-based company.

Robert teaches and performs every year during Swing Week at the Augusta Festival at Davis & Elkins College in Elkins, West Virginia. He is also a featured artist every year at the W.C. Handy Music Festival in Muscle Shoals, Alabama.

As a free-lance musician, Robert has performed with Bud Shank, Houston Person, Warren Vache, Ethel Ennis, Melba Moore, Phil Woods, Mundell Lowe, Scott Hamilton, Ken Peplowski, James Moody, The Harry James Big Band, The Artie Shaw Big Band (w/Dick Johnson) and the Duke Ellington Orchestra, to name a few. He performs frequently with the Smithsonian Masterworks Organization, and is often featured at Blues Alley, where he co-leads a group with his brother, Chuck. Recent performances included a private concert in the East Room at the White House for the President, First Lady, and their guests on Valentine's Day, 2008.

Jim Robeson brought his wealth of musical and technical knowledge to Bias in 1980.

His early years brought such classics as tracks for The Cosby Show and A Different World. He worked with both Trouble Funk and Rare Essence during the infancy of Go-Go. His credits with Bluegrass greats include records for the Seldom Scene, Del McCoury, Mike Auldridge, and no less than six releases for the Johnson Mountain Boys. Over the years he has recorded many of the greats – Tom Paxton, Pete Seeger, Doc Watson, and Taj Mahal to mention a few. His studio partnership with Lynn Morris helped her earn the coveted IBMA Female Vocalist of the Year Award in 1996, 1998 and 1999, as well as Best Song in 1996 for "Mama's Hand."

Jim was behind the board for Mary Chapin Carpenter's hauntingly beautiful "Grow Old with Me" from the John Lennon tribute, Working Class Hero. His credits with artists who have come back to him for multiple releases include the likes of Sweet Honey in the Rock, Bernice Johnson Reagon, Toshi Reagon, Cathy Fink and Marcy

Marxer, Grace Griffith, Pete Kennedy and Bonnie Rideout. It's obvious he's doing it right.

For such consistent, top quality, class-act professional work, Jim has been honored with a Grammy Award for his engineering for Cathy Fink and Marcy Marxer on their Bon Appetit! in 2004, a Grammy Nomination, "Best Engineered Album" for Mary Chapin Carpenter's 2001 release Time*Sex*Love*, and WAMA Awards for Best Recording Engineer four times.

As a sought-after bass player, singer, song-writer, arranger and producer, Jim brings all this to his engineering. He is constantly pushing to learn more about new technology that can bring his clients and Bias more options with greater ease. He is multi-lingual – speaking Digital Performer, ProTools, Nuendo and Acid; also bringing all the best of his years of analog experience to the mix as well.

Bernice Johnson Reagon explains her work with Jim like this: "Jim Robeson and I have created a special kind of studio partnership over the more than 20 years that we have worked together. As an engineer he brings a special range of qualities: he is a creative artist—a performing musician, intelligent, a fast learner—he knows how to wait, and he locks up his ego when he is engineering a session. He is not just a talented engineer, he is a compassionate human being who brings great integrity to his work.

"I think **Tom Williams** is one of the strongest young trumpeters out here, who deserves wider recognition. He's not only strong melodically and harmonically, he is also strong rhythmically because he's a drummer as well as a trumpet player." · Jimmy Heath, master saxophonist-composer

A native of Baltimore, Tom Williams has led a sparkling and varied career since he began studying trumpet and drums as a child. His talent was recognized at an early age by many, and he began working steadily on both trumpet and drums while still a high school student.

After matriculating at Towson State University, Tom joined the renowned Duke Ellington Orchestra, under the direction of Mercer Ellington, with whom he played the national tour of the Broadway smash" Sophisticated Ladies", also touring Japan with the road company. In 1987 he enlisted in the US Army and served 8 years as a featured soloist and clinician with the "Jazz Ambassadors" and "Army Blues" jazz ensembles. In 1991 he was a finalist and 2nd place winner in the first Louis Armstrong International Jazz Trumpet Competition sponsored by the Thelonious Monk Institute of Jazz.

A versatile performer, Tom has played in the show bands of Pattie Labelle, Liberace, Anita Baker, Sid Caesar, Michael Feinstein, Joe Williams, Stevie Wonder, Rosemary Clooney and Aretha Franklin to name a few. He has appeared at numerous jazz festivals and venues with artist such as Donald Brown, Hank Jones, Philly Joe Jones, Gary Bartz, The Vanguard Jazz Orchestra, The Carnegie Hall Jazz Band, Michel Legrand, Ben Riley, Steve Wilson, The Woody Herman Orchestra, Frank Foster, Antonio Hart, Slide Hampton, and Steve Turre.

Tom has recorded with Rob Bargad, Gary Bartz, Donald Brown, Antonio Hart, Jimmy Heath, The Heath Brothers, Larry Willis, and Steve Wilson. As a leader on Trumpet, Tom has recorded two CD's, Introducing Tom Williams, and Straight Street on the Criss Cross Jazz™label. As a drummer, Tom has performed with Curtis Fuller,

Larry Willis, Javon Jackson, Kenny Drew Jr., Gloria Lynn, Geoff Keezer and is leader of InterPlay, which has recorded “First Time” and “Pick Up The Pieces ” on the JazzScapes™label. He has taught both trumpet and drum set privately for over twenty years and joined the jazz faculty at Howard Community College in 2009. Further info: 410-730-1014ph / 410-558-6172 fax. Email:tw@tomwilliamsnet.com.

GLOSSARY

Amplifier/Amp. An electronic device for increasing the voltage or current of an electrical signal. See also "Preamp."

Amplitude. The relative height of a waveform measured on the "Y" axis. This waveform may represent a voltage, current, or sound.

Attenuator. A device that reduces the amount of signal input by a fixed amount, which varies by manufacturer. Also known in audio jargon as a "pad."

Audio spectrum. The range of frequencies between 20Hz and 20kHz. See also "Hertz."

Axis. A fixed reference line for the measurement of coordinates.[153] In audio, several uses include the graphing of sensitivity vs. angle of displacement in microphone pickup patterns, loudspeaker response, amplitude, and time. An example of this type of graphing would be amplitude ("Y" axis) vs. time ("X" axis). See also "Polar patterns."

Baffle. A panel or other surface whose purpose is to prevent or mitigate the transmission of sound. Also known as a "gobo."

Bi-directional microphone. Also known as a "figure 8 microphone" or "bi-polar microphone." This type of microphone's greatest sensitivity is at 0° and 180°.

Its greatest rejection is at 90° and 270°. See "Polar patterns" for pictorial representation.

Bleed/ Bleeding. The tendency of one acoustic signal to be picked up by other microphones. This phenomenon is usually an undesired result of close proximity of multiple sound sources to multiple active microphones. Also known as "leakage" or "leaking."

[153] *Compact Oxford English Dictionary of Current English*, 3d ed., [dictionary on-line] s.v. "Axis" (Oxford: Oxford University Press, 2008, accessed 07 December 2009); available from http://www.askoxford.com:80/concise_oed/axis?view=uk.

Bounce. A term used in analog days to describe the process of combining several tracks to fewer tracks. This process was necessary because of track limitations of analog tape machines. Today this term is used to describe the process of taking all the tracks and processing the information down to a single stereo track to be placed on a CD-R.

Cardioid microphone. A microphone whose polar response closely resembles an upside down heart-shaped pattern. See "Polar patterns" for pictorial representation.

Cent. $1/100^{th}$ of an equal semitone. A synopsis of the history of pitch quantification and the relationship between frequency, period, absolute, and relative cents can be found in Hans-Peter Reinecke, *Cents Frequency Period: Calculation Tables for Musical Acoustics and Ethnomusicology*. (Berlin: Walter de Gruyter and Company, 1970), 16-20.

Channel/Channel strip. An information pathway. For audio, the pathway is through an Input/Output channel. For a complete explanation of the mixing console and Input/Output see John M. Woram, *Sound Recording Handbook* (Indianapolis: Howard W. Sams and Company, 1989), 461-519. In MIDI, a channel transmits/receives data. Most consider the definition of channels and tracks as non-interchangeable.

Click track. A metronomic pulse. The click track helps keep everyone at the same tempo. Usually heard in the headphone mix.

Comping. Jazz jargon describing the action of "accompanying" using chords, rhythmic figures, or melodic filler.

Compressor. A variable gain amplifier, the purpose of which is to reduce the dynamic range of a signal based on the ratio of the input to the output, which is only active above a preset level.

Condenser microphone. A microphone that requires an external power source, usually supplied by either a battery or another voltage source. See "Phantom power."

Control room. See "Recording complex."

Decibel. Abbreviated as dB or 1/10 of a Bel. A decibel expresses a logarithmic function, a ratio of two power-like quantities such as acoustic intensity, sound pressures, voltage, or current. For further discussion see Gary Davis and Ralph Jones, *Sound Reinforcement Handbook* 2ed. (Milwaukee: Hal Leonard, 1989), 19-26. Direct box/DI or Direct inject/input. A small device containing a transformer designed to convert an unbalanced line level signal to a balanced microphone level signal.

Distortion. An alteration of the waveform that may be desired or undesired. Sometimes distortion is a desired affect such as guitar distortion. Some find distortion from tube amplifiers pleasing. For further details, see, Sound Reinforcement Handbook (Davis and Jones), 81-86.

Downmixing. A term used to describe the action of taking multiple audio channels and mixing them to fewer channels. An example would be taking a 5.1 mix and with the aid of a mixing interface, creating a stereo or mono mix. See also "Surround."

Dynamic range. The total range in decibels from the softest signal to the loudest or the difference between the smallest and the largest amplitude.

Dynamic Microphone. A type of microphone that creates a voltage through electromagnetic principles. Most dynamic microphones use a coil of wire or metal ribbon that moves through a magnetic field.

Equalization/EQ. The process of amplifying or attenuating specific frequencies. Boosting or cutting frequencies that are close together causes phase interference. Further discussion of types of equalizers is found in Glenn Ballou, ed., *Handbook for Sound Engineers: The New Audio Cyclopedia* (Boston: Focal Press, 1998), 663-700.

Figure 8 microphone. See "Bi-directional microphone."

FLRB. Front, Left, Right, Back microphone array. The exact set up and parameters is beyond the scope of this dissertation. See Mikkel Nymand "Introduction to Microphone Techniques for 5.1 Surround Sound." Banff: AES 24th International Conference, 2003 for explanation.

Freelance (producer). A person who is hired on a "per-service" basis. "Independent producer" has replaced this term. The term "freelance" also applies to audio engineers and performers who work on a per-service basis.

Frequency. The number of complete cycles in one second in a waveform. Frequency is measured in cycles per second (cps) or in Hertz (Hz), which are interchangeable units. The number of cycles per second in a pure sound wave constitutes pitch. A musical equivalent is "A 440," which designates 440 cps (Hz) as the musical pitch "A" in Western music.

Gain. The measured increase in signal level between input and output devices, usually measured in decibels.

Headphone mix. A mix specifically created for the performers in the studio. Most professional studio consoles have the ability to send at least four discreet mixes to the studio. Also, see "Mix."

Hertz. See "Frequency."

Hypercardioid microphone. A microphone whose polar pattern is similar to the cardioid, except it has a small lobe at the rear that is more sensitive. See "Polar patterns" for pictorial representation.

Input/Output channel. Also called an I/O channel. An electronic routing configuration where the input signal and the output signal are on the same channel strip. For ease of understanding, think of an I/O channel as a 2-way street with traffic going both directions at the same time.

Inverse-square law. The relationship between sound pressure level (in dB) and distance from the sound source. In free-field conditions (no reflective surfaces), the intensity of a signal will vary with the square of the distance. For every doubling of distance from the source, there is a 6 dB drop. Doubling the distance spreads the power over four times the surface area.

Isolation booth. A room that is structurally separated from the main recording room.

Leakage or leaking. See "Bleed."

Mastering. Mastering a CD is the final step in the recording process. The final broadband equalization (boosting or cutting certain frequencies) and compression (controlling the dynamic range or peak loudness levels) are added to the recording as desired or needed. With the advent of software-based programs or portable hardware units, the professional engineer as well as the home recordist can accomplish this step of the process without needing a specialist.

Microphone/Mic. A device for changing acoustic energy to electrical energy. There are two major microphone categories, condenser (powered) and dynamic (self-powered). The condenser type requires an external voltage source. See "Phantom power." The dynamic type creates its own electricity through electromagnetic principles. Also, see "Condenser microphone," "Dynamic microphone," and "Polar pattern."

Sensitivity. A measurement of how much acoustic power is needed to produce a standardized output.

Mic level. The measurements of the output of a microphone expressed as a negative number with the units dBV at a specified input level expressed in dB SPL (i.e., -45 dBV at 94 dB SPL).

MIDI. Musical Instrument Digital Interface. The protocol for communicating Performance data between compatible musical instruments. Further discussion of MIDI and specifications can be found in Glenn Ballou, ed., *Handbook for Sound Engineers: The New Audio Cyclopedia* (Boston: Focal Press, 1998), 1103-1136.

Mix. An amalgam of audio signals. Also used to describe the process of creating the amalgam.

Monitor matrix. Also known as "monitor send." This section of the console allows several discreet mixes. These mixes can be sent to outboard sources such as reverb units or headphones.

Monitor system. The part of the audio chain that reproduces acoustic information for the listener. Included in the audio chain are the amplifiers, EQ (if any), and speakers. Audio jargon for the control room speakers is "monitors."

Omnidirectional microphone. A microphone whose response is uniform in all directions at 1 kHz. See "Polar patterns" for pictorial representation.

Overdub. Laying newly recorded material next to or in place of previously recorded material. When the cost of the expensive tape machines limited the track count, the method was called "sound on sound." The sound on sound technique took previously recorded sounds and simultaneously, but destructively, mixed them with newly recorded material.

Pad. See "Attenuator."

Pan/Panning. A device that has the capability of continuous movement between far left and far right in the stereo field, allowing perceived placement of performers.

Patch bay. A centralized location for interconnecting various input and output points, which connects or transports a signal to outside sources. The patch bay also has the capabilities to allow the connection of multiple devices. The patch bay allows routing to all of the outboard equipment as well as too many points within the signal flow of the recording console via an assignable jack-to-cable-to-jack system. See John Woram *Sound Recording Handbook.* (Indianapolis: Howard Sams and Company, 1989), 510-513.

Perspective, audience/performer. The relationship between listening positions. The audience perspective places one in the audience listening to the performance. The player's perspective allows one to hear the performance arena from the aural viewpoint of the musician.

Phantom power. An external voltage supply for condenser-type microphones. Most mixing consoles have a circuit built into the channel strip designed to add phantom power for condenser mics.

Pickup. A term for an input transducer. A transducer converts one form of energy to another. The two types discussed in this dissertation are air pressure or velocity microphones and contact type. The contact type converts vibrations from the instrument, such as an acoustic bass. The contact is placed between the body of the bass and the bridge.

Plug-ins. Software-based tools used in the recording, editing, and mixing and/or processing of audio tracks.

Polar pattern. A graphing system in which amplitude is represented by the distance from the origin of the circle and direction is represented by the angle at which the point is placed with respect to the origin. Used to describe pictorially the response of a microphone in either two or three dimensions.

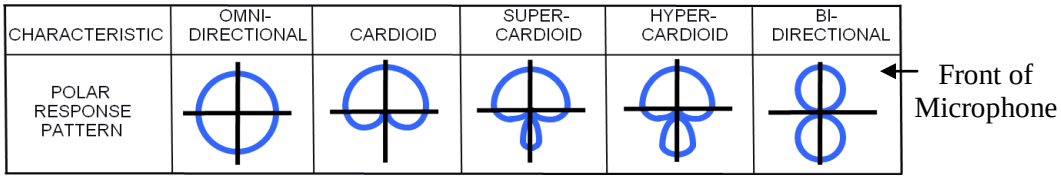

Illustration G-1. Two-dimensional graphical representation of five common polar pattern responses at 1 kHz. The top of each illustration represents the front of the microphone. Simplified from an illustration from Shure Brothers, Inc., used with permission.

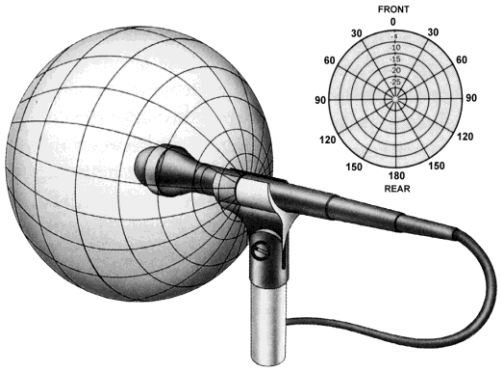

Illustration G-2a.

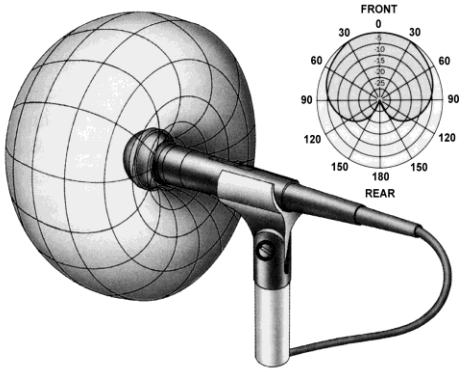

Illustration G-2b.

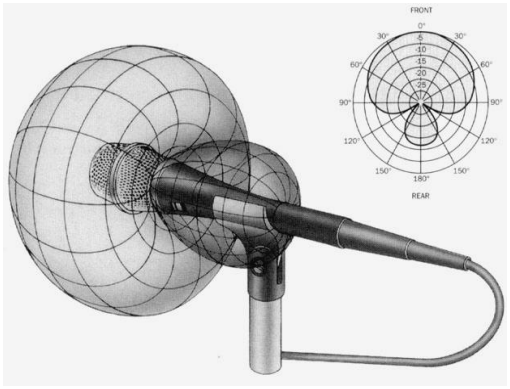

Illustration G-2c.

Illustration G-2. Three-dimensional graphical representation of (a) omnidirectional, (b) cardioid, and (c) super cardioid microphones. Used with permission of Shure Brothers, Inc.

Preamp. A first-stage voltage amplifier, which takes a low-level signal from a microphone and raises it to a standard line-level. Some phonograph cartridges produce such a minuscule amount of voltage that a special amplifier is required before the preamp. This is known as a pre-preamp.

Proximity effect. The perceived increase in the lower frequencies. This is due to the properties of the inverse square law and the cancellation of high frequencies in microphones.

Punch. Carryover jargon from analog tape machine days. The act of punching in a section required the engineer to hit the record button while other tracks were simultaneously being played. See "Multitrack" above.

Recording complex. The physical structure in which most recordings are made. Included in this complex are the control room and studio. Other rooms in the complex might include isolation booth, voice-over suite, sound effects suite and in-house repair shop, equipment storage, and video postproduction suite. Some recording complexes have multiples of any or all of the above rooms.

Control room. The section of the recording studio where most of the recording hardware resides and the engineer and producer listen to the recorded acoustic information. The engineer's position is in the ideal listening position, usually the middle of the recording console. The producer sits on either side while tracking or mixing the session.

Studio. The primary room where performers supply acoustic information.

Isolation booth. A room designed to isolate an individual or small group from another ensemble.

Reverb/Reverberation. A sequence of reflected sounds so closely spaced in time that it is impossible to distinguish one event from the next. See David Griesinger's website—www.davidgriesinger.com.html—for slides and lecture notes on many topics relevant to the physics and psychophysics of reverberation.

Reverb unit. A device that creates or re-creates reverberation through mechanical means such as a plate, an acoustically reflective room, a spring, or an electronic device that emulates acoustic decay through software-based algorithms.

Decay time. The time, in seconds, for the reverberant sound to dissipate.

Early reflections. Reflected sound bounce off walls and ceilings in the room. The first few reflections arrives at the listener after the original sound source. These reflections aid in the listener's perception of the room.

Sample rate. There are two components to a digital sample rate— bit rate and samples per second. For example a sampling rate of 24/96—the bit rate of 24 means each sample of sound is expressed by a binary number 24 digits long. The samples per second are expressed in kHz. This number form the above example equates to 96,000 samples or pieces per second. For further explanation, see Ken C. Pohlmann Principles *of Digital Audio 3d ed.* (New York: McGraw-Hill, Inc., 1995), 22-28.

Shout chorus. Usually the last chorus of an arrangement after the solos, but before the melody line's final restatement characterized by the ensemble's loudest and most active section.

Surround. Name given to the multiple-speaker or microphone configurations. For multiple speakers the first number represents the full-range speakers and their placement, while the second number represents the subs (speakers that only reproduce frequencies below 80 Hz) placed in the center of the listening field. Surround formats include LCR (Left, Center, Right), LCRS (Surround), 5.1, 6.1, 7.1, 7.2, 8.1, and 10.2. See "FLRB" in the Glossary for an explanation on surround microphone setup

Take. Part or all of a selection usually with everyone in the session at that time. Many new tracks and or overdubs may be added to a take. See "Track" and "Overdub." A partial take encompasses a chosen amount of a tune.

Tie line. A cable that connects pieces of equipment in rooms separated by walls. This connection carries an electrical signal to/from a centralized location such as a microphone input to the patch bay where it is connected to the desired channel input. A tie line also allows a second control room to access a remote piece of equipment.

Track. A designated location for acoustic information on the recording medium. In the analog format, this location would most likely be on a multi-track tape machine. In a digital format, the acoustic information might be located on a digital tape machine or as a waveform. Not to be confused with channel. See "Channel."

Trading fours. Jazz jargon describing the action of two or more soloists dividing and alternating between each soloist, the musical form during the solo section. This same concept applies to trading eights and trading twos.

Three-to-one rule. Also, known as the 6 dB rule. In the recording studio, instruments of equal loudness need to be at least three times the distance from each other in order to achieve a minimum 6 dB difference at their respective microphones.

Two-track mix. Also known as a stereo mix. This is the format used to create a CD. For further information on CD formats, see Ballou (1998), 1023-1029.

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