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Studio Magic: The Process, Value, and Ethics of Remastering

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ABSTRACT

Due to the growth of recording technology, recorded music has become the most common form of music listening. Having high-fidelity audio is as important on audience perception of the music as the composition and the musical interpretation. As the process of recording and the final medium of the recording have advanced, the fidelity of the audio has increased, thus decreasing the listener's awareness of the recording itself and bringing their attention to the music. However, older media is reparable to the extent that it can be remastered to decrease scrutiny on the product. What is worth remastering? What is the process of remastering and is there ever a perfect product? Through transferring and remastering Chinese opera tapes, the listener can hear a product closer to "truth" in music. What truth is, ultimately, is up to the remastering engineer's discretion, as well as that of the audience.

Throughout history, live performance has been the primary way music is experienced. In order to convey meaning or draw an audience's attention to certain details, performers and directors must control dynamics, instrumentation, and expression. In Chinese Opera, for example, the singers must sing at both a volume and a range to separate themselves from the instruments to carry the story line or express the characters' emotions to the audience. These functions are also carried out in the performer's actions on stage and set design. However, in more recent history, developments in media, particularly audio recording, have altered how audiences experience music. While it may seem that compositional and performance techniques influence perceptions of a stage work most drastically, recording methods in fact have equal influence on audience perception.

In order to appeal to this view, it is necessary to step back and evaluate what truth in music really is. Every part of music is a creative process – from conception of an idea, story, or melody to composition of those ideas. From there, it is another creative process to interpretation of the performers of the composition to the realization of the interpretations to the audience's perception of the interpretation. No two persons' take on a performance are alike since no two performances are exactly alike. Recording is able to capture the truth through documentation and the archiving of a performance, but even recording techniques can be used creatively to convey a desired performance outcome. It is further necessary to discuss the development of recording techniques and how they have been applied across the world both as documentation and a creative process.

To begin my research, I investigated both the history of recording and processes of mastering and remastering. In Western culture recordings, recordists and engineers have strived to achieve as high fidelity (hi-fi) of sound as possible given recording technology available or accessible. In early 78rpm recordings, there was often a low-cut filter applied directly during the recording process, eliminating artifacts that were indeed present during the recording session (Kendall, 2009). When mastering artists restore these 78s, the recordings can be remastered to bring back this low-cut, called a playback curve, in order to achieve a more accurate representation of the recording room. Other artifacts such as scratches and blips can be eliminated through computer software, resulting in a hi-fi sound. In cases such as *The Complete Recordings (Centennial Collection) of Robert Johnson*, the lower guitar notes have more clarity and in general, a cleaner sound than previous masters and remasters. This is closer to the perceived truth in playback perception, since it sounds closer to what a listener would hear if one were present during the recording or performance.

However, with the advent of multi-track recording on magnetic tape, recording fidelity improved. It was no longer advantageous to apply a low-cut filter during the process as the playback media also improved – vinyl records are softer than the older shellac 78s and did not have a problem handling lower frequencies. In addition, multi-tracking allowed performances to be recorded at separate times or in separate spaces, allowing the technology to be applied creatively. Music recordings became not just an auditory archive of performance, but an aspect of the performer's creative vision. The truth in recording was fundamentally altered.

Perhaps the best example of this change is in the Beatles' recordings post-*Revolver*. A recent article from BBC discussed the role of a record producer after the death of Beatles producer George Martin,

> "Before Martin's era, producers aimed primarily to provide a faithful document of musicians and singers interacting in real time. The studio was regarded as little more than a more controllable environment for recording a live performance. If a musician flubbed a chord or a singer veered off-pitch, it was the producer's job to demand a retake until everything sounded up to par. Producers were responsible for picking songs, guiding arrangements, hiring backing musicians, and making sure the engineers were recording the performance with the utmost fidelity." (Kot, 2016)

Artists like the Beatles, though, wanted to use the studio in new ways, and soon became a studio-only band as they were unable to replicate in a live performance what they had done in the studio.

> "He used multi-track recording and the studio itself as an instrument, manipulating sound in a way that turned The Beatles into the first true studio band in their post-Revolver era…Martin's greatest legacy was to change the role of the producer from a professional who documented a performance to a creative enabler who built new worlds of sound between the headphones."

To recording musicians, truth became more about achieving a sonic vision or capturing a creative idea rather than a performance itself.

Post-recording techniques can further affect the sound of music. In ways such as the aforementioned low-cut filter applied to 78rpm records, equalization, compression, and panning on stereo recordings create possibilities for musicians and engineers to convey what they feel should be heard when it should be heard and where it should be heard. For simplicity's sake, take a common rock band that includes drums, bass, guitar, and vocals; the drums are probably much louder than the vocals – it is therefor imperative to bring the volume of the drums down and bring the volume of the vocals up. A drum kit, which almost always has a kick and

snare drum has lots of frequencies that interfere with frequencies of the other instruments. A kick drum would lack definition if there were no high-end frequency boosted for the attack (the beginning of the hit) of the drum, but lack the feeling of it being a larger and deeper drum if the lower frequencies were not altered as well. Thus, equalization is helpful in acquiring either a truthful representation of the drum or a creative representation of separating the sound. A snare drum may not sound as punchy without compression, where a fast attack will allow that hit to pass but the later volume to be cut short. In a manner of speaking, the snare makes a brief appearance before it gets out of the way for other things going on in the band. In modern stereo recordings, if the guitar were placed in the center of the mix with the vocal being panned hard left and the bass hard right, the listener will be compelled to focus on the guitar (particularly if the volume is higher). However, if the vocals and guitar were swapped, the listener would naturally pay more attention to the vocals. The truth in recorded music is what the musician, mixer, or engineer all creatively decide that to which the audience should pay attention. There is no right or wrong, just more or less desired outcomes.

In traditional live classical archival recordings, what is most desired is as hi-fi a sound as possible. Little noise of recording techniques and clarity of performance is standard. Through what I have been taught as well as what clients expect, the most desired outcome is an accurate representation of the performance in the space where it was performed. For example, a choir recording from a large cathedral should not sound like it was recorded in a small room, but instead give semblance of the way the choir sounded in the cathedral. Though live amplification is sometimes

needed for an audience to hear a solo voice or an accompanying instrument, this is not desired to hear on the final recording; instead, a spot microphone is utilized and blended with the main microphones to bring the right amount attention to the voice or instrument without it sounding totally distinct. Though in studio recordings reverberation is often used as an effect, added reverb in archival recording is not to be heard as an effect, but a tool to enhance the representation of the recorded performance. As Helen Myers puts it, "In fieldwork, it is essential to remember one is recording not only a sound source but also its context, the sound field…placing all the performers in a professional recording studio…robs the performance of its natural ambiance" (as cited by Lysoff, R.T.A., 2006, p. 192). Thus, preserving the context of the recording as well as the performance is crucial in archival recording.

An interesting article by Jens Hjortkjaer and Mads Walther-Hansen discusses the increasing use of dynamic range compression in music. This is a subject that has fascinated me for some time now, since this relates to the so-called "loudness war". The argument is often made that the heavy use of dynamic range compression in music mastering deteriorates sound quality. However, the researchers found that normal hearing listeners that evaluated popular music recordings in original versions and remastered versions with higher levels of dynamic range compression had no preference for the less compressed music. The researchers "also failed to find differences in ratings of perceived 'depth' between the original and more compressed audio" (Hjortkjaer). The study suggests, "listeners are less sensitive to even high levels of dynamic range compression than often argued". Though this may be true in popular music, archival recordings of classical and other types of music

are much different. If a movement or part of a movement is soft and then all of a sudden becomes louder dynamically, the listener should be able to hear that – the overuse of compression will squash the louder parts to make the dynamic range smaller and be very perceptible to most listeners. In essence, it will not sound natural, and not be an accurate representation of the music's context.

The techniques involved in transferring and remastering these different media of audio recording are unique not only from each other – 78rpm shellac compared to 33 ½ rpm vinyl compared to tape – but also from recording to recording and mastering engineer to mastering engineer. Since I had not landed on what sort of source I was planning to master, it was important to research equipment and processes needed for all types.

In his article "One man's approach to remastering", Ted Kendall explains his method of remastering 78rpm recordings. First, it is extremely important to find a suitable source disc. One that is in poor condition will be much harder to remaster than one that is in better condition. On the turntable, the record must be centered as exactly as possible. Though there is usually a pin to help center the record, sometimes the hole in the record is too large and any off-centering can alter the speed and pitch slightly from one side of the record to the other. He notes it is important to transfer at 78rpm and adjust pitch later if required, since this helps decrease wear on the original source. The equipment needed to transfer a record of this type is extensive; the correct size and shape of stylus is different for 78s (U-section) than 33 ½ discs (v-sectioned), again to decrease wear on the disc. For this, he recommends a truncated elliptical tip from Expert Stylus Company. The pickup

should also be stereo and monitored in anti-phase to hear how the stylus sits in the groove of the disc. The arm of the turntable “must be of an effective mass which gives a resonant frequency that is clear of the 78rpm warp region”. Again, too light of an arm will alter how the pitch sounds and too heavy of an arm will cause undue wear to the source.

In the digital realm of transferring Kendall also gives helpful advice. He writes, “sampling rates and enormous bit-depths are of less importance than good clocking and low distortion”. This is important to remember, since it will be difficult to detect a difference of sampling rates to an average listener, whereas poor clocking will result in digital pops and clicks in the transfer. To reduce noise from the source, numerous plugins can be utilized without a painstaking process. Declickers and decracklers reduce the blips while hiss can be done with a noise reducer. Using a graphic equalizer is a great aid. These digital plugins only go so far, however, and some noises must be taken care of manually.

Transferring from tape is somewhat simpler, since the tape machine only needs to be calibrated to the right frequency level, speed of playback, and clean playback heads. At first, I was hopeful to find a contact around the area who had masters of the Seattle rock music from the 1980s-2000s. Working at London Bridge studio, finding an iconic album and remastering it not only would have been a fun task, but something useful to my work. However, after discussing the idea with the owners of London Bridge, they suggested that it might be too hard to find someone willing to give those out and that I should try some museums around the area for source material; doing so would avoid both copyright infringement and also allow

me to put out work with my name attached. After reaching out to Seattle museums, including the Washington State History Museum, Nordic Heritage Museum, Shoreline Historical Museum, Museum of History and Industry, Burke Museum of Natural History and Culture, Wing Luke Museum of the Asian Pacific American Experience, Northwest African American Museum, and the Experience Music Project, the choice came down to transferring discs from the Museum of History and Industry and reel-to-reel tapes of Chinese Opera from the Wing Luke Museum. Since transferring from a disc required the purchasing of many materials not readily available to either Seattle Pacific University or myself on a limited budget, I settled on acquiring reel-to-reel quarter-inch tapes from the Wing Luke Museum.

Copyright law involving music is notoriously complicated, and even for educational use the laws regarding fair use are convoluted. When suits do arise from issues of fair use, it is generally decided on a case-to-case basis. Robert Henley Woody II and Robert Henley Woody III wrote a description of copyright laws in the Phi Delta Kappa Educational Foundation Fastback no. 368. Relating to Public Domain, anything recorded prior to 1978 is in copyright for a total of 75 years, while everything after 1978 is in copyright until fifty years after the death of the author or last surviving co-author, ruling out many sound recordings I was hoping to find.

Fair use laws are even more opaque, with usage allowed “for purposes such as criticism, comment, news reporting, teaching (including multiple copies for classroom use), scholarship, or research”. There are four criteria under the fair use to deem if the usage is indeed a copyright infringement: 1) the purpose and character of the use, including whether such use is of a commercial nature or is for

nonprofit educational purposes; 2) the nature of the copyrighted work; 3) the amount and substantiality of the portion used in relation to the copyrighted work as a whole; and 4) the effect of the use on the potential market for or value of the copyrighted work. Dubbing recordings has the same permissible use as a photocopy – for purposes other than performing, no more than 10% of the work can be used, and for purposes other than performance, a single copy of an entire performable unit such as a section, movement, or aria that is (1) confirmed by the copyright proprietor to be out of print, or (2) unavailable except in a larger work, may be made by or for a teacher solely for the purpose of his or her scholarly research or in preparation to teach a class.

In other words, simply using a released recording would have allowed me little to no material and many questions. If I were to transfer 78rpm discs of Robert Johnson recordings, it would perhaps have been acceptable to remaster four of the songs, or 10% of the recordings he made, or 10% of each song (roughly 20 seconds for each). It would have been extremely important to reach out to the record labels of the recordings I wanted to remaster to gain permission, but in the event this took a long time or was denied, I needed to find an alternative. Therefore, reaching out to museums to work on part of an historical archive would not be a copyright infringement.

To transfer these reels, I took a line out of an Akai Electric Co., LTD. Model GX-4000D tape machine and ran it to an Apogee Rosetta, through a Motu 828x into Pro-Tools. At a sample rate of 96kHz and a bit-depth of 24, the digital sound quality was more than stellar. Since the Apogee Rosetta has a wonderful Big Ben clock,

there were no issues with clicks or blips during transferring. The line out was rather quiet, but this was easily rectified digitally using digital gain boost and maximizers on the plugin iZotope Ozone 6.

The equal importance of recording and performance can be seen specifically in three renditions of a Chinese legend – *Legend of the White Snake*. The tale is about a boy (Xu Xian) who swallows immortal pills, but after throwing them up they are eaten by a white snake – their paths are now linked and after the white snake gains enough power to transform into a human. Years later, a jealous tortoise tries to separate them after not being able to consume any of the pills, and upon finding out his love is in fact a snake, dies of shock. Along with her green-snake friend, the white snake brings Xu back to life, and soon gives birth to their son. The white snake is captured, and twenty years later, the green snake confronts the tortoise and frees the white snake, who is reunited with her husband and son.

In *The Story of the White Snake* (Bai She Zhuang), the traditional Chinese opera instruments are present. It opens with a flute, the *pipa*, and a plucked lute, called *yue qin*. The percussion, which are gongs, have a rising and falling sound. The *erhu* fiddle that accompanies is very nasal, and as mentioned in *World Music: A Global Journey*, "some of the pitches it plays probably strike you as out of tune" (Miller &Terry, 2012, p. 203). The flute is panned hard left, the fiddle hard right. There is a *clavé*-like instrument that ticks a steady beat, called the conductor's clapper, or *Ban gu* (p. 205). The vocals switch back and forth from melody to linguistic tone, but when they are singing melody follow the erhu and yue qin. When the piercing vocals enter, the male voice is slightly right while the female is left (but

further left in relation to center than the male). It is hard to tell if the heavy reverberation sound is due to the recording of the hall in which the performance took place or if there is added reverb. The reverb seems to be mostly on the vocals and melodic instruments, rather than on the percussion. In the fifth part of the opera, the lead female vocal is now centered, with the instruments being reversed from what they were previously. Right at the end of this part, there is an introduction of some deep drums. The second reel opens up with the gongs hitting hard and a short vocal line before the instruments take over the melody. The rest of the opera continues in a similar manner, with dialogue and interplay between instruments and vocals, with some of the last vocals seeming to be sung into a public address system. If a PA system were used, it would explain the stronger amounts of reverb and delay on the vocals rather than the instruments.

In order to achieve a result closer to "truth" in this recording, not much is needed in the way of equalization. There is a wide range of frequencies documented on the tape, including a clear low end with the bass drum hits. Tape has a natural saturation limit, so no extra compression is desired, while the tape has low-noise so extreme use of software is not necessary.

The Legends of the White Snake (Nan Sheng Opera) is a different composition and was recorded in mono, with a brief spoken introduction that sounds as if it were recorded outside as it has birds chirping in the background. The actual opera opens with a multitude of gong hits before the pipa, erhu, and yue qin enter. The female vocal enters first, and seems much closer to the microphones than the rest of the instruments, singing in the traditional high pitched and piercing tone of Chinese

opera. The *Ban gu* clapper is much less prominent on the beat than in *The Story of the White Snake (1)*. The gongs mark the entrance of the lead male character, and he seems further away from the microphones. The vocalists do not seem to be performing at full opera volume, and in general have more vibrato than is standard for Chinese opera (Miller, 2012, p. 203).

This recording has much less room sound than *The Story of the White Snake (1)* and has much more focused midrange, lacking lower frequencies and high frequencies. Adding lower frequencies reveals an even boxier room sound, as if it were recorded in a small theater or stage rather than a performance hall. The end of the reel has some small ensemble popular Chinese music recordings, which leads me to believe that this reel was used for many different recordings from the time. The tape seems as if it has been used many times, with lots of artifacts and even the sound of some other music very quietly behind the main opera. The second side of the reel cuts the music short when the tape runs out.

The Story of the White Snake (2) is yet another composition, but has about twenty seconds of super quick gong hits at the beginning. A reed instrument begins to play along with the gongs around the time the gongs resume the standard vocal introduction. There is no pipa in this performance, but the yue qin is prominent along with the erhu. The *Ban gu* acts in a manner similar to castanets, dissimilar from beat oriented clapper in the first *Story of the White Snake* and much more active than the clapper in *The Legend of the White Snake*. The characters do a lot more talking over background yue qin playing, but do sing along with the erhu and

yue qin when they do sing. The female vocals seem much higher and shrill than the other two operas as well.

As far as the technical aspects of the recordings go, there is a lot of tape noise, and the recording quality seems pretty low-quality; it is thus hard to distinguish in what sort of space the performance was held. Further, the vocals are very quiet compared to the instruments, suggesting that they were further away from the microphones and certainly not amplified in the room. Much work is needed to separate the vocals from the instruments, as they tend to hang in the same register. Because of this and the poor archive quality, the amount of equalization is much greater than on *The Story of the White Snake (1).*

Goals and Outcomes

1999.055.005.016

For this specific opera, recorded in stereo at 7 ½ ips, there was not a considerable amount of artifacts to eliminate from the master tape. With plugins applied to the Master Fader, the tape noise was easily reduced through iZotope RX3 Denoiser by learning on the tape pre-roll. Thresholds were set at -0.9 and reduction was set at 14.4 to eliminate as much of the tape noise as possible without diminishing the quality of the equalization. Artifact control was set in the middle between Musical noise and Gating at 5.6. The input and output settings were matched to provide no noticeable gain difference in the master. To hear this difference, listen to 1999.055.005.016 (1) and (2) (see supplemental files). Bounced file (1) has all plugins inactive, while (2) has Denoiser active. The male vocal

throughout the opera was somewhat muddy. To remove this muddiness, I used a simple EQ3 7-band equalizer. Specifically, there was a slight reduction in the Low Frequency band with a shelf that reduced frequencies at 56.3Hz by -4dB. The Q was set at 1. The Low-mid frequencies were reduced by -7.7dB with a bell at 253.8Hz. The Q was slightly higher at 2.88 to affect mainly the male vocal. Listen to Bounced file (3) to hear this difference in tone.

Lastly in the plugin chain, iZotope Ozone 6 was placed to further equalize, slightly compress, expand the stereo image, and maximize the gain. Band 1 on the equalizer was set at an analog resonant highpass. The frequency was 34.1Hz and the Q was .2. Band 3 was an analog band shelf bell at 216Hz, with a gain of -1.5dB and a Q of 1.3. Band 5 brought back some of the low-mid frequencies by using an analog peak bell at 423Hz with a gain of .9dB and a Q of 1.8. Band 6 was an analog band shelf bell at 2.46kHz with a gain of 1.3dB and a Q of 1.3. Band 7was an analog High Shelf at 4.8kHz with a gain of 2.1 and a Q of 17.2.

The Dynamic Presets were set at a low compression rate since the tape itself has a natural and smooth compression. The Vintage Warmth preset was used with slight gain boost in Bands 1 and 2, with the compressor at -34.3dB on Band 1, -30.1dB on Band 2, and -47.4 on Band 3. The Stereo Imager was set at a width of 0 on Band 1, 34.2 on Band 2, 30.4 on Band 3 and 0 on Band 4. On the Maximizer, the Tube setting was used with a ceiling of -0.2dB and a threshold of -7.1dB. The Character was set at a transparent setting at 6.5 to allow the gain to be raised without too much coloration of the tonal quality.

1999.055.005.027

This reel was recorded in mono at 7 ½ ips and was perhaps the most difficult to remaster. Each of the four tracks required different mastering techniques since they were four unique recordings. On the first track (Jiu Tian Xuan Nu movie soundtrack), there is a noticeable gain change in the recording at the 5:42 mark. To address this, the volume prior to that point was boosted +10.1dB using standard track automation. Though this technically changes the authenticity of the recording itself, the authenticity of the performance is highlighted, rather than drawing attention to the fault in the recording.

To eliminate noise, iZotope RX3 Denoiser was again used, with an artifact control of 6.5, thresholds of 1.0, reduction of 21.6. See Appendix A2 for further details on remastering techniques. The first track, again, was very muddled sounding, with lots of information between 700Hz and 2kHz. With not much information above 5kHz, it was difficult to add air space to the sound of the recording. The vocals were separated slightly from the instruments by boosting dB slightly around 410Hz. The feel of the recording sounded boxy and like it was recorded in a sound studio rather than a hall.

The second track had a much larger room sound, and almost sounded as if the vocals were projected live into the hall. Before I remastered this track, there was little higher frequency information audible in the recording. By adding this in, the room was given a more natural sound. The instruments were made less boomy and rang out less by adding a high-pass filter. The Ban Gu has less pitch in this recording compared to others.

As an effect on the third mono track, I duplicated the recording and nudged the second track by three samples, panning the first track hard left and the second hard right. Though this still results in a mono sound, it is a slightly wider mono sound. However, the product was not something I cared to do on the other tracks, as it was not extremely noticeable and technically voids the recording's authenticity. The recording sounded very thin before remastering, with not much fullness in either the pitched instruments or the voice parts. Rather, there was a considerable presence to the percussion hits. I tried to counterbalance this by first boosting frequencies around 1-2kHz on each track with a 7-band equalizer, then reducing them slightly later on the master track with Ozone.

The fourth tape track sounded like the microphone(s) had been covered with a cloth during recording, placed close to the singers but far from the instrumentalists. To get rid of this unwanted muffling, A lot of boost was needed in frequencies above 3kHz, and a lot of reduction between 300 and 1.5kHz. Unfortunately, due to the condition of the tape, there is hardly any audio information above 5kHz to boost without resulting in a massive amount of tape hiss. Nevertheless, the final result is a drastic improvement on the original transfer.

1999.055.005.128

My goal for this opera was to correct much of the tape noise and crackles. Due to its age and perhaps being pushed with the level during recording, there are many parts that seemed to cut out and compress the music. This became a major distraction during initial listening. Throughout the tape there was a noticeable delay

in the sound, i.e. a quieter repetition of the music after the initial sound. It almost sounded as if they used a delay processor during the recording, but most likely this was due to improper storage, and it seems there is no way to effectively combat this problem. Tape hum was reduced using Denoiser.

The female vocals were shrill but muddy, and most of the other instruments were not distinct from each other. Since most of the instruments sit in the same general register and overlap, there was a lack of overall clarity in the recording. This was heard most clearly with the male vocals, which also showed the delay stronger than the female vocals. The low frequencies overpowered the recording and were also very distracting.

I was able to cut out the low frequencies using high-pass filters, and using higher frequencies separated the attack of the different instruments. The vocals seemed to gain clarity in comparison to the instruments. The *Ban gu* clapper stood out more as well, but because there was no way to remove the delay was still less clear than other recordings. The erhu and yue qin have a strong presence around 1kHz, and lost a lot of their volume trying to bring out the vocals, yet can still be easily heard. The gongs' attacks were also heard with more definition through high frequency boost, but have such a broad range of frequencies that they still tend to overpower the rest of the instruments.

1999.055.005.045

This reel was recorded in mono at 7 ½ ips, with each pair of tracks needing a separate master (tracks one and three and tracks two and four). Tape hum was

again reduced using Denoiser. The first opera was extremely focused around 1kHz, and lacked tightness in low frequencies. High frequencies were also absent so the erhu and yue qin almost sounded like a white noise behind the music. The Ban gu was lost in the recording, while the gongs sounded flat and more just like a clatter than instruments. The vocals were louder than the rest, as they were probably closer to the microphones or had auxiliary microphones.

Through the remastering process, I used iZotopes Decrackler to eliminate blips and other tape noise. This can be difficult to utilize as if set incorrectly will start to eliminate the initial sounding of instruments or vocals. The vocals were made to be less muddy through a reduction of 1kHz, while boosting upper frequencies allowed the plucking of the yue qin and the bow attack of the erhu to be heard more clearly.

The second recording on the reel had similar issues; even stronger mid-range frequencies made the recording quality sound poor, low frequencies were not tight and made the gong hits rumble but not ring out in the room of the recording. The attacks of the erhu and yue qin were lost yet again, and clashed with the vocals. The Ban gu sounded more like a pitched wood block, again clashing with the other instruments. In other words, everything lacked separation or clarity.

With a boost in the 200-500 Hz range, the instruments were allowed to have a clearer pitch, while a high mid-range boost gave the Ban gu a sharper attack; it sounds more like a clapper now rather than a wood block. This boost also gave a clearer separation of the erhu and yue qin compared to the voice. A high-pass filter (which has become a frequent usage on these reels) gave the gongs a less boomy

noise and a more instrumental articulation. The female vocals still seem shrill, but have enough of the pitched range to make it clear that it is the affected singing style in Chinese opera rather than poor recording or equalization. At the end of each of these two tracks were other recordings of popular music – it is likely that this reel was used for multiple projects and recorded over many times. This would also explain the poor remaining quality of the tape.

1999.055.005.038

This reel was recorded at 7 ½ ips in mono. Once again, it required two separate masters. The first recording was fairly interesting to work on – there were not very many problems with blips or other residual noise in the recording, and the recording techniques used enough room to make the recording sound natural and not affected. It sounded like it was actually recorded in a room! There was some sort of electronic instrument or pre-recorded sample used at 5:14 as an instrument or effect. This was the spot I initially used to really focus on the remaster, but when I felt like I got that part to sound right, playback at other areas sounded worse than the original without remaster and I had to begin again. At 25:19 the reel was stopped and it sounds as if levels were adjusted for the next part of the music. Ultimately, this recording initially sounded very dark and unique compared to the others, with most everything sounding muddy, eventually getting clearer after recording adjustments were made.

Because the tape was in better condition than some of the other reels I transferred as well, I was able to add a lot of higher frequencies without adding very

much hiss to the overall sound. The vocals were able to be distinguished easier this way, as well as the sound of the room even further enhanced. This was my first undertaking using AudioSuite plugins with iZotope Spectral Repair (see supplemental files for audio). Though this almost completely eliminates tape blips, it is extremely time intensive. To do this throughout just one of the reels could be an undertaking for an entire year-long project. However, due to the time constraints and the fact that this tape was in decent condition to begin with made it unreasonable to continue for the entire reel.

The second recording on the reel again lent itself to AudioSuite Spectral Repair, this time being slightly more effective on this recording as it had more faults in the audio (see supplemental files), however proving to be even more time consuming as these flaws had to be done in smaller sections. The low-mid frequencies contributed to the overall muddiness, while the upper-mid frequencies contributed to a lack of definition in the instruments.

Through the remastering process, it was possible to give the vocals a brighter sound without making them shrill, also giving the instruments more definition. Slight low-frequency compression gave the low plucked instruments and the lower gongs a chance to be full without warbling in the room. The Ban gu again rang through the recording without sounding flat. The best way to describe the change is as if all the instruments were recorded behind baffles on a stage before remastering, while after it sounded as if they were placed around a microphone and spaced according to relative volume.

1999.055.005.021

Often on these reels, using Denoiser to eliminate tape noise was enough to make the recording sound excellent, while using iZotope Decrackler either was not necessary or cut in too much to other parts of the recording, such as the attack of the gongs or when the vocals would suddenly get louder. However, Decrackler proved very beneficial on both sides of the reel. Since there were pops and crackles throughout the recording, and they did not tend to interfere with the instruments, this really helped to clean up the recording.

The stereo image was quite good already on these reels, but the recording sounded flat. Between the gong hits, vocals, and instruments, every sound just sat together like oil in a puddle of water. By reducing frequencies in around 1kHz, boosting around 300Hz, adding a high-pass, and boosting around 3kHz, all of the parts became discernable. The gongs seemed to have a pitch rather than just be struck pieces of metal. There is more compression on the master between 252Hz and 1.86kHz, which helped keep those frequencies from becoming too loud when desired. Again, the ban gu began to have a pitch, while still sounding distinct from the pipa, erhu, and yue qin.

1999.055.005.023

This stereo recording was in decent condition, so with just a bit of Denoiser, it sounded like a fairly modern live recording. The erhu and yue qin were already fairly well balanced, and the stereo placement in the recording helped separate them. The female vocals were not super shrill as in some of the other recordings, but

this meant that the male vocals were slightly fat and lacked clarity. Adding higher frequencies allowed the room sound to really shine through, giving good presence to all of the instruments (including the ban gu) as well as the male vocals. There are a couple places in the recording where the sound of the room stops dramatically when an instrument ceases playing, such as the pipa. It is probable that the recording was "punched", or that part of a take was not quite good enough and a new take was begun at these points. The pitched drums sounded quite boomy before remastering, but with a high-pass filter as well as the addition of higher frequencies, their attack was made clearer, while the resonance in the room was reduced.

Difficulties and Setbacks

Though I am pleased with the end result of the masters I was able to accomplish, there were some difficulties as well as setbacks along the way. The tape machine available for usage only functioned at 7 ½ ips, so although I had transferred a few reels recorded at 3 ¾ ips, playback was twice the speed – imagine listening to the voices on "Alvin and the Chipmunks", but the whole of the recording sounded like the Chipmunks. There are a few work-arounds for this, such as playing back in Pro Tools at half-speed, but it is impossible to bounce out the recordings at half-speed. To have a correct speed file, I would have had to play back on one computer at half speed, with the outputs going to a Digital-to-Analog converter, then out of that converter back to Digital, into another computer recording at normal speed. This introduces another set of digitization, which can reduce sound quality. Over

multiple times of this analog to digital to analog conversion, the result might be compared to sending a fax of a fax or making a photocopy of a photocopy many times. The final result, too, would have only been at 48kHz, while the ones I had been able to transfer first would have been at 96kHz. The audible quality may not have been drastically reduced, but plugins often sound different for different sample rates. Had I been able to afford better resources, a new tape machine (or a serviced one) would have been my first priority.

One of the reels I tried to transfer was in such poor condition that it would not continue to run on the machine. There is not much I can do about this. Since the Wing Luke Museum had already digitized all of the tapes, I attempted to get the uncompressed WAV files for both this reel and the 3 ¾ ips reels. Due to compatibility issues as well as time constraints, this ended up not being feasible. This also could have changed the sound of the recordings, since the equipment they used to transfer was most likely different. This includes Analog-to-Digital converters and clocks that may color the sound differently than the Apogee Rosetta I utilized.

Facilities and scheduling was another difficulty in the process. Since I also do not have much budget for mastering plugins for myself, I was fortunate to be able to use Professor Ronald Haight's software. Avid's subscription-based service for Pro Tools does not allow iLok license managers to be used from one computer to the next, so all of my work had to be done in the music technology lab at Seattle Pacific. This worked sometimes, but if a band was practicing in another room or other students were in the lab working on projects, I was not able to use the room since I needed everything else to be silent to properly hear the mastering I was attempting.

Again, with a larger budget, I could have invested in my own plugins, speakers, and audio interface (such as the Apogee Duet I used to monitor or a similar device).

Conclusion

Between these three recordings of *Legend of the White Snake*, the same story is told in three contrasting ways. The compositional and performance techniques emphasize certain parts of the story, with some spending more time on character while the other may focus on the legend. However, through the recording, the audience is told other truths about the performance – some were high quality productions in large rooms meant for a large number of people, such as *The Story of the White Snake (1).* It is a complex work of art, not merely a folk tale. The others, performed in smaller venues and with lower budgets, show that the *Legend of the White Snake* is just that – a legend. Any person should be able to hear this legend no matter the production value. In order to convey an accurate representation of the performance, so many creative choices were made through composers and performers and directors, and even through sound engineers. To restore these tapes to their highest quality and, again, a more accurate representation, it is a creative choice of mine concerning what I want to hear. There is no right or wrong, but the creative choices of remastering are of equal importance to the listener's ear as the performance itself.

Recording has just as much influence on the listener's perception of music as the performance aspects of the music itself, but it is hard to pinpoint what truth is in recording. Ultimately, I feel the same way about understanding truth in music as

Robert M. Persig does about understanding quality. In *Zen and the Art of Motorcycle Maintenance*, he asks his students the question, “What is quality in thought and statement?” (1974, p. 187) He had trouble answering the question himself, thinking,

> “Quality – you know what it is, yet you don’t know what it is. But that’s self-contradictory. But some things are better than others, that is, they have more quality. But when you try to say what the quality is, apart from the things that have it, it all goes poof! There's nothing to talk about. But if you can't say what Quality is, how do you know what it is, or how do you know that it even exists? If no one knows what it is, then for all practical purposes it doesn't exist at all. But for all practical purposes it really does exist. What else are the grades based on? Why else would people pay fortunes for some things and throw others in the trash pile? Obviously some things are better than others -- but what's the ‘betterness’? -- So round and round you go, spinning mental wheels and nowhere finding anyplace to get traction.” (p. 188)

Because truth in music is creative, there is no truth, but there is a truth in music since it is creative. Why do some recordings and performances seem more truthful? How do you know that truth exists? If no one knows what truth is, then for all practical purposes it doesn’t exist at all. But for all practical purposes it really does exist. “What the hell is Quality?” he concludes. So what the hell is truth?

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Appendix: On Faith and Learning

I strive to be ethically conscious and morally righteous in my work. I do not necessarily actively try to convert people I know, but try to show them the Christian way of living in how I live. This includes having good work ethic, being polite and kind, as well as humble and gracious. Music, as my academic discipline, can incorporate a strong background in faith and can ask serious religious questions. However, music does not always relate to faith, and is often times opposed to it. What I have seen through my work in the recording end of the industry is that faith does not really enter in to the technical aspects of recording. I do not see this as a problem. Again, I try to live out the Christian lifestyle to my coworkers and clients. My faith is not diminished by my academic discipline, but I do not see that it always has to intersect. I do record religious groups and religious concerts, and when I can find meaning in the music there, I think of it as an added bonus.

Dr. Paul Farmer, though maybe not a professing Christian, is relatable to me. Dr. Farmer's work is disciplined but also creative. He puts thought and creative energy into his work, with the possibility of failure and is joyed at success. He wants to help everyone, disseminating knowledge both to students and to patients. To him, failure is not necessarily being unable to help, but rather choosing not to help. I agree with Dr. Farmer's view of assistance and doing good in the world. I do not even really have any personal dissonance with his methods, which some might seem as unconventional, perhaps rogue, or in some cases subversive. I feel as though Dr. Farmer shows a lot of Christian values and ethics – doing the right thing even though it is hard or not accepted by many.

Contrarily, in *The Outrageous Idea of Christian Scholarship*, George M. Marsden focuses on the positive contributions of a theological context. Marsden argues that through a theological context, or with a theological understanding, a lot of scholarship can be perceived in a deeper and more meaningful way. He cites examples such as creation, particularly in relation to morality. Because Christians do not believe in a strictly naturalistic world, there is a source for morals – God. Christians also believe in God incarnate in Jesus Christ. This allows a "universe that is open to spiritual phenomena that go beyond what people of all faiths or of no formal faith can agree on" (p. 91). Believing in the supernatural changes perspective and even focus in scholarship; it changes what we study and why. Because the Holy Spirit is at work now and through history, scholarly studies can focus on the higher reality and its implications.

Overall, I feel that Marsden is not saying anything new in this chapter. Many medieval scientists (and astronomers in particular) saw their scholarly activity to show the wonder and glory of God. What they did not know also showed the great mystery of God. However, I do not disagree with Marsden – it makes sense that Christians can study the world differently than non-Christians, since we have a source for our morality, and want to know more about God. In my own study, I hope to use my gaining knowledge to help answer some of those questions as well. In blues music, there is not really a God that is prayed to or worshiped. This creates a different set of morals for the blues culture, and I am interested to see how that has carried on and provides meaning to the world.

Found in the book *Models for Christian Education: strategies for survival and success in the twenty-first century*, the chapter "Clarity through Ambiguity: Transforming Tensions at Seattle Pacific University" by Steven Moore and William Woodward discusses the historical tensions at SPU that have given it its character and relation of faith and scholarship. Key to this ideal is the Wesleyan tradition that individual holiness must lead to transformation of the social order (p. 286). In my work, I have striven for this ideal, as I feel that I can influence others through the way I work and act. Secondly, Seattle Pacific University has had a lack of focus in leadership. Often, being academically rigorous and thoughtful does not mean having a clear sense of spiritual direction. I find that sometimes, like a good work of art, meaning comes after the final product.

However, I do not feel that faith and scholarship should be defined by a lack of direction and purpose, nor a "corporate style and structure" (p. 295). This seems to have led (in more recent years) to a business oriented university rather than a focus on character, wholeness, scholarship-for-service, and spiritual formation (306). What I have seen is that success has become measured at Seattle Pacific in terms of financial and professional achievements, rather than the Wesleyan integration of the various dimensions of personhood. To become a "Christian scholar-servant" (306) is what I feel is important in the relation between faith and scholarship.

Though Moore and Woodward argue that Seattle Pacific has found clarity in religious focus through its ambiguity of leadership, demographics, curriculum, and organization, it now feels as if the school has lost its focus. By maintaining its

Wesleyan, evangelical tradition of expansion of serving to a broader community (p. 290), I feel as though the university has gone too far. When my brothers came to SPU, it was acceptable if a new student were *not* Christian, but when I came to SPU, I was told it was acceptable if I *were* a Christian. Though faith and scholarship do not necessarily have to be connected in the general realm of higher academics, higher academics should push for the growing of the four qualities SPU strived (at least at one time) to build: character, wholeness, scholarship-for-service, and spiritual formation.