The Making of an Anechoic Choral Recording

Musical and Technical Issues

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Background

- Why make an anechoic choral recording?
  - Useful for the new generation of acoustic modeling tools such as CATT, Odeon, EASE, etc.
    - These tools generate the impulse responses for the spaces being modeled then convolve the impulse response with the audio material.

Background

- If the audio material already contains room reflections, reverberation, etc., these are then included in the convolution, thus providing an inaccurate representation of the space to the sound. For these modeling programs to be effective in auralizing the space, the source material needs to be free of reflections, reverberance, etc. This is what an anechoic recording is. Recordings made in a reflection free, very low reverberant space.

Background

- These recordings need to be made in special places such as anechoic chambers, or outside away from any reflections (however external or environmental noise usually presents another problem).
- Recordings can be made in existing places with significant amounts of absorption added to create an anechoic type environment.

Background

- There is a limited repertoire of anechoic source material recordings in the world. The following is a short list of some of the most common that have been generally available
  - Anechoic Orchestral Music by Denon
  - JVC Impact Disks
  - Music for Archimedes by Bang and Olufsen

Background

- None of the recordings mentioned contain choral music.
- Wenger had a desire to use a software modeling program to investigate the benefits of proscenium auditoriums that use shells, overhead and clouds vs. none of the above.
- Since choral performance types that take advantage of utilizing shells, there was not a way to auralize this type music.

Background

- Wenger found it necessary to find a way to create an anechoic choral recording to support auralization for this type music.

The Project

- Three things were needed accomplish this project (besides $$$$).
  - Anechoic space to record in.
  - A choir that would be willing to perform in an anechoic space.
  - The recording equipment and knowledge to create the recording.
- We'll review each of these main areas.

The Anechoic Space

- From previous research work, Wenger knew of a large anechoic room at 3M in St. Paul MN that could accommodate a large (80 member) choir.
- Contract was made with John Alexander at 3M responsible for management of the anechoic chamber.
- Discussions were held about the project along with identification of a number of issues that need to be resolved.

The Anechoic Space

- The space needed to accommodate risers for an 80 member choir.
- The room had a support track built-in that worked for supporting choral members on risers.
- 3M structural engineers evaluted the load capabity of the track and gave the approval to use for the project.

The Anechoic Space

- Access to the anechoic chamber is limited due it locating within the search facility at build 201 on the 3M campus.
- Special arrangements for security and escorts had to be made to allow the choir to perform in the anechoic chamber.

The Anechoic Space

- Security clearances were required for all choral members and those in attendance of the recording.
- A “control room” to contain and operate the recording equipment needed to be set up.

The Anechoic Space

- A reverberant test room was converted to a control room. 3M thinsulate material was placed on the walls to damping the room acoustics (very effective).
- Remote monitoring was set up via video/audio link.

The Anechoic Space

- Other comments from John Alexander:

The Choir

- Concurrent with find an anechoic space to record in, was finding a choir that would be willing perform and record in the chamber (not the ideal performance venue from a choral music standpoint).
- St. Olaf College in Northfield was contacted due to their strong choral program and proximity to the anechoic chamber in St. Paul, MN.

The Choir

- A meeting was held with Dr. John Ferguson to discuss the project. It was decided to use the St. Olaf Cantorie due to their mixed arrangement of men and women. Instead of the traditional Soprano-Alto-Tenor-Bass (SATB) configuration, Cantorie members are mixed into small groups of sopranos, altos, tenors and basses which assists in hearing all the parts.

The Choir

- This arrangement provide the greatest level of aural especially important for singing in the anechoic chamber.

The Choir

- Preparation
  - Most songs to be used were acapela (or limited instrumentation) due to the space limitations.
  - Rehearsals were conducted outside, away from buildings, roads or anything that would provide reflections.

The Choir

- Discussions were held with John Ferguson on the best way to handle the anechoic environment as part of the recording session from a musicians point of view.
- It was concluded that the most effective way would be to rehearse in a similar environment preparing the choir for the recording in the anechoic chamber.

The Choir

- Use of headphone to provide an artifical acoustic environment had been discussed, but decided that it would be best to prepare by rehearsing in a similar environment.

The Choir

- Initial recording times allowed for two, 2 hours sessions with a break in between.

The Choir

- Repertoire was varied and included six songs.
  - Beati Quroum Via – Charles Villiers Standford
  - Alleluia – Randal Thompson
  - Almighty and Everlasting God – Orlando Gibbons
  - Who Is This – John Ferguson
  - Psalm 150 – Ernani Aguiar
  - Kyrie from Missa Brevis #4 – Healy Willan

The Choir

- The choir completed all six selections during the first two hour recording session, not needed the second session (very well prepared for the recording and anechoic environment).

The Choir

- Comments from John Ferguson:

The Recording

- Engineering
  - To handle the engineering responsibilities, Tom Mudge and Craig Thorson were contracted from Minnesota Public Radio to engineer the recording sessions. Their extensive background recording choirs and years of experience in recording live events met the requirements for the project

The Recording

- Engineering
  - As part of the project, the recording was going to use an many types of recording techniques and microphone types to allow for experimentation for those using the anechoic recordings for auralization work.
  - A 24 track, 24 bit digital recording system was used for the session.

The Recording

- Engineering
  - The Recording
    - The actual recording of the six songs was completed in 1.5 hours thanks to the we rehearsed choir.
    - No overdubs or intercuts were done as part of the recording process. Each song was complete from start to finish as performed.


JBL

The Recording

- Engineering
  - All recording was done directly from the microphones to a dedicate preamp to the recorder. No mixing was done during the recording session.
  - A number of different microphone techniques were also used; XY, ORTF, spaced omni.
  - In total eight pairs of microphones were used, along with a Soundfield microphone and four “shotgun” microphones. These made up the 24 recording tracks.

The Recording

- Engineering
  - Monitoring of the recording session was facilitated by a simple mixing console.
  - A video link provide a visual link to the anechoic chamber and the choir and director.

The Recording

- Post-Production
  - The recording session was mastered at Studio M of Minnesota Public Radio with Craig Thorson and Tom Mudge.
  - Audition of the various tracks was conducted with the final selection of three microphone pairs providing the best results for auralization
  - The six songs for these microphone tracks were then mastered for an audio CD. Endings for each of these songs were also mastered for the audio CD.

The Recording

- Post-Production
  - Two disks were part of the project; audio CD and an DVD that contained the individual unmixed tracks from the recording session in both 16 and 24 bit .wav file formats at 44.1kHz.
    - This would allow future experimentation by those interested in remixing the recording session.

The Recording

- Post-Production
  - Comments from Tom Mudge or Craig Thorson:

Summary

- Anechoic Choral Recording
  - The recording event required approximately a year and half of planning to successfully coordinate the activities to accomplish this recording session.
  - Due to the unique requirements of an anechoic recording, many additional logistical issues had to be addressed.
  - The recording adds to the limited body of source material for auralization and provides the only large choral source material available.

Summary

- Anechoic Choral Recording
  - The anechoic choral material has been successfully used in provide auralizations that compare proscenium auditoriums using shells, overheads and clouds vs. those auditoriums with out.