



DIGITAL AUDIO

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OUR GOAL

to Learn about how Audio can be captured, manipulated, and stored with the computer; how it might aid in instruction. Teachers will leave with a variety of experiences, and time to develop a lesson using audio content.

- 1930s - Radio Shows, Educational Radio
- 1950s - Distance Education
- 1970s - Telephone, Distance Education
- 1990s - Multimedia, Digital Audio, Books on Tape
- 2000-05 - Web, Podcasts, Compressed Audio

IS AUDIO A STRONG MEDIUM FOR LEARNING?

- Compared to video, and video with audio, **no**.
- Compared with text, **no...**
- But—when paired with activities and other media, **it can be effective**, especially for those with a strength in learning aurally.

FOCUS

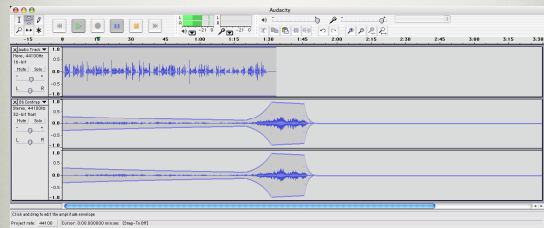
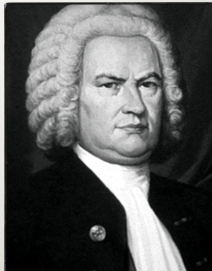
- How are you using audio?
 - To convey information?
 - To set a mood?
 - To change perspective?
 - To reinforce a text? Imagery?
 - To enhance instruction?

SOURCES OF AUDIO

- Teacher
- Student(s)
- Streaming Digital Audio (i.e., digital radio)
- Podcasts, Web
- CD, DVD
- Computer-Generated Read Text

JOHANN SEBASTIAN BACH

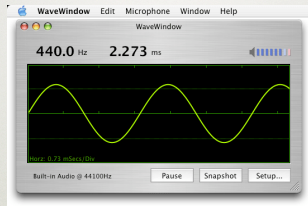
- Born in 1685 in Germany
- Famous organist
- “Baroque” Style
- Many children
- Church music, instrumental music



JOHANN SEBASTIAN BACH (1685-1750)

Bach is remembered today as one of the greatest composers of music in the Western world.

WHAT IS A SOUNDWAVE?



“Sound” is a force of energy, a “wave” that travels through air; it vibrates the hairs and “drum” in our ear—that’s how we hear.

SOUND WAVES

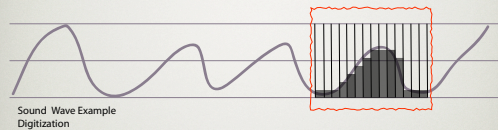
- Changes in **frequency** alter the “pitch” of the tone in simple wave forms,
- Changes in **amplitude** change the “volume” of what we hear

RECORDS

- Think about how your standard record worked...
- A microphone diaphragm vibrated in concert with sound in a room; this energy was transferred to a needle that “reproduced” this signature into a record...
- Play back the record, and the speaker plays-back an amplified version of the recorded sound.

- The recording process whereby the natural energy of sound waves is reproduced by mechanical, magnetic, or electric means is called *analog*—think of **records, cassette tapes, VHS, 8-track, etc.**
- The recording process whereby the sound is converted into numerical information (through analysis) is called *digital*.

DIGITAL SOUND



- **Sample Rate:** How frequently do we take samples and assign a numerical value?
- **Resolution (bit depth):** How ‘exact’ a number do we assign to the sample?

DIGITAL SOUND

- We can record (or play back) digital sound through a variety of formats:
 - Compact Disc
 - Tape
 - Computer
 - Airwaves

FORMATS

- CD - 44.1 kHz frequency, 16-bit
- DVD - 96 kHz frequency, 24-bit
- Mac OS X can record in (standard) 16-bit or 24 bit

IS DIGITAL BETTER?

- Yes—
 - with CDs and DVDs, an optical system reading the data avoids interference and degradation inherent with tape, and noise with records

IS DIGITAL BETTER?

- Yes—
 - since the audio is ‘digital,’ it is not tied to one physical format—it can be stored on optical disc, tape, flash memory, or hard disc

IS DIGITAL BETTER?

- Yes—
 - copies of the original source material are identical to the original, there's no degradation between copies.

IS DIGITAL BETTER?

- No—
 - when digitization occurs, you are throwing away information!
 - Solution? Sample more often.

IS DIGITAL BETTER?

- No—
 - “Compressed audio sounds awful,” etc. “It’s worse than a cassette!”

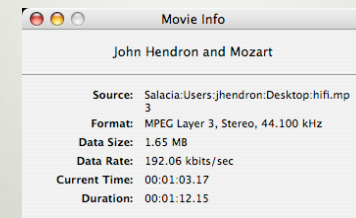
NEED FOR BANDWIDTH

- The advent of computer networks saw the need for compressing data—to make transmission times shorter.
- Born were algorithms to compress data—best examples are GIF and JPEG for images.

COMPRESSED AUDIO

- MPEG-1, Layer 3 (MP3)
- AAC (MPEG-4)
- Ogg-Vorbis
- Quicktime (various codecs)
- Real
- Windows Media

EXAMPLE 1: HI-FI



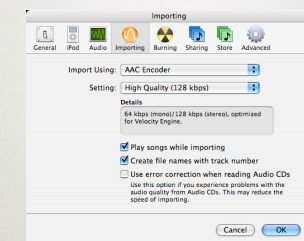
EXAMPLE 2: LO-FI



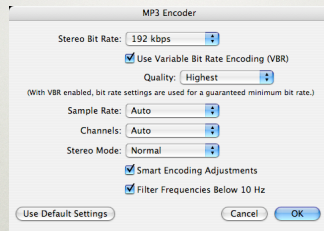
MP3/AAC BIT DEPTH

- What level of quality do you want for compressed files?
- How much space do you wish to save?
- **64 kbit/sec** - good for voice, mono
- **96-128 kbit/sec** - good for music, stereo
- **256 kbit/sec** - hi-fi quality music

ITUNES



ITUNES



IS THERE A 'BEST' FORMAT?

- MP3
 - “open”
 - no rights management, protection
 - very popular
 - good compression, quality
 - embedded tags for pictures and words

IS THERE A FORMAT THAT IS “CD-QUALITY”?

- Yes!
- **AIFF** is a full-quality, 16-bit, 44.1kHz format that is the same as the PCM audio on a compact disc
- AIFF is not compressed—and on average, weighs-in at 10 times the size of an MP3

- Podcasts ([iPodder](#), [PodCast Alley](#), [AudioBlogs.info](#)) (example: [NCQTalk](#))
- Internet Radio (iTunes, [Live365](#), [NPR](#))
- Recorded Books ([Project Gutenberg](#))

- iMovie
- AudioRecorder
- Audacity
- Microsoft Word
- GarageBand

COMPUTERIZED SPEECH

- Read websites
- Read e-texts
- Read instructions

- Tools: VoxMachina, TextEdit, Safari, etc., and Mac OS X Services

ORGANIZE YOUR SPEECH

- Take the MP3 files Vox Machina creates, and organize them using iTunes.
- Burn these audio files to CD-R;
- CDs can be played-back using any CD player

POWERPOINT

- PowerPoint allows recording of audio, to embed into slides; or
- Pre-record clips using Audio Recorder, and import them into PowerPoint
- Use PowerPoint’s “narration” feature to talk over an auto-advancing slide show

KEYNOTE

- Drag any Quicktime-compatible file format into a Keynote slide
- It plays back automatically when the slide is advanced—this includes AIFF, MP3, AAC, etc.

I MOVIE

- Narrate over video, or
- Narrate over a series of pictures...
- Export the content as Quicktime

GARAGEBAND

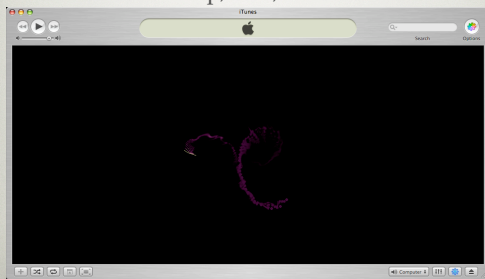
- Use GarageBand software to record many tracks; plus
 - Musical compositions
 - Digital processing (reverb)
 - Soundtracks for multimedia projects using loops

AUDACITY

- Use the open-source **Audacity** to record, and edit tracks of sound
- Export as MP3, WAV, or AIFF

ITUNES

Rip, Mix, Burn



FREEPLAY MUSIC

- <http://www.freeplaymusic.com/>
- Hundreds of tracks in MP3 format for student use in projects

Digital Audio
with John Hendron
June 21-22, 2005
Goochland County Public Schools

Day 1 Highlights

1. Introduction to Audio - Break
2. Take a look at a Sound Scope
3. Learn how to record audio in Microsoft Word
4. Read the paper at <http://www.daniel.compton.be.ca/DE/teaching.php> and answer the following questions with audio recording in MS Word. Copy the questions into a notebook file, and record your answers by speaking into the microphone.
 - 1) In which ways can audio contribute to student learning?
 - 2) In which ways can audio be used to maintain a student-centered learning approach in the classroom?
5. After reading this page <http://blogs.illustration.com/2005/>, describe what you think the difference is between an "audioblog" and a "podcast." This time, record your answer in a new Word document after typing it—I should be able to find both the text and the speech in the same document.
6. Susan Manning presents her ideas in a paper entitled "The Promise of Podcasting." Please access this online: <http://www.pct.k12oh.us/ourpages/03/index.asp>
After reading the article, and perhaps checking out some of the links she presents, please devise a definition of podcasting that would make sense to ordinary folks who might be normal users of iPods and other MP3 players.
This will be saved in a separate Word document (nothing here needs to be recorded).
7. Finally, consider these two links, and read the first: <http://www.classroom.com/2004/04/04/podcasts-for-education>
Next, visit the page mentioned in the article whereby a professor uses podcasting in his college class. Look at his materials (PDF, PPT, MP3), and please create a critique of the lesson.