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Investigating Early Bluegrass Recording Techniques

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By

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Introduction and Background

This paper is about the process of recording a bluegrass band in the twenty-first century, and the steps necessary for that recording to sound as if it were made in the late 1940's or 1950's. For as long as I can remember, I have loved the sound of early bluegrass. One band in particular, Flatt and Scruggs, has always piqued my interest, for several reasons. The first and foremost is the banjo player Earl Scruggs. Scruggs revolutionized and popularized the banjo as bluegrass musicians know it today by using a syncopated three-finger roll that produced a very driving sound. He played aggressively, on the front of the beat, and very clean. Another reason the early music of Flatt and Scruggs has been influential is because of the sound of their early recordings. The instrumental, "Foggy Mountain Breakdown" is a characteristic example. In my opinion, the instruments on this record sound phenomenal, the tone is very rich and full, and the tonalities of the recordings sound big. The banjo is very present and clear in the mix. The banjo is always easy to pick out in the mix of all the other instruments and is popping like a machine gun. This is called the sound "envelope," by sound engineers, which consists of transient, sustain, and decay. Transients consist of changes occurring before the sound reaches its steady-state intensity (the sharp peak, which has lots of inherent high frequency content). Sustain refers to the steady state of a sound at its maximum intensity (when you start to hear the actual pitch), and decay is the rate at which it fades to silence.

I can remember the first time I heard Earl's original December 11, 1949 recording of that song that was done for the Mercury label. I didn't know who or even what I was hearing, but time froze for me until that song was over. I wanted to hear it again, and knew that if I did hear that sound again I would recognize it. Fast forward about six years and I wanted to start learning

how to play the banjo. My uncle, who is a lover of bluegrass music and Flatt and Scruggs, heard that I wanted to learn so he gave me a CD that I listened to. It was the entire Mercury sessions of Flatt and Scruggs, and included on the CD is that original recording of Foggy Mountain Breakdown. I must have listened to that CD every day for two years, and still listen to it when I need a reminder of the energy of those recordings. The music and tonal characteristics on that record are mythical and a mystery to most everyone that plays traditional bluegrass music. The togetherness of the band and the notes they play are so in time—it feels as if they are breathing together. I wanted to learn everything I could about these recordings: the equipment they used at the time, the microphone placement techniques, the techniques of the players and singers, the rooms in which they recorded, how the records were made, the types of instruments that the musicians were playing and how they were set up, and, most importantly, the differences between the recording processes of then and now. I also wondered if these sounds could still be produced today.

Literature Review

One of the most important factors of the sound of those records was the equipment used to record on back then. The Mercury sessions in particular were likely "cut direct to disk," which means the sounds being recorded were engraved directly into a lacquer disk – no mixing, mastering, or adjusting of the sound that ended up as the final product. Just a few years later, tape recording came out, which had much higher fidelity and more time for recording. When one records direct to disc at 78 rpm on a standard 10" disc, there is only about three minutes of space to record onto before the disk is full. A 7" reel of tape holds 1,200' at 15ips = 16 minutes of record time. Speeds of 7.5ips would give you twice that. Tape was also more forgiving than disk recording, because tape could be spliced together if a mistake was made. Before tape recording,

everything was recorded at the same time. If someone made a mistake, the whole recording had to be redone. With tape recording, one could do a few takes and if a mistake was made, it was possible to splice an ending or break from one of the other takes onto it.

One reason that many studios and artist were opposed to using tape was the cost. Engineer Brent King had this to say about recording Ricky Skaggs and Bruce Hornsby's album in the 2000's, *Ricky Skaggs and Bruce Hornsby*. "At one time, you couldn't get tape and by the time we could get it, we were already into RADAR-land," [Meaning using computers for most processes of recording.] He explains, "A lot of times, since we were going for vibe and feel, we would go for multiple takes and the tape bill would have been higher than the recording budget" (Farinella, 2007).

This is what longtime Nashville studio owner and engineer Steve Chandler had to say about recording to tape in 2007. "Rare is the bluegrass project these days that is recorded to tape (though some are still mixed to half-inch); that's a fact of economics, too. Nuendo probably has a stronger footing in Nashville than in any other major recording center, though Pro Tools is definitely the top dog in this town, too, as it is in New York and L.A. Steve Chandler notes" (Jackson, 2008). We can see from these quotes that the studio and recording world have seemingly 'moved on' from the technology and process of the tape recording because of cost, efficiency, and economics.

In addition to using tape, the mixers, equalizers, and compressors used on early Flatt and Scruggs recordings were transformer coupled, and those, paired with the ribbon microphones, really warmed up the tone of the voices and instruments. By contrast, most recordings today are captured digitally within Pro Tools or a similar digital audio workstation, recorded with

condenser microphones, and processed using digital equalizers, compressors, and other plugins. I prefer vintage aesthetics to modern recordings.

Another major difference in the recording techniques of then and now is the way the bands were situated in the studio and the number of microphones used. In the late forties bluegrass bands like Flatt and Scruggs were using between one and three microphones in the studio. They would "work" the microphones by standing certain distances away to effectively mix themselves while the recording is happening.

> "Mixing it was a lot of just balancing the instruments out and putting them at the right level. These musicians are used to performing on a single mic onstage, where the singer moves back and the guitarist moves up. We used this approach on the record. They were all together in the room" (Halbersberg, 2003).

I have heard from several older musicians of that generation that they would do about a minute of the tune for the sound engineer to listen to, then he would come out and place an X in tape onto the floor for each person. This way, they would know where they should stand around the microphone during certain parts of the song so as to not be too loud or too quiet. Some bands that had played together for years and understood the dynamic volume of their songs could do this naturally and mix themselves on the fly, making the sound engineer's job easier. They would all be in the same room, with not many sound baffles (tools used by engineers in the studio to prevent sound from reflecting off of hard surfaces). Since many of these recordings were done in makeshift recording spaces, they may have been limited availability or options for acoustic treatment. Later it became more of an issue that engineers stressed about, so they would place more sound deadening materials around the space that was being recorded.

The microphones used at the time also critically influenced the sound. Engineers used mostly mics that were driven by a thin metal corrugated ribbon inside that caught the sound and

transferred it into a signal. In an interview with Mike Piersante, engineer from the famous multi-platinum soundtrack album to the *O Brother, Where Art Thou?* movie, talked about ribbon microphones and why they were used on that specific project. “Ribbon mics are great,” he said, “I love them because they sound very natural, and when you say that this album sounds like they just set up and played in your living room, that's the quality of great ribbon mics.” (Halbersberg, 2003). Ribbon microphones have bi-directional or “figure-of-eight” pickup patterns that result in the microphone having ‘dead spots’ that are off-axis to the sound source. The engineers learned to use this to their advantage, and would place the microphones so that the dead spots were lined up in a way that would prevent bleed of the other instruments being recorded into that microphone. ‘Bleed’ is when sounds are captured on a microphone that is not intentionally recording that particular sound. For instance, if you soloed the microphone the vocalist was singing into, and you could hear the banjo, that sound of the banjo coming through the vocal microphone would be considered bleed. Rather than recording in the deadest possible space, some studios had rather large rooms that sounded good naturally. They were built to record in, and the engineers would go around and clap in different places in the room to find the spots that were the liveliest, or the spots that reverberated and reflected sound the best, and the deadest, which would be the spots with no echo or sound reflection. They would use that to their advantage when placing certain instruments in the room.

Nowadays musicians are placed in booths that are sound proof. They can usually only hear the other instruments and singers by way of headphones. This seclusion ensures that there is no bleed from the other instruments onto their microphone. This becomes very helpful when doing overdubs, which is when something is recorded later and added to the track after it has been recorded. It is also helpful when a performer has to do a ‘punch-in.’ Punch-ins are when the

engineer records over a part of the song that isn't wanted, and they are useful when someone may have made a mistake on a certain word, phrase, or break. This allows the vocalist or musician to redo just the part that they messed up, rather than redo the entire song. However, if there is bleed onto the other microphones it makes it impossible to hide that mistake. In other words, if the banjo player makes a big mistake and the guitar player's microphone that is about three or four feet away captures that sound loud and clear, even though the banjo may get redone the listener would still hear that mistake because it was caught on the guitar player's microphone too. That is why it is very important to ensure there is as little bleed of sound as possible when recording in this manner. Ralph Stanley spoke about his experiences in the studio in the modern era. "Producers nowadays want a lot of overdubs so that they can take a word or half of a word out," Stanley said,

> The reason for that is, they might find a verse in the first cut and another verse in the fifth cut to match it with that's better than the original one. A record used to sound just like it did when you finished recording it. This record, that's pretty much the way we did it. The new way makes it easier on the artist, I guess, because instead of singing one song 10 times to get it every bit right, you can sing it three times and have enough words or verses to match up if needed. (Halbersberg, 2003).

The vocals are usually done twice in modern recording. The first time is considered a 'scratch vocal.' This vocal track is for reference for the other band members so that they can tell where they are in the song. These don't have to be perfect because they will be replaced with the real vocal track later. Ideally, a studio engineer would want to isolate the vocalist when recording the vocal track he would want to keep, because if the vocal notes are flat or sharp in pitch, the engineer can use programs that correct the pitch of their voice. However, if there is bleed of any other instruments, it will also raise or lower the pitch. So in order for it to work best, the vocals should be tracked separately so that they are the only sounds being recorded at that time.

Another thing that has been brought into the modern world of recording is what's called a 'click track.' Essentially, it is a metronome played over the headphones of the performer. The engineer sets it at the desired tempo to record the song, and those people that are recording have that clicking in their ear with the beat of the song. Its purpose is to ensure that the song doesn't speed up or slow down. So the whole time a performer is playing, they have that click in their ear. The problem I have with this is people then start to 'lock in' with the click track they are hearing and not the other members of the band. This creates a problem for lots of acoustic music, in my opinion, because this type of music relies heavily on interpersonal dynamics.

When people think about dynamics, usually they think of it in terms of playing dynamically with volume. In other words, softening the touch and playing with less volume in certain parts of the song. Then in some parts raising the volume of their instrument or voice and really adding emotional highs and lows to the sound. While that is very important, another dynamic aspect that is often over looked is being dynamic with timing. Just as a pedal steel play can swell the notes of his instrument with a volume pedal to slowly increase or decrease the sound for dynamic effect, one can swell the timing at the beginning or ends of breaks or certain phrases to accent the song the way you want it and give a boost of energy or take that energy away and make the listener feel a certain way. Flatt and Scruggs were absolute masters of this. You can put their records on a tempo map and see that they fluctuate the timing sometimes as much as 10 beats per minute or more. The verses and choruses are usually a bit slower and relaxed. They are singing and tend not to rush the words or which can be perceived by the listener as a place to relax. Then when the instrumental breaks start, sometimes they will pick up just a little bit of speed. Not much, but enough to where it gives the listener the feeling of being sucked back into their seat. That is the feeling I get when someone like Earl Scruggs comes in on

a song like “Foggy Mountain Breakdown,” or “Roll in My Sweet Baby’s Arms.” There is a boost of energy there. When a performer plays to a click track, the tempo does not change at all. So if the people in the band are locked into the click track instead of listening to the other members of the band, the song can lose that feeling of energy and dynamics. I prefer music that has natural and exciting tempo variations. There are also people who have tempo variations that sound like they cannot play in time, because they can’t, and it sounds amateur.

From these sources, I learned that several factors heavily influenced the sound of bluegrass recordings in the 1940s and 50s. The most important were the musicians and singers, the recording equipment, the recording process, the instruments used, the spaces used that the recordings were made in, and the attention to detail of the musicians. I wondered if I could replicate the sounds of these early recordings, along with replicating the equipment, spaces used, talent of the musicians and singers, and the song choices.

Methodology

Because of the many changes in recording techniques, my research indicated that it would prove difficult to replicate this in a modern-equipped digital studio. While that is likely the case for most studios of today, there is a local studio called Bigtone Records that is ideal for a project like this. They have all vintage equipment, similar to the equipment that was used on the early essential bluegrass recordings. The studio has Ampex 350 two-track tape machines, Altec tube-driven compressors, RCA equalizers, and RCA 44 and 77 ribbon microphones. Playback monitoring is through a fifteen inch Altec speaker. Everything is recorded monaurally, which means the same exact sound comes out of both speakers or headphones when you are listening back. Bigtone Records now has a hand built old school echo chamber there that replicates that reverb, or echo, sound that you hear on lots of the old recordings. It is owned and operated by

Jon Atkinson and Danny Michael. They are two blues musicians from California that also believe in recording the old way, and set up a studio to give people the chance to do so.

I have always been interested in this process, because I feel that when musicians are secluded in booths and can't see the other musician or hear them naturally without headphones, they tend to play differently. I also think that those sounds heard on the old records can be produced if we take care to attend to the details and take the process very seriously. I thought it would be interesting to test the idea and see how close we could get to the sounds of early bluegrass records. So I assembled a team of musicians that I felt was up to the task. It is very important when going into the studio to pick musicians that are somewhat on the same page about their feelings of music. They don't have to think the exact same way, but it is important that they all have the same goal in mind. The musicians I chose all have backgrounds and enjoy traditional bluegrass. Between the five of us, it would be hard to calculate the amount of time we have all spent listening to and analyzing old bluegrass recordings. I knew that the sound that those records have is stuck in the heads of everyone I picked for this session and that they would be capable of doing their part to achieve that sound. I had John Kornhauser on rhythm guitar and vocals. John is an excellent bluegrass musician and has a voice like no one else. He is a genius at vocal phrasing, and has a good understanding of how bluegrass rhythm guitar dynamics work. Hunter Berry, fiddler player for Grand Ole Opry member Rhonda Vincent and her band The Rage, was an obvious choice for the fiddle spot. He has such a great understanding and ear for the feel of the music on the early bluegrass recordings. He can play double stops, when the fiddle player bows two notes simultaneously, so clean and clear that it sounds like there are two fiddle players playing at the same time. He gets a great tone out of the fiddle he plays too. I had Joshua Gooding on the mandolin and harmony vocals. Joshua is a very creative mandolinist who has

studied many players, including the originator of bluegrass music, Bill Monroe. Sarah Griffin played upright bass, and she did a fine job. Sarah gets a good tone out of the bass and is very easy to work with in the studio. This is also very important because being in a room all day long with the same people without breaks can be challenging, especially when they are being instructed to play something that might be different than what they are accustomed to. Ego has no place in the studio. Everyone is there for a common purpose, to make a recording that sounds great. I played banjo on this project. I used my Gibson flathead Granada banjo, setup with a set of NOS Vega light gauge strings from the 1950's. I have a photo taken the day of the December 11, 1949 Flatt and Scruggs recording session that included the legendary recording of "Foggy Mountain Breakdown," and Earl Scruggs is shown playing his newly acquired Gibson Flathead Mastertone Granada. In addition, for this session we all tuned up one step from standard tuning. This was done because a lot of the early Flatt and Scruggs recordings were one fret sharp of standard pitch. There are many different theories as to why the early recordings were a fret sharp. Some think the equipment used to record and playback wasn't as consistent as it should be. Flatt and Scruggs' recording of "Roll in My Sweet Baby's Arms" is a good example for the theory of inconsistent recording speeds, because they start in one key and by the end of the song they are almost an entire fret higher than where they started. Without ruling that theory out completely, I believe that they tuned sharp consciously for Flatt's voice and because other members of the Foggy Mountain Boys have stated that, "Earl liked the way his banjo sounded tuned higher."

Time to Record

We all got together the night before our first session and rehearsed a few songs that we wanted to record the next day. We came up with instrumental and vocal arrangements to the songs we had narrowed down to on our list and got comfortable with playing them. The next morning, March 16, 2020, we began to record in the Bigtone studio in Bristol, Virginia. We started with everyone having their own microphone, with baffles between each of us to prevent a lot of bleed, and that proved to be a sound we weren't looking for. Professor Dan Boner, who is the Director of ETSU's Bluegrass, Old-Time, and Country Music program, was there because he has a great ear and understanding of how those old records were recorded, mixed, and mastered. I invited him along for feedback as we tracked so that if he saw or heard something that had gotten by me, he could tell me and we could make the necessary improvement needed. He noticed that it sounded a little muddy, and that we were so far apart that we were struggling to hear each other. Remember, we were all in the same room without headphones or monitors. That combined with the sound baffles and the distance between each person made it hard to hear and focus. After hearing the playback of the first couple takes, he recommended that we try three microphones total.

Using fewer microphones is actually more accurate to how they recorded early bluegrass. Ralph Stanley recalls how they recorded in the early days of bluegrass compared to now in an online article referencing the *O Brother, Where Art Thou* Album. "We were close together where we could hear each other, no monitors, and that's the way I did it when I first started recording," Stanley says, "A lot of us ganged around one mic, but now the studio has little rooms and one musician is in one room and a couple in another, and you need earphones to hear everybody. That's how I've recorded for the last several years" (Halbersberg, 2003).

I have many black and white photographs of early bluegrass bands in the studio and the most microphones they usually are seen with are three, sometimes even less. So Hunter Berry, the fiddle player, and I stood facing one another with the RCA 77 ribbon microphone between us, and John Kornhauser, the lead vocalist and guitar player, and Joshua Gooding, the harmony vocalist and mandolin player, also stood facing each other on opposite sides of the RCA 44 microphone. The RCA 77 ribbon microphones are interesting in that the patterns in which they pickup sound can be altered. We had them set in a figure eight pattern so that they picked up in front and back of the microphones, but not off to the sides. The mics were positioned side by side, with about six feet between them, with their off-axis dead zones facing the adjacent musicians to diminish bleed. In the dead spot adjacent to the mandolin, guitar, and vocal microphone was the bass with its own microphone and a baffle to prevent unwanted sound from bouncing off of the floor. Lynn Fuston and Bill Vorndick did a video explaining the tonality of ribbon microphones and how their dead spots can be utilized. Vorndick explains "What I like about ribbons is that they smooth out the sound. I'm not having to deal with the upper harmonics, and I can get a good nice round tone" (ProfessorDan, 2013).

"One of the cool things about figure-eights is there is absolutely nothing on the sides [of the microphone], says Fuston. "You don't hear a thing" (ProfessorDan, 2015).

Upon transitioning to this setup, the sound become more focused and present. It took away all of the muddiness and unwanted noise in the mix and brought more definition to the notes being played. After listening back to the recording we had just made in the control room, I knew we were a lot closer to the sound we were looking for.

> There is a certain romance to the gritty mono recordings that were usually cut with just a couple of microphones direct to disc: You can sometimes hear the fiddler or guitarist or mandolin player actually leaning in towards the mic for a solo, and you can feel how

> the band as a whole balances itself from moment to moment, both in relation to each other and with the soaring vocal harmonies that rise above the instrumental conversation of the ensemble. (Jackson, 2008).

Standing right in front of another musician helps keep the emotion and feeling up in the music. You are not just playing to four walls covered in sound deadening materials with headphones on and one or two microphones in front of you. You are playing with people and interacting with them. Seeing how they react and the emotions on their faces in certain parts of the song brings more musicality out of me than I can describe. It makes you play to the song and play to each other. You aren't just playing as if you are reading the notes off of a piece of paper. You begin to get creative and play with emotion and purpose. Being able to see the mandolin chop, a quick staccato strum of the strings, and feel it hit you in real time versus hearing it come through a speaker in headphones that cover your ear are two completely different feelings. Being able to hear the exact sounds of your own instrument and experience the soundwaves travel through the wood is more authentic and brings things out of you that you didn't even know you could play. When I have the headphones on and I am in a booth all by myself, I feel that I lose that. I am concentrating too much on trying to make sure I am with the band in my ears, and that I am loud enough and playing at the right volume to get good tone. When a person is in the studio and has the headphones on, it alters how they hear themselves a little bit. They are hearing themselves through a speaker, not the actual sounds of their instrument or voice in the room.

We tracked almost 12 songs in two five-hour sessions at Bigtone Records using vintage equipment and techniques. We averaged doing about three to four takes per song before we felt that we really had it dialed in, and most of the time the third or fourth take was best. I associate that with each person learning what their role is in the song during the first two takes. They learn what spots they are to play fill notes, which is where there is a dead space and what would

normally be a lead instrument plays something there to fill out the space. They also learn where the dynamic points are in the song, and they get a good idea of what and how they are going to play or sing. I also found that once you get past four takes, the music begins to suffer slightly and then quickly gets worse. You begin to get tired of the song, and playing the same part. It starts to lose its feeling and the special moments that make it worth recording. There is a well-known story from the old days of country music where the Louvin Brothers took an unthinkable number of takes on the song "Pitfall." The ending was acapella and very hard to sing. One of the brothers, Ira, was a perfectionist and kept insisting on doing it again and again. They had been trying to record this same three-minute song for hours, and then listened back to the first take to find that it sounded better than any of the dozens of takes they had done after it (Louvin, 2013).

Creating a Control Recording to Compare our Work to.

We finished up our session at Bigtone and then on the next day we went into the studio at ETSU and recorded one song using modern techniques as a control. We used a click track, headphones, condenser microphones, lots of sound baffles, first a scratch vocal track, and then went back and redid it with a real vocal track. We did a few overdubs. Joshua took three or four tries at his break so that we would have options as to what his break was, and I went back and overdubbed banjo later because I was playing rhythm guitar on the track. This allowed John, the guitar player normally, to do the scratch vocals without it bleeding onto the guitar microphone. It took us four and a half hours to record everything for just one song. At Bigtone it would have taken us maybe thirty to forty-five minutes to do the same song. I have included the same song from both sessions for comparison in overall sound, performance, and feeling.

Results

I have included in this document the mastered files of seven of the songs we recorded at Bigtone Records, along with one recording of one of the same songs, but recorded the modern way at ETSU's studio which is all digital for an A/B comparison. When comparing those two tracks, listen to the tone of the instruments. Listen for the grittiness in the sound when someone starts playing a solo, or when John Kornhauser is really singing hard. Listen for the buzz of the two harmony notes when Joshua and John are harmonizing together on the choruses of songs. Listen for space within the music. Does it sounds cluttered, or does it sound open. When listening back, be conscious of how these recordings make you feel while listening to them. Anxious? Happy? Sad? Lonesome? Bitter? Warm? Blue? Aggressive? Where do these recordings take you? What place in your mind do you arrive at? It may be different for every song.

Conclusion

For me, it is a no brainer that the bottom line is music. However, in the music business, the focus can be centered around money. The quicker you are out of the studio equals less money you owe the place for studio time. They can sit in front of a computer and tune vocals, adjust timing, and choose certain notes of breaks for hours and hours during mixing. That just runs the bill up also. The old process of recording is much faster, and in my opinion you get a more colorful musical result from it. What you hear come through the speakers is the actual performance, not something that an engineer has puzzle pieced together. This entire process has been an incredible learning experience for me. From learning how those old tube machines work, learning how the bands stood around the microphones in the studio, studying the timing, tone, and dynamics of early bluegrass bands, and learning the differences between the recording processes from then to now. Bluegrass musicians have been chasing the sounds of the early

records since the day they were released. It is my sincere hope that this project may have shed some light onto some of the many mysteries of that recorded sound, and what it takes to reproduce it, and that it can be reproduced with the right team, equipment, research, precautions, care, effort, and attention to detail.

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