

CD-ROMs, HyperCard, and the Theory Curriculum: A Retrospective Review

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The introduction of Apple computer's HyperCard program for Macintosh in 1987, followed by Robert Winter's 1989 pioneering efforts with the Voyager company, began a new era in computer-assisted instruction (CAI) for music.² No longer are music educators forced to rely upon synthesized sound (generated either internally by the computer or externally by MIDI synthesizer). Now, using a CD-ROM drive controlled by HyperCard, they can employ a variety of orchestral and other sounds in their CAI packages by using digitally-recorded commercial or custom-made compact discs (CDs). Further, HyperCard and other hypermedia programs developed subsequently allow users to traverse lessons by their own custom-designed linear or nonlinear paths; lessons can now easily exploit the pedagogical power of nonlinear music listening with the click of a button. To what extent are commercial packages harnessing these tools to teach music theory more effectively? How can music educators best utilize their potential?

By way of background, let us look first at HyperCard's design metaphor: the stack of cards. Each card may contain text fields, buttons, pull-down menus, graphics, and so on. Buttons, fields, portions of text, and even cards can be designed so that when the user

¹The authors' names are listed in alphabetical order. Placement is not intended to convey primary or secondary authorship; both authors were equal contributors.

²Danny Goodman, author of *The Complete HyperCard 2.2 Handbook*, 4th ed. (New York: Random House, 1993), cites in his acknowledgments a precursor of HyperCard called WildCard, which he previewed in March of 1986. HyperCard 1.0 was released the following year. Robert Winter's first "CD companion," on Beethoven's Symphony No. 9, was released by Voyager Company in 1989.

clicks on them with the computer's mouse some action occurs, such as moving to a new card, playing music, viewing a movie, seeing hidden text, etc. Stacks are often designed so that information can be accessed in a nonlinear fashion—that is, in an order different from the sequential ordering of the cards in the stack. For example, clicking on an item in a Table of Contents card might take the user directly to the specified section of the stack, and clicking on highlighted words ("hot text") might take the reader to a glossary with a definition of that text or to another section of the stack that explains a related concept. A map or diagram might be covered with invisible buttons, so that clicking on a specific location will transport the user to another card with related information, graphics, and sound. Often, at least within sections, linear navigation is also possible by clicking on buttons—typically right or left arrows—to move to the next or previous card in the sequence. Thus both linear and nonlinear learning styles can be accommodated within the same stack. Further, the integration of graphic representations for visual study, explanatory text for reading, sound files of musical excerpts or spoken narrative for listening, and movies for viewing allows the learner to explore a topic through many modalities, which (again) accommodate the variety of learning styles present in a diverse group of students.

Another advantage of HyperCard is that its creators designed the program not only as a browsing tool to be used in navigating commercially purchased HyperCard stacks, but also as an authoring tool whose power for creating custom-made stacks is available to anyone who purchases HyperCard.³ Indeed, educators with access to a Macintosh equipped with HyperCard and a few peripherals—MIDI keyboard/synthesizer, CD-ROM drive, and scanner—as well as a few companion software packages to support this hardware, are able to create CAI packages tailor-made for their students and

³This has been true of HyperCard during most of its brief life. For a time, however, Claris Corporation required developers to purchase a "HyperCard Development Kit," while a scaled-down version of the program (the HyperCard "Player") was bundled with all Macintoshes sold.

their classroom needs, with a visual style almost as professional looking as the commercial packages.⁴

In the spring of 1995, the Eastman School offered its first HyperCard development course, entitled "Computing for Pedagogical and Cognitive Research Applications." The course, now offered each spring semester, is designed to use HyperCard as a vehicle for studying computer-based learning and music-cognitive experimental design and implementation. During the course of the semester, students engage in a review of commercial software packages (both CD-ROMs and non-HyperCard CAI packages for ear training and theory instruction), design and run a music-cognitive experiment that is completely implemented on the Macintosh in HyperCard, and create an individual final project in HyperCard. Final projects vary from music theory tutorials, to ear training drill-and-practice, to repertoire-based CD "companions." Students are also required to complete smaller assignments to acquire HyperCard authoring and scripting skills.⁵

This article draws upon student opinions of the CD-ROMs reviewed as a course requirement, as well as our own.⁶ Based upon

⁴The software we used in our first HyperCard course included MidiPlay for the synthesizer, OFOTO for the scanner, the Voyager CD Audio Toolkit to control the CD-ROM drive, and AudioShop to create sound files. Similar packages are available from other manufacturers. In our first year, we taught in a small classroom equipped with a PowerMac 6100 with built-in CD-ROM drive, a Roland JV-30 multi-timbral synthesizer, AppleDesign speakers, and an overhead projector with Sharp LCD projector panel for displaying the computer images on the classroom wall. For our initial class of ten students, there were three computers in the music library—one with MIDI keyboard—and one additional computer/keyboard station in a student computer lab in another building.

⁵We have used various textbooks in the two years the course has been offered; these books have included George Beekman, *HyperCard 2.3 in a Hurry* (Belmont: Wadsworth, 1996); David Butler, *The Musician's Guide to Perception and Cognition* (New York: Schirmer Books, 1992); Peter Desberg, *Hyper InterActive CAI: Using HyperCard to Develop Computer-Assisted Instruction* (Boston: Allyn and Bacon, 1994); and Danny Goodman, *The Complete HyperCard 2.2 Handbook*, 4th ed. (New York: Random House, 1993).

⁶We wish to acknowledge the input of students who participated in the course: in 1996, Conrad Alexander, Kurt Fowler, Jon Hynes, Jonathan

evaluation criteria developed by the class, Alexander Brinkman implemented an "online" HyperCard journal. This journal stack can usually be opened at the same time as the software being reviewed, and the user can go back and forth between the application and the journal at will. Menu items allow the user to print out the text of the entire journal or of individual entries, to save a copy, to import entries from another journal, and so on. The journal serves two purposes besides the obvious one of providing a place to keep the reviews: it illustrates an ad hoc application written in HyperCard specifically for the course, and the scripts used to implement the stack are studied later in the course when the students are learning HyperTalk programming techniques. The review process familiarizes students with commercial applications that they may wish to use eventually in the classroom; it also provides a "jump start" for the planning of their own final HyperCard projects for this course. Students are encouraged to make note of features they particularly like (or don't like) in the commercial products so that they can incorporate (or improve upon) these features in their own stacks.

The journal template consists of a title card, one blank journal entry, and help cards that give instructions for use of the journal. Each review is contained on one card, shown in Figure 1, which has fields for the reviewer's name, the date of the review, and the title and author of the software. The program type (Tutorial, Drill and Practice, Game, or Simulation)⁷ is specified by clicking on radio buttons, as is the overall rating, which ranges from 1 (poor) to 5 (excellent). Once students have determined the program type, they

Keeble, Jeff Markarian, Jocelyn Neal, Sean Owen, Scott Spiegelberg, Matt Stull, Kristin Tait, Allen Tinkham, Gustavo Tolosa, Allison Weitzman, and Matt Wozniak; and in 1995, Robert Blaine, John Clevenger, Stefanie Crumbley, Bret Dorhout, Valerie Errante, Jonathan Flowers, Rebecca Levell, Gerry MacDougall, Kimberly Shaw, and Tom Toner.

⁷Desberg, *Hyper InterActive CAI*, 6-11. According to Desberg, tutorials present new information; he characterizes a tutorial as "a private tutor for the student." A drill-and-practice program, on the other hand, "assumes that there has been previous instruction" and is used to "strengthen associations, or refine and improve new skills." A simulation "presents a model, or recreates an event. The student then interacts with the model." Games are fun, interactive activities which may reinforce or test mastery of concepts previously taught.

are asked to evaluate the program based upon criteria specific to that type. For example, in the drill-and-practice and game categories, students consider not just content, sequence of presentation, and pedagogical appropriateness of the tasks, but also a number of other factors that are important to these software types. Is the medium appropriate? Is the activity fun and engaging? Is speed a factor? Is effective feedback given? Does the program contain branching for remediation and advancement? For tutorials, students again look at content and evaluate the appropriateness of the examples chosen. They also look to see whether the interface allows students to traverse the stack by different routes and at different paces to meet different learning needs, whether there is a vehicle for student input, whether there is any feedback, and whether it tests mastery.

Various parts of the students' reviews are contained in the journal's pop-up fields, which are accessed by clicking on buttons labeled Publication Information, System Requirements, Overview, Visual Style, Navigation, and so on, as Figure 1 shows. When the user clicks on one of the buttons, the button "expands" to become the title bar of a field that fills the whole card. The field scrolls, so that any amount of text can be entered; reviewers can also access additional pop-up fields that contain outlines summarizing the criteria students are to consider in evaluating each feature, as shown in Figure 2. For every piece of software, students are asked to provide as much information as possible about the authors and publishers and to evaluate: 1) hardware and installation requirements, 2) visual style, 3) ease of navigation, and 4) instructions. Visual factors include the choice and size of fonts, use of integrated modalities (such as musical examples, graphic artwork, animation, speech, and movie clips), use of color, layout, and attractiveness. Ease of navigation is judged by the consistent placement of buttons and fields, intuitive icon choices, a clear indication of where the user is and how to get elsewhere, and use of nonlinear navigation tools such as hot text. Finally, the instructions are evaluated for clarity and concision. Students also report on the mode in which the instructions are delivered, since they may appear as printed documentation, or online as balloon or pop-up help, as help screens accessed by buttons or menu items, as spoken narrations, or as animated "tours" of the software.

Figure 1. Online journal

Reviewer: Tom Toner	Date:	Publication Information
Title: Igor Stravinsky: Rite of Spring		System Requirements
Author: Robert Winter		

Program Type: ☒ Tutorial ☐ Drill and Practice ☐ Game ☐ Simulation	Overall Rating: ☐ 5 ☐ 4 ☐ 3 ☐ 2 ☐ 1 ☒ 4.5 ☐ 3.5 ☐ 2.5 ☐ 1.5
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User Interface:	Visual Style Navigation Instructions
General Discussion Content Other	

Help Menu Bar New Card Delete Card Navigate
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It is important to remember that the media (hardware and software) were in the process of development during the years that these programs appeared on the market. All of the early products are black and white because color Macintosh computers were not yet in common use, and early HyperCard versions did not support color. In addition, new features were added to the HyperCard program itself with each new release. For example, HyperCard 2.0 (1990) introduced many new features, such as "clickLine," which allowed the user to navigate not only by clicking on buttons but also by clicking on lines of text in fields. This version also introduced the "picture" command, which displayed color or black-and-white pictures at high resolution. More recently, other authoring packages with different strengths have been used in product development, and some products originally written for Macintosh are now available for PCs running Windows.⁸ It is important in reviewing each CD-ROM to keep in mind the limitations of the media at the time when the packages were written, and not to discount the early ones on the basis of features that were not available then; we find some of the early packages among the most satisfying in terms of their content.

As our review process progressed, it became clear that each software company has developed its own individual style that varies only slightly from package to package. We have chosen to discuss the common features of these programs by company before examining the content of individual products in more detail.⁹ For each company—the Voyager Company, Warner New Media, Future Vi-

⁸The Voyager web page (<http://www.voyagerco.com>) lists Windows versions of four of the CD-ROMs reviewed here: the Beethoven 9th *Symphony*, Stravinsky *Rite of Spring*, Mozart "Dissonant" *Quartet*, and Strauss *Tone Poems*.

⁹Two packages, owned by Eastman's Sibley Music Library and reviewed by our students, are not included in this essay. These are "Xplora: Peter Gabriel's Secret World" and "Jump: The David Bowie CD-ROM." Due to the length of this review and the fact that these packages are less useful for teaching music-theoretical concepts, we have omitted them here. Of interest, however, is an extended section in Peter Gabriel's product on non-Western instruments, complete with sound clips of indigenous music, color videos, and related information.

Figure 2. Sample journal entry with help screen

The screenshot shows a software window with a title bar and navigation buttons. The window is divided into two main sections. The left section contains a journal entry, and the right section contains a help screen for the 'Overview' topic.

Journal Entry:

Robert Winter's Igor Stravinsky: The Rite of Spring is an interactive CD-ROM/HyperCard stack that explores almost every possible aspect of Stravinsky's Rite of Spring. The first card outlines the overall format of the stack:

- A Word from Winter
- A Pocket Guide
- Stravinsky's Orchestra
- Stravinsky's World
- The Rite as Dance
- Rite Listening
- A Close Reading
- The Rite Game

Help Screen (Overview):

Overview Outline

Include:

- A SHORT description of product (what does it do?)
 - Features (short overview)
 - Audience (stated or presumed)
 - Objectives (are they stated or implied?)
- Pros (strong points)
- Cons (weak points)
- Bottom Line (Sum up in one or two sentences)

Winter's Rite is designed primarily for a music student, probably at the college level, who is not familiar with Stravinsky's work. This particular audience, more than others, would benefit from the detailed historical and theoretical discussion and would best achieve Winter's implicit goal of heightening his user's knowledge of the Rite. However, someone who was only an appreciator of music, with marginal knowledge of music theory, could skip over aspects of the stack that would not be understood and still learn a great deal about the Rite. At the other extreme, Winter includes some rather

sion, Microsoft, and Calliope—the general discussion is followed by a review of each product in chronological order by publication date.¹⁰ Finally, readers will recognize in our format design elements from other publications: the consistent use of identical subsections was borrowed from *Consumer Reports* and the Pros/Cons headings from the product reviews in *Keyboard Magazine*.

VOYAGER COMPANY

Voyager was the first to introduce a CD companion series, beginning with Beethoven's Ninth Symphony in 1989. Each of the six packages surveyed here shares a number of organizational features: most contain a Pocket Guide, information about instrumentation, information about the composer's life and times, a "Listening" section, a Close Reading, More Reading, a Glossary, and a Game. Though most of these section headings are self-explanatory, a few require further description. The Pocket Guide provides a broad overview of a work's formal design on a single card, as shown in Figure 3. Clicking on any line (e.g., First Theme) highlights the line and plays the specified passage. The Close Reading section "flips" from card to card, displaying a running commentary on what is heard in the music. The user can read the commentary while listening, or turn off the sound while browsing the information. The Close Reading commentary is generally aimed at the level of a music appreciation class and is frequently accompanied by attractive scanned artworks, which makes for entertaining light reading but provides little of interest to music theorists. Finding the right tone for this commentary is understandably difficult, considering the broad range

¹⁰Contact addresses and/or phone numbers from the CD-ROM packaging follow: Voyager Company, 578 Broadway, New York, NY 10012, (212) 219-2522; Warner New Media, 3500 W. Olive Avenue, Burbank, CA 91505, (818) 843-6311; Future Vision, 300 Airport Executive Park, Nanuet, NY 10954, (914) 426-0400; Microsoft, (800) 936-3500 or (206) 635-7172; and Calliope Media, 1526 Cloverfield Blvd., Santa Monica, CA 90404-3502, (510) 427-3906. Some of these companies may also be reached electronically; Voyager Company may be reached at techsupport@voyagerco.com or <http://www.voyagerco.com>; Calliope at magic@calliope.com or <http://www.calliope.com>.

of musical abilities users may bring to these packages. The level of music-theoretical discourse and explanation also varies widely from package to package—considerably higher in the Stravinsky and Strauss packages, for example, than in the Mozart.

In the later Voyager packages, the Close Reading cards sometimes contain buttons that provide “an in-depth study of themes and events using audio examples and notation.”¹¹ These “Closer Look” or “Detailed View” links take the user to more detailed analyses, often including excerpts from the score in musical notation. The music stops while the reader examines this additional information; in this respect, our reviewers preferred the Warner New Media packages, in which the user may choose to continue listening to the music while exploring hypermedia links. The Closer Look details are generally of more analytical interest to the music theorist. Unlike the Warner New Media products, the Voyager packages generally do not attempt to teach music theory “rudiments” (like note reading, scales, triads, etc.) in an individual tutorial section; the music-theoretical content generally relates directly to issues arising from the piece under study.

The More Reading section is an annotated reading list. With the exception of the earliest product, in which this bibliography was a subsection buried within Beethoven’s World, the reading list is accessible from the main table of contents. Musicological and music-theoretical books and journal articles are cited, complete with publication information and a short description of contents. These descriptions vary in their usefulness from package to package, possibly another by-product of the authors’ search for the right balance for a diverse audience. Our reviewers felt that the Mozart Dissonant Quartet package is aimed at users with less musical background than the other Robert Winter packages, and this is evident in such bibliographical commentary as “if you’ve wondered what a crack Mozart scholar does, here’s a wonderful introduction” (in reference to an article by Alan Tyson). After the initial Beethoven CD-ROM (which has far fewer opportunities for nonlinear browsing), most of the Voyager products use a small superscripted “R” throughout

¹¹Robert Winter, “User’s Guide” to the CD Companion “Igor Stravinsky: *The Rite of Spring*” (New York: The Voyager Company, 1991), 6.

Figure 3. Pocket guide with navigation bar: Schubert,
"Trout" Quintet (Voyager)

Pocket Guide				
First Movement	Second Movement	Third Movement	Fourth Movement	Fifth Movement
EXPOSITION First theme Second theme Closing themes Repeat (exposition) DEVELOPMENT RECAPITULATION First theme Second theme Closing themes	FIRST PART First theme Bridge Second theme Closing themes SECOND PART First theme reprised Bridge Second theme Closing themes	SCHERZO First theme Second section Repeat TRIO First theme Repeat Second section Repeat SCHERZO DA CAPO	THEME Variation 1 Variation 2 Variation 3 Variation 4 Variation 5 CODA	EXPOSITION First theme Transition Second theme Closing themes RECAPITULATION First theme Transition Second theme Closing themes
QUIT	?	G	CONTENTS ^	RETRACE ^
			☒ PLAY THROUGH	PAUSE
			00:12	

the text as a link to the More Readings section; these function like footnotes for attribution of quoted material and as sources for further exploration of a topic. In comparison with other publishers, Voyager is most consistent in providing detailed bibliographical information for its quotations (Future Vision is the poorest in this respect). Finally, most of the Voyager packages include "A Word from the Author," a lengthy sound clip of the author speaking in general terms about the creation of the CD-ROM, accompanied by his scanned photograph or sketch.¹²

Each of the Voyager CD-ROMs concludes with a Game section, which varies by author. Most of the Winter programs use a multiple-choice quiz format for up to four players, with three topic categories: Listen Up, Knowing the Score, and Life and Times. On each turn, the player chooses a category and level of difficulty (measured by the number of points awarded). In the Listen Up category, the user hears an excerpt from the composition under study, and then answers a question about its orchestration, structure, location within the work, etc. In Knowing the Score, players are quizzed about orchestration, special effects like *col legno*, dynamic or tempo indications, etc. In Life and Times, questions about the composer, collaborators, first performance, or historical era are posed. Humorous feedback is excellent in these packages, and may include short sound files of German (Beethoven and Mozart) or French (Stravinsky) exclamations of congratulations or dismay—depending on whether the question is answered correctly—applause, animations (such as Beethoven sprouting sunglasses that wiggle up and down in delight),¹³ and text fields with amusing comments about the answer

¹²Our reviewers soon tired of this feature and felt that these messages were a little too self-serving for the authors' egos. In particular, Robert Winter's voice became all too familiar, since in the Mozart Dissonant package he chose also to read the entire Mozart's World text into a sound file. His obvious enjoyment of the limelight reaches its height in the Ragtime package from Calliope; much of this CD-ROM is comprised of videos of Robert Winter delivering user-friendly music appreciation lectures.

¹³Users with faster computers may find that those animations timed to correspond with sound files were clearly written for older and slower Macs. In the Beethoven package, in particular, one hears the German exclamation first and then views Beethoven opening and closing his mouth like a fish, with no sound present at all!

chosen. The Voyager products designed by other authors contain other types of games, described in more detail below. Several packages use games based on "Concentration," in which players match pairs of musical excerpts by ear; these provide less feedback and test fewer areas of knowledge than the quiz-style games of the Winter products, and usually received lower ratings from our reviewers.

All of the Voyager packages share a similar visual style and user interface. For example, Voyager limits its software to a black-and-white format with screen size appropriate to the Mac Classic, but the visual design is extremely tasteful and the company adds visual interest by creating clever animations with its scanned images, often synchronized with the recordings. This black-and-white "limitation" works to the company's advantage for individuals or schools that own older Macintoshes, since many of the color packages produced by other companies either will not run at all on black-and-white monitors, or crash frequently on machines with limited memory. Installation of the Voyager programs is uniform and generally not problematic.¹⁴

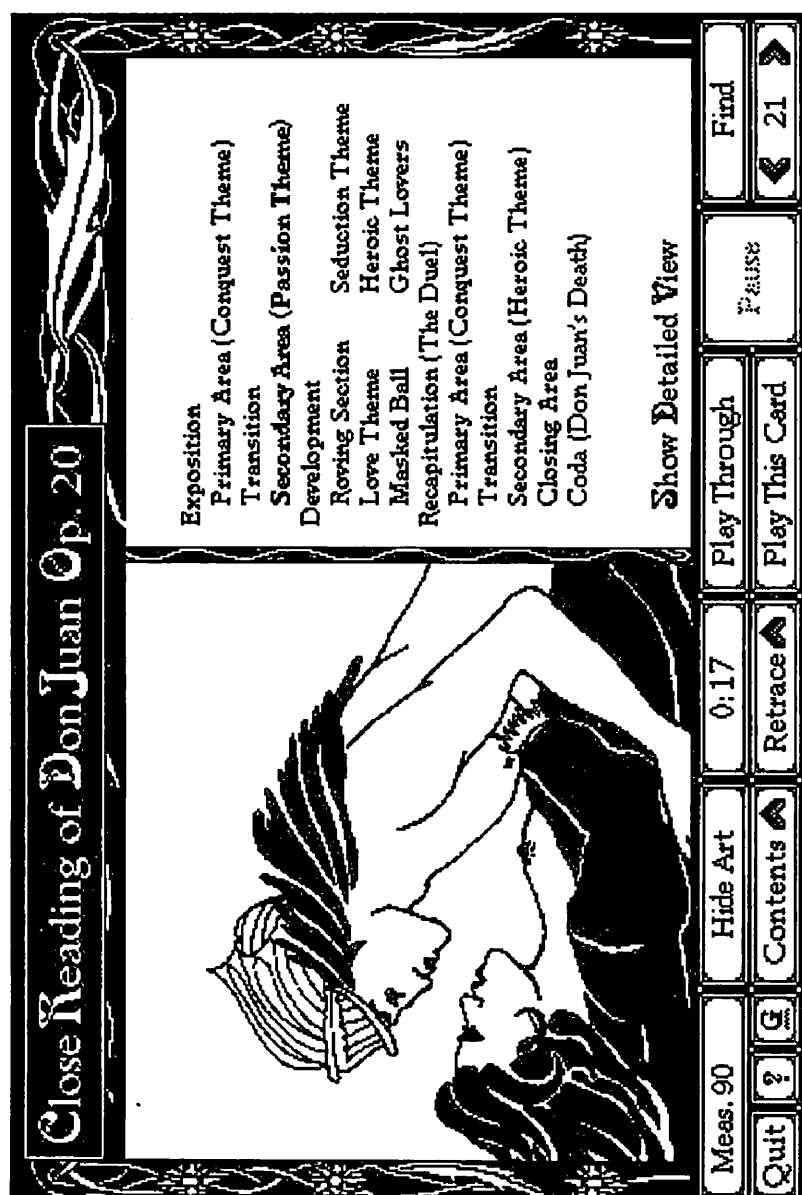
Most Voyager programs share a navigation bar similar to that shown at the bottom of Figure 3. The first two buttons are fairly obvious in their function: Quit terminates the program and the question mark turns on "balloon help." The "G" button (for Glossary) identifies hot text visually; when this feature is enabled, words that are linked to the Glossary are underlined so that they are easily identified. Once transported to the Glossary, users can navigate via

¹⁴To install, users copy a folder from the CD-ROM onto their own hard disk (a version of HyperCard is included in a separate folder, and may be copied as well if needed); most Voyager packages also have fonts that must be installed in the user's system folder (to ignore this step, as some of our student reviewers did, destroys the screen design and alignment of buttons and text fields). The program is run by clicking the appropriate file on the hard disk, not the CD itself. Despite the fact that some of these programs were created with very early versions of HyperCard, we had no problem running the Voyager CD-ROMs on our hard disks from more recent HyperCard versions. In all CD-ROM packages, Virtual Memory should be turned off; in early versions of System 7, "playthrough" must be checked on the "Sound In" portion of the Sound Control Panel.

a pop-up alphabetical menu or with the right- and left-hand arrows; they return to the hot-texted card that brought them here by means of the Retrace button. One limitation in the Voyager packages is that hot text is linked only to the Glossary, so that clicking on "English Horn," for example, will bring the user to that entry in the Glossary but with no means of accessing the discussion of the English Horn in the section on orchestral instruments. This is but one example of the hypermedia limitations of the early Voyager packages, which tend to include large text segments for linear browsing with few links for further exploration (like an online book). Another such limitation is the Find button, which only functions within the portion of the program the user is currently navigating. If the user implements a search for English Horn while in the Glossary section, for instance, the orchestral instruments chapter is likewise not found.

Figure 4 shows additional navigational features in the Close Reading sections. The Contents button displays a pop-up menu that allows easy navigation to all main sections of the stack. Retrace has two functions: clicking on the word takes the user to the card previously visited; clicking on the arrow provides a lengthy pop-up listing of the titles of recently visited cards. By dragging the mouse up the list and releasing it, the user can return directly to any of these cards. We found these navigational tools among the best of the CD-ROMs surveyed. The "Find" button activates HyperCard's search function. Finally, the user moves through the cards via left and right arrows in the lower right-hand corner of the screen. A numeric tally (e.g., "33 of 37") shows the location in this portion of the stack—an important feature in hypertext documents, where users can become overwhelmed or "lost" among the various navigational links. Above the navigation bar is a second bar that shows the current measure number in the composition, a Hide Art button (unique to the Strauss package), the time elapsed in minutes and seconds since the beginning of the movement, and buttons that allow the user to pause the CD, play the entire movement (Play Through), or play just this single card.

Voyager should be credited with sharing its achievement by marketing its CD Audio Toolkit for other HyperCard developers right from the beginning (rather than hoarding their achievements

Figure 4. Close reading interface: Strauss, *Tone Poems* (Voyager).

for in-house use). In the Toolkit are ready-made buttons that act as CD controllers, a template for the Close Reading sections that can be adapted to work with any commercial CD, and an Audio "Event Maker" that captures timings of the CD so that developers can access discrete excerpts.¹⁵ With these tools, music theory instructors are not limited to the repertoire represented by these commercial CD-ROMs, but can develop their own literature-based classroom presentations with only minimal HyperCard experience.

Ludwig Van Beethoven, *Symphony No. 9*: A CD Companion by Robert Winter (The Voyager Company, 1989)¹⁶

Pros

An instructive tool for those interested in CD-ROM development, this product was the first of its kind. Content generally good; retains an "open" HyperCard environment.

Cons

Fails to exploit the full potential of hypermedia—no true hot text, rudimentary graphic design, poor synthesized sound on some examples, and long passages of online reading without sound.

Bottom Line

This product remains strong despite its relative age in this rapidly changing technological field; users who look beyond the computer interface will find useful information embedded here.

¹⁵"The Voyager CD AudioStack: A Toolkit for using HyperCard with CD Audio Discs" (Santa Monica, CA: The Voyager Company, 1989).

¹⁶The documentation that accompanies the Beethoven package reviewed here is dated 1989, while the CD itself is dated 1991. The reason for this discrepancy is made clear by a small insert, notifying the user that this is an "upgraded" version of the CD Companion to run under HyperCard 2.0. [Perhaps such an upgrade would have solved the installation problems we encountered with "The Magic Flute," the earliest of the Warner New Media Products.] The Beethoven upgrade also adds

Survey of Contents

The Beethoven 9 CD-ROM was a remarkable achievement in its time and remains so today. The visionary Robert Winter must be credited with adapting HyperCard for teaching theory and history through music literature, and with the tenacity to carry this idea through to marketable products. His initial offering contains a recording of the work by the Vienna Philharmonic and Vienna State Opera Chorus, conducted by Hans Schmidt-Isserstedt, with soloists Joan Sutherland, Marilyn Horne, James King, and Martti Talvela from their 1966 Decca recording. This CD-ROM set precedent at the Voyager Company for what was to become a standard organizational scheme: A Pocket Guide, Beethoven's World, The Art of Listening, A Close Reading, and The Ninth Game. Most of these subdivide into "chapters." For example, Beethoven's World contains an Introduction, Beethoven's Life, The Conversation Books, Beethoven's Sketches, Beethoven and Schiller, Performing the Ninth Then, Performing the Ninth Today, and More Reading. Beethoven's World has much to offer in terms of historical content, including a discussion of the Napoleonic wars, the three primary crises of Beethoven's personal life, the conversation books (with extended quotations that are fascinating to read) and sketches, the logistics of arranging the ninth symphony's premiere, etc. The package fails to maximize the hypermedia potential of HyperCard, however, and contains several long sections for silent reading with limited changes in graphics and few links to related topics or musical excerpts. One exception occurs in the section on the sketchbooks, which contains synthesized sound files of early versions of symphonic themes drawn from the sketches; users can compare the sound of the early versions with Beethoven's final realization (though the quality of the synthesized sound is quite poor).

the balloon help feature, which has become standard in the other Voyager packages. The printed documentation that accompanies this CD, incidentally, is the most complete of all the products reviewed here, with detailed set-up, installation, and navigation instructions including numerous "screen shots" of the product in action. It may therefore be a good "starter" program for the novice HyperCard user, even though some of the later packages exploit hypermedia capabilities more fully.

The Art of Listening's title and organization imply content appropriate to a music theory class, but the analysis is low-level and aimed primarily at hearing the character, recurrence, and development of themes, with only cursory attention given to the tonal structure of the symphony (and of sonata form in general). The subsections include Musical Architecture, Sonata Form Demystified, The Classical Orchestra, Anatomy of a Symphony, and The Text of Schiller's Ode. The first of these includes scanned images of famous buildings like the Taj Mahal and Guggenheim museum to illustrate principles of repetition, contrast, and variation that occur in architecture and music. Sonata Form Demystified divides into further subsections: History, Terminology, Sonata Psychology, Musical Elements, Exposition, Development, Recap, and Coda. The sonata psychology section introduces ideas of stability, conflict, and resolution; these remain primary principles throughout Winter's disappointing treatment of sonata form. On the positive side, many appropriate listening examples drawn from the Symphony allow musical novices to hear a three-part structural division of sonata form in the most general sense, and the Musical Elements section puts symphonic excerpts to good use in defining such concepts as key, mode, modulation, rhythm, meter, etc. The Classical Orchestra contains only a few cards per family of instruments, with scanned black-and-white images of the instruments and excerpts from the symphony that allow users to hear the instruments in context. This section does not contain extra sound files of the instruments as soloists for comparison with their orchestral sound, as do many of the later CD-ROMs.

Anatomy of a Symphony is perhaps the most useful section to music theorists. Throughout this section are opportunities to play excerpts from the symphony and view musical notation of the excerpts in reduction, but information is packed into dense prose. Again, Winter gives more attention to thematic analysis than tonal, and a few unusual terms are employed (he calls the final movement "sonata-concerto" form). In an interesting nonlinear design feature, Winter links this section interactively with the Close Reading section. At any point during the Close Reading, users may click on the button bearing the movement number and be transported to Anatomy of a Symphony for more detailed reading; there, another button is provided to return.

Evaluation of Contents

Winter's prose does not "talk down" to the user in this package, nor is it quite so flowery as in the Dissonant Quartet; instead it is packed full of interesting nuggets of musicological and historical information of interest to amateurs and professionals alike. It is unfortunate that his analytical emphasis on thematic characterization and "psychology" of the movements takes precedence over attention to harmonic structure.

Design Features

Experienced users will miss some elements they expect in a Voyager package. It has no opening animation and no spoken narrations, solo instrument examples, or excerpts from other compositions pressed onto the CD. In the primary navigation bar, there is no Retrace button nor a "G" button to identify hot-text links to the Glossary. Indeed, there are no hot-text links to the Glossary at all, which is a self-contained portion of the package. The More Reading section is contained within Beethoven's World, and is not linked—as in the later packages—to other portions of the stack by the superscripted-R "footnote" icons. There is no true hot text for non-linear exploration of topics; instead, words preceded by bullets may be clicked on to activate pop-up fields containing definitions or related information. The graphics too are quite rudimentary compared with the later Voyager products. One helpful feature of the Beethoven package is a blank text field in which the user may take notes online; although Voyager abandons this idea in its later offerings, it is a standard feature of the Warner packages.

The limitations cited above pale in comparison with Winter's achievement, however. For the company's initial offering, the interface is remarkably similar to what was to become Voyager's standard. Of interest to developers is the fact that this is an "open" HyperCard stack; that is, no limitations or protections have been placed in the scripts to prevent knowledgeable users from "peeking" at the stack's internal structure, studying scripts, altering buttons, changing texts in fields, and so on. This is in keeping with the philosophy surrounding early HyperCard development efforts, in which sharing and cooperation were common.

W. A. Mozart, *String Quartet in C Major, K. 465, The "Dissonant": A CD Companion* by Robert Winter (The Voyager Company, 1991)

Pros

Contains some good aural reinforcement of music-theoretical concepts relating to form, harmonic motion, and dissonance treatment using excerpts from the quartet.

Cons

Interface sometimes resembles an online book—with sections consisting of many successive cards of “linear” text to be read, and insufficient opportunities within these sections for listening to the quartet or for nonlinear exploration of related concepts.

Bottom Line

The least successful offering by Robert Winter.

Survey of Contents

This CD-ROM contains the familiar sequence of primary topics in a Robert Winter product—A Pocket Guide, The Instruments, Mozart’s World, Quartet Listening, A Close Reading, More Reading, A Quartet Glossary, and The Mozart Game—accompanying a performance of the Mozart composition by the Angeles Quartet. The structure and interface of the Pocket Guide, Close Reading, More Reading, Glossary, and Game are enough like the other Voyager packages to warrant no further discussion here. The Instruments section is divided into four chapters: The Quartet Instruments (a fairly basic introduction to the string instruments, but with click-and-hear features), Anatomy of a String Quartet (primarily a labeled diagram that focuses on the various parts of the violin—neck, scroll, f-holes, etc.), The Bow (often neglected in discussing the string instruments), and From Home to Concert Hall (just two cards, focusing primarily on the change in players’ seating arrangement from

the intimacy of the home to the more public venue). The *Anatomy of a String Quartet* is really a misnomer, since it does not deal with the full quartet in any detail; further, it is easily confused with *Anatomy of a Quartet*—a valuable subsection under *Quartet Listening*—which includes detailed diagrams of the movements' formal structure.

The content of *Mozart's World* is fairly predictable, with chapters entitled: *Child of the Enlightenment*, *The Prodigy*, *On the Road*, *A Prisoner in Salzburg*, *Escape to Vienna*, *Public Successes*, *Music for the Home*, *Papa Haydn*, *Writing Quartets*, and *A Quartet Party*. The section on "Writing Quartets" is completely missing from the stack, though it appears as a menu item; selecting the menu item takes the user nowhere, and clicking sequentially through the cards of *Mozart's World* brings the reader directly from the *Papa Haydn* subsection to the *Quartet Party*. Obviously a section originally envisioned by the author was cut from the final product, but was never removed from the chapters menu.

The section *Quartet Listening* includes: *A Rationale*, *Democratic Impulses*, *Characterization*, *Tension and Resolution*, *Rhythmic Play*, *Color*, *Anatomy of a Quartet*, and *Mozart at Work*. The first three of these deal in vague generalities, while the remaining sections are quite specific analytical sections with much to offer the music theory student. The *Characterization* section is particularly weak, especially Winter's decision to retell the first movement of the quartet as a narrative:

We do no violence to the spirit of Mozart's age—nor to the view of music as the ultimate mirror of society—if we trace the evolution of an imaginary heroine throughout the course of the first movement of K. 465. She enters the world innocently enough, as a theme accompanied simply by second violin and viola. . . . When the theme emerges again, it is, to be sure, in the same minor mode in the cello. But almost immediately the darkness turns to sunshine. Our heroine stands upright and proud, wiser and stronger from having overcome adversity.

Many of our students were appalled enough by this narrative to quote whole long portions of it in their reviews, as we do now. Clearly, Winter is not speaking to an audience of music theory stu-

dents, but to whom exactly is he speaking? We question this approach, even for general audiences.

On the other hand, several sections of Quartet Listening are among the strongest of the package. These contain good examples drawn from the piece to explain music-theoretical concepts. For example, the Tension and Resolution section explains the concept of appoggiatura, then gives aural examples from the quartet; whenever this type of dissonance occurs in the listening excerpt, the screen flashes the text "Appoggiatura!" Similar "ear training" cards are provided to illustrate dissonance resolution, tonic and dominant harmonies, modulation, and pedal point. The Rhythmic Play section uses a similar approach to examine phrase structure and rhythmic crescendos, while Color explores chord spacing, register, use of inversion versus root position chords, mixture (without using the term), and so on. The most valuable portion of the package for form study is *Anatomy of a Quartet*, which contains schematic formal diagrams of the movements, complete with repeat signs as appropriate and Roman numeral designations of the primary harmonic areas tonicized in each section. The user really must dig to find this type of structural analysis, however; discussions of sonata form elsewhere in the stack are more superficial and deal with a three-part characterization of the form in terms of stability moving to conflict and then to resolution (see the Glossary entry, for example).

Evaluation of Contents

This package generated a good deal of disagreement among our reviewers, and was rated (on a scale of 1 to 5) anywhere from 2.5 to 5. Two features stood out among those who rated the product poorly: first, the linear nature of much of this CD-ROM and, second, the level and tone of the commentary. One student, for example, summarized her opinions as follows: "I would not purchase this program due to. . . the boring visual style, and the fact that you cannot listen to the piece in the majority of stacks. The good theoretical content is too difficult to glean from the eloquent [but] not-so-entertaining commentary. It is too much like listening to a lecture or reading a book."¹⁷ She is correct that much of the stack is designed

¹⁷Kimberly Shaw, a student in the 1995 spring semester.

to be read, and no musical clips are available in these portions. Unlike the Warner products, which make a CD controller available at all times, Voyager only allows the user to play music at particular points in the stack. The user is left reading in silence much of the time, which defeats the purpose of a multimedia product in our opinion. Winter may have sensed this silence problem himself, and tried to solve it by providing a recorded spoken narration of the Mozart's World section; thus users can choose to listen, rather than read. Still, this section has a linear design, with few opportunities for user-determined exploration of related issues.

Design Features

This package follows the standard Voyager interface, with less attention given to visual design than subsequent offerings by this publisher. The Pocket Guide is particularly plain. The title card of each main section uses scanned black-and-white images of some type, with a musical motto played as the card is opened, and throughout the stack there are recurring images of a hand-written score—presumably Mozart's autograph copy. One feature unique to this package is the option for listeners to navigate Mozart's World with spoken narration; users may choose to view the text and read along with the narration, or to view related artwork while listening to Winter reading the text. Fortunately, the narration may be "paused" at any time, so that users can read in silence if they prefer.¹⁸

¹⁸Unfortunately, the Pause button is not available in the Quartet Listening section, so users may assume that they are forced to listen to entire pre-determined musical excerpts here or jump to another card to turn off the excerpt. A little experimentation shows, however, that a second click on the button that plays the excerpt will also stop the excerpt.

Franz Schubert, *Quintet in A Major, D. 667*: A CD Companion by Alan Rich (The Voyager Company, 1991)¹⁹

Pros

Excellent graphic form charts with harmonic structure detailed; good and accurate tutorial on sonata form. Detailed discussion of "Die Forelle" that allows comparisons between the song and quintet.

Cons

Information less deeply embedded than later Voyager Products (e.g., Stravinsky, Dvorák); many successive cards with mostly linear reading material.

Bottom Line

A good resource on sonata form and this work in particular. Quality comparable to the Beethoven Ninth Symphony stack; shares its "open" HyperCard format if you know a few key commands.

¹⁹Alan Rich has continued to develop multimedia CD-ROMs for the Voyager Company in his own series, entitled "So I've Heard." These reasonably-priced products (\$24.95) are introductions to music history (or music appreciation) in three volumes: Bach and Before, The Classical Ideal, and Beethoven and Beyond (the latter available also in Windows format). In his own humorous style, Rich is quoted on Voyager's web page, saying "if I had this available when I studied music in school, I'd probably still be a musician."

We were intrigued to discover that Rich has authored a similar product in book form for Polygram in collaboration with Harper Collins (1995), part of its "Play by Play" series. This book is marketed with a CD of the Mozart Piano Concerti, Nos. 20 and 21, and reads just like a low-tech version of a CD-ROM in (linear!) book form with chapters entitled: Classicism Reborn, Music Goes Public, Musical Structure in the Classical Era, Mozart: Divinity and Reality, From Sublimity to Tragedy, Mozart After Mozart, and Play by Play: Mozart's Reinvention of the Piano Concerto. This last section is intended to be read while the user listens to the work, with CD timings indexed to the commentary; form charts are also presented with timings indexed to each formal division. The book contains a glossary and suggestions for further reading and listening.

Survey of Contents

The Table of Contents summarizes the eight primary sections of this product: Pocket Guide, "Die Forelle," Close Reading, A Classical Background, Inside Schubert, Glossary, More Reading, and Trout Cookbook (a game). The CD contains performances of the quintet—by the Alban Berg Quartet with guest artists Elisabeth Leonskaja playing piano and Georg Hörtnagel playing double bass—and the song from which Schubert drew inspiration and thematic material, with Barbara Hendricks, soprano and Radu Lupu accompanying at the piano. The Pocket Guide, Glossary, and More Reading sections need no further comment, since they are virtually identical in format to other Voyager products, except to say that the More Reading section is disappointing. Only 13 cards in length, More Reading contains sketchy annotations and gives no publishers for any of the books; no specific articles are cited. The "R" icons, which in all Voyager stacks function like footnotes to bring users to the More Reading section, are used only sparingly here.

The "Die Forelle" and Close Reading sections follow a similar format, with commentary timed to change in synchrony with the music. As usual, these comments are intended as light and entertaining reading, and contain little music-theoretical depth. The first card on the first movement, for example, contains the following text: "A big, gleaming arpeggio starts the movement off with two pieces of good news: 'I am here' and 'I am in the key of A major'." An improvement over earlier Voyager packages is the link between Close Reading and Charting the "Trout Quintet" (discussed below), which allows users access to a detailed click-and-hear analysis of the tonal structure that they can follow while listening, if they tire of Rich's commentary. Unlike the Warner New Media packages, however, this change cannot be made without disrupting the playthrough; thus, the CD stops and listeners must start again at the beginning of the movement or click on the appropriate place in the form chart to resume listening. "Die Forelle" also uses the Close Reading Format, with commentary on the left-hand side and the song's text on the right; a click of a button changes the text from German to English (or vice versa).

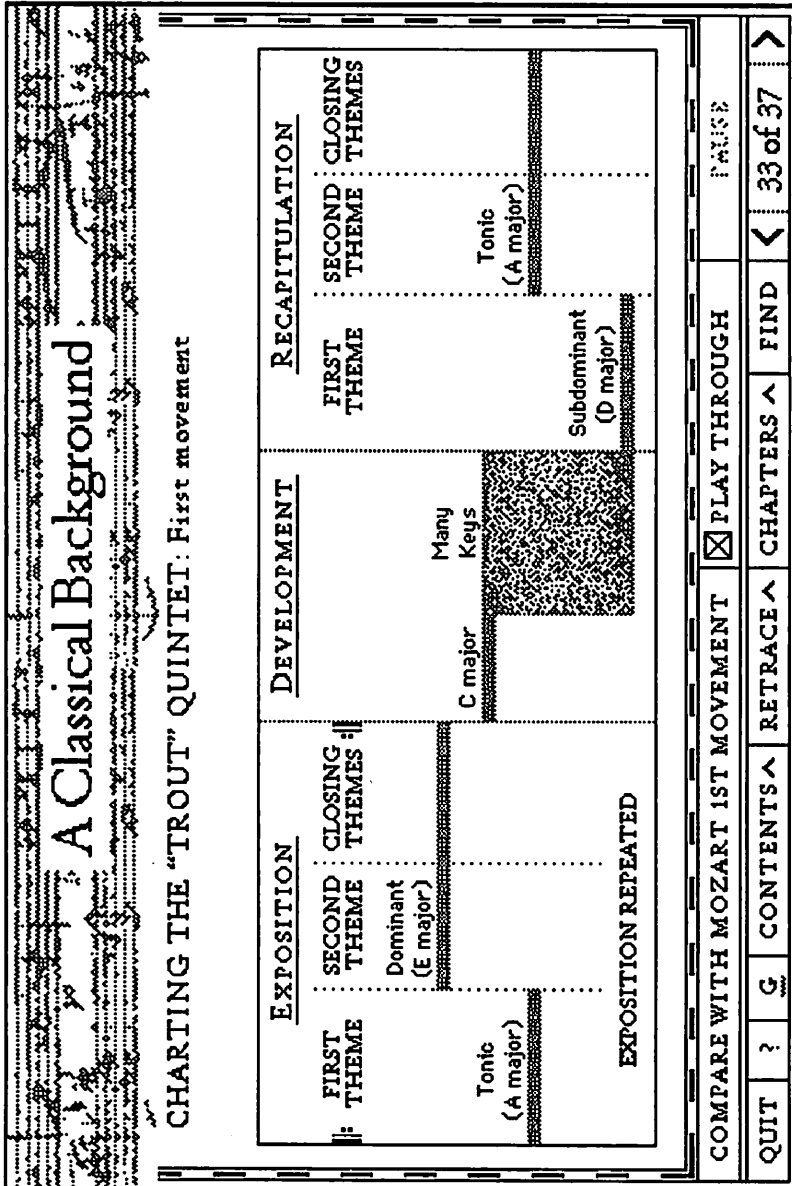
Inside Schubert contains no surprises, and follows a format similar to the biographical sections of the other early Voyager products in that they are very much text and image oriented (like an online book), with very few opportunities to click and hear or to leap to other related portions of the stack. Hot text (revealed when the user clicks on the "G" button) is linked only to the Glossary, and "R" icons (few in number) are linked to More Reading. The subsections include: Schubert's Vienna, An Unfinished Life, The Tone Poet, and A Trout is Born.

By far the strongest section—from the point of view of the music theory teacher—is A Classical Background, whose subsections include: The Classical Ideal, Sonata Form, Schubert as Classicist, and Charting the "Trout" Quintet. The second and last subsections contain Rich's treatment of form and tonal structure, which is better than any of the Voyager products authored by Robert Winter and more useful for the classroom. Figure 5 shows Rich's diagram of the first movement from Charting the "Trout"—very similar in format to what we might draw on a classroom chalkboard. The Compare with Mozart button takes users to a similar diagram for "Eine kleine Nachtmusik," the subject of much of Rich's sonata form discussion. Listeners can toggle back and forth between Mozart and Schubert to compare Schubert's subdominant return to Mozart's tonic return in the recapitulation, as well as Schubert's choice to begin the development in a key other than the dominant. The sonata form section contains many listening examples from the Mozart work to help users hear key changes and structural divisions; even the definition in the Glossary is sensitive to the issue of harmonic design.

The CD-ROM concludes with a Trout Cookbook: "ten Voyager-tested recipes for the venerable fish, and a game of musical concentration you can play while cooking."²⁰ The left-hand side of the game card displays a palette of icons, each of which plays a musical excerpt from the quintet; excerpts must be matched by clicking on icons in pairs until two matching items are found. The icon buttons

²⁰Alan Rich, "User's Guide" to the CD Companion "Franz Schubert, Quintet in A Major, D. 667: 'The Trout'" (Santa Monica, CA: The Voyager Company, 1991).

Figure 5. Interactive sonata form chart:
Schubert, "Trout" Quintet (Voyager)



disappear as excerpts are correctly matched, revealing a graphic humorously related to the trout recipe shown on the right-hand side of the card. This is the most successful concentration-style game of all the products reviewed here; excerpts are distinctive and of sufficient length to facilitate matching, and the gradually revealed graphic beneath the music icons provides extra incentive.

Evaluation of Contents

There is simply not as much information here as there is in the Warner New Media products, nor even in the Voyager Dvorák package. Information is not very deeply embedded, so the user can visit most of the cards in one or two sessions with the stack. What is here, however, is quite good—particularly the treatment of sonata form and the comparison between song and quintet, which anyone teaching the composition would want to show.

Design Features

The “Trout” is a recurring design motif, and little fish grace every title card in clever animations. Some fish are dressed: the Inside Schubert trout wears a Sherlock Holmes cap while peering through a magnifying glass; the More Reading trout wears glasses and peers at a book. This is an entertaining feature of the design, which otherwise bears all the standard characteristics of a Voyager product.

Interestingly, this product maintains an “open” HyperCard environment like the Beethoven stack, except that in this case the environment is more concealed. The menu bar has been hidden and cannot be summoned by the common keyboard command; likewise, the message box’s functions have been disabled. Other HyperCard keyboard commands work, however, and we were able to examine scripts and to cut-and-paste text into this review without difficulty. While this is a useful feature for HyperCard stack developers, the stack contains enough safeguards to keep all but the most computer-savvy students from getting into the product and changing text, moving buttons, etc.

Igor Stravinsky, *The Rite of Spring*: An Interactive Companion by Robert Winter (The Voyager Company, 1991–1992)

Pros

Terrific explanation and clarification of a difficult modern musical idiom. Accessible to the aficionado; enlightening for the professional. Lots of good background material.

Cons

Essays occasionally spend too much time in linear online-book mode.

Bottom Line

One of Winter's most successful Voyager packages: "Anyone, at any level, who is studying, performing, or appreciating the Rite should be familiar with (or preferably own) this stack."²¹

Survey of Contents

This program uses the magnificent 1985 Decca recording by the Orchestre Symphonique de Montréal conducted by Charles Dutoit and supplementary audio tracks on individual instruments recorded especially for this package. The primary sections of the program will come as no surprise to Winter fans: A Word from Robert Winter, A Pocket Guide, Stravinsky's Orchestra, Stravinsky's World, The Rite as Dance, Rite Listening, A Close Reading, Rite Glossary, and The Rite Game. As in other Voyager products, the Pocket Guide is a single card that allows users to listen nonlinearly by clicking on sections in any order. The first card of Stravinsky's Orchestra is a diagram of the standard orchestral seating plan; clicking on each section transports the user to another card with pictures of individual instruments. The user can listen to an excerpt by the section or go to discussions of the individual instruments. Orchestral sections and individual instruments are illustrated with recorded ex-

²¹Tom Toner, a student in the 1995 spring semester.

cerpts from the *Rite*. The brief comments are not generic; they deal with the way Stravinsky uses the instrument or section in this work. Like the other primary sections of the program, Stravinsky's Orchestra is designed for nonlinear browsing, but can be read sequentially through the use of right- and left-arrow buttons.

Stravinsky's World contains ten "chapters": Introduction, Stravinsky: A Biographical Sketch, Stravinsky's Creative Life, Sergei Diaghilev, Avant-garde Paris, The Ballets Russes, *The Firebird* and *Petrushka*, The Genesis of *The Rite*, A Brief Performance History, and More Reading. This section gives lots of fascinating background information about the composer, his times, and the piece. Each card contains text and a picture or other appropriate graphic. Long stretches of text are interrupted only occasionally by Reference icons ("R") identifying quotations or spoken commentaries by Winter, accessed through buttons with titles such as "Tell me more about Rimsky's Romanticism" or "Tell me more about 'The Firebird'." These short lectures with examples played on the piano offer insights about Rimsky Korsakov's influence on his pupil, and stylistic differences between *The Firebird*, *Petrushka*, and *The Rite*. The More Reading section is a well-annotated bibliography that provides paths for further exploration of various relevant topics: Introduction, Origins, Criticism, Dance, Analysis, and Stravinsky on Stravinsky. This section is linked to several different primary sections.

Appropriately, *The Rite as Dance* opens with a flip-card animation that simulates a dancer in motion. This section has three chapters: A Lost Legacy, Scenario and Choreography, and Reconstructing Nijinsky, plus a link to the same More Reading section discussed above. This section presents notes on the choreography and gives details of attempts to reconstruct Nijinsky's choreography from Stravinsky's notes in the original four-hand piano score. The Scenario and Choreography chapter presents information collated from four different sources for each dance.²²

²²The sources are a letter by Roerich, Stravinsky's notes on the four-hand score, an interview attributed to Stravinsky but later disavowed by him in the journal *Montjoie!*, and notes prepared by Stravinsky for Koussevitzsky for an early concert performance. (Roerich collaborated with Stravinsky in creating the scenario for the ballet.)

Rite Listening, the largest expository section, has the following subdivisions: Getting our Bearings, Revolutionary Rhythms, Rite Themes, Rite Harmonies, The Rite Orchestra, Rite Orchestration, The Shape of a Ballet Score, Performing the Rite, and More Reading. It is here that Winter attempts (with a good deal of success) to make Stravinsky's compositional style in the work meaningful to both amateurs and trained musicians. He accomplishes this with characteristic humor ("How do we describe a chord that seems ideally suited to accompany an Excedrin headache?") and carefully chosen audio-visual aids. For example, he illustrates regular meter by showing "ONE two Three four" on the screen with each word highlighted cyclically as an excerpt from *Spring Rounds* is played. This is contrasted with techniques like the cross-accents in "Augurs of Spring" by a graphic showing metric beats with accented beats in larger font:

1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4

As the music plays, each measure is highlighted. Winter uses similar techniques to illustrate a whole litany of rhythmic techniques, in his terminology: regular meter, syncopation, unit pulse, "revealed" unit pulse, "complex" unit pulse, "erratic" unit pulse, meterlessness, and polyrhythm, always with examples from the full ballet or with single instrument excerpts. In a similar manner, Winter illustrates various scales, e.g., octatonic, pentatonic, dorian, etc. with a graphic showing the scale degrees and interval patterns; as a tune from the *Rite* is played, the appropriate scale degrees are highlighted on the screen. In describing Stravinsky's use of "borrowed" material, Winter aligns Stravinsky's altered version of the music with the original, as Figure 6 shows. The user clicks on icons to play and contrast the versions. He goes on to contrast Stravinsky's melodic material with more traditional tunes in a number of different ways, e.g., contrasting the number of different notes and tessitura in Stravinsky's themes with a number of well-known traditional melodies.

Figure 6. Thematic derivation: Stravinsky, *Rite of Spring* (Voyager)

RITE LISTENING

Rite Themes

EXAMPLE 1. Though perhaps the simplest instance of adaption, Stravinsky drops extraneous notes (shown by *), adds the grace notes, and varies the rhythms.

Juszkiewicz, no. 157

Introduction

5

QUIT ? G INDEX CHAPTERS RETRACE FIND

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Of course, Winter introduces other common elements of Stravinsky's style, such as ostinato, modified ostinato, opposition (contrast), "evolving" themes, and so on. Winter's inventive expository methods make Stravinsky's compositional techniques understandable to the nonmusician and clarify them for the trained musician. His approach to the harmonic material is equally accessible:

In the baldest possible terms, harmonies in *The Rite of Spring* result from the superimposition of individually consonant chords in collectively dissonant relationships. The great majority of chords in *The Rite* can be reduced to clusters of major triads, minor triads, and dominant sevenths (technically a dissonant chord, but a mild one). I hasten to add that these harmonies exist in *The Rite* largely as self-sufficient sonorities, far from their traditional tonal functions.

Winter uses graphic techniques and superb examples to help clarify concepts such as superimposition, layering, "chord streams," "stacked chords," compound ostinatos, etc. His discussion of Stravinsky's orchestration again deals with specific techniques, always illustrated by excellent musical examples.

The Shape of the Ballet Score discusses form in the work, beginning with similarities and differences between parts one and two. This is followed by a discussion of each section of the score. A Show Overview button on each card produces a diagram section (see Fig. 7); clicking on each element in the diagram plays the excerpt. Performing the Rite discusses differences in recordings conducted by Stravinsky, Monteux, and Dutoit, particularly with regard to tempo. Winter concludes that the latter most accurately follows the tempo indications in the score, and discusses several reasons for his elation in discovering this recording.

A Close Reading is typical of Winter's other packages. Each card combines a basic music-appreciation description synchronized with the music and a table giving an overview of the form of the current section. The user can toggle back and forth between the overview and a more detailed chart at will. The Rite Glossary and The Rite Game are similar enough to these sections in other Voyager products to warrant no further discussion here, except to say that the Game is stimulating, fun, challenging, and really does test understanding of the material presented and familiarity with the composition as a whole.

Figure 7. Formal overview: Stravinsky, *Rite of Spring*,
 "Ritual of Abduction" (Voyager)

RITE LISTENING		The Shape of a Ballet Score		
	OVERVIEW Ritual of Abduction [Presto] J. = 132			Shape
	Theme 10 a (21 ♩, timpani) b (24, triplets) a (27, timpani)			A
	Brass arpeggios (10 + 8)			
	Themes 11 (13) 10 a (11) 11 (6) 10 a (9) 11 (15) 10 b (21)			B
	Brass arpeggios Tremolos			
	Theme 12 a (6, staccato chords) a (6) a' (13) a' (10) a' (12)			C
	Theme 11 (27) Tremolos			B
	Descending chords + 2-note motive (27)			
	Theme 10A a (3 + 10 ♩, timpani → brass) a (3 + 20)			A'
	Theme 10B a (9 ♩, timpani → strings) a (3) a (6) a (4)			
Four emphatic chords Trills (link to "Spring Rounds")				
HIDE OVERVIEW				
QUIT ? G INDEX ▲ CHAPTERS ▲ RETRACE ▲ FIND				

Evaluation of Contents

In his spoken introduction to this program, Robert Winter says that the program is intended both for those whose music training is limited to listening to their favorite music program on their car radio, and for trained musicians; for each group he promises to "open the music up and bring it into sharper focus." Presenting a work such as this in a way that is meaningful to such a diverse audience is a tall order, and Winter succeeds admirably. Difficult concepts are made exceptionally clear through use of many innovative and creative graphic and audio techniques—this is multimedia at its best! Although the material is presented in a manner that should be accessible (at least at some level) to nonmusicians, the presentation never talks down to the listener, and many concepts will be enlightening to users at any level of musical sophistication.

Design Features

The basic design is vintage Voyager with few surprises. Some of our reviewers complained about the "primitive" art work in black and white, but we found the visual style effective and appropriate to the material. The uses of animation, particularly the presentation of pictures in the introduction synchronized with accents in the score and the flip-card animation of the dancer at the beginning of the Dance section, were particularly effective. Not stretching the technological envelope has definite advantages: these programs run flawlessly on Macs that are primitive by current standards, and fly on newer models.

Richard Strauss, *Three Tone Poems*: A CD Companion by Russell Steinberg (The Voyager Company, 1992)

Pros

One of the best Voyager offerings in terms of the depth of embedded information, accuracy of music-theoretical definitions, documentation of sources, and striking “art deco” visual design.

Cons

The graphics include a number of scanned artworks of semi-nudes which may be offensive to younger users (or, more likely, to parents of younger users!); disappointing game section that does little to test mastery of concepts.

Bottom Line

The author has managed to strike the right balance in his prose, user options, and content, so that the package is useful for collegiate music majors, while still providing nontechnical and entertaining information for a general audience.

Survey of Contents

This product contains the typical Voyager features, as well as some that are distinct to this offering. The primary contents include: Pocket Guide, Close Reading, Master Orchestrator, Inside the Score, The Tone Poem, Pragmatic Romantic, Prankster’s Game, More Reading, and Glossary. In this package, the Pocket Guide covers three distinct works and thus comprises four cards: the first a sketchy formal diagram of all three compositions, then three additional cards with more detailed diagrams of each work (*Don Juan*, op. 20; *Death and Transfiguration*, op. 24; and *Till Eulenspiegel*, op. 28 in performances by the Cleveland Orchestra with Lorin Maazel conducting). Each of these features the standard interface, whereby section names are highlighted as the corresponding section of music is heard, and listeners may click on any section to listen and compare sections in a nonlinear manner.

The Close Reading offers two choices on its split screen. On the right side is a broad formal diagram of the work that successively highlights sections as they are heard; if the user clicks on "Show Detailed View," the table is replaced by a deeper-level formal analysis of thematic entrances similarly linked to the music. It is disappointing that Steinberg chooses to focus solely on thematic analysis here and not to include any tonal analysis, especially since he has a rather detailed section on chromatic harmony in the Inside the Score section. On the left side of the screen is running commentary typical of the Voyager Close Reading sections; however, users may choose instead the "View Art" button, which replaces the commentary with a series of pictures that paint the story of the tone poem in broad strokes and are synchronized to change in time with the events depicted in the music.²³ Steinberg's running commentary, while geared to general audiences, does not seem to "talk down" to the more knowledgeable user as does the commentary of some of the other CD-ROMs reviewed here.

The Master Orchestrator and Inside the Score are among the most useful sections for undergraduate music majors. The Master Orchestrator contains three subsections: Strauss's Orchestra, Instrumental Artistry, and Master Brushstrokes. The first of these pales next to the detail of the Microsoft and Future Vision packages; yet it contains accurate information on orchestral instruments, instrumental effects, tone color, etc., and does so using musical examples drawn from the tone poems. The Instrumental Artistry and Master Brushstrokes sections move far beyond what is accomplished in the Microsoft and Future Vision packages, however, in that they discuss with some sophistication techniques of orchestration employed by Strauss in these works. In all of the Master Orchestrator sections, instrumental solo excerpts from the tone poems may be heard alone or in their orchestral contexts—some with accompanying score re-

²³One rather jarring element in the beautifully designed user interface is the number of bare women's breasts visible in the semi-nude people who populate this CD-ROM. In particular, one of the artworks accompanying the *Don Juan* Closer Reading shows the protagonist atop a woman whose chest is bared; even the title card to the Glossary features a ring of dancing nude maidens carrying a garland that conceals only some of their attributes.

ductions and “scrolling highlights” that move in time with the music to identify the section of the score being heard—and commentary describes the special effects achieved by the composer.

Inside the Score contains five subsections: Shapes and Textures, Motives and Themes, Tempo and Rhythm, Harmony, and Structure. The least useful of these for the theory student is the Shapes and Textures section, which speaks in general terms to a general audience and uses contour graphs (with scrolling highlights synchronized to the music) instead of score representation. Of interest to conductors and performers, in particular, is the Tempo and Rhythm section, which (among other things) contains comparative tempo choices between a 1957 recording by George Szell and the 1982 recording by Lorin Maazel. This section also contains a clickable “metronome bar”—a linear graph with tempo markings from zero to about 165. Clicking on the bar at any point plays a Strauss excerpt at the tempo chosen. Of most use to music theory teachers are the final two subsections of this unit, on Harmony and Structure. These contain accurate and informative diagrams and definitions of concepts commonly taught in theory classes, including mixture, augmented sixth chords, and sonata form. Sonata form is taught as an expanded binary structure, with emphasis on harmonic motion rather than on a three-part thematic or dramatic layout. Here, at last, is a discussion of the tonal structure of the tone poems and their formal relation to “traditional” sonata form. Discussions in these sections are illustrated with CD excerpts and score reductions (complete with moving highlights, as in other sections of the package).

The final three sections of the CD-ROM are The Tone Poem, Pragmatic Romantic, and Prankster’s Game. The first two are historical in nature: the Tone Poem contains subsections on the Genesis of the Tone Poem, Sounds of Romanticism, and Strauss’s Tone Poems; the Pragmatic Romantic contains the composer’s Biography, Influences and Contemporaries, and Strauss and Film Music (which documents elements of Strauss’s music that may have been influential upon contemporary composers of film music). Finally, the Prankster’s Game is a disappointing series of Concentration-type games, organized by topic (Heroic Themes, Virtuositic Excerpts, Sigh Figures, Brass Passages, etc.) in which players click on pairs of Play icons in

search of matching Strauss excerpts. While the excerpts are drawn from the pieces under study, this game design does little to test students' mastery of the concepts covered in the CD-ROM and there is little in the way of "bells and whistles" to reward students who perform well on the Frankster's Game.

Evaluation of Contents

The content of this CD-ROM is excellent on many levels—from the descriptions of the tone poems' stories through graphics, sound, and text, to the music-theoretical explanations of sonata form, harmonic function, and so on. Figure 8 shows Steinberg's diagram of sonata form as compared to the structure of two of the tone poems. Music theorists will note that this sonata form diagram is not at all in conflict with what is generally taught in music theory classes—a problem that does occur in some of the other CD-ROMs reviewed here. In preparation for the Roman numeral analysis that appears in this diagram, the author has clearly introduced the concept of harmonic function (including not just a cursory explanation of I, IV, and V, but also more advanced topics like VI as a key area in Romantic music). He defines other concepts crucial to this repertoire as well, including the appoggiatura, deceptive resolutions, mixture, and the respelled augmented sixth to effect "surprising" modulations—all illustrated aurally with sound clips from the Strauss tone poems under study (plus a few from Wagner and Mahler).

Design Features

This CD-ROM employs one of the most striking designs of all the black-and-white products. Its art deco borders and graphics impart a certain "flavor" that is distinct from all the other Voyager packages. The user option in *A Close Reading* to view art instead of text provides the interested amateur with yet another path through the music that is entertaining and nontechnical. The quality of the art varies dramatically from tone poem to tone poem, with *Till Eulenspiegel's* art work the least effective. In most other respects, the design features are consistent with other Voyager titles.

Figure 8. Sonata form adapted to the Strauss *Tone Poems* (Voyager)

Inside the Score Structure

The broad tonal frameworks for both *Don Juan* and *Death and Transfiguration* adhere to Romantic sonata form. In the following chart click on the roman numerals to hear excerpts from the major structural moments of each piece.

Part 1	Part 2	Part 3
EXPOSITION	DEVELOPMENT	RECAPITULATION
Primary Area	Extension + Retransition	Primary Area
Theme 1	many parts + lead in	Theme 1
Secondary Area		Secondary Area
Theme 2		Theme 2
<i>Don Juan:</i>		
I	VI	I
<i>Death and Transfiguration:</i>		
i	III VI vi	i V I

Quit ? G Contents Retrace Chapters Find 117 of 142

Antonín Dvorák, *Symphony No. 9: A CD Companion* by Robert Winter (The Voyager Company, 1994)

Pros

The only CD-ROM with a complete interactive reduced score of a symphonic work; contains a fascinating repository of primary sources regarding Dvorák's trip to the U.S. and the influences of African-American and Native-American music upon his work; good hypermedia links.

Cons

Contains very little in the way of a music theory tutorial; harmonic analysis is buried in "Show Overview" buttons.

Bottom Line

One of the strongest offerings by Robert Winter, though somewhat short on music-theoretical detail.

Survey of Contents

The primary sections of the CD-ROM include: A Pocket Guide, A Romantic Orchestra, Dvorák and the New World, New World Listening, A Close Reading, A New World Glossary, an Annotated Bibliography, Direct Testimony, and Getting to Carnegie Hall (a game/quiz); the work is performed by the Vienna Philharmonic, conducted by Kirill Kondrashin. Many of the primary section types will be familiar to users of previous Voyager packages. The Glossary and Bibliography are similar enough not to warrant further discussion here, though their links to the Direct Testimony section (described below) increase their effectiveness. The Pocket Guide differs slightly from previous packages, however, because of the cyclic nature of Dvorák's composition: some themes are given two designations, one of which is a "cyclic" number. This designation enables the listener to identify and click on the themes that recur

from movement to movement in an effective (nonlinear) listening demonstration of cyclic composition.

The sections on the orchestra and on Dvorák's life and times are what one would expect from their titles. The Romantic Orchestra presents the line drawings and information about the symphonic instruments divided by family, as well as examples of the instruments playing solos and excerpts from the New World Symphony. The engaging Dvorák and the New World tells the story of Dvorák's reluctance to leave the "Old World" for the New, his contract negotiations with the National Conservatory where he was to teach, and the fascination he developed for the American-Indian and African-American musics he encountered. The story is told in eleven chapters: Humble Beginnings, Recognition and Celebrity, Invitation and Crossing, Life in New York, The National Conservatory, The Great Debates, The Summer of '93, Hiawatha Meets Buffalo Bill, New World Premieres, Goin' Home, and The Legacy. This section contains a copy of the only known recording of the famous Negro Spiritual singer and arranger, Harry T. Burleigh, singing "Go Down, Moses." In both of these sections—indeed throughout the CD-ROM—information is deeply embedded, and nonlinear modes of navigation are encouraged (the effective use of hypermedia has grown with each of Winter's CD-ROMs). Thus, for example, a brief quotation is given a superscripted "R" icon, which takes the user to the More Readings Section; clicking on a magnifying glass icon there transports the user to Direct Testimony, where the complete text is given in its original context (which often makes for fascinating reading!). Throughout both sections are many opportunities to hear musical examples; the historical section even contains sound files of interviews with Dvorák's acquaintances from the American years.

New World Listening contains many opportunities for listening in its subsections: Confronting the New World, Symphonic Folk Songs, Repetitive Rhythms, Heartrending Harmonies, Sophisticated Scoring, The Quest for Unity, listening units for each movement, and Knowing the Score. Of interest historically throughout this section are comparisons between musical events in the New World Symphony and dramatic events in Longfellow's poem, "Song of Hiawatha"; Dvorák apparently acknowledged such links in the primary sources Winter consulted in assembling this CD-ROM. Par-

ticularly disappointing are the two units that would seem to be of interest to music theorists: Heartrending Harmonies and Knowing the Score. The first of these includes illustrations of concepts like the diminished seventh chord and the augmented sixth chord—complete with animated ear-training examples from the symphony—but the explanations are cursory and nontechnical (e.g., no mention of how to spell the chords), and very little other music theory is explained. Knowing the Score is aimed at the nonmusician and gives ten “maxims” for following score highlighting with the eye as a means of learning to read music. The units on folk song and rhythm provide some interesting listening material on pentatonic and modal melodies, on the nature of repetition, and on Dvorák’s indebtedness to “Negro” and “Indian” music; highlighting analytical units during musical examples also makes for effective ear training here. Winter finally addresses the issue of key relations and tonal structure in the movement-by-movement analysis that follows the Quest for Unity section, but only if the user chooses to click the “Show Overview” button. Here, one finds a rather cluttered form diagram with thematic analysis and keys (both letter name and Roman numeral function) identified, as well as words like “build up” and “dissolve” between formal units. Users can click at any moment to listen to the item selected.

The Dvorák Close Reading section shows marked improvements over its predecessors. Winter’s commentary, synchronized with the music, is a listening guide that describes what is heard in language that novices will understand, but it does not resort to the simplistic adjectives that characterize many other CD-ROMs. What truly sets this section apart is a Show Score button that gives the user an online reduced score with (optional) moving highlights for the entire symphony! More experienced users who do not care to read Winter’s listening guide can instead follow the score; choosing this option reveals a Show Commentary button that stops the movement temporarily to give a more detailed discussion, complete with buttons that play related sound files. Available throughout the Close Reading section is a magnifying-glass button linked to the New World Listening section, so that listeners can toggle back and forth between sections to compare information at several levels.

The last two sections of the CD-ROM are both strong. Direct Testimony—a section that appears also in Winter's first project for Calliope—is an online repository for primary sources relevant to the topic, including the complete text of period newspaper articles, reviews, letters, etc. It is linked interactively with most other sections of the package; this is a valuable research tool and makes for fascinating reading. The game, *Getting to Carnegie Hall*, is an ingenious multiple-choice quiz. Users are presented with a map interface; questions appear in pop-up boxes superimposed upon the map. For each question answered correctly, the Dvoráks are gradually advanced along the map across Europe to board their ship to the U.S., and so on (pertinent dates and details regarding their mode of travel and stops along the way are given as well). Questions are generally well-designed. They are offered at beginning, intermediate, or advanced levels, and require players to identify themes from the symphony and to retain historical and biographical information about the times. Bonus points can be earned to pay for a post-premiere party for the Dvoráks!

Evaluation of Contents

This product is a wonderful musical and cultural history of the United States at the end of the nineteenth century, using Dvorák's years here as its point of entry. It provides a good formal overview of the symphony, along with a possible programmatic and literary interpretation based on Longfellow's "Hiawatha." Information is deeply embedded and linked at many levels, so that the user will undoubtedly return on more than one occasion and still find something new. The CD-ROM's primary sources and recorded interviews alone are valuable features; indeed, these features make this package "not so much a 'CD-Companion' to Dvorák's New World Symphony as the beginnings of a cultural history of America at a crucial juncture in her history," to use Winter's own words.²⁴

It is clear—by the inclusion of primary sources, by the responsible footnoting and bibliographical detail, and by the level and type

²⁴Robert Winter, Read Me ("About This Program"), from the CD Companion to "Antonin Dvorak, Symphony, No. 9: From the New World," card 25.

of analysis—that the author is a fine musicologist who is committed to winning new audiences for “classical” music through interactive media. It is unfortunate that Winter does not have a music theorist on his design team; a theorist could serve as a useful double check on analytical terminology and symbols, which sometimes do not conform to common usage (for example in E minor, Winter correctly identifies a G Major section as III, then goes on to discuss a modulation to g# minor as motion to iii# instead of #iii).

Design Features

This is the best of Voyager’s packages in terms of nonlinear opportunities for navigation. Users are kept from “losing themselves” in hypermedia possibilities by means of the Retrace button, function-specific icons (like the magnifying glass for links to Direct Testimony), and through helpful indexing using pop-up menu bars. On the opening card, for example, are two buttons (Sounds and Pictures) that pop up an alphabetical index to all the sound files and pictures in the entire product—an invaluable feature if the user is trying to track down a specific item, such as the sound file of Harry Burleigh’s performance. Navigation buttons are consistently placed from section to section, and their function is easy to intuit; hot-text links to the Glossary (as in all Voyager products) are underlined when the user clicks on the “G” button. Even the Glossary and More Readings sections contain various buttons to play audio examples and to transport the user to Direct Testimony for further detail.

The graphic design and black-and-white animations that mark the Dvorák package are simple, yet striking and effective. The depth and breadth of the historical and cultural information, as well as improved hypermedia links at all levels of the design, make this product stand out from the other Voyager products.

WARNER NEW MEDIA

The three Warner packages (Mozart: *The Magic Flute*; Beethoven: *String Quartet No. 14*, op. 131; and Johannes Brahms: *A German Requiem*) are similar in design and interface. Each has a First Choices card where the user decides the starting point in the program, which listening mode to use, etc. In addition there is a button that opens another stack with detailed instructions and descriptions of features of the package. Each of the three programs offers five different "tracks" of running commentary, presented on cards that change at appropriate times while the music is playing. The Exploring the Music and Notebook tracks are common to all three. Like Voyager's Close Reading section, Exploring the Music gives commentary at a basic level that guides untrained listeners through the music. Each card includes a CD control panel, the current time and measure in the movement, an array of buttons that allow the listener to change tracks at will, and links to related topics. The Notebook, a feature unique to this company's products, consists of blank cards for users to take notes. Each of these cards is labeled with the section of the composition, and the cards change as sections change in the performance.

The other three tracks differ among the packages: *A German Requiem* and *Magic Flute* offer complete German text and English translation; the *Requiem* includes a track presenting a conductor's notes on performance and interpretation; and the *Magic Flute* offers a Running Commentary of the action, which helps the listener to envision what is happening on the stage. Since text and translation tracks are not needed for the Beethoven Quartet, these are replaced by two more analytical tracks: Structural Analysis is a running commentary on form in the piece; and Harmonic Analysis comments on keys. Although some statements are merely descriptive ("A turn toward the key of B minor begins"), others show how keys relate to one another within a movement or between movements.

Each of the Warner products has a Program Book—the primary table of contents. Here the user can select any of the five listening tracks, or click on buttons that take one to a new listing of related topics about historical period, composer, music theory rudiments,

or genre. Each package includes a multilevel "Map" of the composition, similar to the Voyager Pocket Guides. The highest level lists the primary movements or sections of the work. An In Depth button next to each section title takes the user to another card, which shows the primary subdivisions of the movement, with measure numbers and CD start times. In Depth buttons at this level reveal pop-up fields showing more detail and various icons. Clicking on an eighth-note icon displays music notation of the current theme and plays it, usually on the piano; a button called "More about this theme" gives more detailed information. This type of embedded structure occurs in other sections as well; for example, hot text may bring up a pop-up field with additional icons, such as a magnifying glass for more information or a microphone that plays a recorded voice pronouncing foreign names and terms. In the sections that present expository material, the cards are numbered (e.g., 9 of 44). Each package includes a separate sound-clip index, glossary, bibliography, pronouncer index, and tempo guide.²⁵ A Backstage section gives detailed information about the recording, writers, programmers, editors, and production staff. Each program has a Final Exam on the music, composer and background material. The Exam includes True/False, Multiple Choice, and "Drop the Needle" sections.

Navigation is consistent within each program and between them, so the user should never get badly disoriented despite the complexity and diversity of the material. Each program uses a special icon—the composer's face in the Brahms Requiem and Beethoven Quartet, and the Sphinx in *The Magic Flute*—to return to the main menu (Program Book) from other sections. One can change commentary tracks while the composition is playing by selecting one of five numbered buttons at the top left of the card. Although the user can take many varied "side trips" or digressions for related background material or definition of terms, a special icon (different in each stack but always in the upper left corner of the card) takes the

²⁵The tempo guide defines tempo indications such as Allegro, Andante, Presto, etc. All of these programs have links to passages in the specified tempo. The *Magic Flute*, in addition, has metronome icons which invoke simulated metronome clicks for each tempo.

user back to the currently selected commentary track. A small CD control panel is almost always present, although its location sometimes changes, and the user has the option of letting the music continue while exploring related topics or pausing so that none of the running commentary is missed.²⁶ Topics can be accessed in a variety of ways: from the Program Book, via hot text and related-topic buttons on many cards, and through specialized indexes.

The depth and breadth of information in these packages are remarkable: commentary and analysis of the music at different levels of sophistication, historical background, information about the composer and genre (including examples by other composers), clips of other compositions by the current composer, an introduction to music theory rudiments and definitions (even including some basic ear-training), and much more. Related material is presented in various ways. Occasionally an introductory passage is presented via recorded voice—a pleasant change of pace. Many of the cards include line drawings and scanned art work (in monochrome), and hot text is always available if the user needs definitions of terms.

²⁶Our reviewers liked being able to listen to the music while browsing related material—a feature not available in many packages.

Mozart, *The Magic Flute* (Warner New Media, 1989)²⁷

Pros

A wealth of deeply embedded information about the opera, Masonic tradition, music theory, and the composer; a complete online translation of the libretto, and high-level music analysis with effective aural demonstrations.

Cons

Buggy program on newer Macs, even when run on the older versions of HyperCard on which it was developed.

Bottom Line

The information presented here was well worth the major problems we encountered retrieving it. We would love to see this program reworked to run reliably on current Mac systems.

Survey of Contents

This is the first of three CD-ROM packages from Warner New Media's "Audio Notes" series. The package consists of three compact discs, containing the full performance of Mozart's opera by the Chor des Opernhauses Zürich, directed by Nikolaus Harnoncourt, plus HyperCard stacks that, according to the promotional literature, contain more than 7000 "screens."²⁸ The text and analysis are both by Irene Girton. The basic design and style used in all of the Warner products are present here, although they were refined and improved in the Beethoven and Brahms packages released subsequently.

²⁷Although the copyright date is 1989, this package was not released until March of 1990.

²⁸We did, however, note that cards are not always used efficiently. For example the Help section, which consists of 19 cards, was replaced in the later releases by a single card with pop-up fields.

Users make initial decisions on the First Choices card. They may choose whether they want to hear the music only or whether they want to hear a summary of the dialogue in English or German between numbers. Users then specify the starting point: Overture, Program Book, Opera Map, or Index. Other choices include whether or not to hide the menu bar,²⁹ and whether or not a laser disc player is attached to the computer system. On the Program Book card, the user selects one of five listening tracks: English, German, The Story, The Music, and Notebook. The first two give an English translation or the original German text on screen as the opera plays. The Story is a running description of the action on stage, which helps the user envision the opera. The Music is a basic commentary at a music-appreciation level, and Notebook consists of blank pages synchronized to the music, on which users can make their own notes. Besides the listening tracks, the Program Book offers sections called Analysis, Opera Map, Transition Menu, Sidebars, and Final Exam.

For each numbered section of the opera, The Analysis offers a form diagram and summary of the key relationships. Figure 9 illustrates the content of two cards, showing the form of No. 1 and a more detailed analysis of section C.³⁰ The analysis goes beyond simply naming keys; it often provides a discussion of the larger tonal context in the passage. Clicking on an icon (not shown in Fig. 9) plays the passage in question.

As in the later packages, the Opera Map is the primary vehicle for choosing or changing locations in the opera. At the highest level, it lists the acts and numbered sections. Clicking on the More Detail button at the bottom of the card shows a second-level breakdown by measure, e.g., "1–17 Introduction; 18–32, The Snake Attacks; 33–39, Tamino Pleads," etc., as shown in Figure 10. Next to each entry in this table is an Info icon, which takes the user to the corresponding entry in the Analysis stack. At each level of the Opera Map the current section is highlighted during continuous play, and the user can listen nonlinearly by clicking on various sections.

²⁹The default is to hide the menu bar. Clicking on Show consistently crashed the program.

³⁰From the analysis of the first portion of the C section of Act I, No. 1, Introduction. *Magic Flute* (Warner New Media, 1989).

Figure 9. Form diagram and key relations, *The Magic Flute* (Warner)**No. 1. Introduction. Tamino, Three Ladies**

Form: A: introduction a b a'
 B: introduction; a a' b c d c d'
 C: a b c extension
 D: a b b
 coda

Key: C minor – E-flat major – G major – C major

Tempo and meter: Allegro 4/4 – Allegretto, 6/8 – Allegretto, alla breve

Subsequent cards give a more detailed analysis:

C: a, mm. 120–127: (eighth-note icon) Once again tonality, tempo and meter change here; we are now in G major (not the expected G minor!), Allegretto, in a lilting folk-like 6/8 meter. G major is a key often associated with the rustic clown, Papageno; it is interesting that the Ladies appropriate it here. It serves a long-range function in the harmonic structure of the entire ensemble, as a stepping stone in a vast arpeggio from the key of the opening, C minor, through E-flat major, on now to G major, which will soon lead to the final key of the number, C major. A harmonic full circle is achieved thereby.

The Transition Menu affords an opportunity to experience the material between musical numbers in the form of Dialogue Text, English Summary, or German Summary. The user chooses the transition by number and format. Dialogue Text displays the complete text of the spoken dialogue in English translation, while the user listens to the German. The summaries provide a description of the action and dialogue in English or German. These are presented on cards while a pleasant male voice reads the text. Another button displays a Dialogue Text Menu, which allows the user to go directly to the dialogue text for any transition.

On each disc, a Sidebar menu lists supplementary material (the contents are listed in Table 1). Topics are not grouped into logical categories, as they are in later packages; thus, subjects of all sorts—historical, theoretical, sociological, and musicological—are lumped together. Still, the amount of information here is monumental, and

OPERA MAP • NO. 1 • 1 OF 2 || 0:13

No. 1 - Introduction				
Measure	Event	CD1	LD1	Info
1-17	Introduction	0:00	9:51	
18-32	The Snake Attacks	0:30	10:18	
33-39	Tamino Pleads	0:56	10:44	
40-46	The Ladies Answer	1:09	10:57	
47-62	The Ladies Boast	1:24	11:11	
63-86	They Admire Tamino	1:54	11:43	

 Main Opera Map
  Transition Menu
  LaserDisc
  Index

several techniques are used to present it—short essays, clickable menus and graphics, animated lectures, etc. In addition to text, graphics, and music notation, the essays contain hot text and note icons that play music, so there is ample opportunity for nonlinear browsing and user interaction. Although there is some duplication among the three discs, different material is often presented under the same sidebar title. For example on one disc, clicking on Masonic Symbolism produces a card with pictures of the characters and objects that have symbolic meaning in the opera (flute, snake, glockenspiel, etc.). Clicking on each produces a card with a discussion of the symbolic meaning of that character or object. On another disc, the same sidebar title produces a discussion of early alternative theories—that symbols and characters in the Magic Flute represent Austrian historic figures, eighteenth-century music and art, the French monarchy, or the French revolution. An interactive table lists these four categories; clicking on a picture of each character inserts information into the table showing who or what the character represents in each theory.

Several topics on each disc are presented in lecture format, with a recording of a human voice presenting material. The lecturer illustrates concepts on the piano, while music examples and diagrams are shown on the screen, often with animated highlighting to clarify points. This mode of presentation is used effectively to introduce theory concepts such as fugue and modulation. Although not interactive in the usual hypermedia sense, it is fast paced, informative, and a refreshing change of pace. Sometimes various techniques are combined. The discussion of Florence Foster Jenkins is begun in lecture format; then while a historic recording of the famous (or infamous) soprano singing the Queen of the Night aria is played, cards with text and pictures present additional biographical and historical information.

Unlike the other Warner products, the Final Exam consists only of multiple-choice questions, but these deal with the music as well as with historical and theoretical concepts, and many questions are given.³¹ The user is given immediate feedback and correct answers

³¹We never did get to the end, but exited by clicking on the Sphinx button to return to the main program or on Exit.

Table 1. Supplementary material: Mozart, *The Magic Flute* (Warner)

“Sidebars” on Disc One Anti-Feminism, Cast of Characters, Debut: “The Magic Flute”, Dialogue in Opera, Dynamics, Fugue, Giesecke & the Libretto, Magic in Opera, Masonic Symbolism Menu, Modulation, The Musical Styles, Original Playbill, Origins of the Story, Rhythm & Meter, Emanuel Schickaneder, Tempo Guide
“Sidebars” on Disc Two The Bass Aria, Cast of Characters, Coloratura, Debut: “The Magic Flute”, Florence Foster Jenkins, Mozartian Recitative, The Opera’s Transition, Origins of the Story, Patter Song, The Power of Music, Recitative, Seventh Chord, Shakespeare and Mozart, Sound and Sensation, Symbolism of the Opera, Vocal Ranges
“Sidebars” on Disc Three Cadence, Cast of Characters. Characters– Masonic, Chorale, Debut: “The Magic Flute”, Dynamics, History of Singspiel, Isis and Osiris Legend, Letters from Mozart, Magic Opera’s Fate, Masonic Prejudices, Masonry, Mozart’s Death, Mozart’s Final Year, The Musical Styles, Past Performances, Symbolism of the Opera, Tempo Guide

are supplied immediately. After many questions, appropriate clips from the opera are played until the user clicks on Next Question. When the user exits the exam a picture of an obelisk is shown, with seven levels labeled from 1 to 7. A line moves up the obelisk (like rising mercury in a thermometer) to the appropriate level—then a “sun” icon is placed over the level marker and an appropriate message is displayed, from “You need much help” to “International Superstar.”

As in the other Warner Packages, the Back Stage section gives extensive information about the performers, the authors and production staff, and the Audio Notes series. Other supplementary information includes a bibliography with full publication informa-

tion and an index that is implemented in a manner similar to that in the Brahms Requiem package described below. Although a Glossary is mentioned in the Back Stage credits to Irene Girton, we were unable to locate this as a separate section. The Glossary seems to be folded into the index—clicking on some words takes the user to a specific card in other supplementary discussions; others produce a pop-up field with a short definition. We miss a readily available Reference Guide, which was introduced with the Brahms package.

Evaluation of Contents

This package contains a wealth of deeply embedded historical, sociological, and analytical information about the opera. Though theory rudiment sections are more limited than in the later Warner products, the introductory sections, e.g., Fugue and Modulation, are presented at a high level that will be accessible to beginners but still meaningful to more advanced students. The analysis is very well done, both in the analytical sections and in the tutorials, which use examples from the opera as illustrations. For example, after introducing pivot-chord modulations in the abstract, an excellent example from the opera is played while an analytical reduction of the passage is shown on screen. Although measure highlighting is not used, the analysis is added below the staves as the music is played. The reduction is easy to follow and is an exceptionally clear illustration of the concept. A similar technique is used to illustrate common-tone modulations. The depth of the analysis, including large-scale tonal motions, analytical reductions, and effective use of Roman numerals, reflects the close involvement of a “real” music theorist in this project.³²

Design Features

This stack, which uses a wide variety of hypermedia techniques effectively, is designed in black and white in an art deco style with an Egyptian theme. Navigation is consistent, both internally and with the other Warner products. Although there is a great deal of

³²Irene Girton, the author of the text and analysis for this package, is a professor of music theory at California State University at Los Angeles.

deeply embedded information, users can click on flute or Sphinx icons at any time to get back to the current listening track or to the main table of contents, respectively. In addition, each card has left and right arrow buttons for moving forward or backward in the current section, a Back (retrace) button, and a CD icon that brings up a full CD control panel.

Our biggest problem with this stack was getting it to run, which proved to be very difficult on contemporary Mac systems. We did finally manage to run it on a Macintosh Centris and (after a fashion) on two Power Macs.³³ The program crashed frequently, sometimes locking up the computer system completely. We wish there were a newer version of this CD-ROM package that would run on current Macs. The content is magnificent, but few users will have the patience to get through it.

³³The auto-install program in this package did not work at all. Following directions that came with the media, we got the program to work by installing all of the files manually, and hiding or renaming the Home stack on our computer. We then started the program by double-clicking on HyperCard 1.2.5, the newer of the two versions provided by Warner New Media. The earlier version of HyperCard provided on the CD (Version 1.2.2) crashed immediately, and the Package would not run using the current version (2.3) of HyperCard on our system. On the Power Macs, the program was unable to keep track of the location of the various stacks in the package, and every time we clicked on a button we got a dialogue box asking us to locate the required file, even when it was the stack currently in use.

Ludwig van Beethoven, *String Quartet No. 14* (Warner New Media, 1990)

Pros

Progressively more detailed music analysis in different listening tracks; innovative Blueprint section details the function of each instrument. Contains a basic music theory tutorial.

Cons

Occasionally buggy. Why play Beethoven's Fifth Symphony while viewing the title card?

Bottom Line

The weakest of the three Warner packages, but still well worth study.

Survey of Contents

This application is based on the 1987 Teldec recording of Beethoven's Op. 131 by the Vermeer Quartet. The commentary was written by Cynthia Woll, the producer of the later Brahms Requiem package. Unlike the other two Warner New Media products, this package is contained on only one disc—not due to the amount of detailed supplementary material, which is extensive, but because the composition is shorter.

Like the other Warner products, this one contains five different "tracks" of running commentary synchronized with the music: Exploring the Music, Structural Analysis, Harmonic Analysis, Blueprints, and Notebook. The first and last of these are like the tracks by the same name in the other packages. Since there is no text, and translation is not required, there is room in Warner's standard design for more analysis, and successively more detailed levels of analysis are a strong point in this package. Exploring the Music presents the user with elementary comments at a music-appreciation level and introduces music terminology through hot-text links. Struc-

tural Analysis is a running commentary on form, a bit more detailed but still nontechnical, which might be appropriate for an undergraduate music major studying form. Harmonic Analysis identifies key relationships in the current movement primarily, but also shows relationships between movements. Since the emphasis is on harmonic goals and tonic and dominant “structural pillars,” this section would be useful for students learning to hear basic harmonic function and tonal motion. The Blueprint section was a favorite of many of our reviewers. This section is a graphic representation of the music (see Fig. 11). Each instrument is represented by a rectangular field on the top of the card. Beneath is a description of the “building blocks” of the movement, with the primary melodic material notated on the staff, and identification of the movement and current formal division. As the music plays, the text in the instrument fields constantly changes to indicate the role each instrument is playing at any given moment, and cards change to show new “building blocks.”

Quartet Map provides a multi-level overview of the form of the Quartet, with the current section highlighted. Each entry in the chart identifies the current section, measure numbers, and the time, not only on the Vermeer Quartet recording but on an alternate recording by the Juilliard Quartet, a useful comparative tool for an analysis-and-performance discussion.³⁴ The top level lists the seven movements, with In Depth buttons to transport the user to the next level, which shows the primary formal divisions of the movement. Where appropriate, there is a third level giving a more detailed breakdown, but deeper levels giving information about keys and thematic relationships found in the Brahms package are missing here. The Quartet Map also serves as a “junction box,” which allows the user to change movements or sections within the stack. Clicking on the buttons numbered from 1 to 5 at the upper left takes the user back to each of the five listening tracks.

A summary of the background and supplementary material in this package is shown in Table 2. Some of the material presented in Foundations—Major Scales, The Circle of Fifths, Minor Scales, Keys,

³⁴The alternate recording is not included in the package and must be purchased separately.

Figure 11. Blueprint section: Beethoven, *String Quartet No. 14* (Warner)

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0:29
m8

Violin I

FREE MATERIAL

Violin II

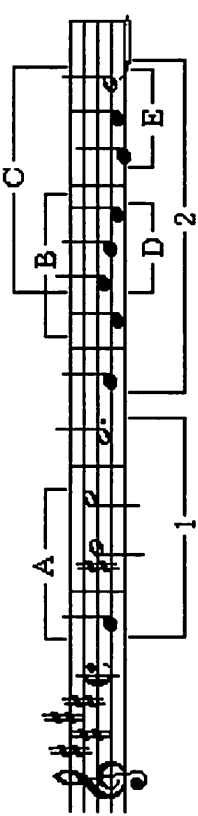
FREE MATERIAL

Viola

SUBJECT PART I

Cello

This movement's building block: FUGUE SUBJECT



Key: C# Minor

Meter: Alla Breve

Form: Fugue

Exposition 1

The Fugue
Quartet Map

Blueprint Help
Index



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and Understanding Harmony—is identical to material in the Brahms package, discussed in more detail below. The subsection on The Invention of Notation is a 37-card side trip that begins with Guido d'Arezzo and the hymn for the feast of St. John the Baptist (*Ut queant laxis*).³⁵ As usual, the hypermedia format is used effectively—the beginning of the hymn is shown in music notation with buttons to play sound clips of a men's chorus singing the first syllable of each phrase, producing the notes of the scale. The following discussion relates the C, G, and F clefs in common use to overlapping instances of the Guidonian hexachord, explains the "Guidonian hand," and then "mutates" to discussion of whole and half steps, the development of the piano keyboard, and a philosophical discussion of fact versus theory (presented as "natural" versus "man made").

Musical Architecture is a potpourri of topics dealing with chamber music, string quartets, musical form in general, and (primarily melodic) analysis of movements in this particular quartet. Some subsections duplicate material from other Warner packages.³⁶ The discussion of Fugue is cursory, but defines general principles and terms, with links to excellent examples of inversion, retrograde, and stretto from Bach's *Musical Offering*, Bartók's *Music for Strings, Percussion and Celesta*, and Stravinsky's *Symphony of Psalms*, for example. Keys to the Puzzle is an interesting discussion of relationships between Op. 131 and other late quartets by Beethoven. The discussion of melody emphasizes motive, but also relates surface events to the larger structure, as shown in Figure 12.

The Composer discusses various aspects of Beethoven's life and character. The section on Beethoven's Deafness—based on extensive research by Dr. Vincent Goodhill, Professor of Surgery and Chairman of the Board of UCLA's Hope for Hearing Foundation—is fascinating. Twenty-eight cards speculate on the cause and effects of Beethoven's deafness. Audiograms are used to show the probable extent of Beethoven's handicap at various stages of his

³⁵This example is shown to be related to "Doe, A Deer" from *The Sound of Music*, which is more familiar to most users.

³⁶For example, much of the discussion of sonata form is similar to that in the Brahms package, but with a different Mozart piano sonata as the model. The first movement of Mozart's Sonata in Bb, K. 333 is used here.

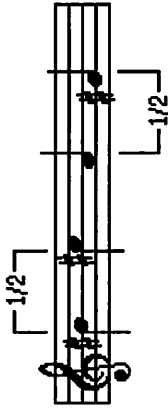
Table 2. Supplementary material: Beethoven,
String Quartet No. 14 (Warner)

Primary Section	Topics Covered
Foundations	Rhythm and Meter, Tempo Guide, Dynamics, The Basics (Theory vs. Fact, Pitch, The Octave, Intervals, Naming Intervals, Consonance and Dissonance, Naming Pitches, Invention of Notation, Major Scales, The Circle of Fifths, Minor Scales, Keys, Understanding Harmony)
Musical Architecture	About Melody, Melody Movement 1, Melody Movement 2, Melody Movement 3, Melody Movement 4, Melody Movement 5, Melody Movement 6, Melody Movement 7, About Chamber Music, Chamber Music Menu, The Fugue, Keys to the Puzzle, Musical Architecture, Sonata-Allegro Form, The String Quartet, Texture, Violin, Viola, Cello, Stringed Instruments, Enharmonic Notes and Keys, Chord Inversions
The Composer	Beethoven the Visionary, Images of Beethoven, The Irreverent Beethoven, The Three B's, What is Classical Music?, Beethoven's Deafness, The Late Quartets, Beethoven and the Metronome, First Performances, The Conversation Books, The Sketchbooks
The Timeline	Medieval, Chant, Ars Nova, Renaissance, Baroque, Classical, Romantic, Modern, Monteverdi, Josquin, Bach, Haydn, Mozart, Beethoven, Brahms, Stravinsky
Final Exam	Drop the Needle, Multiple Choice, True/False
Backstage	About This Series, About the Recording, About the Creators
Index	
Bibliography	

Figure 12. Motivic and key structure: Beethoven,
String Quartet No. 14 (Warner)

Melody Mvt. 4: Theme & Variations • 7 of 15

The large outline of the work is based on the thematic idea of B#-C#-A-G#: two pairs of half steps.



The half-step theme is even reflected in the outline of the **keys** of the first four movements: C#-D-B-A. It seems logical then, that Beethoven uses pairs of half steps—A-G#: D-C#: G-F#: E-D#—as the main material in building his melody here.



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Theme & Variations

Keys To The Puzzle

Melody Menu

Index

life, and excerpts from his works from the same periods are filtered to show what Beethoven probably heard.³⁷ This attention to detail contrasts favorably with the Future Vision Beethoven Fifth package, which only briefly discusses Beethoven's deafness and his "Heiligenstadt Testament."

The Timeline is a thumbnail sketch of music history, showing only the high points. The user can click on various composers or periods to reach a brief discussion, including a few sound clips. The Final Exam has three categories: Drop the Needle, Multiple Choice, and True/False. Within each category, questions are presented in random order, and feedback is limited but immediate. The user is told that the answer is correct, or the correct answer is provided and the question is put back in the question pool so that it can be asked again. Many questions have a humorous element. For example: "Ars nova is" . . . (choose one) an exploding star, bel canto singing, "new music" of the Middle Ages, or "a refined insult." These light moments make the "exam" fun as well as informative. Backstage gives detailed information about Warner's product line, the developers, and performers. The other reference material (Index, Bibliography, and Glossary) is similar in structure to corresponding sections in the Brahms Requiem package, but not as extensive.

Evaluation of Contents

One of our reviewers said of this package, "This CD-ROM is so incredibly thorough it could be its own music course. If you learned everything in it you should earn at least 3 college semester credits."³⁸ This product provides information that will be interesting and stimulating for users at many levels. Many concepts and ideas are appropriate, at least as supplementary material, for college-level music theory courses, but information is also provided at a more basic level, useful for amateur musicians or interested high school music students. Users at this level will find that the program is challenging and provides ample room for growth.

³⁷ Audiograms are graphs that show hearing profiles through air and bone conduction over the normal range of hearing. The graphs show the extent of hearing loss in various frequency ranges.

³⁸ Stefanie Crumbley, from our TH 423 class of Spring 1995.

Although a great deal of information is presented, the organization is not as strong as in the Brahms Requiem package, which came out a year later. The careful reader probably noticed in Table 2 that the subsections are sometimes forced into sections rather randomly. In spite of a few organizational problems, the content is generally excellent, and presented in a manner accessible to users with a broad range of musical skill and background.

Design Features

Like the Mozart package, this CD-ROM is tastefully done in black and white, with a consistent interface and appearance from section to section. The visual and artistic design are given as much care as the content, and the combination is rewarding in many ways. Some of our reviewers felt that navigation could be confusing at times—that it was easy to become lost in the “labyrinth” of nested hyperlinks. Others would have liked to be able to change movements or sections without going through the Quartet Map junction. Some of these problems could have been alleviated by adding extra buttons to each card, but the result would have been more cluttered and could have resulted in more user confusion. We think the design choices are reasonable, even elegant in many cases. With the amount of material presented, users will want to spend many hours with this stack, and will quickly become accustomed to the Warner design conventions.

We did notice some problems in synchronization of cards with the music in the continuous commentary tracks—cards sometimes flip back and forth a couple of times rather than changing cleanly. This problem seems to have been solved before producing the Brahms package. The program was a bit “buggy” on some computer systems, and would occasionally produce error messages or hang up completely, necessitating rebooting the computer; it is much better in this regard than the Magic Flute package, and the content is well worth the effort.³⁹

³⁹We found that the program ran best if we first opened our current version of HyperCard and then started the Beethoven stack.

Johannes Brahms, *A German Requiem* (Warner New Media, 1991)

Pros

Beautiful performance, with relevant material accessed through a variety of linear or nonlinear paths. Good introduction to music theory rudiments, including some ear training.

Cons

Occasionally buggy on some systems. Why play the Brahms-Haydn Variations while showing the title card?

Bottom Line

A prime example of hypertext design; of interest to users at all levels from amateur to professional. Imparts an understanding of the style, historical period, and the way this particular Requiem fits into the genre and relates to the human need to express mourning.

Survey of Contents

This is the last of the three Warner offerings and in many ways the most polished. The performance, by the Atlanta Symphony Orchestra and Chorus, is conducted by Robert Shaw. The primary author is Martin Perlich, with the music analysis by Roger Lebow. The package shares many features with the earlier Warner products.

Immediately after the title card, the user is given a choice of starting points similar to those in the Mozart package. The main table of contents, or Program Book, lists the five listening "tracks" (Exploring the Music, English Text, German Text, A Conductor's Thoughts, and Notebook) and primary supplementary topics on this disc. At the bottom of the card are links to the Reference Guide, Requiem Map, the Help card, and The Texts (which accesses texts for the entire work, in English or German, listed by movement). Among the listening tracks, A Conductor's Thoughts is unique to this package. This commentary—written by William Hall, conductor of the William Hall Chorale, *not* by Robert Shaw—is displayed

on cards as the music plays, and gives insight into performance and interpretation issues, although it would hardly be sufficient for a conductor preparing for a performance.

Like Voyager's Pocket Guides, the Requiem Map gives an overview of the work's form with the current section highlighted in synchronization with the music; the user can listen nonlinearly by clicking on any section. The number of levels in the Requiem Map is remarkable. The highest level lists the movements. Clicking on an In Depth button next to each movement brings up another card showing the large-scale form of the movement and the primary subdivisions. An In Depth button next to each subdivision shows a pop-up field with additional detail, usually including the measure numbers, the key, and the German text. Clicking on an eighth-note icon shows the theme of this section in music notation, which is realized in a piano recording. More About This Theme pops up another field with additional information, e.g., the derivation of the theme or comments about the orchestration. Some fields also contain hot text linked to the Glossary or other sections of the program.

The supplementary "chapters" in this package are listed in Table 3. Each of these sections is divided into a number of subsections, most of which are many cards in length and contain hot text and buttons linked to definitions in the Glossary and related music clips. The two discs contain some duplication, but the amount of information here is impressive. The sections that occur on both discs are treated in more detail below. Time and Place puts the Requiem in historical and sociological context, while Music of Romanticism discusses common genres of the period. The Composer gives a thumbnail sketch of the composer's life, introduces some of his other major works with substantial sound clips, and discusses Brahms's debt to Beethoven's work. Music, Mourning & Magic is an interesting look at mourning rituals in several diverse cultures. The Requiem Timeline presents a card with nine tombstones labeled with titles of Requiems from different historical periods, detailed in Table 3. Clicking on each icon plays a sound clip from the work, while showing appropriate artwork.⁴⁰

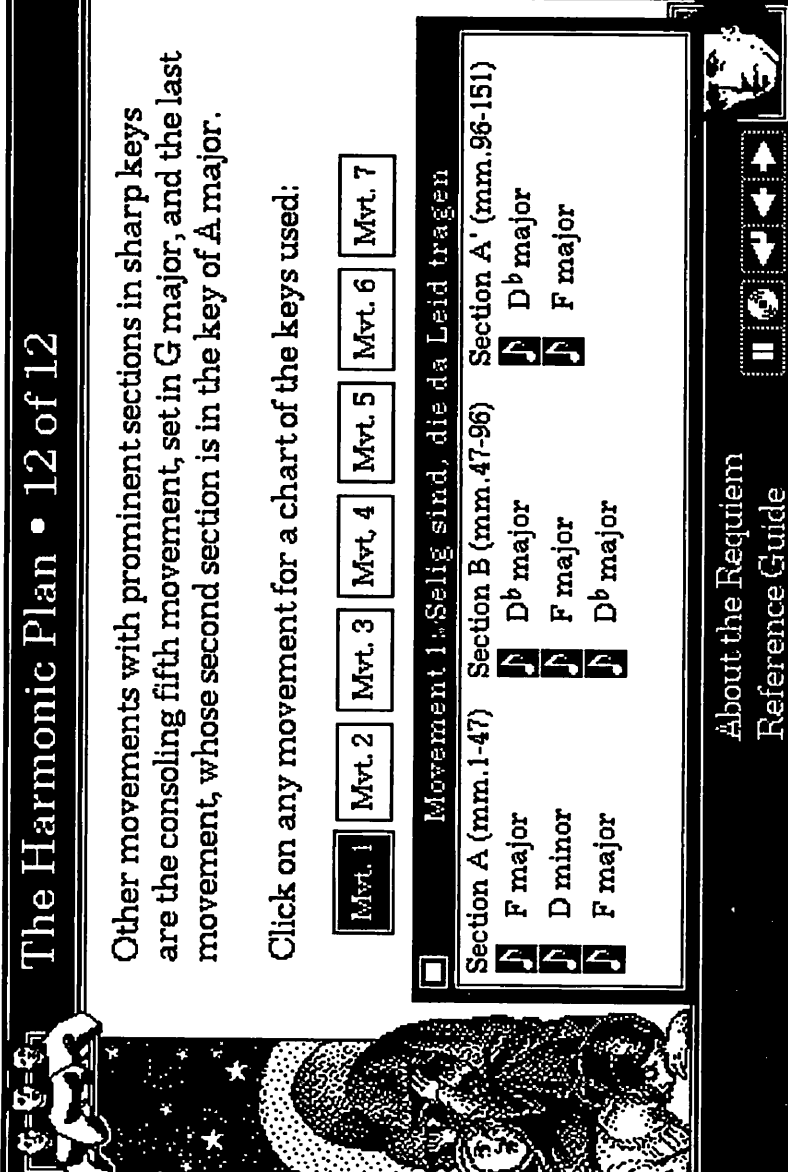
⁴⁰These clips are identical to those in Music, Mourning & Magic's section "Compare the Requiems."

Table 3. Supplementary material: Brahms, *A German Requiem* (Warner)

CD One: Movements 1–3	
Primary Section	Topics Covered
Time and Place	Romanticism, French Revolution, Napoleon, Rationalism, Rise of the Middle Class
Music of Romanticism	The Nationalist Opera, The Song Cycle, The Tone Poem, Ethnic Dances
The Composer	A Brahms Gallery, More Music of Brahms, Footsteps of the Giant
Music Theory	Sonata-Allegro Form, The Fugue, Rhythm & Meter, Major Scales, The Circle of Fifths, Minor Scales, Keys, Understanding Harmony
About the Requiem	A German Requiem, First Performance, Later Performances, Derivation of the Texts, Musical Sources, The Harmonic Plan, Theme Transformation, Choral Basics, Choral Composition, Word Painting–Mvts. 2 & 3, Solo Lines–Mvts. 1 & 2, Fugal Techniques–Mvts. 1–3, Creative Highs & Lows–Mvts. 1–3
Reference Guide	Glossary, Index, Pronouncer Index, Sound Clip Index, Tempo Guide
Requiem Map	Theme-by-theme guide to the music allowing selection of various levels of detail
CD Two: Movements 4–7	
Primary Section	Topics Covered
Music, Mourning & Magic	Mourning in Music, Ancient Mourning Rituals, Magic Rituals, Gregorian Chant, The Requiem Mass, Compare the Requiems, The Dies Irae, Protestant Mourning
Music Theory	Sonata-Allegro Form, The Fugue, Key Color, Rhythm & Meter, Major Scales, Circle of Fifths, Minor Scales, Keys, Understanding Harmony
About The Requiem	A German Requiem, Derivation of the Texts, Theme Transformation, Word Painting–Mvts. 4–7, Solo Lines–Mvts. 4–7, Fugal Techniques–Mvts. 4–7, Creative Highs & Lows–Mvts. 4–7
Requiem Timeline	Middle Ages: Anonymous; Renaissance: Pierre de la Rue; Baroque: Heinrich Schütz; Classical: Mozart; Romantic: Berlioz, Brahms, Verdi, Fauré; 20th Century: Britten.
Reference Guide	Bibliography, Glossary, Index, Pronouncer Index, Sound Clip Index, Tempo Guide
Requiem Map	Theme-by-theme guide to the music allowing selection of various levels of detail
Final Exam	Multiple Choice and True/False questions about the Requiem and supplementary material.
Backstage	About the Series, About the Recording, About the Creators

About the Requiem gives historical and analytical information about the work. The background material includes speculation on why Brahms wrote the Requiem, discussion of the premiere and later performances, derivation of texts, musical influences, an introduction to the problems of choral writing, and so on. The analytical material includes thematic transformation, contrapuntal techniques, and key relations. The latter is presented in The Harmonic Plan, a section that discusses key relationships in general and in the Requiem, and terminates with tables showing the key relationships in the whole work. This is implemented with buttons for each movement that display diagrams showing the form and primary keys for each (see Fig. 13). Clicking on the note icon next to each key label plays a cadential progression (on the piano) establishing the key. Thus the user can hear the large-scale tonal motion in a condensed format, but cannot hear actual excerpts from the Requiem. Unfortunately, keys are listed only by name (Bb), rather than by function (e.g., V). The Fugal Techniques section employs music notation for the subject and a graphic representation for each fugal entry. The user can listen to the subject alone, or can play the full excerpt while rectangular boxes representing subject and answer entries are highlighted in real time.

The Music Theory tutorial is surprisingly thorough, considering the format and the intended audience. Sonata form is presented as an extended binary form with emphasis on the key relationships. The first movement of Mozart's piano sonata in C Major, K. 279 is used as a model. During the discussion the user clicks on buttons to hear the themes, and is even given the opportunity in the recapitulation of comparing the sound of the second theme in the tonic with its original statement in the dominant. This piece is contrasted with a Brahms sonata (also in C) that uses less conventional key relationships (C major to A minor in the exposition; C major and C minor in the recapitulation). The Fugue section introduces basic concepts and familiarizes the user with concepts and terms such as imitation, episode, repetition, inversion, and stretto. Understanding Harmony, with 44 cards, is the longest section. The concepts are mostly sound, though basic, but there are glaring part-writing errors in the opening discussion comparing horizontal (melodic) music with vertical (harmonic). The user is taught to construct triads on various scale

Figure 13. Harmonic plan: Brahms, *A German Requiem* (Warner)


The Harmonic Plan • 12 of 12

Other movements with prominent sections in sharp keys are the consoling fifth movement, set in G major, and the last movement, whose second section is in the key of A major.

Click on any movement for a chart of the keys used:

Mvt. 1 Mvt. 2 Mvt. 3 Mvt. 4 Mvt. 5 Mvt. 6 Mvt. 7

☐ Movement 1: Selig sind, die da Leid tragen

Section A (mm. 1-47)	Section B (mm. 47-96)	Section A' (mm. 96-151)
F major	D ^b major	D ^b major
D minor	F major	F major
F major	D ^b major	

About the Requiem
Reference Guide

degrees, and is introduced to various cadence types. Quizzes after each section reinforce understanding of the material; the user is asked to perform tasks such as choosing the correct scale degree on which to spell primary triads (in several keys), and even recognizing tonic and dominant chord functions and cadence types aurally. Immediate feedback is given, but the program does not keep track of the score and mastery of the material is not mandatory.

The number of different entry points into the material is refreshing, particularly after spending an exasperating hour trying to relocate some specific bit of information in one of the Future Vision Products. A Reference Guide (book icon) is available from the Program Book, as well as directly from many different cards. Clicking on this icon summons a pop-up field with a clickable table of contents: Glossary, Index, Pronouncer Index, Sound Clip Index, and Tempo Guide. The Index is in hypertext format: clicking on each item takes the user directly to a discussion or definition of a related topic or word elsewhere in the stack. In the right margin of each card are buttons labeled with initial letters of the first and last entry on each card (e.g., Ac–Br, Br–De) that allow the user to go directly to the desired page without flipping through cards. The Glossary is arranged in much the same manner. The Pronouncer Index lists all foreign words used in the program; clicking on a word produces a recorded human voice giving the correct pronunciation.⁴¹ The Sound Clip Index on the first disc lists 33 other works quoted in various discussions. Clicking on a note icon next to each title plays an excerpt from the work. The Sound Clip Index from the second CD lists about 40 entries, including several from the discussions of mourning in music: Keening, Hindu Chant, Arabic Chant, and Navajo Night Chant. All of these clips are worked seamlessly into the supplementary discussions throughout the program. The tempo guide lists the Italian tempo indications from the score, with buttons to play representative passages. The bibliography is not annotated, but does contain complete publication information.

The Final Exam consists entirely of multiple-choice and true/false questions, asked in random order. We like the fact that many

⁴¹The pronunciation of individual words is available from many locations in the program by clicking on a microphone icon.

questions deal with the music directly. For example, instead of being asked to define terms like *stretto* or *polyphony*, an excerpt from the *Requiem* is played and the user is asked to choose the answer that best describes the excerpt. The user is also asked to identify the movement from which excerpts are drawn, and many questions deal with the background material as well. Since the correct answer is given immediately, one can learn a good deal by taking the exam. A running total of the number of correct answers and the number of questions answered is displayed on the card. If the user clicks on *Next Question* without answering, the question is not counted in the total. Feedback is gentle—when leaving this section the user is presented with a mountain scene with an animated sunrise. A text from the *Requiem* is displayed on the sun—"Ye now have sorrow" or "Blessed are they who live in your house"—depending on the percent correct.

Backstage has three subsections. About the Series is a commercial for the three Warner products. About the Recording includes nine cards with information about The Atlanta Symphony Orchestra, Robert Shaw, and the soloists on the recording. About the Creators credits the producers, authors, editorial staff, artistic and graphic staff, programmers, etc. It is refreshing to have this level of detail. The only thing missing is a discussion of the credentials of the primary writer and analyst, although perhaps the contents of this impressive CD-ROM are sufficient documentation of their abilities.

Evaluation of Contents

This is the culmination of the Warner New Media products that have appeared on the market, and is the most highly developed in terms of organization of material for hypermedia presentation. The authors have done a magnificent job in finding a balance and tone suitable for diverse audiences, and the package will be enjoyable and educational for many levels. Although accessible to the interested amateur or aficionado, the content of most sections is interesting even to a professional musician. Understanding some of the harmony segments requires at least elementary music reading proficiency, although the sections on form (e.g., sonata and fugue) should be accessible and informative to nonmusicians. Although

the theory content is basic, it is essentially correct, and could reinforce concepts taught in many undergraduate theory courses; it would certainly be valuable and challenging to a music appreciation class. The form diagrams (including key relations) and discussion of compositional techniques would be a valid starting point for anyone who wants to get to know the work more intimately.

Design Features

The designers solved the problem of distractions from the “desktop” by introducing a colorful floral background that covers everything, and placing their stack over this.⁴² The stack itself uses only dark blue and cream; the text may be blue on cream, or white on blue. Thus the effect is not that different from the two earlier Warner Products—most of the artwork is essentially monochromatic, but substituting blue and cream for black and white adds warmth. Warner New Media is the most successful of all of the publishers reviewed in consistently implementing a successful hypermedia format, and this product is outstanding in that regard.⁴³ Navigation is always consistent and intuitive. Our reviewers liked the fact that it was possible to listen to the music continuously while exploring related topics. The user can change listening “tracks” or explore background material at will, all while the music plays. The only time the music stops is when one clicks on a note icon to play an excerpt, or in a few places where spoken narrative is used for contrast. In these instances the music picks up seamlessly after the interruption. A pause button is always available at the bottom of the card, so the user can stop and start the music at will, and clicking on

⁴²Our only complaint about this arrangement was that it was impossible to get to the desktop while the stack was in use, making note-taking for this review difficult. It would have been nice to have a button somewhere to escape temporarily from the application, as in the Future Vision products. However, it was easy to print individual cards in the Warner New Media Products, which proved to be impossible in Future Vision.

⁴³Voyager and Robert Winter improved their hypermedia skills with each product, with the Dvorák and Ragtime packages the most effective in this respect.

a disc icon brings up a full CD control panel. Despite the true non-linear capabilities and complexity of this program, after a short acclimation period the user is never lost. From any card in the package, the user can click on an icon (three choristers) at the upper left of the card to return to the primary listening "track" (German or English text, descriptive commentary, user notes, etc.). It is also easy to change tracks, flip to the Requiem Map or Program Book, or take hypermedia excursions into the background material. The music doesn't falter and each new track picks up in exactly the right place.

FUTURE VISION

Future Vision, a company which produces CD-ROM packages on a number of subjects, includes two music literature-based CD-ROMs in their product line: "Beethoven's 5th: The Multimedia Symphony," and "Tchaikovsky's 1812: The Multimedia Festival Overture." These two packages share many design features, including a striking color interface, beveled buttons, and transparent text fields that let beautifully crafted backgrounds show through. The Main Menu has large buttons for each primary section: biographical information on the composer, a "listening guide," the "structure" of the piece, games, and a control panel for the CD player.

The Biography section is implemented as a time line covering approximately 100 years, with red dots indicating the years in which the composer was born and died and a sliding button that indicates the current year. Above the time line on each card are two fields that contain text and scanned art work or paintings, often in full color. The user traverses the time line by clicking on right and left arrows on either end or by dragging the slider to the desired year. Either action takes the user to the closest chronological entry—some years have no information at all. When more than one topic is to be presented for a given year, the text field is replaced by a short topic menu.

The listening guide (e.g., "Listening to the 5th") consists of two fields. The first is a form table listing the sections of the movement; clicking on a section label produces text in the second field describ-

ing that section of music. The description is pretty low level: ("Here comes the second **theme** . . . a very calm, lyrical and legato melody. What a contrast!"). Above each table are buttons for changing movements. To the right of the text field are four buttons. The first has as its icon the opening motive of Beethoven's Fifth Symphony (the same icon is used for Tchaikovsky). Clicking on this button displays a portion of the score, sometimes in reduction, corresponding to the first few measures of the section. The Play Section button plays the music in the excerpt while each measure is successively highlighted, a Pause button stops the music, and Play All plays the movement beginning with the section selected on the form table. As the music plays, the current section is highlighted on the form table, and the accompanying descriptions appear in the text field. Some of these descriptive comments have a More button in the text field, which stops the music and displays a pop-up field with more detailed but still mostly nontechnical commentary. The descriptive text is often disappointing in content, and awkward syntax hints that the writers or editors are not fully conversant with musical terminology and usage. For example, one "detailed" comment states that "the bridge theme is extended but this time it is not modulated." There are also some unfortunate associations made in hot-text links.⁴⁴ At one point, the authors note: "Tchaikovsky made a slight **harmonic** change, and the last **note** is now played no less than fourteen times instead of the former three." Clicking on the hot text **harmonic** brings up the acoustical definition of harmonics, however, rather than one dealing with harmony.⁴⁵

The Structure section consists of one card with form charts for each movement, similar to the Voyager Pocket Guides, and duplicating exactly the form tables from the listening guide. Clicking on one of the movements transports the user to the corresponding section of the listening guide; thus this section provides a slightly different starting point but does not provide any new information.

⁴⁴The bold words are "hot text." Clicking on these brings up the definition in the Glossary.

⁴⁵There are many similar examples. It seems that someone went through the text and made a link for any word that occurred in the glossary, without checking to see if the definition had anything to do with the context in which the word was used. This could have been generated by a computer program.

Perhaps the strongest section of these packages is "Musical Instruments," which includes for each instrument group (woodwind, brass, strings, percussion) and each individual instrument a color picture, the range, a short "essay," and a QuickTime movie of the instrument or family in performance. Unfortunately, the musical excerpts in the movies are not taken from the piece under consideration. The essays are a strength, however; they often comprise several cards and give considerably more detailed information than the "Musical Instruments" package from Microsoft.

The Glossary contains an alphabetical list of words, each of which is linked to a card with a definition or discussion. The arrow buttons for changing cards are labeled with the next (or previous) term in the Glossary—a nice feature. The user can drag a slider to the desired letter or click on any letter of the alphabet. There are a few glaring errors in the Glossary's contents. For example, in the definition of harmonic we are told: "On stringed instruments, harmonics are relatively high sounds which are produced by lightly touching the strings at definitive points with the bow."⁴⁶ This definition also contains a circular reference: "see also **Harmonic Series**," an entry that merely says "see **harmonic**." Most of the Glossary is identical in the two programs.

The Future Vision packages include three games, which are virtually identical in the two products; each has "novice" and "advanced" levels, and can be set for one or two players. Play the Tune is a glorified "Simon" game played on a beautiful three-dimensional keyboard (white keys only). The program plays a note (the key is depressed), and the user plays the same note by clicking on the key with the mouse. The computer then repeats the first note and adds another, and the user tries to match the sequence, which gets progressively longer until the user fails to match a pitch. Although the exercise is fun and has great visual and aural effects, the sequences—which appear to be random—have no relation to the piece in question. At the novice level there is a different colored dot on

⁴⁶When we printed this entry, a slightly different text was produced: "Harmonics are relatively very high sounds produced in stringed instruments by lightly touching the strings at definite points while using the bow." It may be that some of the errors and awkwardness were produced by an editor rather than by the author of the text.

each key, so the user can use visual cues in addition to (or instead of) aural memory. "Match the Tune" is a glorified version of "Concentration." Here 24 buttons, each with a picture of the composer's face, are arranged in random order on the card. Clicking on each button plays a short clip of a theme from the work under study. When two buttons with the same clip are chosen in succession, the buttons disappear, and the objective is to clear the board. The clips are so short (1-2 seconds) that it is sometimes difficult to tell which ones match. At the novice level, clicking on each button displays a graphic symbol (heart, spade, club, etc.) so again the player can use visual cues rather than aural ones. There is no requirement to identify the themes or the movements from which they are taken. "Tune on Trivia" is essentially a timed multiple-choice game. A question is asked and the user tries to select the correct answer. Questions are all from the supplementary information (Glossary, Biography, and Musical Instruments) and do not deal specifically with the music. The game is fast paced with lots of aural feedback and real-time scoring of points for correct answers. Many of the questions are identical between the two packages.

Both programs are easy to use. Navigation is consistent and intuitive, since each card features the same control bar at the bottom, with buttons for Help, Main Menu, Glossary, Back, and Quit. In each section, Help consists of an animated guided tour. The instructions are given by a recorded human voice, which describes the features of the section while the cursor moves on the screen, clicks on buttons, etc. These programs are visually stunning; each section has a different background, e.g., the composer's face, a portion of a manuscript or hand-written letter, etc., all in pastel colors with occasional details in bright basic colors.

Although our reviewers had mixed opinions of these packages, most felt that the visual aspect was far superior to the content. One student summed up the Beethoven package as follows: "If multimedia for multimedia's sake is okay with you and you are less concerned with the content being presented than the way it looks, this CD just might be for you. Otherwise, grab a good recording of the Fifth and a score and enjoy."⁴⁷ In our opinion, the Beethoven pack-

⁴⁷Allison Weitzman, a student in the 1996 spring semester.

age was stronger than the Tchaikovsky, particularly with respect to the musical analysis, but a fair evaluation of a product such as this must consider its intended use and audience. Another student summarized the Tchaikovsky program as "an 'edutainment' package for the general public, not a tutorial for a course in musicology."⁴⁸ As such, these programs do a decent job of introducing the novice to musical terminology and to the music, although at a very basic level.

Some of our students had technical problems running these packages. There were frequent crashes and problems with video clips, which may have been caused by insufficient memory or improper settings.⁴⁹ Fewer problems were encountered if the students were working on PowerMacs. Finally, this company was the first among those reviewed here to issue versions for Macintosh and IBM computers on the same CD-ROM. Macintosh users can run the Future Vision applications directly from the CD-ROM by clicking on an icon of the composer's face, while IBM users must run an installation program to install the appropriate files on the hard disc.⁵⁰ We suspect this will become more common; the Calliope offering from Robert Winter is also a cross-platform product, and Voyager has now reissued its early products in Windows versions.

⁴⁸Jeff Markarian, student in the 1996 spring semester. We are amused to note that the Future Vision web page does indeed list these products in an "edutainment" category.

⁴⁹Although the directions don't state this explicitly, the operating system control panel for the Monitor should be set to 256 colors. If the colors are set to a higher number, the buttons that highlight measures in the music examples turn black instead of gray, and the music is hidden instead of highlighted. Thanks to Jeff Markarian for finding the solution to this problem.

⁵⁰We did not try to run the IBM version.

Beethoven's 5th, the Multimedia Symphony (Future Vision, 1994)

Pros

Art work and graphics are among the best of the products reviewed; there are many interesting design features. Useful tutorial on orchestral instruments with video clips.

Cons

Weak in content and overall organization; contains numerous factual errors. There is no bibliography, and sources of information are not cited.

Bottom Line

Appropriate for novice or for a music appreciation course, less so for college-level music majors.

Survey of Contents

This package utilizes a recorded performance of Beethoven's Symphony No. 5 by the Zagreb Philharmonic, conducted by Richard Edlinger. Video clips in the Musical Instrument section are of members of the Ra'ananna Symphonette Orchestra. The main menu has six sections: Beethoven's Biography, Listening to the 5th, The 5th's Structure, Musical Instruments, Games, and CD Player. The biography, implemented as a time line, contains information about Beethoven's life, presented in bite-sized chunks—1740: Beethoven's Father; 1746: Beethoven's Mother; 1770: Beethoven's Birth; 1773: Death of Beethoven's Grandfather; 1774: Beethoven's Music Education; and so on. An extra Quote button on many cards displays a pop-up field with a quotation from Beethoven or about him. Most are from Beethoven's letters, but some are by writers about Beethoven.⁵¹ Each card has beautifully scanned art work, often in

⁵¹The exact source or context of the quotations is never given. Most are followed by vague parenthetical references to the source: Letters, Schindler's Biography of Beethoven, etc.

full color, and usually pertinent to the topic. Listening to the 5th provides a clickable form table for each movement and running commentary, at a music appreciation level, synchronized to the music. Often cards contain a second level of detail, available through a More button. Many short examples are given in beautifully rendered music notation, with measure highlighting while the example is played. The 5th's Structure provides a second path into this same section, but with form tables for each movement combined on the same page. "Musical Instruments" is one of the strengths of this CD-ROM, as described in our general discussion of the Future Vision packages.

Evaluation of Contents

This program is probably designed for nonmusicians with an interest in music, and much of the music description is appropriate for that level. College-level music students and music professionals will find some interesting information in the Biographical section, although the level of information and detail is nowhere near that of some of the other programs reviewed here. There is no bibliography, and sources of information and art works are not identified. Although the running commentary in the "Listening" section is at a pretty low level, some of the material accessed through More buttons may be useful to music students. The Musical Instruments section has the strongest content. Although the coverage here is limited to the standard orchestra, this area is treated in more detail than in the Microsoft product. As with the rest of the program, the games emphasize "glitz" over substance and do little to test or develop knowledge or skill. Even the "Concentration" game, the only section that deals with the actual music at all, only requires the user to match snippets of themes. A more meaningful variation could have required the player to put the snippets in order to reconstruct themes, or to identify the source movement. For any audience, the factual errors that occasionally appear are problematic. We even found errors in the game: when asked how many players were required to play a quintet, the program told us that five was the wrong answer: "To play a quintet you need 3 players!"

Design Features

The visual design is superb, and navigation is straightforward due to a consistent interface. We also liked some of the innovative aspects of the interface, e.g., the sliders on the Biography's time line and Glossary's alphabet. The most annoying design feature is the lack of direct access to "detail" cards during playthrough. Accessing these cards through "More" buttons is slow, both entering and leaving the detail layer, and the music stops when this feature is used. A separate pop-up layer that can be viewed continuously while listening to the music, as in the Warner New Media products, would make this information much more accessible. We also would have liked an option for continuous playthrough with the score visible, as in Voyager's Dvorák package. Since so much of the score is already embedded in the program, this would not have been difficult to implement.

Although navigation is easy and intuitive, we found the organization of material awkward. Nowhere at the top level is the form of the piece or individual movements identified by name, for example. The section labels on the form diagrams suggest to the knowledgeable reader (but probably not to the intended audience) that the first movement is in sonata form, yet explicit statement of this fact is buried somewhere in the "More" detailed discussion. Since information at this level can only be reached indirectly through individual links from cards in the Listening section, trying to find or relocate a specific bit of information that is not in the Glossary can be a frustrating experience.

Tchaikovsky's 1812, the Multimedia Overture (Future Vision, 1994)

Pros

Like the Beethoven 5th package, this program is visually stunning. The art work and graphics are outstanding. Excellent tutorial on orchestral instruments is nearly identical to the Beethoven package.

Cons

Weak in content and overall organization; "analysis" consists mostly of inventing and elaborating upon a symphonic poem-type program for the overture. No bibliography, nor are sources of information cited.

Bottom Line

The content, particularly the music analysis, is pretty thin and contains factual errors; probably not useful for music majors except for entertainment.

Survey of Contents

This package utilizes a recording of Tchaikovsky's 1812 Overture by The Sydney Symphony Orchestra, conducted by José Serebrier. Video clips in the Musical Instrument section are of members of the Ra'ananna Symphonette Orchestra. The main menu has six sections: Tchaikovsky's Biography, Listening to the 1812, The 1812's Structure, Musical Instruments, Games, and CD Player. As in the Beethoven package, the biography is implemented as a time line with discussion and artwork—in this case many scanned photographs, including Tchaikovsky's body and death mask. Although Tchaikovsky's final illness is discussed in some detail, there is no mention of the controversy over the circumstances of his death. The quotations that appeared in this section of the Beethoven package are replaced here by short digressions about other historical events in the same year. These are sometimes interesting and help the reader place events in historical context; they are sometimes trivial.

In "Listening to the 1812," it is apparent from the section labels on the form table that the author considers the piece to be at least loosely based on sonata form. The author divides the work into five large sections: Introduction, Exposition, Development, Recapitulation, and Re-Introduction. Under each of these are subheadings. For example, the Introduction is subdivided as follows: Theme I (A Solemn Prayer), Theme II (A Heartbreaking Melody Toward Battle), Development (Theme II), A Vortex of Ideas (Preparation for War), and Theme III (The Russian Army). Similar labels are given for each section.

The commentary in the Listening section consists almost entirely of developing this "program" throughout the overture. "More" buttons simply elaborate the program, as in the following quotation:

One after the other, the French units storm forth in succeeding waves. Little do they know what General Winter has in store for them. They are still full of enthusiasm, confidence, and fighting spirit. The rising waves are executed by the violins and the violas, while the other instruments play fragments from the continuation of the French anthem, leaving little doubt as to the absence of the march that signified the Russian army, the one we have heard in the introduction to the whole overture. Did you notice the entrance of the bass drum and the cymbals at the end of each wave? Do they depict the thundering of cannons?⁵²

As in the Beethoven package, The 1812 Structure duplicates the form charts from the "listening" section and provides a different entry into this section. The Musical Instrument section, Games, and Glossary are virtually identical to those in the Beethoven 5th package.

Evaluation of Contents

The programmatic dimension of the work's structure is not unreasonable, considering the subject, use of Russian and French national themes, etc., but we were unable to find such a detailed and specific program in the literature. Since (as in the Beethoven pack-

⁵²*Tchaikovsky's 1812, the Multimedia Overture* (Future vision, 1994), from the running commentary in "Listening to the 1812" section and "More" commentary for Section 3, part 5.

age) no sources are cited, it is impossible to determine whether the program outlined is the author's invention, Tchaikovsky's intent, or another scholar's analysis. The emphasis on extramusical events results in a shallow "analysis" at best. Though sequences, motives, and the like are indicated on the music examples, there is no mention of keys, and tonal relationships are ignored entirely. The author asserts that this movement is based on sonata form, but there is no discussion of how the work relates to that form in terms of tonal areas, presentation or recapitulation of material, or development of ideas.⁵³

Design Features

The design is virtually identical to that of the Beethoven 5th; see the general discussion of Future Vision products for further detail.

MISCELLANEOUS PUBLISHERS

Two CD-ROMs fall into our miscellaneous category, since they are not part of a series produced by a single company but are instead individual efforts: Microsoft's "Musical Instruments" and Robert Winter's "Crazy for Ragtime." The latter promises to be the first of a series produced by a new company, Calliope Media, Robert Winter's new affiliation after leaving Voyager.⁵⁴ These programs have color interfaces with striking visual design features. While they seem expressly designed for the home rather than the educational market, both contain information appropriate to a university setting, particularly for schools with ethnomusicological or popular music course offerings.

⁵³Compare this to the treatment of form in the *Voyager Strauss: Three Tone Poems* package discussed elsewhere in this review.

⁵⁴A check of Calliope's web page reveals two music packages currently in production, featuring famous performing artists: "Itzhak Perlman Interactive Tchaikovsky" and "Domingo." Other offerings by this company focus on the visual arts.

***Musical Instruments* (Microsoft Corporation, 1993)**

Pros

Encyclopedic coverage of instruments from many cultures in a user-friendly and attractive format, including not only pictures but lengthy sound files of stylistically appropriate music for each instrument.

Cons

No mechanism for testing user's comprehension or mastery of content; no videos of instruments in performance.

Bottom Line

Appealing and useful for all age levels in university or home setting.⁵⁵

Survey of Contents

The Contents card offers users four choices: Families of Instruments, Musical Ensembles, Instruments of the World, and A-Z of Instruments. The families of instruments are divided as one might expect: brass, strings, woodwind, keyboards, and percussion. Musical Ensembles explores ensembles of the Western classical tradition, as well as popular and non-Western groups: orchestras, wind bands, jazz bands, steel bands, gamelans, chamber groups, and rock bands. Each of these groups is further divided into types. For example, the Orchestras card contains buttons for the Baroque, Classical, Nineteenth-, and Twentieth-century orchestras. Even more surprising is the level of detail for the popular media: Rock Bands are divided into Rock 'n' Roll, Heavy Metal, Soft Rock, and Pop

⁵⁵One of the reviewers (Marvin) took this package home for her children (ages 4 and 7) to try; they were entranced and engaged for many hours and were spouting information about instruments for days afterwards.

Band; while Jazz Bands are divided into Small Jazz Band, Dixieland, Jazz-Rock Fusion, and Big Band. The level of hypermedia embedding is also impressive: under Gamelan, the user may choose Javanese or Balinese; a picture of the ensembles' instruments appears, along with explanatory text and an extended sound file of each type of ensemble in performance. Clicking on individual instruments of the ensemble provides a close-up and more detailed information, with a sound clip of that instrument playing an idiomatic excerpt in solo. Beneath the individual pictures are icons, entitled: Types (cross-cultural links to other instruments within that "family"—so that French horn, Wagner tuba, shofar, and rkang-gling all appear together), Facts (such as size, range, origins), and See Also (links to instruments related by membership in the same ensemble). This layout for individual instrument cards is consistent throughout the stack, with the exception that some of the more common Western instruments are treated in more detail, including labels for all of the instrument's parts (some in red hot text which, when clicked, reveals close-up photos and additional information), a View icon (which provides photographs taken from other perspectives), and a Sound Box icon (which gives the range of the instrument, possible special effects like muting, and additional sound clips). At the top of each instrument card beside its name is another sound icon: this one invokes a human voice which pronounces the name of the instrument (handy for those non-Western instruments!).

Clicking on Instruments of the World transports the user to a map of the world with clickable continents. Choose a continent and a close-up of that geographical area appears along with small color pictures of the folk instruments indigenous to that area; next to each instrument is a small speaker icon, which plays an abbreviated clip of the instrument when clicked. Clicking on a picture takes the user to that instrument's information card, as described above. A-Z of Instruments is an alphabetical listing—from Accordion to Zurna—beautifully displayed with instrument pictures and sound icons arranged in columns beneath large alphabet letters. Choosing an instrument from this array has the same result as choosing from the world map, though this listing is more complete; it contains both folk and "Classical" instruments.

Evaluation of Contents

The material is excellent, with the small reservation that this is a browse-only stack; there is no vehicle for student input. A concluding quiz—possibly in gamelike format—would make this stack much more useful in an educational setting. Videos of the instruments in performance would also add to the CD-ROM's educational value. Incidentally, none of our reviewers (many of whom were performers) found any factual errors in the information given for their own instruments. Though we cannot vouch for the accuracy of the information on non-Western instruments, we suspect that these were as thoroughly researched as the Western instruments.

Design Features

This package features easy and intuitive navigation; users may either click on instruments or hot text, or they may use the navigation bar that appears at the top of each screen. This bar contains buttons for Contents, Index, Back, Next, and Random (all of which are self-explanatory except the last, which moves the user randomly from card to card). Choosing "About Musical Instruments" from the Macintosh Apple menu provides extensive documentation regarding the compositions played and the recordings from which they are drawn; individual performers or ensembles are generally not credited, however. Sources of the images are also identified.

Robert Winter's *Crazy for Ragtime* (Calliope Media, 1996)

Pros

Impressive repository of primary sources (articles, sheet music covers, film clips) within a beautifully designed full-screen color interface; a fascinating historical and sociological window into the ragtime era.

Cons

Of limited usefulness in the music theory classroom; requires a powerful computer with plentiful memory and disk space.

Bottom Line

Buy this package for musicology or popular music courses, or take it home to enjoy with the family.

Survey of Contents

"Crazy for Ragtime" is a very impressive package. Like the Future Vision products, this CD-ROM has a beautiful color interface—with transparent fields so that background graphics subtly show through—many color videos of the author and performers speaking and playing, and full-screen music notation of complete compositions with moving highlights as pieces are played. Robert Winter's previous multimedia experience and musicological training elevate this product far above Future Vision's two packages, however.⁵⁶ Winter's training as a scholar is clearly evident in this CD-ROM's emphasis on primary sources: silent film footage of authentic ragtime dance performances from the Library of Congress, color scanned images of some 200 sheet music covers, an annotated bibliography of current ragtime research, archival sound clips, and the full text of (and complete citations for) 248 articles on ragtime

⁵⁶Robert Winter is listed as President of Calliope, which represents a break from his previous association with the Voyager Company; much of Winter's design team seems to have come to Calliope with him as well.

and related subjects from the first two decades of this century. Winter has found an authentic voice here that is free from the flowery prose and music appreciation-type vagueness found in some of his *Voyager* offerings. The Glossary entries, for example, read like true dictionary definitions.

The primary table of contents contains the following sections: A Word from Robert, The Ragtime Craze, A Ragtime Sampler, Listening to Ragtime, Let Me Perform!, Make Your Own Rag, Reference Room, and Credits. The Ragtime Craze and Listening to Ragtime sections use roughly the same lecture format. Each begins with a video clip of Robert Winter delivering an entertaining and informative talk on the topic in question, then moves to scanned images appropriate to the topic, which change in synchronization with his spoken narrative. Users have the option of reading the narrative in a text field while listening, or of turning off the audio track to read silently. One advantage of the reading option is that these fields are filled with hot-text links to the Glossary for further edification. Unfortunately, Winter's narration is the only audio choice given the user; so listening to ragtime compositions while reading is not an option. A CD controller would be a welcome addition to the product.

Choosing to listen to the narration straight through the Ragtime Craze results in a continuous 54-minute presentation, with a mixture of Winter's lectures on video and images from primary sources. Subsections give a history of the various ragtime traditions and biographies of some of the primary figures, including Minstrels and Cakewalkers, Coon Songs and Piano Men, Stark Contrasts: Classic Ragtime, Adaline, Julia, and May (female ragtime composers), Animal Dancing, Tin Pan Alley, and Usurped by "Jass." We found some of this history to be fascinating—particularly the incipient racism present in the Coon Songs, the discussion of women's suffrage and how the Victorian climate impacted female composers, and the biographical information on composers like Irving Berlin. Winter tells a great story.

Listening to Ragtime, in a format nearly identical to the Ragtime Craze, contains subsections articulated as questions: What is Ragtime, Anyway? Don't All Rags Sound Alike? How Fast Should Ragtime be Played? Do Ragtimes Have Tunes? Can I Learn Rag-

time Harmony? How are Ragtimes Put Together? This section contains virtually the only music-theoretical information in the CD-ROM. Of particular interest is the "What is..." section, which defines duple and quadruple meters and explains some basic formal units like the "curtain" introductions and 16-bar "strains," with examples from various marches and ragtimes. The "How Fast..." section defines concepts relating to tempo and performance practice, and includes fascinating sound files from the Library of Congress of Jelly Roll Morton playing Joplin's "Maple Leaf Rag" in a fast "St. Louis style" and a slower, bluesy "New Orleans style." The Ragtime Harmony section, evaluated below, is the primary music-theoretical resource.

The Ragtime Sampler is the primary music-listening section, containing 54 piano rags and nine ragtime songs played by Winter himself and sung by soprano Dale Franzen and baritone Nmon Ford-Livene. All the selections are accompanied by orange and brown dots: orange dots signify a digital audio performance, brown ones denote an additional synthesized piano version. These synthesizer versions allow the user to change the tempo in real time, and (in another section) to transpose and string together excerpts from various compositions to "make your own rag." Users may play the rags from this title card by clicking on a dot, or may click instead on a title to learn more about the rag. This latter choice brings up a card with historical information and links to the Cover Gallery and Composer Gallery, as well as two types of listening opportunities with moving highlights: Play the Notation (a full-screen score that highlights one measure at a time) or Form (a pictorial form diagram that highlights each 8- or 16-bar unit as it is heard).

The final three sections of the CD-ROM address performance, composition, and research on ragtime. Let Me Perform addresses three performance venues: playing piano rags, dancing to rags, and singing rags. In the first of these, Winter coaches performers on issues of rehearsal technique and performance practice with video clips of himself at the piano in six miniature master classes entitled: Ragtime is Hard, Separate the Hands, Use a Metronome, Lose the Pedal, Take Appropriate Freedoms, and Perform a Drama. While these tips may seem self-evident to the seasoned performer, these units contain valuable lessons to the amateur or beginning per-

former, and Winter conveys them convincingly. The second, on ragtime dancing, contains Library of Congress footage of authentic ragtime performances with explanatory text (all for silent reading and viewing—again, there is no CD controller for listening here). The third, on ragtime singing, offers short videos of the two singers featured on the CD, describing their experiences performing this music and seeking convincing interpretations. The composition section, described more fully below, takes the place of a game (which was standard fare in Winter's Voyager packages).

Finally, the Reference Room offers users a wealth of resources—pictures, text files, and video clips—for browsing. Organized into six sections (Composer Gallery, Picture Browser, Cover Gallery, Movie Arcade, Direct Testimony, and More Reading), this section provides hours worth of fascinating reading and viewing. All but the last subsection are comprised of original sources gleaned from library and private collections (a clear demonstration for students of the difference between primary and secondary sources for research purposes). The sheer number of resources stored here is impressive: 138 pictures, 200 sheet music covers, and 248 articles dating roughly from 1900 to 1920. Of particular interest is the section entitled Direct Testimony; the titles of these articles alone are revealing: "War on Rag-Time," "'Coon Songs' on the Wane," "Rag-Time Hurts Classics," "Paderewski Can Play Ragtime," "Harmless Sexuality of Syncopated Music," etc. To his credit, Winter has not simply listed the titles; complete texts are given in lengthy files for most of these essays. More Reading is an annotated bibliography of secondary sources organized by topic.

Evaluation of Contents

Of particular interest to teachers of music theory who wish to incorporate some popular music into their curriculum is the harmony subsection of Listening to Ragtime. Without talking down to his readers, Winter succinctly explains the use of Roman numerals for diatonic triads, and illustrates I, IV, and V through ragtime excerpts with Roman numeral analytical charts that highlight the appropriate harmony in synchronization with the music. This tutorial continues with generally accurate definitions of secondary dominants, augmented sixth chords, bVI chords, and fully-diminished

sevenths. The musical excerpts that illustrate these are well-chosen "ear training" examples, though the analytical symbols sometimes leave something to be desired (e.g., IV^{6#} for the augmented sixth chord). Ear training of various formal designs may be accomplished with some of these rags (including strophic song forms, binary forms, marches with trio, etc.) by using the form diagrams in the Ragtime Sampler. A few features mar this section, however: the absence of harmonic information in the form diagrams, the fact that users cannot move between the two listening venues (the form diagram and score notation) without starting the piece over from the beginning, and the fact that the design prohibits users from listening while reading explanatory material.

The Make Your Own Rag section is a wonderful tool for teachers who appreciate the value of model composition for teaching music-theoretical concepts. In this section, users choose a type of rag and the corresponding formal scheme appears on the screen (e.g., "curtain, vamp, A-strain," etc.). Next, users choose among any of the authentic rags for which the CD has MIDI files, and a formal diagram of that rag appears. By choosing formal sections from a succession of rags, users can piece together their own compositions (e.g., the curtain from "Alexander's Ragtime Ball," the A-strain from the "American Beauty Rag," the B-strain from "Heliotrope Bouquet," etc.). This hands-on exercise reinforces various concepts regarding form, phrase structure, and variation. The next step reinforces harmonic concepts: the user must now transpose the various borrowed sections (with the click of a button) to a unified tempo and key; students who have learned the harmonic lessons of this CD-ROM will remember to transpose the trio to the subdominant.

On the whole, this package has too little music-theoretical content to recommend it to theory teachers, but that conclusion is not intended to denigrate the product. Indeed, its seamless blending of historical, sociological, biographical, musical, and artistic information is a real cross-disciplinary multimedia achievement—one can envision wonderful uses for such a product in a liberal arts course on cultural history or in any number of cross-disciplinary courses spanning this historical period.

Design Features

This is a beautifully designed CD-ROM with impressive navigational features. Upon opening, viewers are treated to a full-color map of the United States. As ragtime strains are heard, a Maple Leaf moves to the center and expands into a viewing screen on which a black-and-white cakewalk movie begins to play, while colorful sheet music covers appear and disappear upon it. Users may continue to watch this animation for the full duration of the rag, or may click to move on. Clicking produces a number of pulsating dots on the map, which mark important cities in the history of ragtime development; simultaneously, the main menu items appear along the bottom edges of the map. Users may click on menu items to begin exploring the CD-ROM or they may move the mouse over the city dots; pop-up fields identify the cities at their map location, which then move center screen and expand to reveal the cover of a rag written or published in that particular city, along with supplementary information and a sound clip drawn from the rag. This opening screen sets the stage for a product that is visually stunning throughout.

This product's beauty, comprehensive topic coverage, and hypermedia capabilities come at a price, however. The CD-ROM requires a powerful Macintosh, and the documentation gives a number of trouble-shooting tips for getting the video or sound to work.⁵⁷ Like the Future Vision products, "Crazy for Ragtime" is a cross-platform product that also runs on Windows for IBM. This is not a HyperCard program, incidentally, but runs in an application called ScriptX; the installer puts a copy of ScriptX Player on the user's hard disk.

⁵⁷The product requires a 68040 processor or faster, 8 MB available RAM (12 MB installed), a 256-color display and System 7 or higher; the required RAM is even higher for a PowerMac (16 MB installed). The trouble-shooting tips came in handy during the review process, when at seemingly random times the audio narrations would suddenly cease working so as to result in movies with no audio track sounding, while musical excerpts from the rags played perfectly. At other times, the narrations would work, but the rags wouldn't play. Sometimes quitting the program and restarting the machine was all that was needed to solve the problem.

Finally, the navigation tools in this package are just as impressive as its visual design. A control strip that can be retracted out of the user's way appears along the top of the screen, and contains the following elements: Quit, Contents, Find, Glossary, Retrace, a "back" arrow, and "?". Some of these features are familiar from the Voyager products, but some are remarkably improved. The Find button, for example, asks the user to specify which portion(s) of the stack to search, rather than limiting its search to the section from which it is called. The Glossary is implemented as pop-up fields, with dictionary-like definitions that contain hot-text links in two colors: green links transport users to other Glossary items and red links play related sound file examples. The question mark button calls pop-up fields appropriate to the current section. These help screens give detailed instructions for navigating and using the particular section in question. Within certain sections of the CD-ROM, users are also given a Sort function. In the Cover Gallery, for example, icons for each cover are initially listed in alphabetical order, but users may resort by date, composer, city, publisher, or subject. In sum, this is a polished package, the product of many years of multimedia experience by Robert Winter and his design team. We encourage Calliope to continue seeking subjects that will attract buyers in the home market, but also to develop those subjects in ways that will have more relevance for the music theory classroom and the educational market.

MULTIMEDIA DEVELOPMENT: PAST, PRESENT, FUTURE

Someone once said, "If you don't know where you are going, you'll probably end up somewhere else." We undertook this review, in part, to understand where we have been, where we are now, and where we are going in multimedia development. Table 4 summarizes this progression as a timeline. Reflection upon the offerings listed leads us to project some trends. There was a two-year period between the introduction of HyperCard and the first Voyager CD-ROM release; this must have been a period of intense development at both Voyager Company and Warner New Media. The timeline

shows at least one classical music release each year between 1989 and 1992. The only release in 1993 was Microsoft's "Musical Instruments," which is not music literature-based. We found no new releases in 1995; however, 1996 saw the publication of CD-ROM "companions" to two music anthologies: *The Norton CD-ROM Masterworks* (see Gary Wittlich's review elsewhere in this issue), and Rebecca Kaufman's *Maestro 2.0*, which accompanies Roger Kamien's *Music: An Appreciation*.⁵⁸ The future looks promising.

Almost all of the new releases from 1993 to the present are in color and include color pictures and QuickTime movies; the single exception is the Voyager Dvorák package. The Read Me button on the Dvorák opening card contains what amounts to a farewell to the black-and-white HyperCard interface that Winter has used to such good effect in his Voyager products. After outlining some of the innovations in computer hardware over the last half-decade, Winter summarizes:

If the past is any guide, these technological advances will continue, perhaps at an even more dazzling pace. And if the past is any guide, multimedia producers will rush to implement these bells and whistles into their programs. When you can bump the retail price up twenty bucks for packaging that says "Includes QuickTime Movies," it is hard to argue with the logic.

While Peter [Bogdanoff] and I are looking forward to color, to video, and to the big screen, I must confess that we feel downright nostalgic about our farewell to 9-inch one-bit. Like the pencil sketch or the charcoal drawing, this is a medium with its own subtle beauties.⁵⁹

Another trend is toward multi-platform products. In the beginning, Apple was way ahead in providing multimedia capabilities in its computers, but all of the recent releases are available for both

⁵⁸The *Norton CD-ROM Masterworks* by Daniel Jacobson and Timothy Koozin (New York: W.W. Norton, 1996) includes twelve pieces from the repertory of *The Norton Scores* and Joseph Machlis's *The Enjoyment of Music*. Rebecca Kaufman's *Maestro 2.0* (New York: McGraw-Hill, 1996) contains a tutorial on music fundamentals, as well as a listening guide to over 40 compositions discussed in Roger Kamien's *Music: An Appreciation* (New York: McGraw-Hill, 1996).

⁵⁹Robert Winter, from the Dvorák package, Read Me, cards 3 and 26-27. Peter Bogdanoff was Winter's collaborator on all the Voyager products, as graphic and interface designer, as well as programmer. He has remained with Winter in the move to Calliope.

Table 4. A music CD-ROM timeline

1987 1988 1989 1990 1991 1992 1993 1994 1995 1996 1997 1998

- HyperCard Introduced (Apple)
 - Beethoven Symphony No. 9 (Voyager)
 - Mozart "Magic Flute" (Warner)
 - Beethoven Quartet No. 14 (Warner)
 - Mozart "Dissonant" Quartet (Voyager)
 - Schubert "Trout" Quintet (Voyager)
 - Brahms Requiem (Warner)
 - Stravinsky "Rite" (Voyager)
 - Strauss Tone Poems (Voyager)
 - Musical Instruments (Microsoft)
 - Dvorák "New World" (Voyager)
 - Beethoven 5th (Future Vision)
 - Tchaikovsky 1812 (Future Vision)
 - Ragtime (Calliope)
 - Masterworks (Norton)
 - Maestro (McGraw)
 - La Bohème (EMI)

????

Macintosh and IBM platforms. This is not surprising, since the multimedia potential of the latter has been catching up, and this is a much larger market.

What has become of the pioneers in the field? A brief search of the World Wide Web yielded both bad and good news. At this writing, despite numerous web searches and telephone calls, we have been unable to determine whether Warner is still in the classical CD-ROM business. It is disappointing that we have seen nothing from this company since 1990, despite an extensive list of projected titles in their initial publicity literature and the excellent content of their initial offerings.⁶⁰ There are two possible reasons for this. First,

⁶⁰An insert in the Magic Flute package states: "This full-range program will cover, at first, the core music works important in surveying the fundamentals of 'what do I listen for' in music." The projected titles for the initial series included, in addition to the three titles reviewed here, Bach: *The Art of the Fugue*; Berlioz: *Symphonie fantastique*; Stravinsky: *The Rite of Spring*; Mozart: *Symphony No. 40 in G Minor*; Tchaikovsky: *The Nutcracker*; Britten: *Young Person's Guide to the Orchestra*; Vivaldi: *The Four Seasons*; Rachmaninoff: *Second Piano Concerto*; and Schoenberg: *Pierrot*

the market for this type of product can't compare with the potential for popular music releases in our culture. Second, at the turn of the decade, when initial development was taking place, few computers were routinely equipped with the requisite CD-ROM players, which may have affected sales adversely. A recent PBS radio piece on the plight of CD-ROM development companies stated that the market is not as large as expected, users demand polished, "glitzy" products at low cost, and commercial development of high-quality packages is expensive (estimated in the quarter-million-dollar range). The conclusion was that only large well-established companies could afford to stay in the business. Certainly Warner falls into this category, and we hope they will return to center stage, since their products were among the best we reviewed. We are pleased to report that Voyager is still producing "classical" CD-ROM packages. They have introduced versions of their earlier products in the IBM (Windows) format and new packages are promised as well.⁶¹

It appears that the Dvorák package was Robert Winter's "swan song" with the Voyager Company, though he never states this explicitly in any product materials. His last package for Voyager, in 1994, predates his Calliope "Crazy for Ragtime" by two years. Calliope has a number of CD-ROMs in the fine arts available and under development. At this writing, "Itzhak Perlman: Interactive Tchaikovsky" (on the violin concerto) is under development, and "Domingo," a CD-ROM package featuring the famous tenor, is projected for joint publication by Calliope and EMI Classics in 1997.⁶²

Lunaire. They also state that "the initial Warner Audio Notes series will supplement this repertoire with compilations of works covering subjects from plainchant to pop."

⁶¹Voyager's new products (either released or imminent) include a survey of music literature in the "So I've Heard" series, cited previously, and Morton Subotnick's "All My Hummingbirds Have Alibis." Their online catalog also includes a number of pop music and children's music packages.

⁶²According to their web site, EMI Classics has a new multimedia division, which contains one Mac/IBM cross-platform "enhanced CD" thus far: on Puccini's *La Bohème*. An enhanced CD can be played like a regular audio CD but contains extra tracks for multimedia material, which can be read by a computer with a CD-ROM drive and software.

Apple Computer's HyperCard continues to evolve, both in its native capabilities and through external command packages developed by other companies. Though it is still a useful development tool, it is no longer the only player in town. Competing products such as Macromedia Director (available for both Macintosh and IBM platforms) and Multimedia ToolBook for IBM are viable and powerful alternatives, and other multimedia development tools continue to be introduced. As both hardware and software evolve, more advanced features such as color, video, three-dimensional graphics, and sophisticated animations will become routine in multimedia productions.

The capabilities of the World Wide Web continue to evolve as well, with the introduction of high-level development tools such as those provided by Java. In the future, multimedia development efforts may be ported to the Web, obviating the distinctions between different types of hardware, but at this time the bandwidth necessary for real-time transmission of high-quality audio and video is not available.⁶³

We hope that the trend toward glitzier products will enhance rather than replace the attention to detail and content in the early releases. We would encourage any product development team to include a music theorist as well as a musicologist. A theorist's input would broaden the product's audience even further among the musically literate, and would open up its market to the theory classroom (in their present form, most CD-ROM packages seem aimed toward music appreciation and music history content). Theory teachers could use more emphasis on harmony and harmonic concepts—both in the analyses and in supplementary "tutorial" sections—and more detail and sophistication in the discussion. A theorist would help sort through the occasional errors in analysis and terminology that tend to creep into these products as well.

We predict an increase in the use of multimedia development tools for in-house development of ad hoc teaching applications by theorists and musicologists. Some faculty members are already us-

⁶³Voyager Company has released CDLink, a product that makes it possible to control CD-ROMs over the Web, but each user must have the requisite hardware and the specific CD for any given application.

ing these tools, and their use will increase as students, such as those in our current multimedia development class, become faculty colleagues. Many of our students' final projects are just as polished as some of the commercial products we have reviewed here, and the level of musical discourse is often higher. Although they are working in HyperCard at the present time, the techniques and concepts learned will serve them well in any multimedia development environment. Of course, a prerequisite for developing in-house applications for teaching is the availability of classrooms equipped for multimedia presentation. Fortunately, these are beginning to appear more commonly on college campuses.⁶⁴

Although many of the packages reviewed here were designed for the mass market, the best of them are superb supplementary material for theory, musicology, and music literature courses. Encourage your libraries and computer labs to purchase them, and if you find them valuable, spread the word to your colleagues, recommend them to your students, let the publishers know your needs, and request that valuable older releases be maintained in current catalogs.

⁶⁴We currently have one such facility at the Eastman School of Music, and others are being planned.