Chapter 1

Introducing Digital Video

In This Chapter

- Defining digital video
- Editing video on your own computer
- Sharing digital video

In 1996, I read a technical paper on a new technology from Apple Computer called *FireWire.* This new technology promised the ability to transfer data at speeds of up to 400 megabits per second. "Yeah, right!" I quietly scoffed to myself, "Why on Earth would anyone need to transfer that much data that quickly? Besides, Apple will be out of business by the end of '97."

Yeah, right.

Thankfully I was wrong about Apple, and I soon learned about a new phenomenon called *digital video* that could take advantage of this new FireWire technology. Digital video files are big, too big in fact for computers of just a few years ago to handle. But FireWire allows high quality video to be shared easily and efficiently between digital camcorders and computers.

Of course, more than just FireWire was needed for this digital video thing to catch on. Personal computers still had to become fast enough to handle digital video, and prices for digital camcorders only fell within reach of mere mortals just a couple of years ago. Digital video is here now, and anyone with a reasonably modern computer and a $500 digital camcorder can make movies like a pro. With the recent advent of DVD players and recordable DVD drives, sharing your high quality movies with others has never been easier.

This chapter introduces you to digital video and shows you how easy it is to edit and share your movies with others.

What Is Digital Video?

Human beings experience the world as an analog environment. When we take in the serene beauty of a rose garden, the mournful song of a cello, or the

graceful motion of an eagle in flight, we are receiving a steady stream of infinitely variable data through our various senses. Of course, we don't think of all these things as "data" but rather as light, sound, smell, and touch.

Computers are pretty dumb compared to the human brain. They can't comprehend the analog data of the world; all computers understand are *yes* (one) and *no* (zero). In spite of this limitation, we force our computers to show pictures, play music, and display moving video; infinitely variable sounds, colors, and shapes must be converted into the language of computers — ones and zeros. This conversion process is called *digitizing*. Digital video — often abbreviated as *DV* — is video that has been digitized.

To fully understand the difference between analog data and digital data, suppose you want to draw the profile of a hill. An analog representation of the profile (shown in Figure 1-1) would follow the contour of the hill perfectly, because analog values are infinitely variable. However, a digital contour of that same hill would not be able to follow every single detail of the hill, because, as shown in Figure 1-2, digital values are made up of specifically defined, individual bits of data.

Figure 1-1: Analog data is infinitely variable.

Comparing analog and digital video

Digital recordings are theoretically inferior to analog recordings because analog recordings can contain more information. But the truth is that major advances in digital technology mean that this really doesn't matter. Yes, a digital recording must be made up of specific individual values, but modern recordings have so many discrete values packed so closely together that human eyes and ears can barely tell the difference. In fact, casual observation often reveals that digital recordings actually seem to be of a higher quality than analog recordings. Why?

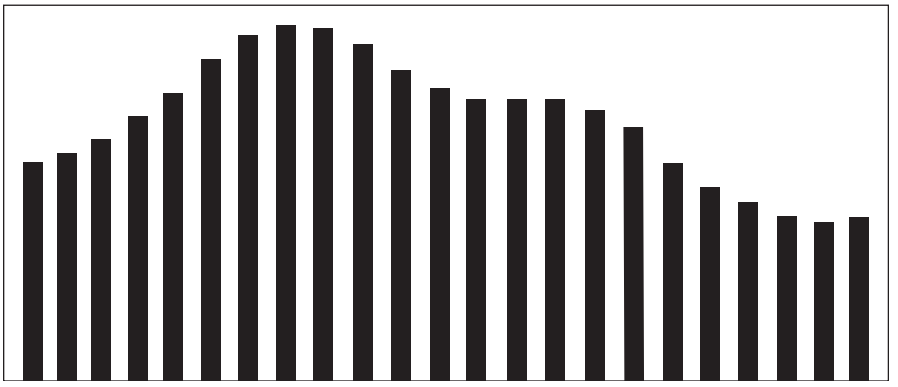

Figure 1-2: Digital data contains specific values.

A major problem with analog recordings is that they are highly susceptible to deterioration. Every time analog data is copied, some of the original, infinitely variable data is lost. This phenomenon, called *generational loss,* can be observed in that dark, grainy copy of a copy of a copy of a wedding video that was first shot more than 10 years ago. However, digital data doesn't have this problem. A one is always a one, no matter how many times it is copied, and a zero is always a zero. Likewise, analog recordings are more susceptible to deterioration after every playback, which explains why your 1964-vintage *Meet the Beatles* LP pops, hisses, and has lost many of its highs and lows over the years. Digital recordings are based on instructions that tell the computer how to create the data; as long as it can read the instructions, it creates the data the same way every time.

Whether you are editing analog or digital material, always work from a copy of the master and keep the master safe. When adding analog material to your project, the fewer generations your recording is from the original, the better.

When you consider the implications of generational loss on video editing, you begin to see what a blessing digital video really is. You're constantly copying, editing, and recopying content as you edit your movie projects — and with digital video, you can edit to your heart's content, confident that the quality won't diminish with each new copy you make.

Warming up to FireWire

FireWire is one of the hot new technologies that makes digital video so fun and easy to work with. FireWire — also sometimes called IEEE-1394 or i.LINK — was originally developed by Apple Computer and is actually an interface

format for computer peripherals. Various peripherals including scanners, CD burners, external hard drives, and of course digital video cameras use FireWire technology. Key features of FireWire include

- **Speed:** FireWire is really fast, way faster than USB or serial ports. FireWire is capable of transfer rates up to 400Mbps (megabits per second). Digital video contains a lot of data that must be transferred quickly, making FireWire an ideal format.
- **Mac and PC compatibility:** (What a concept.) Although FireWire was developed by Apple, it is widely implemented in the PC world as well. This has helped make FireWire an industry standard.
- **Plug-and-play connectivity:** When you connect your digital camcorder to a FireWire port on your computer (whether Mac or PC), the camera is automatically detected. You won't have to spend hours installing software drivers or messing with obscure computer settings just to get everything working.
- **Device control:** Okay, this one isn't actually a feature *of* FireWire, it's just one of the things that makes using FireWire really neat. If your digital camcorder is connected to your computer's FireWire port, most video editing programs can control the camcorder's playback features. This means you don't have to juggle your fingers and try to press Play on the camcorder and Record in the software at exactly the same time. Just click Capture in a program like iMovie or Pinnacle Studio, and the software automatically starts and stops your camcorder as needed.
- **Hot-swap capability:** You can connect or disconnect FireWire components whenever you want. You don't need to shut down the computer, unplug power cables, or confer with your local public utility district before connecting or disconnecting a FireWire component.

All new Macintosh computers come with FireWire ports. Some — but not all — Windows PCs have FireWire ports as well. If your PC does not have a FireWire port, you can usually add one using an expansion card. (I cover all kinds of optional upgrades and adjustments to your system in Chapter 2.) Windows 98 and higher include software support for FireWire hardware. If you're buying a new PC and you plan to do a lot of video editing, consider a FireWire port a must-have feature.

All digital camcorders offer FireWire ports as well, although the port isn't always called FireWire. Sometimes FireWire ports are instead called "i.LINK" or simply "DV" by camcorder manufacturers who don't want to use Apple's trademarked FireWire name. But rest assured, all digital camcorders have a FireWire-compatible port. FireWire truly makes video editing easy, and if you are buying a new camcorder, I strongly recommend that you buy a camcorder that includes a FireWire port. Chapter 3 provides more detail on choosing a great digital camcorder.

Online versus offline editing

A video file represents a huge amount of information — so it takes up a lot of space in the digital world. You need fast hardware to handle video, and monster hard drives to store it. To conserve storage space during editing, professionals have long used a trick called *offline editing*. The idea is to capture lower-quality "working" copies of your video into the computer. After you complete all your edits and you're ready to make your final movie, the software decides which portions of the original video must be captured at full quality — and then automatically captures only the portions you need.

Conversely, if you work with full-quality video on your computer for all your edits, you are performing what video pros call *online editing*.

Offline and online editing are techie terms used by the pros. In practice, most affordable video editing programs don't give you many choices. A standout exception is Pinnacle Studio for Windows (as profiled in Chapter 5), which has an offline-editing feature called SmartCapture. This feature captures large sections of video at preview-quality — which means it may not look as sharp as full-quality video, but it doesn't take up nearly as much hard disk space. Then, when you're done editing, SmartCapture automatically captures only the full-quality footage needed for the movie and applies all your edits automatically.

Editing Video

Editing video projects with a program like Pinnacle Studio or Apple iMovie is pretty easy, but this wasn't always the case. Until recently, the only practical way for the average person to edit video was to connect two VCRs and use the Record and Pause buttons to cut out unwanted parts. This was a tedious and inefficient process. The up-to-date (and vastly improved) way to edit video is to use a computer — and the following sections introduce you to the video-editing techniques you're most likely to use.

Comparing editing methods

Video (and audio, for that matter) is considered a linear medium because it comes at you in a linear stream through time. A still picture, on the other hand, just sits there — you take it in all at once — and a Web site lets you jump randomly from page to page. Because neither of these is perceived as a stream, they're both examples of nonlinear media.

You tweak a linear medium (such as video) by using one of two basic methods — *linear* or *nonlinear* editing. If your approach to editing is linear, you must do all the editing work in chronological order, from the start of the

movie to the finish. Here's an old-fashioned example: If you "edit" video by dubbing certain parts from a camcorder tape onto a VHS tape in your VCR, you have to do all your edits in one session, in chronological order. As you probably guessed, linear editing is terribly inefficient. If you dub a program and then decide to perform an additional edit, subsequent video usually has to be redubbed. (Oh, the pain, the tedium.)

What is the alternative? Thinking outside the line: *nonlinear editing*. You can do nonlinear edits in any order; you don't have to start at the beginning and slog on through to the end every time. The magical gizmo that makes nonlinear editing possible is a combination of the personal computer and programs designed for nonlinear editing (NLE). Using such a program (for example, Apple iMovie or Pinnacle Studio), you can navigate to any scene in the movie, insert scenes, move them around, cut them out of the timeline altogether, and slice, dice, tweak and fine-tune to your heart's content.

Editing a short video project

Editing video is really cool and easy to do if you have a reasonably modern computer. But why talk about editing when you can jump right into it? Here's the drill:

1. **Open Windows Movie Maker (Windows) or Apple iMovie (Macintosh).**

   If you don't know how to open your video-editing program, or if you aren't sure you have the latest version, check out Appendix C for information about iMovie, or Appendix E for the scoop on Windows Movie Maker. If you are prompted to create a new project by iMovie, create a new project and call it Chapter 1.

2. **Put the CD-ROM that accompanies this book in your CD-ROM drive.**

3. **Choose File⇨Import in iMovie or File⇨Import into Collections in Windows Movie Maker.**

4. **Browse to the `Samples\Chapter 1` folder on the CD-ROM.**

   In iMovie, hold down the ⌘ (Mac) key and click each clip once to select all three of them. In Windows Movie Maker, click the file `Chapter1` to select it.

5. **Click Open (iMovie) or Import (Windows Movie Maker).**

   Three clips appear in the browser window of your video-editing program, as shown in Figure 1-3. The figure shows iMovie, but Windows Movie Maker (shown in Figure 1-4) is fairly similar.

6. **Click-and-drag Clip 01 from the clip browser and then drop it on the storyboard.**

7. **Click-and-drag Clip 02 and drop it on the storyboard just after Clip 01.**

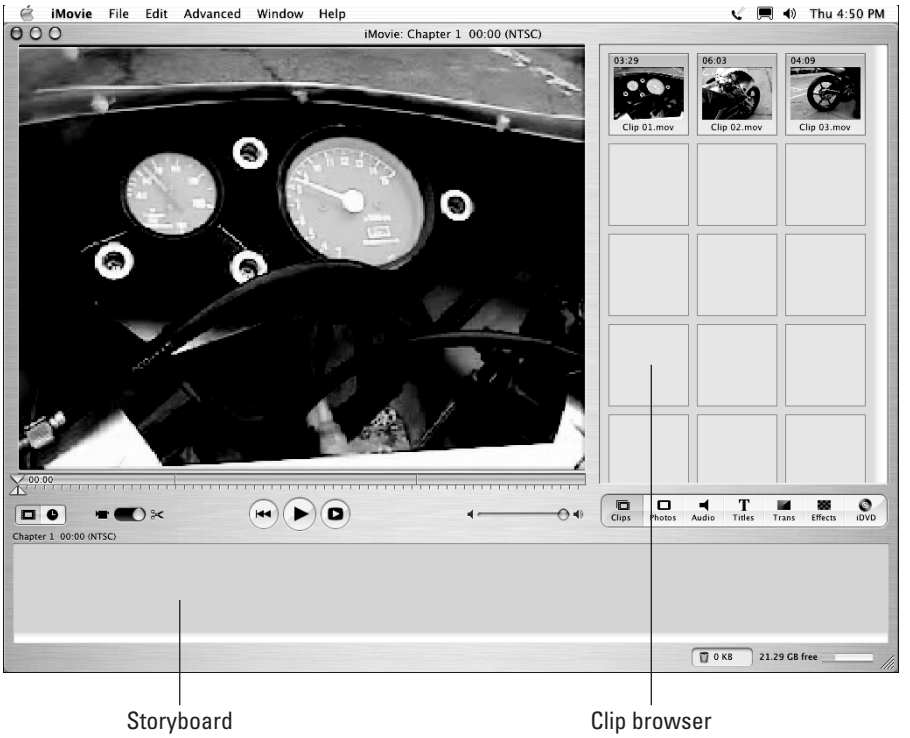

Figure 1-3: Three sample clips have been successfully imported.

Congratulations! You've just made your first movie edit. You should now have two clips on the storyboard, looking similar to Figure 1-4.

If your Windows Movie Maker window doesn't look quite like this, click the Show Timeline button (if you see it on-screen).

Well, okay, what's so nonlinear about that? After all, you placed one clip after another — that's about as linear as an edit can get. You could easily imagine doing the same thing with a camcorder, a VCR, and some cables.

Aha, but here's the kicker: What if you decide to insert Clip 03 in-between Clips 01 and 02? If you're "editing" with a camcorder and VCR, this move suddenly becomes a horrendously tricky edit to make. But with a nonlinear editing program like iMovie or Windows Movie Maker, the edit is easy. Just click-and-drag Clip 03 and drop it right between Clips 01 and 02. The software automatically shifts Clip 02 over to make room for Clip 03, as shown in Figure 1-5. Almost as easy as shuffling cards, edits like these are the essence of nonlinear video editing.

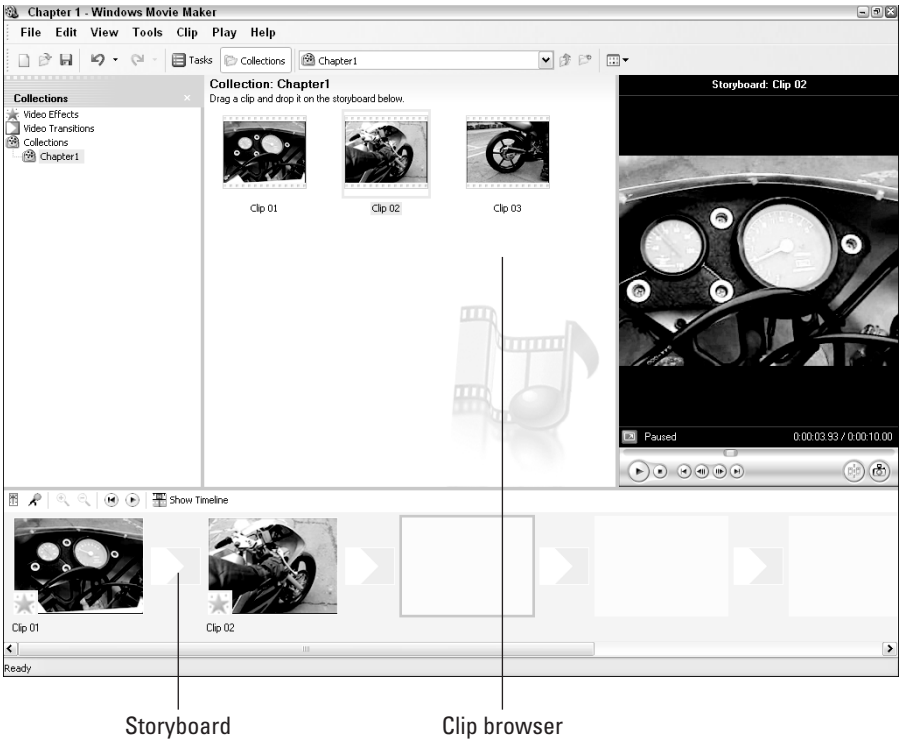

Figure 1-4: Two clips have been placed in the storyboard.

Performing Hollywood magic at the click of a mouse

The previous section shows the basics of making a movie by assembling clips in a specific order — and frankly, most of your editing work will probably consist of simple tasks like that. But when you want to go beyond ordinary, you can really spice up your movies by adding special effects or transitions between clips. (Special effects are covered in Chapter 11, and I show you just about everything you'll ever need to know about transitions in Chapter 9.)

Of course, there's no need to wait until later. Modern video-editing programs make it really easy to add special creative touches to your movies.

Creating a transition

You can add a transition to the simple movie you put together in the previous section by following these steps:

1. **Open the Chapter 1 sample project you created in the previous section if it isn't already open.**

   You can follow these steps using any movie project that includes two or more clips.

2. **Open the list of video transitions in your editing program.**

   In Apple iMovie, click the Trans button just below the browser window. In Windows Movie Maker, click Video Transitions under Collections on the left side of the screen.

3. **Click-and-drag one of the Circle transitions to a spot between two clips on the storyboard.**

   A transition indicator appears between the two clips, as shown in Figure 1-6.

4. **Click Play in the preview window to preview the transition.**

   If you are using iMovie, the transition may not appear immediately. If you see a tiny red progress bar under the transition, wait a few seconds for it to finish. When the progress bar is complete, you should be able to preview the transition.

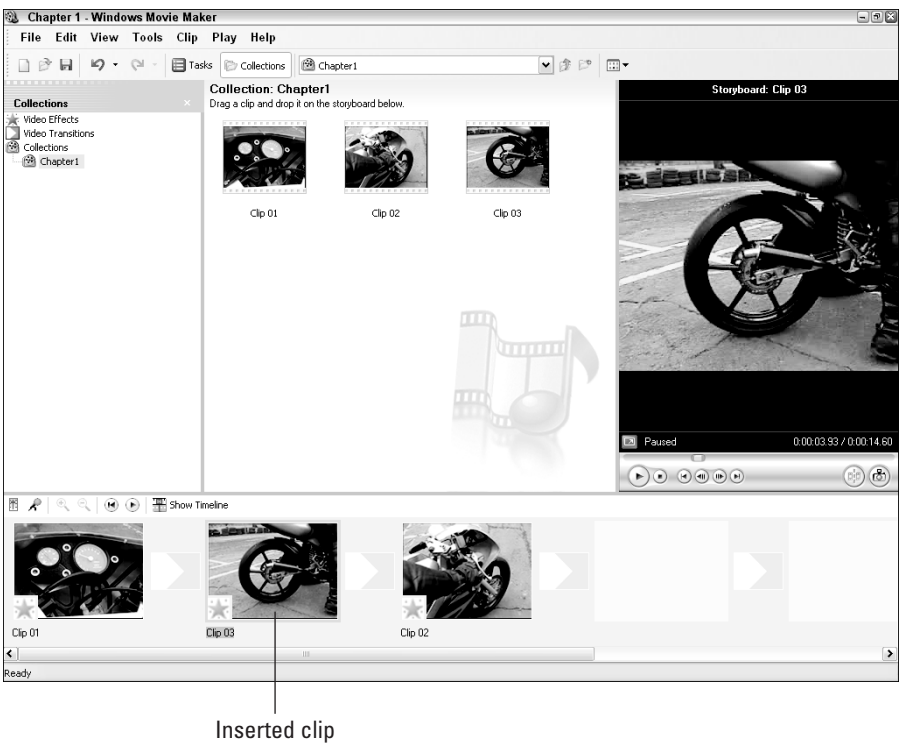

Figure 1-5: Clip 03 has been inserted between Clip 01 and Clip 02.

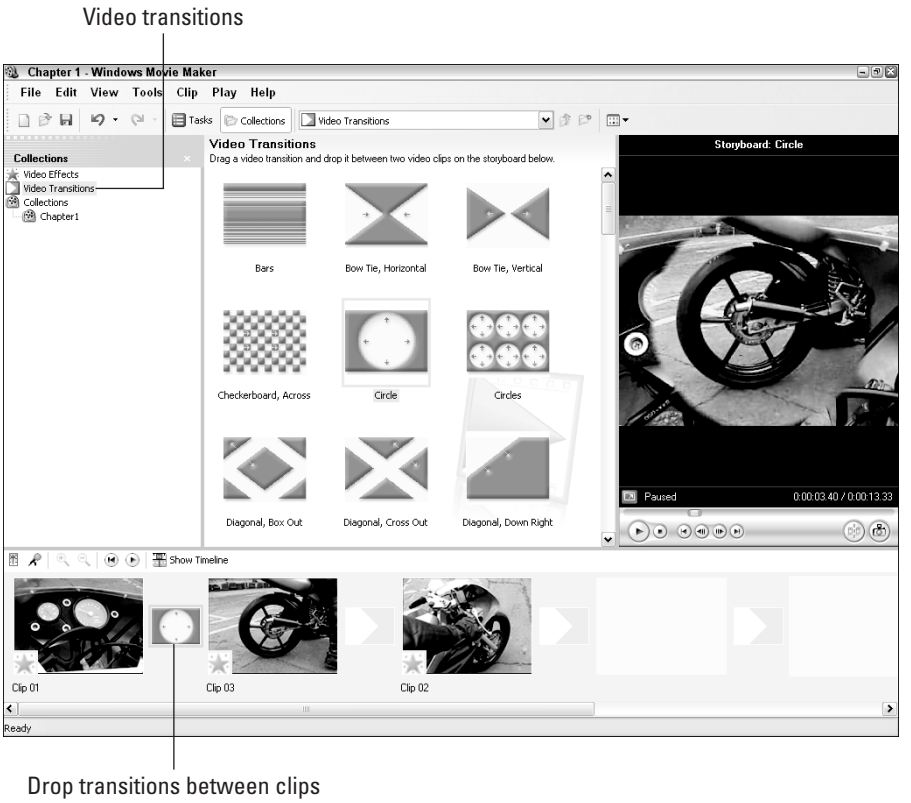

Figure 1-6: Transitions add a special touch to your movies.

Pretty cool, huh? But wait, that's not all!

Creating special effects

Adding special effects to your video is pretty easy too. Here's one that makes a video clip look like it came from a really old reel of film:

1. **Click a clip in the storyboard to select it.**

   If you're following along using the sample clips from the companion CD-ROM, choose Clip 02, which is probably the last clip in your storyboard.

2. **Open the list of video effects in your video-editing program.**

   In iMovie, click the Effects button under the browser window. In Windows Movie Maker, click Video Effects under Collections on the left side of the screen.

3. **Click an Aged Film effect to select it.**

   In iMovie, there is only one Aged Film effect. In Windows Movie Maker, scroll down in the list of effects and choose one of the Film Age effects. It doesn't matter if you choose Old, Older, or Oldest.

4. **Apply the effect to the clip.**

   In iMovie, click Apply at the top of the effects window. In Windows Movie Maker, click-and-drag the effect onto the clip on the storyboard.

5. **Click Play in the preview window to preview the effect as shown in Figure 1-7.**

   Again, if you're using iMovie, you will probably have to wait for the tiny red progress bar on the clip to finish before you can preview the effect.

These are just a couple of the cool things you can do with digital video. Part III of this book helps you explore the wonders of video editing in greater detail. So break out your director's chair and get ready to make some movie magic!

Figure 1-7: Making video look like aged film is just one of many special video effects you can use.

Sharing Video

One of the best things about digital video is that it enables you to get really creative with your own movie projects. To make your work worthwhile, you may want to share your video work with others. Thankfully, sharing digital video is pretty easy too. Part IV of this book shows you all the details of sharing video on tape, DVD, or the Internet, but the following sections provide a handy, brief glimpse of what you can do.

Exporting a movie

Modern video-editing programs are designed to make it as easy as possible to share your movie projects — often with no more than a couple of mouse clicks. For now, we'll export a movie that would be suitable for viewing over the Internet. This section uses the project created in Chapter 1 (using sample clips from the CD-ROM), but if you have your own edited movie, you can use it instead. The steps for exporting your movie are a little different depending on whether you are using Apple iMovie or Windows Movie Maker, so I'll address each program separately.

Exporting from Apple iMovie

Apple iMovie exports movies in QuickTime format, or you can export directly to your camcorder's videotape or Apple iDVD. To export your project in iMovie, follow these steps:

1. **Open the project you want to export (such as the `Chapter 1` project).**
2. **Choose File➪Export.**

   The iMovie Export dialog box appears.
3. **Choose how you want to export your movie from the Export menu.**

   For now, I recommend that you choose To QuickTime (as shown in Figure 1-8).
4. **Choose a Format, such as Web.**
5. **Click Export.**
6. **Give a name for your movie file in the Save As box.**

   Make a note of the folder in which you are saving the movie. Choose a different folder if you wish.

   If you remove the `.mov` filename extension, Windows users (you probably know a few) will have a hard time viewing your movie.
7. **Click Save.**

Figure 1-8: Choose export settings in this dialog box.

iMovie exports your movie. The export process may take a few minutes, depending on how long your movie is.

Exporting from Windows Movie Maker

Like iMovie, Windows Movie Maker also enables you to export video for a variety of applications. Windows Movie Maker is especially well suited to exporting movies for Internet playback. To export a movie for online viewing, follow these steps:

1. **Open the project that you want to export (such as the Chapter 1 project).**
2. **Choose File⇨Save Movie File.**

   The Save Movie Wizard appears.
3. **Choose an export format for your movie and then click Next.**

   For now I recommend choosing My Computer.
4. **Enter a filename for your movie and choose a location in which to save the file.**
5. **Click Next again.**

   The Save Movie Wizard shows details about the file, including the file size (see Figure 1-9).
6. **Click Next again.**

   The export process begins.
7. **When export is done, click Finish.**

Your movie will probably begin playing in Windows Media Player. Enjoy!

Figure 1-9: Review movie details here.

Playing your movie

After your movie has been exported, playing it is pretty easy. Simply locate the file on your hard disk and double-click its name. The movie should automatically open and start to play, as shown in Figure 1-10.

If you exported your movie from Windows Movie Maker, the movie file will be in Windows Media (WMV) format. Despite the name, you don't have to be a Windows user to view Windows Media video. You do need Windows Media Player to view Windows Media files, but Microsoft offers a version of Windows Media Player for Macintosh. Figure 1-10 shows a Windows Media version of the Chapter 1 movie, playing contentedly on my Mac.

Movies created on a Mac are also cross-platform-friendly. iMovie outputs videos in Apple QuickTime format, and Windows versions of QuickTime (shown in Figure 1-11) have been available for years. Chapter 14 tells you more about available video-player programs.

Figure 1-10: Windows Media movies can be played on a Mac . . .

After you have previewed your movie, you can either share it with others or edit it some more. I usually go through the preview and re-edit process dozens of times before I decide that a movie project is ready for release, but thanks to digital video, re-editing is no problem at all. Chapter 13 offers some tips for previewing your movies more effectively.

Figure 1-11: . . . and QuickTime files can be played in Windows.