

Project Number: FUB MU 1004

PROMOTING THE MUSIC DIVISION AT WPI

An Interactive Qualifying Project Report

submitted to the Faculty

of the

WORCESTER POLYTECHNIC INSTITUTE

in partial fulfillment of the requirements for the

Degree of Bachelor of Science

by

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**Date: January 10, 2007**

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**Professor Frederick Bianchi, IQP Advisor**

1. music
2. technology
3. engineering

# Promoting the Music Division at WPI

*Using video technology to promote music ensembles to prospective WPI students  
Participation in music programs enhances the abilities of engineering students*

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Presented to: Professor Frederick Bianchi  
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Project number: FUB MU 1004

Submitted in Partial Fulfillment  
of the Requirements of  
Interactive Qualifying Project Program  
Worcester Polytechnic Institute  
Worcester, Massachusetts

## **Abstract**

Music programs at WPI provide much more than a mode of diversion and socialization for an engineering student: the right side of their brain, used to solve mathematical problems involving logic, abstract reasoning, and spatial-temporal tasks, is being stimulated. Lesley Blumberg '07 has developed a promotional DVD, highlighting the music ensembles available to the WPI student body. Distribution to prospective students will help increase enrollment at WPI, while encouraging greater participation in the various music ensembles.

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# I. Introduction

Worcester Polytechnic Institute is typically recognized as “one of the nation’s *earliest technological universities*”.<sup>1</sup> While math and science are the academic areas that the majority of WPI students focus their attention, many have also pursued areas within The Humanities and Arts throughout their academic career. WPI provides a thriving music and performing arts program to its students. The dilemma lies in the fact that so few people know about it. Hence, the reason for working with the Music Department, under the guidance of Professor Frederick Bianchi, to develop a promotional DVD. This marketing device can be used by the university, for distribution to prospective students, alumni, and trustees, in order to improve their awareness about the WPI Music Department. WPI is committed to graduating well-rounded students: one competent in the technologies, but also capable of demonstrating knowledge in The Humanities and Arts.

The purpose of this IQP is to support and strengthen the music program at WPI by increasing student involvement in WPI music ensembles. This objective will be achieved by providing a new marketing device to be distributed to incoming and perspective students. The DVD highlights all of the instrumental and vocal groups on campus by featuring students practicing in rehearsals and performing at concerts and other events. It was created using contemporary production tools such as Final Cut Pro and DVD Studio Pro. WPI is recognized as a technological university and it is important for students to be aware of the musical opportunities available at WPI, beyond mathematics and science.

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<sup>1</sup> <http://wpi.edu/About/>

## II. Background

### ***Participation in music programs enhances the abilities of engineering students***

Engineering students often choose to continue their involvement in music programs when they enter college. Many of these students have studied music from early childhood and feel it has helped them develop focus and discipline; traits that benefit an engineering student. Participation in a musical group can provide a welcome relief from the daily grind of solving mathematical equations and writing up science labs, while also providing an opportunity to socialize. However, music programs provide much more than a mode of diversion and socialization for an engineering student: the right side of their brain is being stimulated in the process. It is the right side of the brain that engineering students use to solve mathematical problems involving logic, abstract reasoning, and spatial-temporal tasks. Whether listening to music or performing in some type of music making, engineering students can derive great benefits from participating in music programs.

College students consider listening to music to be one of their top relaxation activities. They believe that music provides a distraction from the demands of academic classes, competitive sports, Greek life, and their jobs. While it is essential for a college student to take a break from these activities and responsibilities, it is not surprising that listening to music ranks high on their list of ways to relax. One of the many properties of music is that if one chooses to focus entirely on a song, then everything else seems to vanish into the background for a few brief moments. Hence, listening to music is an indispensable tool for the typical college student desiring to relax.

Music does not just act as a diversion, but as a focus. Just as someone listening to music can get lost in a song, someone performing the song can focus just as much on the actual piece.

The focus of the performer manifests itself in many different ways: reading the sheet music, pressing the right keys or singing the right notes, keeping an optimal breathing pattern, maintaining the correct tempo, and following the director. From all of this, one can see that there is a characteristic that every proficient performer must possess; the ability to pay close attention to detail. The same focus and attention that makes one an accomplished musician, also makes a competent engineer. Trained musicians recognize key changes throughout a musical piece and know how to predict the direction of the piece because of those changes, which is akin to an engineer recognizing subtle changes in the conditions of an experiment and knowing how those changes will affect the final outcome. Both fields actually require many of the same basic skills. Subsequently, it is vital for any successful engineering university, such as WPI, to also have a thriving music and performing arts program available to its students.

The truth of the matter is WPI has already done this. The problem lies in the fact that so few people know about it. Hence, the reason I worked with the Music Department, under the guidance of Professor Frederick Bianchi, to develop a promotional DVD. This marketing device can be used by the university for distribution to prospective students, alumni, trustees, etc. WPI is very committed to graduating well-rounded students: one competent in the technologies, but also capable of demonstrating knowledge in The Humanities and Arts.

### **III. Project Implementation**

#### ***Using video technology to promote music ensembles to prospective WPI students***

This project was an extensive undertaking and in order to achieve the best quality DVD possible, certain steps needed to be accomplished in a specific order. The project began with acquiring the contact information for the directors of every group as well as the times and locations of all their rehearsals and concerts. Once that was accomplished, the next step was to arrange for recording sessions for each group; some included interviews with individual students and faculty members (Appendix B: Musical Groups Directory for Recordings and Contact Information). It was necessary to orchestrate the taping schedule carefully and fairly. Scheduling was complicated because many of the groups met at the same time or on the same day. This sometimes meant recording three groups in the same afternoon (approximately six hours of footage). Some groups also wanted to be recorded twice because they felt that they had an off night or were missing too many members. Recording the groups seemed endless.

Recording consisted of organizing the groups into different arrangements to show their full potential. Sometimes the entire group was taped, while on other occasions only specific individuals were. Using different angles to record the same image is what allowed for the variation necessary in the DVD to keep the viewer's attention while still watching the same group (Appendix A: Video Hardware Suggestions and Hints).

Many means of communication were considered when choosing the best way to connect with incoming and perspective students. Some of the options included: the Internet, VHS, CDs, and DVDs. The pros and cons of these choices needed to be researched to determine which one was the best for this type of media. The Internet was ruled out first because it was determined



that no matter what form the final product was in, it could always be integrated into the Music Department or individual groups' websites once complete. Recording to VHS was the next possibility. The issue with this format is that most people are not buying VHS tapes anymore and some do not even have the accessories to play them on their TV. Not to mention, VHS tapes take up a lot of space and storing them in bulk could become problematic depending on the location. When considering CDs, it seemed like the perfect choice because most students entering college are purchasing computers anyways. However, the parents of these students may not have a computer, may still be using an outdated computer that only plays floppy disks, or could have even given their child their newest version to bring to college. Not to mention, a CD is only able to hold 600Mb, where a DVD is able to hold 4.5Gb of data. A DVD format would suit the most media capacities; including TV and computer. It seemed like an ideal way to allow viewers to personally choose which viewing option was better for them. DVDs are also much lighter and more compact than VHS, which allows for efficient distribution.

Now that the format was decided on, the next challenge was learning an editing program to combine video clips in a sequential order that flows for the viewer. The program that was chosen is called Final Cut Pro (Appendix E: Using Final Cut Pro). It consists of “powerful and precise editing tools”, “real-time multistream effects”, “multicam editing tools”, and “advanced color correction”.<sup>2</sup> After taping each group, the video footage was captured onto the eMac so it could be edited in Final Cut Pro (Appendix D: How to Convert Video Footage into Computer Files). This process would have been simple if one chose to include every element of the recording, but was much more tedious to review and select only the best parts of the video to be captured for the DVD. It made more sense to be selective in what was recorded at the rehearsals and added to the computer hard-drive because there is a limited amount of space for files of this

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<sup>2</sup> <http://www.apple.com/finalcutstudio/finalcutpro/>

size. At one point in the project an external hard-drive became a necessary addition to the eMac in order to continue editing the 40+ hours of video that had been taped.

Once the footage was captured onto the computer from the digital videotape, the next step was to edit the footage from each individual group. This must be the most well thought out part of the project because the result of this work will be exactly what the viewer will see when the DVD is complete. Selecting footage that is both visually and aurally appealing is very difficult. So, clips were selected that had at least visually or aurally pleasing traits and were then overlapped when necessary.

On average the editing process takes about six to seven hours per group. This includes selecting the sections of footage that will be in the video, organizing the footage into an order that makes sense both musically and visually, adding in cross-fades for the audio transitions and cross-dissolves for the video transitions, using color correction for footage that has undesirable lighting, zooming in on clips that are not centered or are too far away, and rendering footage after making changes to it. The sequence created for each group was made up of rehearsal, concert, interview, and/or group dynamic footage and lasts approximately two and a half to four minutes in length, which was long enough to be informative and still hold the viewer's attention. Each sequence was reviewed on the computer and then on an actual TV to see if it met all the necessary requirements (Appendix C: Instructions on how to connect TV to Computer).

After editing the video in Final Cut Pro, the next step is to import the edited clips into DVD Studio Pro, so that they can be made into a DVD format with menus (Appendix D: Making a DVD with Files from Final Cut Pro on DVD Studio Pro). The DVD was designed to allow the viewer to play the entire video or to choose an individual group to view, while still in the menu

screen. By having this timesaving feature, the viewer can go directly to the groups they are interested in.

There were many strategies used in turning the initial video footage of the groups into an artistic piece that members of the WPI community would enjoy watching. Some of these were planned from the beginning and others were decided on as the problem or situation materialized. Some of the planned techniques included: taping the same event from different angles, panning, playing the audio from an interview while watching a group perform, the questions asked in the interviews, showing the groups in practice and in concert settings (to show improvement), transitioning between scenes and groups, using pictures to commemorate significant events, and when listening to an interview, lower the volume level of the background music from a performance.

Some of the unprompted techniques included: deciding the order in which the clips and groups were played, the psychological flow between clips, keeping time and the viewers' attention, viewing the groups having fun (showing their personalities, not just their performances), and using music from one clip and aligning it with a better visual of that same song.

## IV. Literature Review

A college student's participation in a music or engineering program can enhance abilities and improve skills that apply to both. Two of the leading researchers in the area of Music and Brain Function are psychologist, Frances Rauscher, Ph.D. and neuroscientist, Gordon Shaw, Ph.D. They represent a research team from the University of California, at Irvine, who "have confirmed this causal link between music and spatial intelligence" (Chipongian).

"Their newest study, known as the 'Mozart Effect', substantially extended their 1993 research that was based on Dr. Shaw's theory that neural impulses are organized into patterns by the cerebral cortex" (Chipongian). They discovered that listening to music, especially Mozart's Sonata for Two Pianos in D Major, improves one's "ability to see patterns in space and time, or to form mental images from physical objects, and to manipulate (i.e., rotate, or turn) such images in one's mind"(Chipongian). This ability is also known as one's spatial-temporal intelligence; a necessity for an engineer. "These researchers theorize that spatial reasoning abilities are crucial for such higher brain functions as music, complex mathematics, and chess. As many of the problems in which scientists and engineers engage in cannot be described in verbal form, progress in science may, in fact, be closely linked to the development of certain spatial skills" (Columbia).

While "science has not found a specific 'music center' in the brain because the ways in which the brain processes music is complex, [scientists believe the right brain is the area involved in visual and auditory pattern recognition]" (Institute). "Shaw's summative statement, that 'there are co-relational, historical, and anecdotal relationships between music cognition and cognitions pertaining to abstract operations such as mathematical or spatial reasoning,' is a sound and well-grounded observation" (Columbia).

## V. Results and Conclusions

After completion of the DVD, the goal is to reproduce it with financial support from The Humanities and Arts Department, the WPI Music Association, and the WPI Marketing Department. Copies will be made for all of these divisions within WPI, as well as the Admissions Department and all the music ensembles included in the video. If backing to duplicate these DVDs is unavailable, the content could be used on the website of the WPI Music Department in hopes of gaining students' interest. This may be an option even if financial support is available.

While this project's original goal was to increase interest in WPI's Music Department through prospective and incoming students, many more people will be affected by the production of this DVD. It could be the beginning of a new relationship with alumni contributors who have been waiting to see the music program grow at WPI and feel it is a good cause to support. It may also help WPI professors receive funding to expand the music department. This may someday include initiating the development of a new major in Music Engineering.

This Interactive Qualifying Project provided an opportunity to investigate an area in The Humanities and Arts that is very dear to me; Music. It was an honor and a privilege to attend the rehearsals and concerts of the WPI music ensembles while taping their performances for this promotional DVD. I have learned so much about the Music Department, the challenges of taping and recording, the use of editing programs, the responsibilities of keeping a master schedule in order to attend each rehearsal and concert, and the causal link between music and spatial intelligence. This worthy project began as a Sufficiency and is now complete as an IQP. The DVD incorporates twelve musical ensembles at WPI and was produced in Final Cut Pro. The final DVD was burned in DVD Studio Pro and is ready for distribution.

## VI. Works Cited

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"Music Makes you Smarter." Educational Cyberplayground. April 2005. <<http://www.edu-cyberpg.com/Music/musicsmart.html>>

Rauscher, Ph.D., Frances and Gordon Shaw, Ph.D. 1998. "Research Findings Show Music Can Enhance Key Component of Human Intelligence". March 2005. <<http://www.edu-cyberpg.com/Music/musicsmart.html>>

The Institute for Music and Neurologic Function. The Importance of Brain Research April 2005. <[http://www.bethabe.org/Resource\\_Center97.html](http://www.bethabe.org/Resource_Center97.html)>

## Appendix A: Video Hardware Suggestions and Hints

1. Oil the Camera's pan tilt head on the tripod.
  - Discovered that the pan tilt head can be noisy while recording the Concert Band's performance. It caused interference in the videotape.
2. Use an extended microphone chord and hold the microphone far away from the camera when recording.
  - Discovered the tape reel makes a clicking noise, which is heard in some of the early recordings.
3. Zoom in as much as possible during the recording process
  - After capturing footage onto the computer in Final Cut Pro, it becomes gradually more difficult to keep a crisp picture as changes are added. Resizing the video is the one of the worst ways to make the footage look pixilated. This was discovered when working with footage of SHM during the ICCAs.
4. Record in SP mode instead of EP mode as EP reduces picture quality.
5. Use DVD-R format (not DVD+R) when using iMacs to burn DVDs.
6. Adjust the equalizer, so that it is not preset to amplify certain frequencies while you are editing. Instead, do all mixing and equalizing in Final Cut Pro, so that it will be preserved in the video.
7. Keep all receipts of purchased videotapes and DVDs for reimbursement.

## Appendix B: Musical Groups Directory for Recordings and Contact Information

Concert	Rehearsal	Interviews	Groups/Musicians/Directors	E-mail
L	L	L+M	John F. Delorey Director of Choral Music/Adjunct Instructor	<a href="mailto:jfd@WPI.EDU">jfd@WPI.EDU</a>
L+M	L	L+M	Douglas G. Weeks Administrator of Applied Music	<a href="mailto:dweeks@WPI.EDU">dweeks@WPI.EDU</a>
	L		Richard G. Falco Director of Jazz Studies	<a href="mailto:rfalco@wpi.edu">rfalco@wpi.edu</a>
L	L		Glee Club Mario Angotti – President	<a href="mailto:jfd@WPI.EDU">jfd@WPI.EDU</a> <a href="mailto:mario@wpi.edu">mario@wpi.edu</a>
L		L+M	Alden Voices Maria Mavromatis - President	<a href="mailto:jfd@WPI.EDU">jfd@WPI.EDU</a> <a href="mailto:eutuxia4@WPI.EDU">eutuxia4@WPI.EDU</a>
L	L	L	Simple Harmonic Motion Travis Briggs – President	<a href="mailto:jfd@WPI.EDU">jfd@WPI.EDU</a> <a href="mailto:tmoney@wpi.edu">tmoney@wpi.edu</a>
L	L	L	Interstate 8 Lori Ferris – President	<a href="mailto:jfd@WPI.EDU">jfd@WPI.EDU</a> <a href="mailto:lori1138@WPI.EDU">lori1138@WPI.EDU</a>
L	L		Audiophiles Rick Richter – President	<a href="mailto:punkrich@WPI.EDU">punkrich@WPI.EDU</a>
L	L	L	Concert Band - Doug Weeks Amanda McCullough	<a href="mailto:dweeks@WPI.EDU">dweeks@WPI.EDU</a> <a href="mailto:amccullo@WPI.EDU">amccullo@WPI.EDU</a>
M	L	L+M	Orchestra - Doug Weeks Amanda McCullough	<a href="mailto:dweeks@WPI.EDU">dweeks@WPI.EDU</a> <a href="mailto:amccullo@WPI.EDU">amccullo@WPI.EDU</a>
L	L		String Quartet	<a href="mailto:dweeks@WPI.EDU">dweeks@WPI.EDU</a>
L	L	L+M	Woodwind Quintet Amanda McCullough	<a href="mailto:dweeks@WPI.EDU">dweeks@WPI.EDU</a> <a href="mailto:amccullo@WPI.EDU">amccullo@WPI.EDU</a>
	L		Jazz Stage Band	<a href="mailto:rfalco@wpi.edu">rfalco@wpi.edu</a>
L	L	L	Pep Band / Marching Band Matt Shaw - Drum Major	<a href="mailto:mshaw323@wpi.edu">mshaw323@wpi.edu</a>
L	L	L	African Percussion Ensemble Gladman Taranhike	<a href="mailto:g_man@WPI.EDU">g_man@WPI.EDU</a>
		L+M	Patrick Quinn – director of humanities + arts	<a href="mailto:quinn@WPI.EDU">quinn@WPI.EDU</a>
		M	Louis J. Curran	<a href="mailto:lcurran@WPI.EDU">lcurran@WPI.EDU</a>



## **Appendix C: Instructions on how to connect TV to Computer**

1. Connect TV and Computer to camera (RCA Composite video & DV 1394 Firewire respectively)
2. In Final Cut Pro select Audio/Video Settings from the Final Cut Pro menu
3. Make sure that Video playback says Apple Firewire NTSC (720 x 480)
4. To send audio output to TV, change Audio Playback from Digidesign HW (MBox) to Firewire DV
5. Click OK
6. In the view menu, select External Video and make sure "All Frames" is checked off
7. The camera takes about 5 seconds from the start of video playback in Final Cut Pro to sync up initially with the computer.

## **Appendix D: Final Cut Pro Directions**

### ***How to Convert Video Footage into Computer Files***

1. File
  - a. Log and Capture
2. Mark (In point)
3. Mark (Out point)
4. Log Clip
5. Highlight clips that you want captured
6. Capture
  - a. Batch
  - b. Continue

### ***Making a DVD with Files from Final Cut Pro on DVD Studio Pro***

1. File
  - a. Import
    - i. Asset
      1. Click on video
2. Drag video into timeline
3. Insert DVD
4. Click BURN

## Appendix E: Using Final Cut Pro

The following image models a typical layout of the computer screen while editing video in Final Cut Pro:

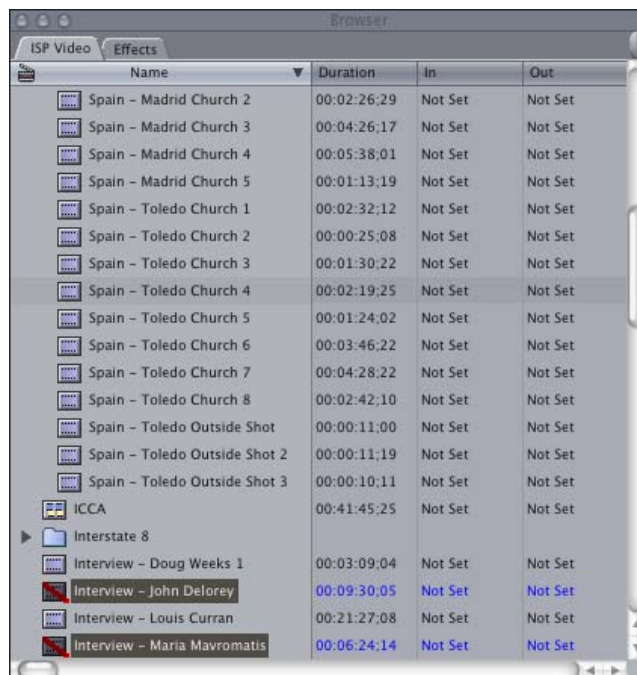


The rendered sequence appears in the window at the top right of the screen. This sequence is what the viewer will see when they watch the DVD when it is complete. Due to differences in formatting, the TV crops the image and only shows what is within the light blue boxes in the canvas window. The blank video window in the middle top of the screen is the clip editing window. This is where special effects and filters are added to individual clips in the sequence. The window in the top left is the video library which stores all of the video clips that were previously captured. Each performing group was organized into sub folders, called 'Bins'. The main window on the bottom displays the clip sequence. This serves as a storyboard during the editing process.

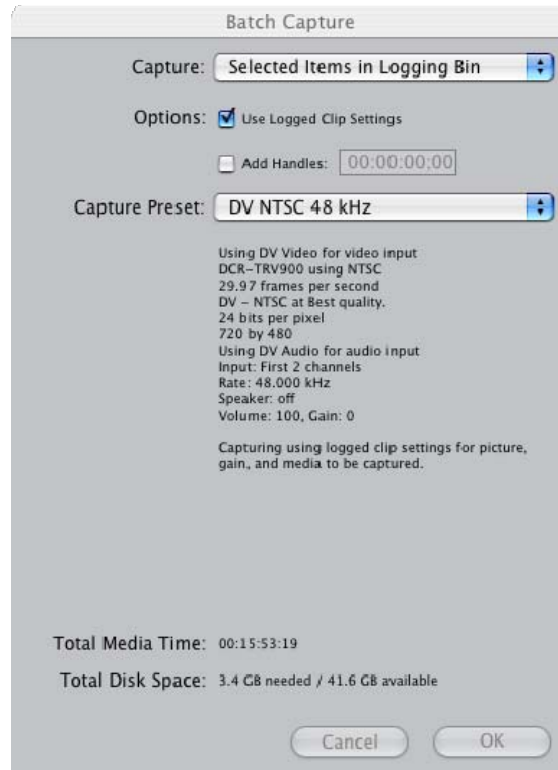
To transfer video clips into the computer, one uses a feature called Log and Capture. This is a multi-step process, including the following steps: First select Log and Capture from the File Menu.



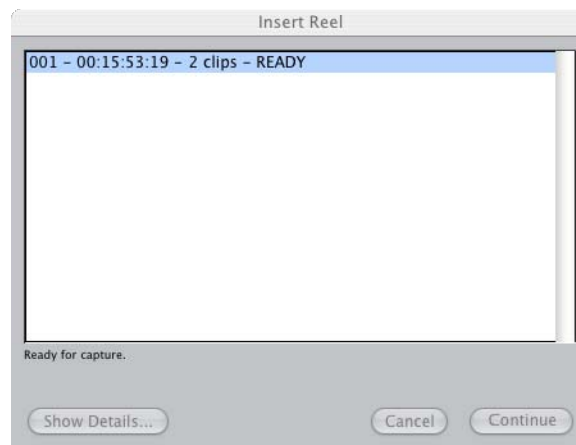
Second, scroll through the video tape using the on screen playback buttons in anticipation of finding a clip that is significant and worth loading into the computer. Then set the times where the clip starts and ends by selecting in and out points. Do this by scrolling to the start of the clip and press the **i** key on the keyboard. Then scroll to the end of the clip and press the **o** key. Click the **Log Clip** button and give that clip a meaningful name. In the example above it was called “Interview – John Delorey”. After scrolling through the entire tape, capture what was logged. To do this, look through the library and select only the clips that have a red bar through them by holding down the Apple key and clicking on them.



Once selected, click on the Batch button in the Log and Capture window. This will bring up a window asking about capturing formats and handling. It always looked like the following:

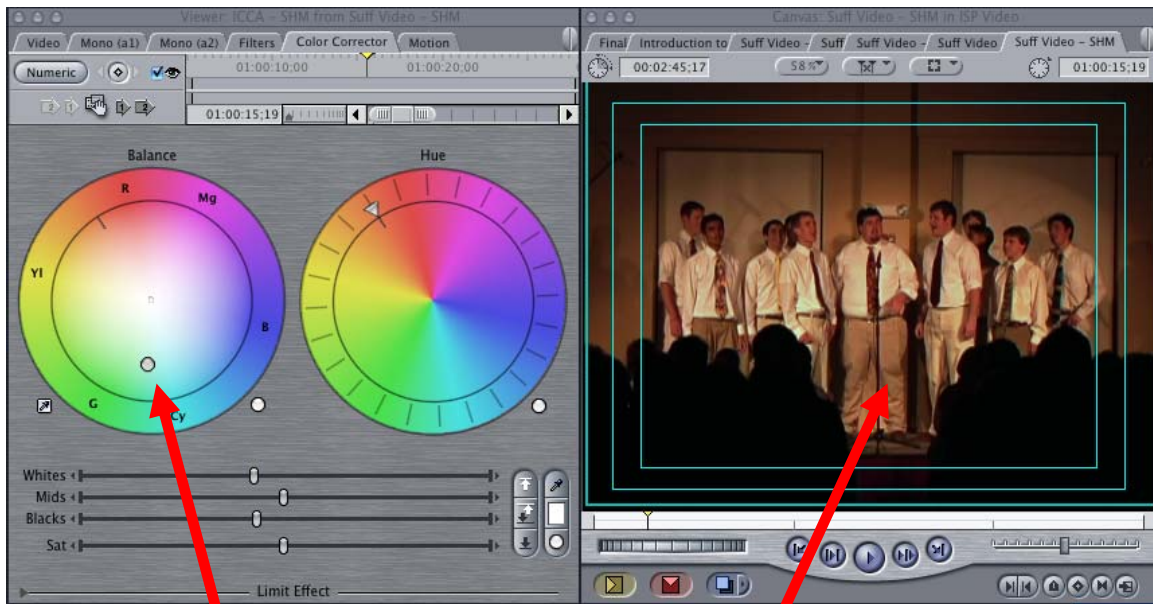


If it matches this set up, click the OK button. In a new window a summary is provided describing what it is going to do:



Click continue. At this point do not touch the computer because it has to dump, in real time, the video footage to the computer. After dumping to the computer, a second summary window will pop up that informs the user of any errors that occurred while capturing (usually none). Drag the clips from the library into the sequence, cut them down, layer them on top of each other and do other basic editing.

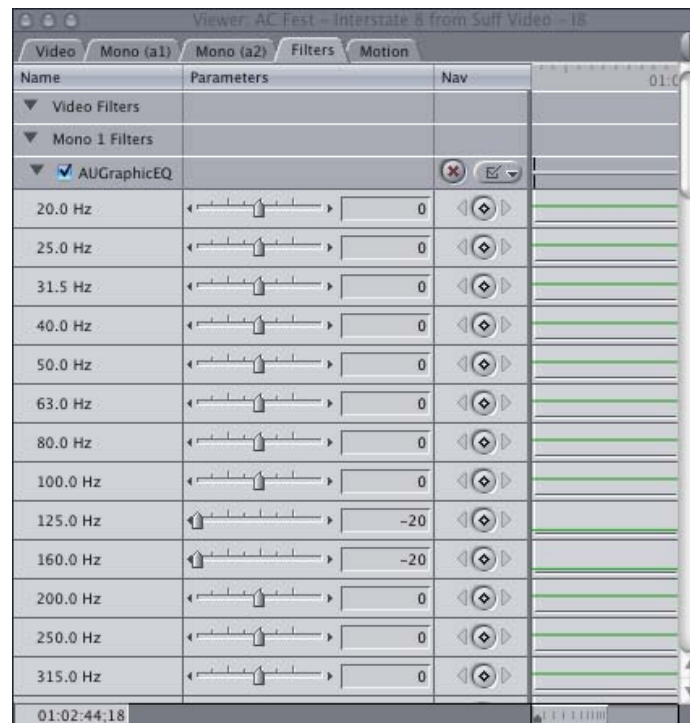
Once the sequence is the way it should look for the viewer of the DVD, look at each clip carefully on the TV and perform color correction. To do this, double click on the clip in the sequence window. This will bring the clip up in the top middle window. Then go to effects and drag Color Correction from the Video Filters bin in Effects to the top middle window. This will launch a color balancing tool in order to fine tune video. The video on the top right along with the TV will reflect changes made to the colors. Once happy with the changes, render the sequence by using the keyboard combination Apple-R. Upon completion of the render, save immediately.



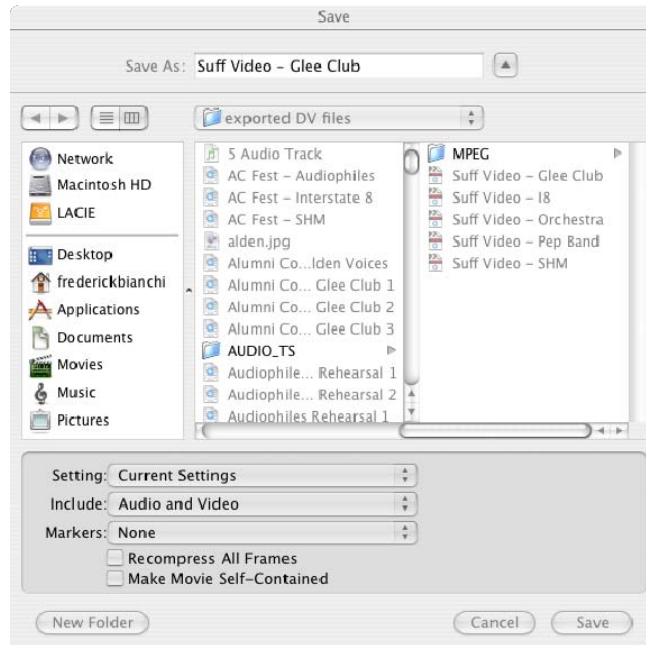
Dot indicated what colors to compensate to achieve color correction

Real Time Image Previewing

After sequencing the clips, review each one critically. If one finds that there are inconsistencies or low frequency hums in the selection, use the Audio Filters to compensate. To accomplish this task, refer to the effects window within the browser. Click on Audio Filters and select AUGraphicEQ under the Apple menu. Drag AUGraphicEQ into the Clip Window which will open a new tab in the Viewer. Based on the sound issue, raise or lower the amplification of the corresponding band pass filter. For humming associated with electrical equipment, eliminate frequencies between 125-160Hz.

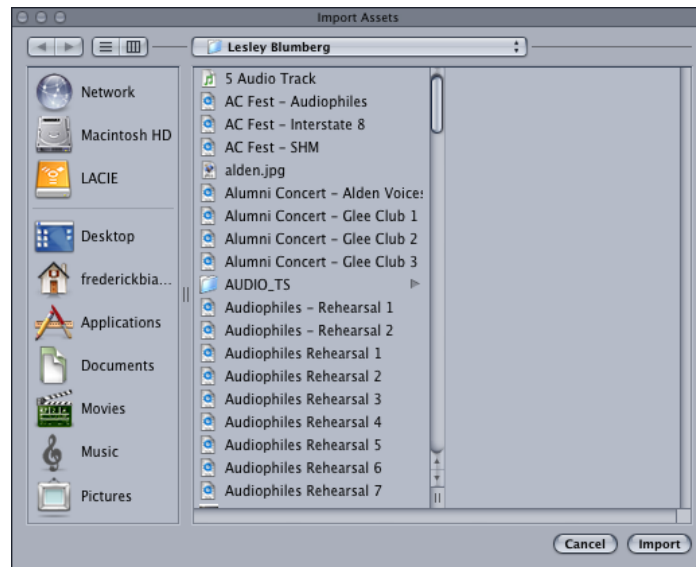


After completing the sequences that will be used in the final DVD, they will need to be exported into DVD Studio Pro. In order to export a specific sequence, one must make sure the desired selection is open in the Timeline window. In order to export the clip, click on File, then Export, then Quick Time Movie. This will bring you to the following window:



Save the exported sequence to a location that can be accessed by DVD Studio Pro. Make sure that “Recompress All Frames” and “Make Movie Self-Contained” are unchecked. This will save hard disk space as well as shorten the amount of time needed to export.

Open DVD Studio Pro. Click on the button labeled “Import Assets” on the toolbar. A screen similar to the following image, will appear. Find the location where the files were exported and select the items of interest. Then click on “Import”.





The imported clips can be found in the “Assets” window. Drag them as needed into the Track Editor window in order to include them in the final DVD. Each clip can be separate or concatenated into numbered tracks. Arrange which tracks will include the sequence(s) by selecting a track number in the view drop down menu.



In order to make a menu, click on the “Add Menu” button in the toolbar. A new menu option will appear in the Outline window. Click on it to open in the Menu Editor window. Then choose a template from the Palette or create your own, then click Apply. The next step is to modify or create buttons in the Menu Editor window. To create a button, go back to the Palette and click on the Button tab. This will provide multiple options to be used in the menu. To modify a button, click on it and its properties will show up in the Inspector Button window on the bottom right of the screen.

In the Advanced tab within the Inspector Button window, choose a Target. This is the actual function of the button when you click on it in your computer or play on your TV. Next one needs to set up the Navigation for the button. This refers to the arrow buttons on your remote control.

To create headings, go back to the Palette and click on the Text tab. This will provide multiple options to be used in the menu. To modify a heading, double click on it and change the content as necessary. You can also control click on the text and modify fonts and colors. Below is an example of a menu made in DVD Studio Pro.

Menu 2 English Settings

0 100 200 300 400 500 600 700

## Music at WPI

Simple Harmonic Motion (SHM) is a student directed all-male a capella group.

SHM selects its voices each Fall from the membership of the Men's Glee Club.

For more information email [shm@wpi.edu](mailto:shm@wpi.edu)

Simple Harmonic Motion  
[www.wpi.edu/~shm](http://www.wpi.edu/~shm)

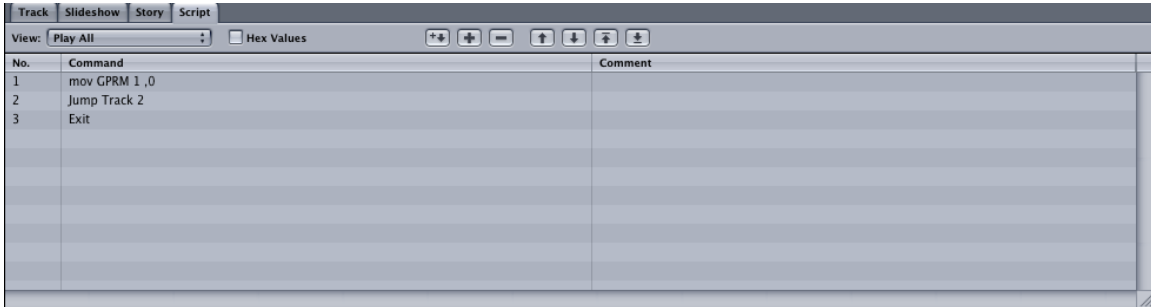
Content Here 1



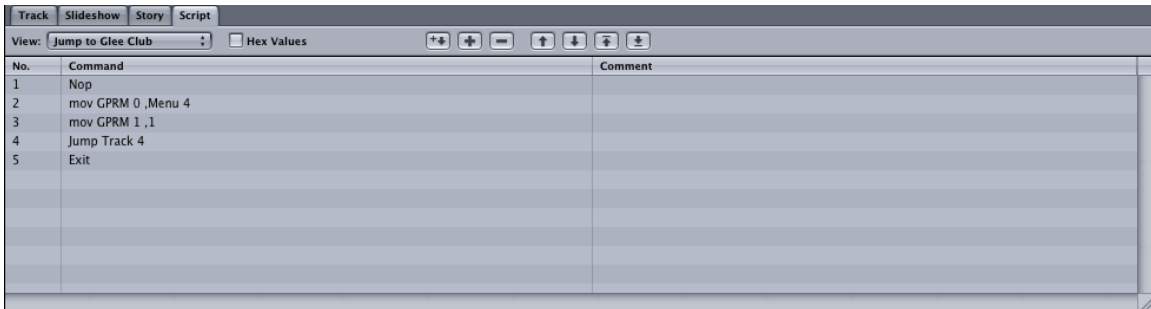
UP Play

← Main Menu → EXT

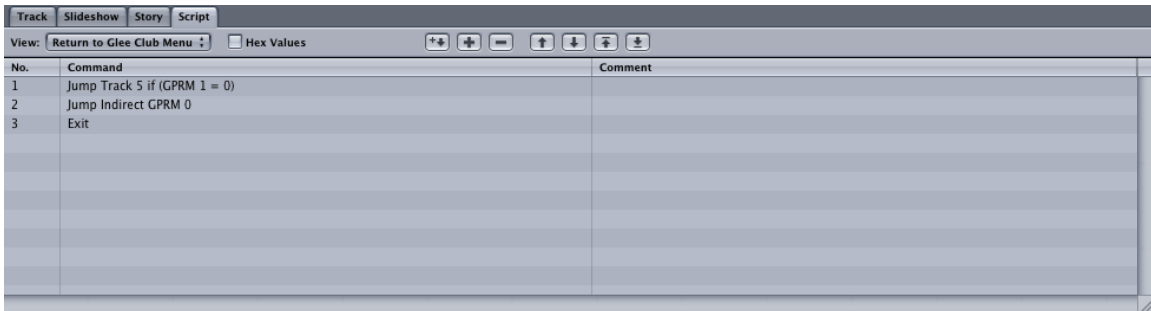
Use scripts to help the viewer smoothly navigate through the DVD. Once scripts are complete, they can be assigned as Targets for buttons and tracks in the Inspector Window. For example, if each group were contained in a separate track and you are interested in playing through all the groups in a sequential order, a script will be needed to run at the end of one track and direct the DVD player to the next one. Refer to the window below for an example.



Another example is directing the player to only play one group's sequence at a time. A script needs to be written and executed in the menu in order to only play the one clip. Refer to the window below for an example.



Another example is directing the player to return to a menu of choice if you are only playing one groups sequence. Refer to the window below for an example.



Simulate the DVD by clicking on Simulator in the toolbar. This will cause a screen to appear with normal playback controls. Use this window to test out all buttons, targets, and scripts. Close out of this window when you have finished and continue editing the DVD if needed.

Once complete, click the Burn option in the toolbar and insert the blank DVD.

