



**Nut and Bolts: Introduction** This handout will walk you through the nuts and bolts necessary to integrate videos, VCRs, audio, and computers. It is *not* about nonlinear video editing programs such as iMovie or MovieMaker, although the the workshops covers these programs. It *is* about getting video into and out of programs such as multimedia, web page builders, and word processing. Setting up at least one workstation where students can bring video in and out from the computer creates a whole new dimension for both making and distributing student work. For school, the web, and the home, the implications are great. Through video, authentic student work can be incorporated into many kinds of technology. Similarly, work can be shared at home and other educational settings.

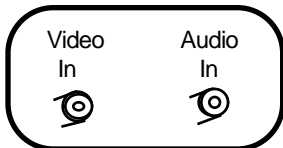
### Video In on Older Machines: Analog (Non-Digital) Video Capture

Video was generally carried into older computers through one of three ports. These ports differ in speed. One choice was to use either the **printer** or **modem port**. The disadvantage of these ports was that they only work with dedicated devices. They have an liability in terms of transfer speed.



A better way to import analog video (sometimes called “video capture”) was through **video in**, via an **RCA jack** or, sometimes, the superior **SVideo**. These ports can handle live video from a camcorder, recorded images (including movies) from a VCR, video from laser disc player, television channels

from a VCR’s tuner and generally anything that outputs through an RCA cable. RCA inputs were standard on older, true A/V **computers**. Check the back to see if your computer has RCA inputs like those in the illustration below. Your old



*Note: Generally, video cards will have two audio input jacks for stereo applications. The illustration shows one audio input for simplicity.*

computer may also be equipped with a video input card (sometimes called a video capture card). For most computers, Mac and

Windows, these ran around (or below) \$100. They are still available. For laptop computers, they generally fit into the PCMCIA slot. SVideo connections were also often used, and the SVideo signal is always superior. Your older computers still capture video! However, the small size of their drives and their inability to run the great new editing programs leaves them less desirable. **But they still work!** For multimedia and web-based video, their liabilities are not so great. You might keep them around as a workstation for those applications.



## Video In on Newer Machines: True Digital Video

New computers have superior **IEEE 1394** connections. **Firewire** is the Apple-licensed term for this connection that is becoming generic. There are others (Sony uses **iLink**). Digital camcorders come equipped with this connection. This makes true digital editing possible and is a serious breakthrough in quality, speed, and flexibility. **USB** ports are also common and can be used for video. USB combo units with both video in and out are available. IEEE 1394 remains faster. IEEE 1394 and USB connections are wonderful, but it is a nagging problem to make sure your software will find them, particularly with Windows. Calls to vendors are not uncommon. Make them if you have to.



Images from broadcast television can also be brought in through a tuner card. A tuner card has an "F" connector just like the antenna connector on a television or VCR. You simply connect an antenna cable or cable TV cable to pull programs into your computer -- or to watch television on your computer monitor. There are now USB devices with tuners built in available at a reasonable price.



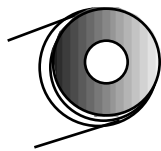
Digital video still cameras are becoming increasingly flexible and digital images from these cameras can be incorporated into videomaking or multimedia application. The bottleneck process of loading cumbersome software to download images from these camera has been alleviated by the use of media storage cards (such as the pictured SmartMedia card). USB and perhaps IEEE 1394 (firewire) devices that take the cards directly make these images much easier to use.



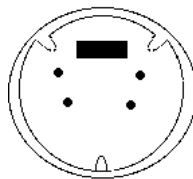
### Illustrated Summary of "Video In" Connections



RF ("radio frequency")



RCA jack - video output



S-Video



USB video



IEEE 1394 "Firewire"

**barely acceptable**      **better**      **best (analog)**      **digital (less loss)**      **digital - best**

Note: Images from this page came from a variety of sources. Most were generated by the author but some came from publicly distributed pages on the internet, including [www.howstuffworks.com](http://www.howstuffworks.com); <http://www.pc-card.com>; <http://www.newnex.com>. The latter site sells these cables (no endorsement implied, but a nod for the images).



## Nuts and Bolts: Video Out For Multimedia : Print to Tape

Multimedia projects can and should include videos of or by students, animated sequences, film clips, and more. However, video takes up stupendous amounts of hard drive space. Additionally, multimedia projects often don't convert well to paper to archive or share student work. **The answer is to print on video tape.**

**Computers** have always generated video output. That is how the monitor works. However, monitors display images and text in a different way than televisions. That is why images of computer monitors on television often seem to roll.

To convert one kind of display into the other requires a **scan converter**. This intercepts the monitor output from the computer and converts it to a video signal. In an **A/V computer**, the scan converter is built in.

Scan converters can convert the monitor signal output in three ways. They are not equal in quality. As discussed in VIDEO IN (above), there are RCA video outputs (sometimes called *composite video*), SVIDEO output, or USB output.



Buy a scan converter that has S-video capability. It is an indicator of better quality. Video or S-Video signals can also be sent to a VCR (or other computer) to record. If an S-Video signal is used, the VCR must be a S-VHS machine. These have become relatively affordable (less than \$200). **Don't** record on the SVHS setting or the video will only play on SVHS machines. If you are going to make copies from your original-- and you probably are, then **do** record using the SVHS setting and when you make copies, just make them onto regular VHS machines using the regular video RCA jacks.



If your computer has S-Video out (check the back) then you don't need a scan converter if you are willing to buy and SVHS VCR. One advantage of a scan converter is that it will work with any computer. You can move it from machine to machine or class to class.

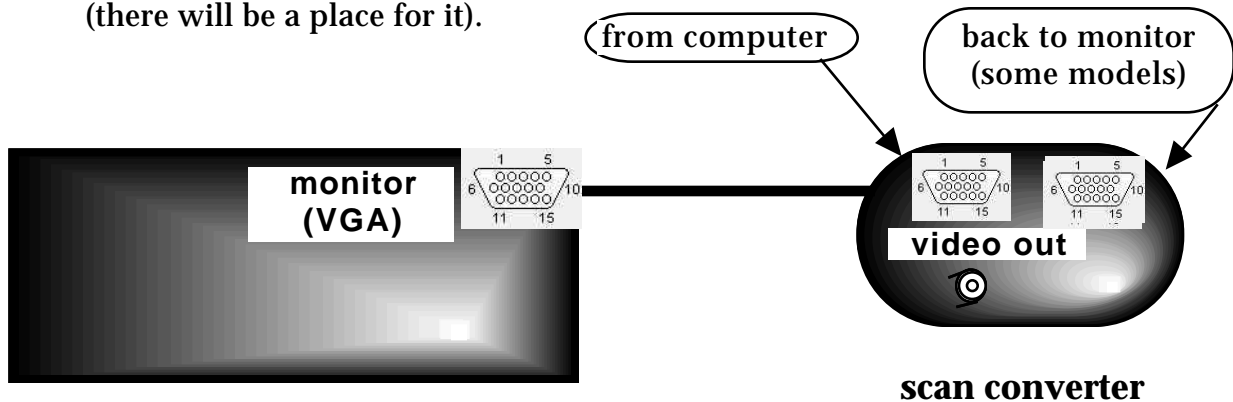
A firewire connection allows you to export video from video editing program but **does not** let you export HyperStudio or PowerPoint or other programs to videotape.

## Video Out: From The Computer:

Note: If you are moving digital video in and out of a computer for iMovie (Mac), MovieMaker (PC), etc., you do not need the information below. The computer feeds video from the editing program directly back to the camcorder through the firewire. From the camcorder, you can go directly to a VCR using the RCA cable adapters that came with the camcorder.

To get video out, connector the scan converter to your computer one of three ways:  
(Remember: If you have S-Video out and an SVHS VCR, you can skip this part!)

1. Disconnect your computer monitor and connect the scan converter to the now vacant monitor port. Reconnect your monitor to the scan converter (there will be a place for it).



back of computer

2. Connect the scan converter to the extra “monitor out” port on the computer (the same place you would connect a data projector). This is the usual method with laptops.
3. If you have a truly old computer or a “special” monitor-less design, you have to add a connection inside the computer. Try *Power R* (1-800-729-6970).

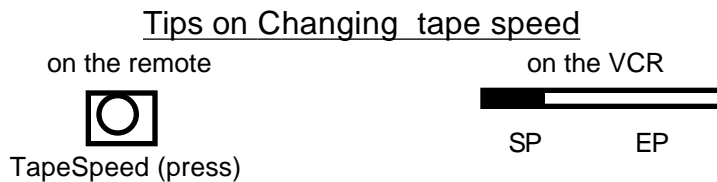
## Video In to the VCR

Once you have video going *out* from your computer, it is a matter of getting the video *in* to a VCR, or other video device. This is not technically difficult, but there are enough little details that completing this connection is the most common question I get from teachers the midnight before a project deadline. Step by step, here’s how to do it. (Soon, everything will be digital and it *should* get much simpler).

1. Connect the computer and scan converter (see above). Start with the **video out** RCA jack on the scan converter (or on the computer if you have an A/V computer). Connect it to the RCA **video in** jack on the VCR (RCA male to RCA male cord).

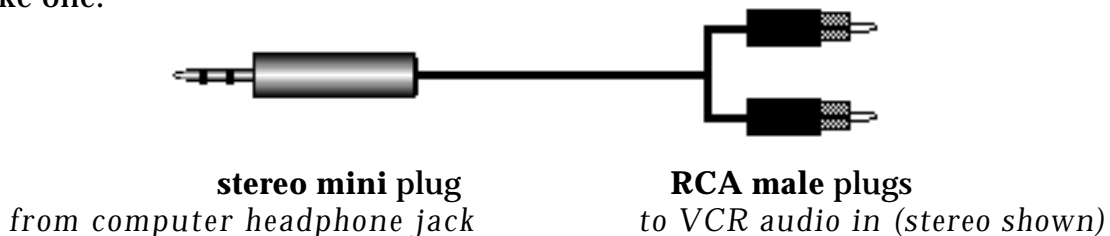


2. Set the VCR to **input** or **auxiliary** or **line** or whatever designation the manufacturer uses to turn the VCR's attention to the jacks in the back. Use the **input switch**, commonly on the remote but sometimes on the VCR. Occasionally, the **channel up/down** button will lock into the line function. *If you see a channel number on the VCR (e.g., "3"), your VCR is not tuned into the jacks in the back.*
4. Set the tape speed to **SP** (the "two hour" speed). Set the VCR/TV switch to VCR. You should see your computer on the television set connected to your VCR (not a bad trick in itself).
5. Hit **record** on the VCR. Anything you do on the computer will now be recorded on videotape to share, archive, send home, or show to teachers or students.



## An Important Element: Adding Sound

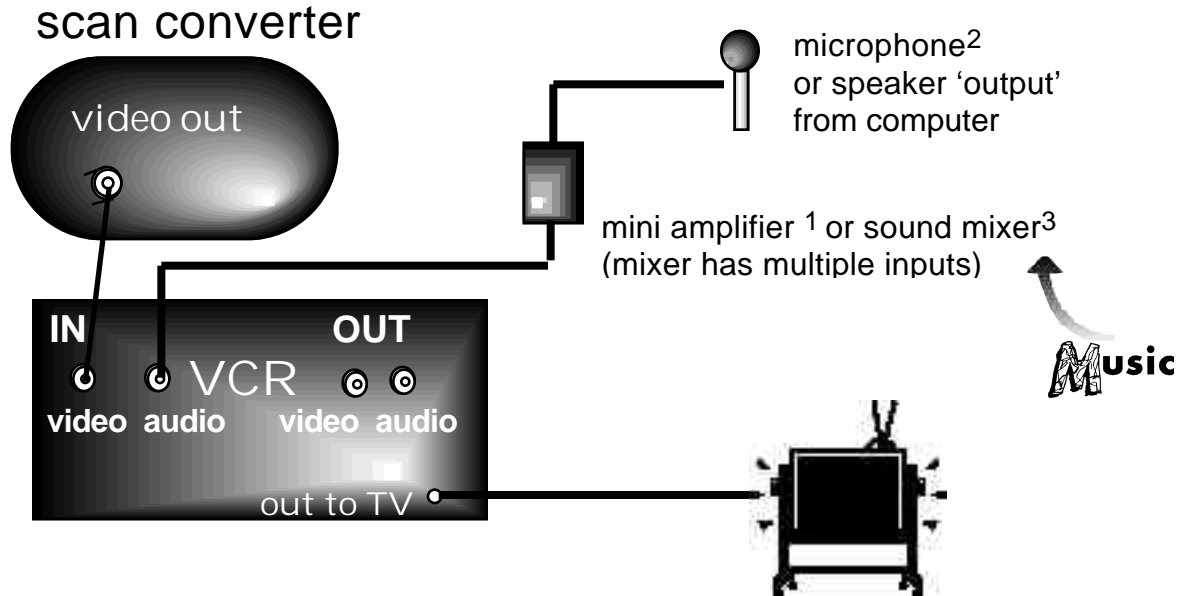
If you wish to include the sounds from the computer on the tape, also connect the **headphone** output jack to the **audio in** jack on the VCR (the computer **speaker** jacks may be a little too noisy). The computer speakers (or headphones) are probably stereo. If the VCR is not stereo, just connect to the single **audio in** jack. The connector cable will look like this. If you can't get the identical cable, use adaptors to make one.



If you want to add narration instead of the sound from the computer, connect a **microphone** to **audio in** on the VCR. The microphone by itself won't be strong enough to be heard. You will need to add either a **mixer** or a mini-amplifier (as shown below). Students will be able to narrate as they watch the output from the computer on the television (turn the volume down or you may get feedback). When you **record** on the VCR, it will record the computer as video and the microphone as audio.

There are serious advantages to buying a mixer. They are available for less than \$50,

and they enable students to mix music with their narration, a powerful addition to any project. You may mix narration, computer sounds, and music (or other audio sources) for your soundtrack. They can be very effective. Connect the microphone, computer speakers/headphone, and music source (a CD in the example) to the mixer inputs. Then connect the mixer output to the VCR. The computer generated projects will then have a wonderful and rich sound track on the videotape you have made.



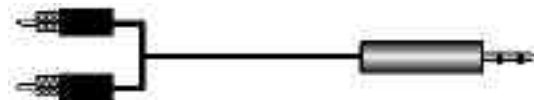
1. Radio Shack part# 277-1008C (around \$11)
  2. Radio Shack #331060 (\$24)
  3. Radio Shack, ET AL (\$25-\$50)
- The part numbers change often, but the salesfolk will get the general idea.

### Adding a Mixer to the Mix

A mixer will enable you to add music underneath narration. It also allows sound, music, sound effects, and computer sounds to be combined. The VCR has one set of input jacks, so to mix sound you need a device with many inputs. By connecting the output from the mixed to the inputs on the VCR, you are able to add more audio effects and more audio impact that you would otherwise be able to do.

An added bonus to having a mixer is that you can also add the mixed audio output from the mixer into the computer-- via the microphone input-- if you want to bring richer audio to computer inputs and/or narration into computer projects. Programs (and computers) that allow students to record their own voices will never be the same. Use a stereo RCA to stereo mini cord to connect the mixer to the computer. Some computers may connect via the USB port. You will need a an adapter.

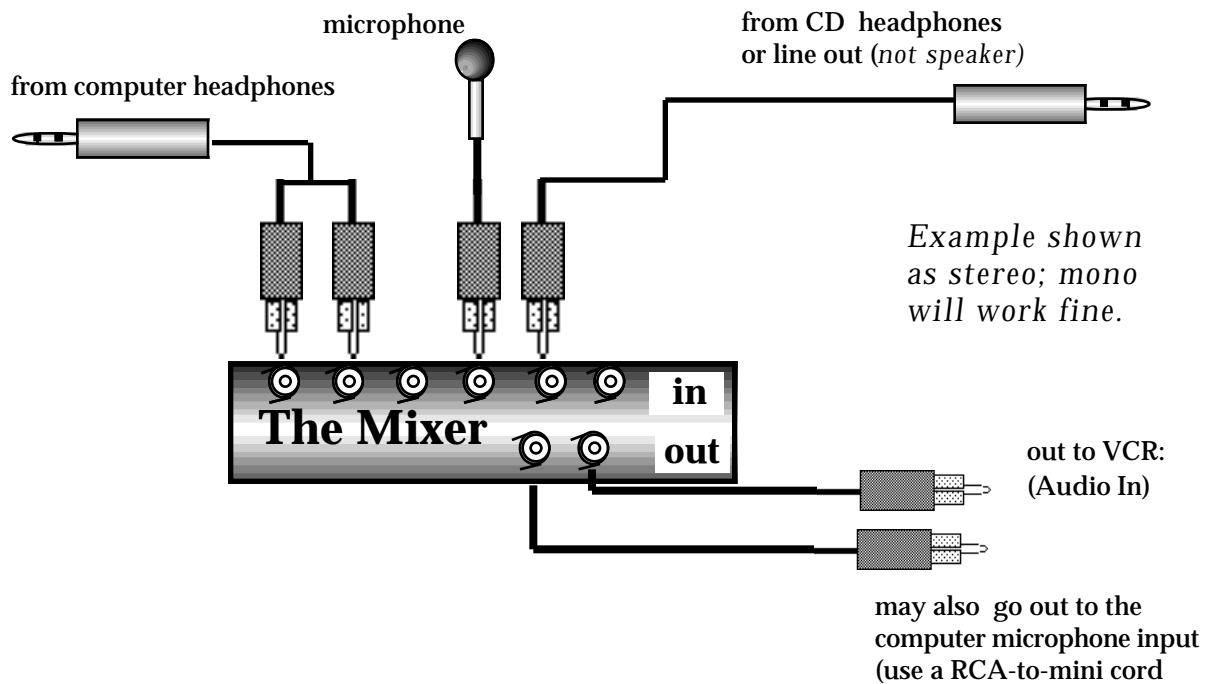
**Mixer  
(audio out)**



**Computer (microphone  
input) or USB adapter**

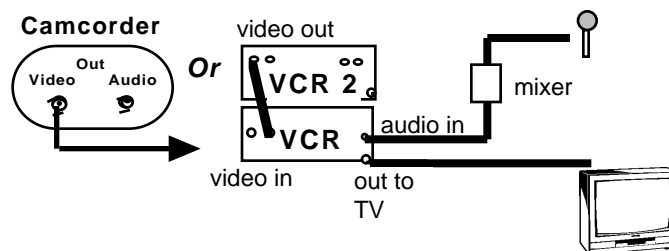
## The Mixer

The elements of a creating a rich audio track for video or multimedia projects. The connections below are not to scale.



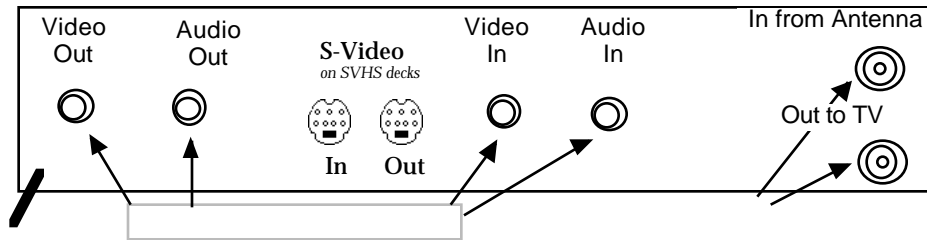
## More Options: Changing Sound Tracks

Another thing a mixer makes possible is the ability to add a second track, or 'voice-over' to an existing tape. Students could write and add a new sound (and new script) to a movie or documentary. Everything from dubbed movies to new versions of classic plays is now possible. Cartoons, Shakespeare, or other programs engaging to students can now be transformed into student work. Do this by connecting two VCRs and the mixer as illustrated below. Put the blank tape in VCR and the original in VCR 2.



# A Cable and Connector Visual Glossary

A closer look at the back of a VCR.



USB "A" connects to the computer



USB "B" connects to the peripheral



USB "Universal Serial Bus" offers transfers rates of up to 12 megabytes per second, more than 50 times old serial ports (and 12,000 times bus ports). Keyboards, video, and more can be moved through USB connections.



IEEE "firewire" a/v 4 pin (typically goes into an appropriately equipped camcorder)



IEEE "firewire" 6 pin (the usual computer connection)



IEEE 1394 is know by many names, commonly by IEEE or Firewire (an Apple trademark). IEEE 1394 is fast--at 400 Mbps it has 30 times more bandwidth than USB. It is also hot pluggable and supports up to 63 devices and cable lengths up to 14 feet.

*laptop adapter card for firewire*



**Video and Audio Out** a typical digital camcorder. It allows a digital camcorder to connect to a "regular" VCR for copies or viewing.



3.5mm angled plug to 3 RCA plugs 2.0m



S-Video output on computer or VCR



New storage devices using IEEE and USB are cheaper, faster and bigger. A 40 gigabytes drive can be as inexpensive as \$300, compared to a Zip drive (\$100+ for device, \$10+ for 100 megabytes) or Jaz (\$100 for a gigabyte) for examples: [www.promax.co](http://www.promax.co)



# A Cable and Connector Visual Glossary *continued*

## PLUGS JACKS



RCA male



RCA female



mono mini-plug



stereo mini-plug



BNC male



BNC female



"F" connector female to male



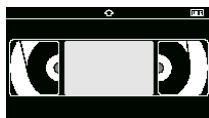
1/4" (or phono)



RCA to mini adapter



cables: RCA to -RCA



The term for male connectors.

The term for female connectors.

RCA connectors. At Radio Shack they call these "phono" connectors. They are used for VCR video /audio in and out; old Apple II monitors; laser disc outputs. They were used on old hi-fi's as speaker outputs (avoid connecting your equipment to these plugs, since they are too "hot" (amplified).

Mini-plugs. Also called "1/8" or "3.5 mm." These are used for headphones in cassette players, CD players, audio inputs on most computers, speaker outputs on most computers; microphone jacks on camcorders. Inexpensive microphones use these connections (and many are very good).

BNC. This is a more professional video output. The female is barrel-shaped. It is good to have a BNC-to-RCA adapter in your pocket. You never know when a VCR will have BNC jack instead of an RCA.

By many names, RF, "F" connector, or coaxial cable this connector lives behind your VCR and connects it to your television. Usually you find the cables in a variety of lengths with male connectors on both ends. Be careful not to bend the little pin in the middle.

Phone plugs or 1/4" plugs were the former connector of choice for headphones. You still find them occasionally on mixing boards or other equipment. Have adapters handy to convert this old plug. Only Radio Shack resists calling them "phono" plugs.

**Adapters.** You can get anything connected to anything. Radio Shack is a good place to begin. Electronics store in bricks (stores) or clicks (online) will everything else. You can convert audio to stereo, vice versa, and nearly everything else. Shown is the absolutely essential "RCA-mini" adapter.

**Cables.** The most readily available cables are RCA male to RCA male. You can get them in a variety of colors at Radio Shack--very useful in the classroom. Have adapters handy to convert the cables to mini males.

**8mm vs VHS-C.** VHS -C cassettes will fit into regular VCRs (with an adapter). 8mm will **not** do

*some images came from radioshack.com and <http://www.securityideas.com/conad.html> and [www.amabilidade2002.com](http://www.amabilidade2002.com)*

# Bonus Section: Integrating Video Clips Downloaded from the Web



There is an increasingly large number of video resources accessible through the Internet. With the right browser configuration and software support, these video resources can be pulled down from the web into a student's hard drive where they can be incorporated into multimedia projects. Actual video clips of President Bush (both of them) speaking on specific issues, and scientists like Robert Oppenheimer, authors like John Grisham, Maya Angelou can add great weight and insight into student projects on appropriate topics. To have access to these clips, you need the following:

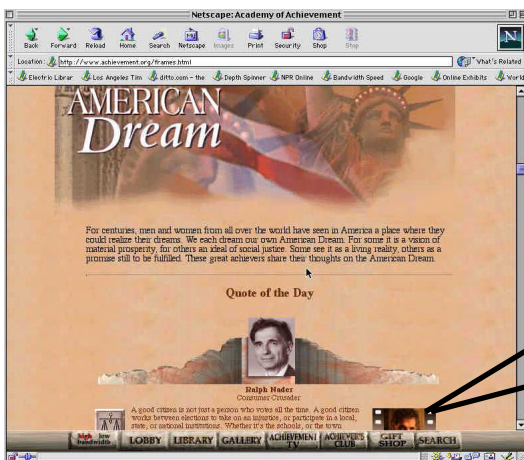
**The right browser.** Netscape and Explorer both work, but sometimes versions will foil you. (Netscape 6 seems to be a problem, for example). Switch if it won't work with your current browser.

**The right video playing software.** QuickTime Pro (Mac or PC, \$29 apple.com) is great for this. On some sites, Windows Media Player 7 (Mac or PC, microsoft.com, free) will do the job. Get both. QuickTime Pro is seriously worth the money.

**The right video format on the site you're visiting.** Straight streaming can't be captured (without some secret and very suppressed software). However, many times people posting video clips of exemplary people, movie trailers, etc., enable their clips for downloading. **Note:** These clips are wonderful in HyperStudio, PowerPoint, etc., but they won't fit neatly into digital editing programs such as iMovie or IntroDV. They can be squeezed into such projects, but they show the strain.

Here is how to do it. First, in QuickTime Pro.

1. Navigate to a site that offers video resources (such as achievement.org, below)

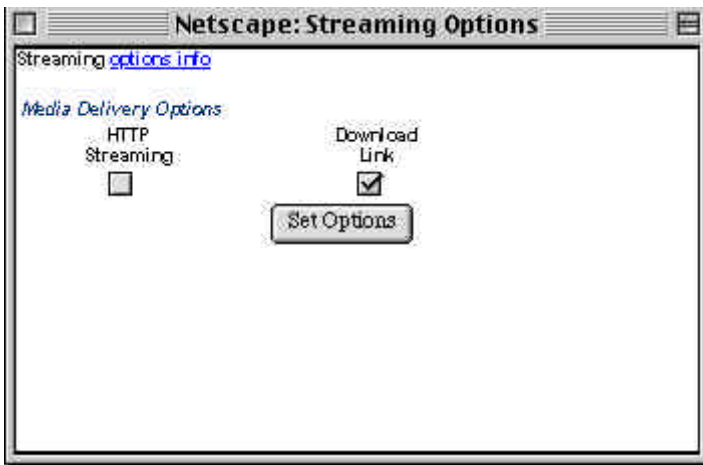


2. Find where to launch the video. Click on the link.



3. After the clip has downloaded (the grey bar is completely filled), hold down the mouse (right click in Windows). Select “SaveAs QuickTime Movie”. Select the folder where you want it stored and there it will be for your future use. Create a new folder for your clips. Otherwise they might get lost. Note, this works with movies streamed to the web as QuickTime. And it only works with QuickTime Pro (\$29), not the free player.

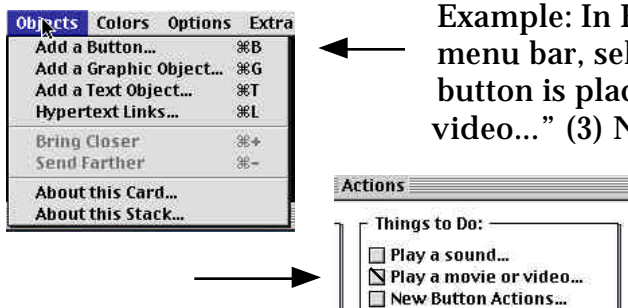
**In Windows Media Player, the operation is similar.**



1. Navigate to a site that streams in Media Player such as [www.unitedstreaming.com](http://www.unitedstreaming.com) (for which you’ll have to get a guest password).  
 2. Click “Streaming Options”. A box will open.  
 3. Set the option for “Download Link”. The clip will now download into your hard drive, just as if it were a VCR!

### On to Multimedia!

Now in HyperStudio, PowerPoint, et. al., you will have a bigger video library to choose from. Follow the directions in the software and your student projects will have video and sound from experts in the field, NASA, JPL, relevant TV commercials ([adcritic.com](http://adcritic.com)) and more. Video takes up space, so remember to pick up an external hard drive to hold them all---- or plan on burning some midnight CDs.



Example: In Hyperstudio (1) from “Objects” in the menu bar, select “Add A Button”. (2) Once the button is placed, select the action “Play a movie or video...” (3) Navigate to the folder where your movie is stored. It will now be a resource, like clip art, you can bring in whenever needed.

# Resource Page

**AV Computers:** Older Macintoshes with “A/V” label; Windows machines: Gateway (inc. laptop model), Compaq, Sony, ET AL. Be sure to check for RCA jacks in the rear (or front in some models). On newer machines, there will be IEEE 1394 (firewire) connections. This serve as video in and out. USB port can support video capture and output. Peripheral devices must be purchased to do this.

**Video Capture Cards:** **Mac:** Apple brand video cards or irez.com. **Windows ;** Iomega; Many others. **Vendors:** 800.323.2325 or www.videoguys.com; or bhphoto.com. Your computer may already have this input card.

**Camcorders:**



Anything with video/audio outputs (even “broken” camcorders that won’t record or rewind) will work for video inputs. 8mm or VHS will work. Check newer digital cameras to ensure they have both input and output. Preferred brands are Canon or Sony. Make sure to buy a digital camera with analog inputs **and** outputs. VHS-C is the smaller version of VHS. Their tapes will play in regular VHS machines (8mm will not).

**VCRs:**

Anything with video and audio out and in. SVHS and Hi8 are superior, but more expensive for tape and machines. Digital decks with firewire connections are still (2001) not practical for generic classwork. But computers with firewire and digital camcorders may excellent editing stations for relatively little money.

**Tuner Cards:**

**Mac:** Apple brand **Windows:** Many options (check for bundled software)

**Scan Converters:**

Various brands (\$80-\$249) 1.800.538.8866; www.focusinfo.com

Remember, these are NOT scanners. The names are unfortunately similar.

**Software: (both platforms)**



Vendors: Learning Services 800.877.9378; Acorn Media 800.368.5812 Morph (free w/ HyperStudio or \$19) 800-757-7707; SmartSound (sonicdesktop.com)

HyperStudio (Knowledge Adventure, 1-800-HYPERSTUDIO; \$100)

Goo (Metatools, \$29) www.metacreations.com/products/goo

Adobe Premier (educator price \$130) www.adobe.com

KidPix; QuickTime Pro (mac or PC: \$29); MovieWorks (both mac/PC)

Adobe GoLive (ed. price around \$60) www.adobe.com

**Digital Editors:**



**Mac:** .iMovie; iMovie; Final Cut Pro (\$900+); Premiere; EditDV

**Windows:** IntroDV (easy), EditDV, trial download digitalorigin.com; also

**Cross Platform:** MovieWorks, Adobe Premiere (\$900+).

**People:**

Nancy Smith (“Auntie Goodiebags”)- claymation on the computer,

AuntGoodie@aol.com, or PO Box 6262 Syracuse, NY 13217,

Hall Davidson, hall@ccd.edu or hall@deltanet.com,

Jeff Peach, teacher, morph, videos, etc., peach@oro.net

Tim Fleck tfleck@aol.com



**Other:**

California Student Media and Multimedia Festival (www.mediafestival.org)

At: www.HyperStudio.com: **VCR as Printer:** pdf file; **Quicktime VR**

**Tutorial; VHS short length tapes:** AVA 1.818.709.1800 (Bani)

**Making Multimedia Movies:** terran.int.com/info/MMMIntro.html

(good glossary at same site); http://videouniversity.com

**Soundtrack Software:** SmartSound; www.sonicdesktop.com; 800.454.1900;

Sound Companion 800-877-0858; Zillion Sounds, www.beachware.com

QuickTime Pro (both platforms): www.apple.com





Hall Davidson  
KOCE-TV  
hall@cccd.edu

Updated!

Metamorphoses  
CHANGING FACES OF TECHNOLOGY  
2 0 0 2



## The Nuts and Bolts of Digital Video Seattle, Washington 3/16/02



IEEE1394

- I. What Digital is Video ? Overview
- II. What makes it such a good match for K-12 (examples)
  - a. media
  - b. multimedia
- III. Digital Video and the Computer:
  - a. Nuts & Bolts: Getting Video In & Out
    - i. hardware -camcorders, computers
    - ii. software -
  - b. Output: VHS, Web, Multimedia
    - i. file formats
    - ii. storage:external drives, VHS, miniDV, 8mm)
- IV. Resources for Digital Videos
  - a. digital stills (digital still cameras)
  - b. CD-ROM (videos, stills)
  - c. quicktime files (downloads, originals, purchased)
  - d. music (digitized, original)
  - e. copyright issues
- V. Editors - Nonlinear Video
  - a. QuickTime Pro
  - b. iMovie, IntroDV
  - c. Premier, Final Cut Pro
- VI. Tools for Digital Video
  - a. Morph, Goo
  - b. StudioArtist, Electrifier Pro
  - c. QuickTime VR, Panoramas
- VII. Before it Begins and When It's Over
  - a. rubrics, planning guides
  - b. festival





# Late Breaking Resource Supplement

- More on Digital Video background and products  
<http://www.howstuffworks.com/>  
<http://www.askfor1394.com/>  
<http://www.nonlinearvideo.com/introdv.htm>  
<http://www.promax.com/>  
<http://www.videoguys.com/media100.html>
- Free Morphing Program  
<http://www.asahi-net.or.jp/~FX6M-FJMY/mop00e.html>
- **Morph Template (Student Aging) & Morph Tutorial**  
<http://www.halldavidson.net>
- Free Downloads (Demos)  
 HyperStudio - <http://www.hyperstudio.com>  
 StudioArtist (Mac only for now) - <http://www.synthetik.com/>  
 SmartSound - <http://www.sonicdesktop.com/>
- **Storyboard help** (with model for TV broadcast partner)  
[www.schoolhousevideo.org](http://www.schoolhousevideo.org)
- **Holding a Student Media Festival - The Whole Thing**  
[www.mediafestival.org](http://www.mediafestival.org)
- Finding Hall Davidson  
[www.halldavidson.net](http://www.halldavidson.net)
- **Peachpit Press** -  
*QuickTime 5 for Mac and Windows*  
*The Little Digital Video Book*  
[www.peachpit.com](http://www.peachpit.com)
- iMovie Manual  
*iMovie 2 - The Missing Manual*  
[www.missingmanual.com](http://www.missingmanual.com)
- Extra iMovie Transitions (Slick)  
[www.geethree.com/](http://www.geethree.com/)
- IntroDV (Windows)  
<http://www.discreet.com/purchase/> (\$79)
- Cleaner 5 (file compressor for digital video)  
<http://www.discreet.com/>
- Internet compression comparison  
<http://ecos.ca/video/>
- **Videomaker magazine** and online resource  
<http://www.videomaker.com/scripts/lobby.cfm?id=9>  
<http://www.videomaker.com> Notes on Resources
- USB to DVD, USB to Video (Input Card)  
<http://www.ulead.com>
- **MovieMaker Tutorial (Microsoft) Windows XP "PC iMovie"**  
[http://www.microsoft.com/windowsxp/wmx/howto/video\\_watch.aspx](http://www.microsoft.com/windowsxp/wmx/howto/video_watch.aspx)

# Morpher



# Great Web Sites

Date:



For Research



As Publishing



As Interactive Learning Experiences



As a Source for Lesson Plans