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ABSTRACT
        This manual provides general information and
guidelines for developing hypermedia instructional materials.
Introductory material explains what hypermedia is, the structure of
hypermedia, and hypermedia in computer assisted instruction. A study
using hypermedia to supplement basal readers at the elementary level
is briefly reported and possibilities for using hypermedia in content
area subjects are noted. The manual then goes on to provide specific
instruction for using HyperCard on a Macintosh computer to create a
simple hypermedia template and subsequent hypermedia lessons.
Instructions include screen illustrations. Specific steps for
creating a hypertext document template are then provided followed by
directions for preparing hypertext document lessons. The last section
gives detailed instructions on how to develop hypermedia lessons
using a specific template. The manual concludes with a comparison of
HyperCard 1.2 versus HyperCard 2.0, a glossary, and a list of
publishers of hypermedia software. (Contains 17 references.) (DB)

Hypermedia in the Classroom:
A Development Handbook
For Teachers

The Dragon
in the ClockBox
by M. Jean Craig   Part 1
a story from your book
Magic Times

STOP   7 ▦ Pages   Title   √

Written and Prepared By
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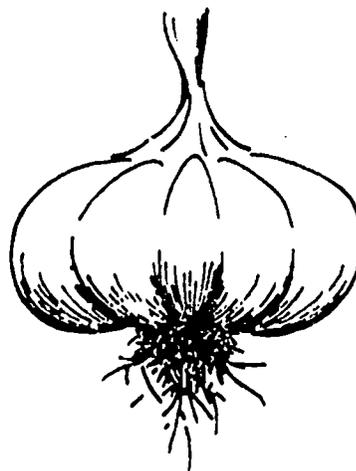
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Introduction

Hypertext and *hypermedia* are relatively new terms for today's computer using educators although the basic concept of non-sequential, computer-based text first was envisioned more than 40 years ago (Bush, 1945). Since this capability for microcomputers became widely available in 1986, interest in hypermedia has been growing rapidly throughout the educational community. This recent interest has resulted in a rapid increase in the number of magazine and journal articles, papers and presentations at educational conferences, and hypermedia educational software programs available for classroom use. Hypermedia as an educational tool is very different from traditional computer assisted instructional software, offering a new format for providing instruction and information via a computer.

The format of a traditional textbook leads the reader through a page-by-page progression from the beginning to the end. Additional information or clarification must be obtained from supplementary reference sources (e.g., a dictionary, thesaurus, encyclopedia, or another person). Hypermedia, on the other hand, provides immediate access through its computer format to supplemental information that the reader wants or needs without the interruption of seeking additional help outside of the immediate reading environment. A hypermedia textbook might include extra information in the form of additional text, computer generated speech, graphic representations, animated sequences, or combinations of text, speech, and graphics. Video segments may also be incorporated into hypermedia through videotape and laserdisc technology. This presentation system provides a reader an individualized way of accessing information, based on the person's needs or interests.

A hypermedia page might be thought of as a composite of several sheets of transparent film overlaying one another, each sheet containing its own unique information. The top layer sheet in the hypermedia page provides the initial information to be viewed and also serves as a menu for accessing information available on the underlying pages. The secondary text or graphics from the underlying pages is viewed by the reader in special windows that appear either alongside or overlaying the original page. From a secondary page or window the reader has the option to return to the original screen without the window, or further pursue new information in additional windows. These enhancements are typically accessed through the use of a mouse. The mouse controls cursor movement and selection of computer functions without the need for a keyboard. Selecting a word, for example, could give a choice of the word's definition or pronunciation, or provide a picture associated with the word. Further selections on the second

> In a traditional textbook, a reader progresses page-by-page from beginning to end.

> A hypermedia page can be thought of as several sheets of transparent film overlaying one another.

First layer

> Most insects are solitary creatures but there are some that have developed societies. Of special interest are the honeybees . A single beehive may contain many thousand bees.
>   The hive is constructed of honeycomb which is made up of tiny hexagonal cells. These cells hold the hon

Page 3

Overlay graphic for second layer

layer pages or on any subsequent layer could take the reader to additional areas of information

The layered property of hypermedia can be used to provide readers with supplementary and supporting information in the form of text and/or graphics. In addition, hypermedia has other capabilities 'hat can be used for enhancing text: (a) a network of associative links in which related topics throughout the document are linked via buttons, (b) a note-taking function for compiling information from different areas of the document into one personalized file, (c) a tracking system providing students with the ability to backtrack through a document or locate pages previously read, and (d) a dynamic indexing system for accessing information not already linked to the page being read. The idea of hypertext as described by Nelson (1974, 1978, 1981) included different types of hypertext forms, from simple links between chunks of related text, to a more loosely structured text navigation system connected to a vast knowledge library including all pertinent information about a subject.

Exploration of hypermedia can be left entirely to the reader or be controlled in varying degrees by a presentation sequence programmed into the hypermedia document itself. Readers of hypermedia, then, have the option to browse through reading material in a totally open-ended manner corresponding to their interests and needs, or to use the guided exploration.

Hypertext/hypermedia, as it evolves, may take on many different forms. Some may prove more effective for particular types of reading material or instructional purposes. A form that is good for recreational or informational reading might not work well as a tutorial or as reference material. With new products described as hypermedia beginning to appear in the educational marketplace it is necessary for classroom teachers and other educators to become familiar

The layers of hypermedia can be used to provide readers with supplementary and supporting information.

with this new instructional mode in computer assisted learning.

Thinking in Hypermedia

Hypermedia instructional materials are very different from traditional computer assisted instructional software, providing a new format that is concurrently a tool, a tutee, and a tutor (Taylor, 1980). First, hypermedia materials can serve as a tool by facilitating the collection and presentation of information that might otherwise require a time-consuming search of multiple sources. Word definitions and spoken pronunciations for new vocabulary along with pictures, animated graphics, or video clips that illustrate processes or concepts being introduced or reviewed can be delivered through the hypermedia format providing students with new experiences related to the topic being studied.

Hypermedia instructional materials act as a tutee by allowing learner control over the paths they follow and the knowledge structures they create while searching for information. Although they may be designed with a guiding structure built in, students still can be given many choices for accessing the information. Students can have control over (a) the order of presentation of information, (b) the number of times information is accessed, and (c) the particular medium through which the information is displayed (e.g., a text definition or description, a graphic representation, a video clip, or digitized sound or voice).

Finally, hypermedia instructional materials can assist students as a tutor by providing instructional strategies to foster reading comprehension and improve study skills. Adding enhancements that simplify or help students understand the syntactic and semantic structures of a text can be included in a hypermedia document along with more traditional comprehension and self-monitoring strategies. Features such as a graphic depiction of the spatial and contextual relationships of pronouns and anaphora to their referent words give students a clearer understanding of text structures that otherwise might be confusing (Higgins & Boone, 1990). Questions inserted in the text, paragraph or page summaries, and pre-reading guides are easily incorporated into hypermedia materials. The scope and complexity of these strateg.es are limited only by the capabilities of the computer/authoring system combination being used and by the imagination and skill of the developer.

Hypermedia Computer Assisted Instruction

Consideration of hypermedia as a new mode for computer assisted instructional (CAI) material can provide a useful point of departure for looking closely at the possibilities for hypermedia in education. While a hypermedia equivalent of a high school content area textbook or an elementary basal reader will include very different types

Hypermedia materials provide an instructional format that is concurrently a tool, a tutee, and a tutor.

The scope and complexity of hypermedia materials are limited only by the capabilities of the computer, authoring system, and by the imagination and skills of the developer.

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of help and information, the same hypermedia conventions may be used in both. The look and feel of all hypermedia materials can be kept very similar while the purpose or instructional objectives vary widely. This uniformity of design provides students with a familiar context for learning both across the curriculum and regardless of age or ability level.

> Hypermedia CAI based on basal readers or content area texts can provide a new vehicle for interactive learning.

Students wrestle with textbooks every day; not just in and out of lockers, but with unlocking the meaning hidden within the syntax and semantics of the printed page. In elementary school, these books are most often basal readers, books with a common pedagogy and scope and sequence of skills for learning to read. After elementary school, the common textbook is the content area text (e.g., science, social studies, history). Hypermedia CAI based on basal readers or content area texts can provide a new vehicle for interactive reading instruction offering different levels of text enhancement.

Elementary Basal Readers

A research project recently completed at the University of Washington involved the development and testing of hypermedia reading materials based on an elementary basal reader series. Over the three years of the project the lessons covered three levels of instructional features: (a) level one, text with enhanced surface structures; (b) level two, text with enhanced syntactic and semantic structures, and (c) level three, text with built in comprehension strategies.

Enhanced surface structures.
Many students either do not have the experiential background that is necessary for understanding what they read, or do not access the information they do possess for successful comprehension. In a hypertext document, related pictures, animated graphic sequences, simple definitions, synonyms, and computer generated speech, are included to supplement the student's existing knowledge. These enhancements provide a poor reader with the additional information needed for better comprehension.

Most insects are so[...] there are some that h[...] societies. Of special i[...] honeybees . A singl[...] contain many thousan[...]

hexagonal:

—having six (6) sides.
A hexagon.

The hive is constructed of honeycomb which is made up of tiny hexagonal cells. These cells hold the honey.

Page 3

Enhanced syntactic and semantic structures.
Enhancements at this level of hypermedia include strategies for decoding unknown words and for understanding the relationships between words and phrases in the text. The use of phonics, structural analysis, and context clues provides immediate help for decoding words unfamiliar in print to the reader. The tutorial sequence illustrates the connection of a pronoun to its referent in the text. This type of graphic representation shows the relationship of words and phrases in

a reading passage.

This level of hypermedia CAI provides an educational scaffold made up of strategies for understanding and decoding text. This scaffold may become less necessary as an external intervention in the student's reading process, and become a more internalized, automatic function. The hypermedia reading lesson provides as much or as little external intervention as the individual needs.

Most insects are solitary creatures but there are some that have develop societies. Of special interest are the **honeybees** . A single beehive may contain many thousand of them.

The hive is constructed of honeycomb which is made up of tiny hexagonal cells. These cells hold the honey.

◄ Page 3 ►

Enhanced comprehension structures. This level emphasizes leading the reader through one or more process strategies for improving comprehension. The scaffold concept applies at this level as well. Such techniques include literal and inferential questions, paragraph summaries, main idea matching, or re-reading for specific detail, all strategies similar to those used in a teacher-directed reading activity. The hypermedia lesson presents the same instructional strategies as a teacher directed lesson, with appropriate interaction and reinforcement.

Most insects are solitary creatures but there are some that have develop societies. Of special interest are the **honeybees** . A single beehive may contain many thousand of them.

The hive is constructed of honeycomb which is made up of tiny hexagonal cells. These cells hold the honey.

How do bees use honeycomb?

Hypermedia in a Content Area

Content area textbooks such as science, history, and government are prime candidates for adaptation to a hypermedia instructional format. The large quantity of reference information available in these disciplines limits the scope of a general textbook for the sake of readability. The multiple layers of a hypermedia medium provide space for volumes of additional information while retaining an easy-to-read general format for the text.

Also available are features simply not possible in traditional print on paper. A hypermedia American history lesson, for example, might include an actual recitation of the Gettysburg Address while showing a series of pictures surrounding the event. A geography lesson could take the format of a spatially oriented data base in which a map of the United States would reveal information about each state through cursor selection on the state itself. This could be replicated to countries and cities, providing information pertinent to each level (e.g., country, state, county, city).
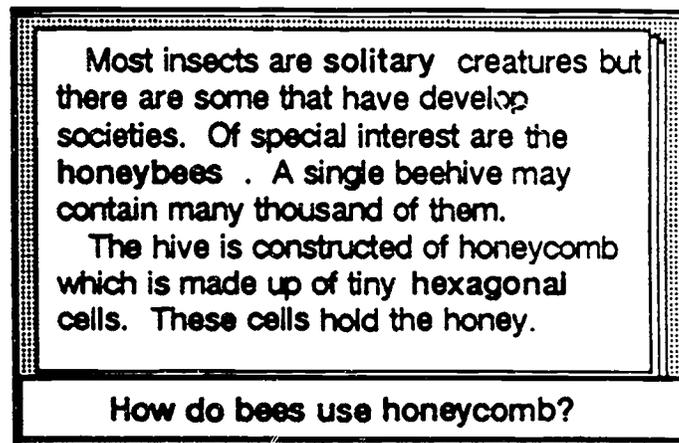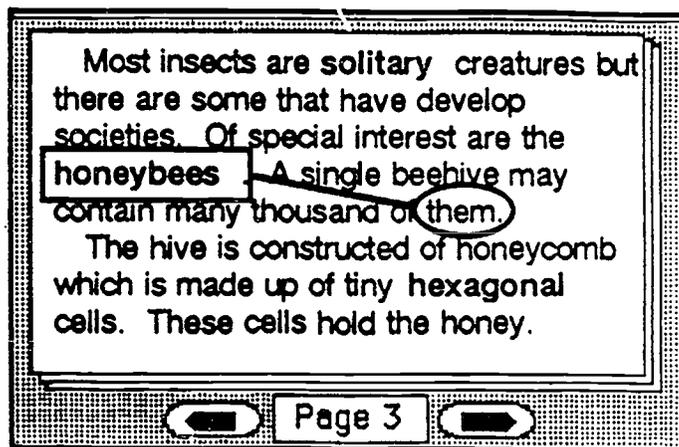
Features are available in hypermedia that are simply not possible in traditional print on paper.

Summary

Hypermedia appears to hold many possibilities for educational use, from a highly unstructured document for exploring just about any subject, to a more specific, directed teaching tool such as a study guide for a content area text or a basal reader supplement. The hypermedia format of layered text accessed in a non-sequential fashion by the reader, provides dynamic, interactive instruction very different from traditional computer assisted instructional programs.

With the increasing interest in educational hypermedia applications, more and more computer software labeled hypermedia is becoming available for classroom use. These materials will likely take on many different forms and functions as hypermedia products evolve in the classroom and in the marketplace. It is important, then, for an educator to evaluate hypermedia software just as critically as any other instructional tool planned for use in the classroom.

The success of students with hypermedia materials at both the secondary and elementary levels is encouraging (Higgins & Boone, 1990; Higgins & Boone, in press). The active and deliberate involvement of students when using the hypermedia materials allows movement through material at a student's own rate of speed as well as providing the opportunity to review material as many times as necessary. This opportunity for students to access information in private, review information more than once, and have control over the presentation of that material could mean the difference between successful achievement and failure for some students. Whether the subject matter is from a high school social studies text or an elementary school basal reader, hypermedia is a new mode of text and information presentation that very likely is here to stay. It is a new and exciting concept in the field of computer use in education.

Hardware and Software

This manual assumes that you have a Macintosh Plus, SE, Classic, LC, or IIsi with a hard disk drive, HyperCard Version 1.x, a HyperCard reference manual, and some time on your hands. Attempting to use HyperCard for developing hypermedia lessons without a hard disk drive is not recommended. The HyperCard application and a HOME stack should be resident in their own folder on your hard disk. Starting up HyperCard from this folder will cause HyperCard to save all your stacks to this same folder. HyperCard automatically saves your stacks for you. A stack is the name for any kind of program or lesson you create in HyperCard.

HyperCard originally appeared as Version 1.0 with subsequent updates up through Version 1.2. Although all references to HyperCard in this manual are to the Version 1.x series, HyperCard 2.0 can be used to build the template. A discussion of HyperCard 2.0 is included as an appendix. To determine which version of HyperCard you have installed on your hard drive:

    1. Click one time on the HyperCard icon to select it.

    2. Select GET INFO from the File menu.

    3. The version number will be listed in the Info window.

A hard disk drive makes the development of hypermedia lessons much easier.

Hypermedia Template Features

Developing a template to accomplish similar tasks is a familiar strategy for computer users and programmers. Once a template is built in a spreadsheet, database, or word processing program, one has only to enter new information for each new job. Construction of a hypermedia document template likewise makes sense for teachers who want to provide their students with computer assisted instruction through the hypermedia format. Using HyperCard, this can be a relatively easy task.

Instructions for creating a simple hypermedia template and subsequent hypermedia lessons follow. This is not a HyperCard tutorial. Exact step by step instructions would be too lengthy for publication. Those who are somewhat familiar with the Macintosh computer or who have some experience with HyperCard and have a HyperCard manual available should have little trouble, however. It should be kept in mind, that as in any programming task, many ways exist to solve a particular problem. Those included here may not be the most efficient or elegant, but they do work. The document design and preparatory steps outlined here should also be of help when using other hypermedia authoring systems.

> Construction of a template makes sense for teachers who want to provide students with CAI through the hypermedia format.

Windows, Buttons, and Links

HyperCard, with its metaphor of note cards in stacks, gives a familiar visualization to programming in this authoring environment. One card in a HyperCard stack represents one full screen on the Macintosh. For a hypermedia document, each screen (or card) may be thought of as one page in the document. Buttons, cursor sensitive areas, are created on the cards to link them together. The buttons also serve to call windows of varying sizes to overlay the current screen. These windows may contain either text, graphics, or text and graphics together. Through this system of cards, windows, and buttons, a hypermedia document is linked together.

> HyperCard operates on the metaphor of note card in stacks.

The Template

This template contains ten cards which allows for ten screens of original text. Each card contains links to two graphic windows and two text windows as well as links to the next original page and the previous original page. The last page reconnects to page one.

The ten pages (cards) of original text are connected in a sequential order through page-turning buttons. Additional layers of information for each page are available through four windows, two graphic and two text.

This template produces what is perhaps more correctly called a limited or guided hypermedia document. While enhancements to the original text via the text and

> The template produces a guided hypermedia document.

graphic windows on each page are available, there are no referential links between the separate pages. These links would connect or reference related facts or ideas scattered throughout the text. This is a very reasonable option and has been left out only to keep the template simple.

Getting Started. HyperCard programming is accomplished mainly through menu selection of options and immediate mode commands. Starting from scratch is as easy as: (a) selecting NEW STACK from the menu bar; (b) creating a background; and (c) creating the number of cards necessary through menu selection of NEW CARD.

Background. Every page in a hypermedia document should bear some similarity to the others in terms of the look and feel of its operational features. This provides a familiar context for reading and learning. A HyperCard stack will have at least one background that is shared by many or all the cards. It can be designed using the built in graphics tool provided in the system but must be done while in the "background" mode. Page 11 shows a representative hypermedia background. The right and left arrow buttons and the stop button, along with the graphic simulation of stacked pages are features of every card in this stack. Only the white area, where the text for that page will appear, changes from card to card.
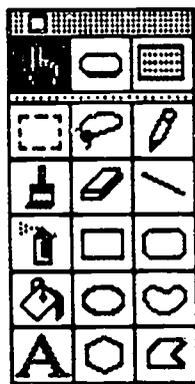
Cards. Each time a new card is created in a HyperCard stack, it is assigned an ID number unique to that stack. This number is necessary for keeping track of the cards in the stack. For example, the script (HyperTalk code) for a page-turning button must include the card ID number of the destination page (e.g., GO TO CARD ID 2345). It is necessary then to make a listing of these card ID numbers as the cards are created. This is done by menu selection of OPTIONS and then further selection of CARD INFO.

As the first 10 cards, corresponding to the 10 original text pages, are created, their ID numbers must be noted and matched to a page number (e.g., Page 1, CARD ID 2834; Page 2, CARD ID 3730; etc.). This information will be used often as you navigate through the template. When the
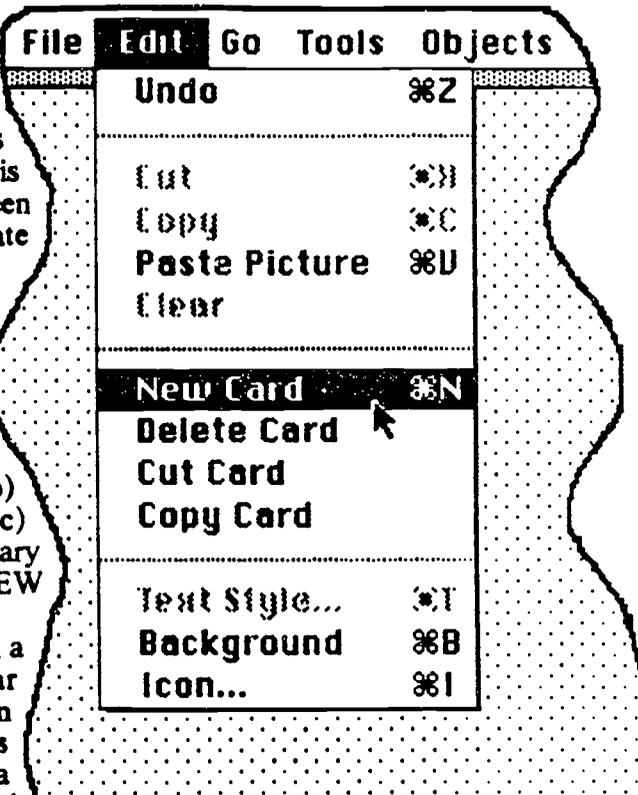
A familiar context for reading and learning can be accomplished by designing a background that is shared by many or all the cards.

template is duplicated, the card ID numbers remain the same, so Page 1 in the original template and Page 1 in the 100th copy of the template have the same card ID numbers.

Text Windows. Fields are the HyperCard primary function for displaying text. Fields can be in the background of the stack, and thus appear on every card, or can be specific to a particular card.

Fields are the primary mode of displaying text in HyperCard.

This template will use CARD FIELDS exclusively, those specific to one card. Card fields are numbered consecutively from one, up to the number of fields created. Text for the fields is entered in word processor fashion on the screen when the field is active. Again, it is necessary to keep track of what information goes into which field. One way to accomplish this easily is to associate the FIELDS with correspondingly numbered BUTTONS (e.g., Field Button 1 accesses Card Field 1). The information in the card field, then, should be related to the word associated with the like-numbered button. Although fields are available in several modes, the SHADOW box, in a non-scrolling mode seems best unless a large amount of text is needed in the field.

Graphic Windows. There is no graphic window function in HyperCard 1.x as there is for text. This must be simulated. The simulation is accomplished in the following manner:

1. Copy the text portion of a page using the "marching ants" tool in the TOOLS menu.
2. Create a new card from the EDIT menu. This will put a blank card on the screen with nothing but the BACKGROUND visible.
3. Paste the text from the original page onto the new page.
4. Using the graphics tools create an empty box where you want the graphic window to appear. A shadow box in the upper right corner is a good spot.
5. Copy the graphic you want from the SCRAPBOOK and paste it into the empty box you just created.
6. Note the CARD ID number of the new page.
7. Return to the original page.

The graphic window simulation is effected by a BUTTON script which calls the new card to replace the original. Since the only thing different in the two cards is the graphic box, it appears that the box is an overlay to the original page rather than a full page replacement. Similarly, to hide the graphic window, the script calls the original page back. This appears to make the window disappear (see Figure 4).

Buttons. Buttons are the real workers in HyperCard. The scripts, or HyperTalk programming code, associated with the buttons are very powerful. Buttons are created from the OBJECTS menu and the NEW BUTTON command. Buttons can be different sizes or fully transparent. A transparent button, overlaying any word, phrase, graphic, or

Buttons are the real workers in HyperCard. A transparent button, overlaying a word, phrase, or graphic, becomes a very powerful hypermedia function.

graphic part, becomes a very powerful hypermedia function. Unfortunately, buttons come only in the traditional rectangular shape familiar in most Macintosh graphic applications although they are fully adjustable in size and dimension. The scripts associated with the buttons are activated by the mouse click operations of mouseUp (releasing the mouse button) or mouseDown (clicking the mouse button down). MouseUp is the most widely used.

Go   Tools   Objects   Font   Style

Button Info...
Field Info...
Card Info...
Bkgnd Info...
Stack Info...

Bring Closer   ⌘·
Send Farther   ⌘·

New Button
New Field
New Background

STOP   Page 6
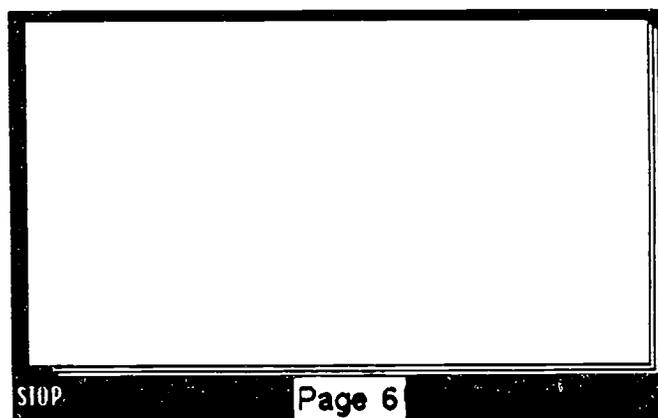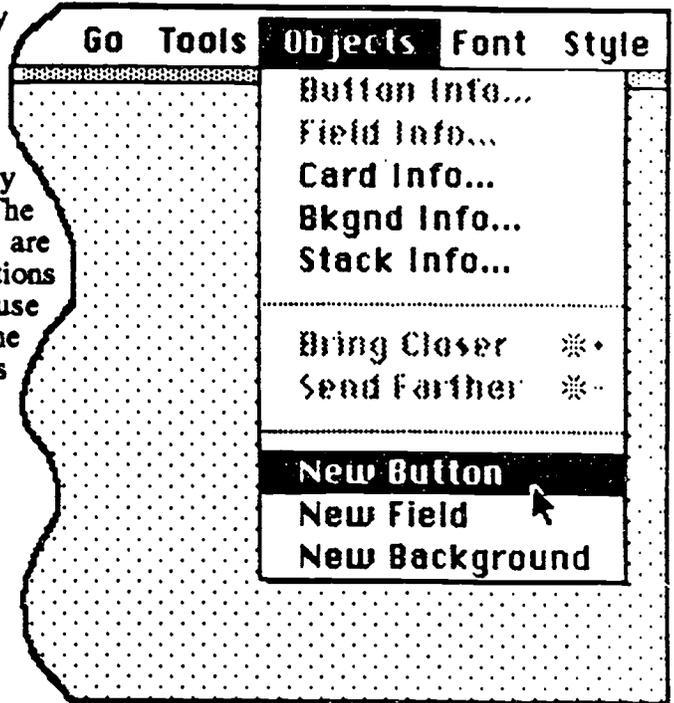
A hypermedia lesson template.

Template Directions

A hypertext document template is now ready to be built following these directions.

Create the Cards
1. Open HyperCard.
2. Go to FILE menu and select NEW STACK; name it; unselect the COPY CURRENT BACKGROUND box; select NEW.
3. Go to EDIT menu and select BACKGROUND.
4. Go to TOOLS menu and use these MacPaint-like graphic tools to create a background. Plan this out ahead to save time.
5. Get the MESSAGE BAR with COMMAND-M; type SET USERLEVEL TO 5, (this puts you into scripting mode).
6. Go to OBJECTS menu and select CARD INFO; make note of the card ID number. (This is the card identification number for Page 1 of the hypertext document). Click OK.
7. Go to EDIT menu and select NEW CARD. (A new card identical to the previous one will appear.)
8. Go to OBJECTS menu and select CARD INFO as before and note the card ID number. (This is the card identification number for Page 2).
9. Repeat steps 7 and 8 until you have 10 cards. Be sure to note the CARD ID NUMBER each time you create a new card and list it somewhere with its corresponding page number.

Make Additional Cards to Simulate Graphic Windows
Each original text page will have two graphic windows and two text windows. For ten pages of original text this means 20 additional cards will be created for the graphic window simulations. Be sure to list the CARD ID NUMBERS for the two new cards next to the page to which they will be connected.

Each original text page will have two graphic windows and two text windows.

e.g.,
Page 1
id#2834
window 1 id#6338
window 2 id#6573

Page 2
id#3730
window 1 id#7030
window 2 id#7249)

Follow steps 7 and 8 in the instructions for creating cards until 20 additional cards are created and noted as shown above.

Create the Fields for Text Windows

1. Get the message bar with COMMAND-M; and type GO TO CARD ID (then the number for Page 1 from your list--e.g., GO TO CARD ID 2834 and press return).
2. Go to the OBJECTS menu and select NEW FIELD; double click on the field when it appears on the screen; type FIELD 1 as the name; select SHADOW; click on FONT; choose font and size; then select OK.
3. Move and resize the field on the page.
4. Repeat Steps 1 and 2 above, but naming the second field FIELD 2.
5. Do this for each of the 10 original text pages in the template. Use the instructions in Step 1 to move from page to page.

Create the Buttons

1. Get the message bar with COMMAND-M; and type GO TO CARD ID (then the number for Page 1 from your list--e.g., GO TO CARD ID 2834 and press return).
2. Go to OBJECTS menu and select NEW BUTTON; double click on the button; name the button GRAPHIC 1; choose TRANSPARENT and AUTO HILIGHT; then click on the SCRIPT box.
3. Between the script lines ON mouseUP and END mouseUP type in the following script:

```
GO TO CARD ID (ID # of window 1 of page 1)
WAIT UNTIL THE MOUSECLICK
GO TO CARD ID (ID # of page 1)
```

Line 1 calls the graphic window page.
Line 2 holds the   until the mouse is clicked again.
Line 3 calls the original page back into view.

4. Repeat Steps 2 and 3 above, but naming the button, GRAPHIC 2, and changing the CARD ID NUMBER in Line 1 of the script to that of Window 2 of Page 1.
5. Go to OBJECTS menu and select NEW BUTTON; double click on the button; name the button FIELD 1; choose TRANSPARENT and AUTO HILIGHT; then click on the SCRIPT box.
6. Between the script lines ON mouseUP and END mouseUP type in the following script:

```
SHOW CARD FIELD 1
WAIT UNTIL THE MOUSECLICK
HIDE CARD FIELD 1
```

Line 1 calls the text window.

Line 2 holds the window until the mouse is clicked again.
Line 3 hides the text window.

7. Repeat Steps 2 and 3 above but naming the button FIELD 2, and changing the FIELD NUMBERS in Lines 1 and 3 of the script to FIELD 2.

8. Resize and stack these buttons somewhere convenient on the page.

9. Do this for each of the 10 original text pages in the template. Use the instructions in Step 1 to move from page to page.

Create Page-Turning Buttons

1. Get the message bar with COMMAND-M; and type GO TO CARD ID (then the number for Page 1 from your list--e.g., GO TO CARD ID 2834 and press return).

2. Go to OBJECTS menu and select NEW BUTTON; double click on the button; name the button NEXT PAGE; choose ROUND RECTANGLE and AUTO HILIGHT; then click on the SCRIPT box.

3. Between the script lines ON mouseUP and END mouseUP type in the following script:

GO TO CARD ID (ID # of the next page)

---

4. Repeat Steps 2 and 3 above but naming the button PREVIOUS PAGE, and changing the CARD ID NUMBER in the script to that of the page just preceding. In the case of Page 1 which has no preceding page, you may want to put the CARD ID of Page 10. This connects the start and the end of the document in a loop.

5. Position and resize these buttons in appropriate spots on the page.

6. Do this for each of the 10 original text pages in the template. Use the instructions in Step 1 to move from page to page. Buttons can be copied and pasted from page to page.

The template is finished. From the Macintosh Finder, duplicate the template and use the new copy to begin constructing a hypertext document. With this template, some creative ideas, and an original text that you want to adapt to a hypertext document, an effective piece of instructional or informational software can be built.

> With the template, some original text, and a few creative ideas, an exciting piece of educational software can be built.

A Hypertext Document

Document building is broken down into nine basic steps. Each step is listed with annotations, suggestions, and discussion below.

Enter Text of the Original Document. HyperCard has two text modes. There are the text fields which remain dynamic much like text in a word processor document, and there is the

graphic mode of text presentation. The original text should be entered on the cards in the graphic mode using the TOOLS menu. Care must be taken in entering this text as it is not an editable file, but rather a graphic. Enter the text in an extended typeface but without any boldface or italics. To choose a font or style, first select the text function from the TOOLS menu. COMMAND-T presents a selection window for font, size, and type style. Make the appropriate selections and return to fill the page with text. Continue page by page until the document has been entered. Take care to not split meaningful units of text or syntactic structures between pages.

Decide Which Words Will Be Hyper-enhanced. Based on the intent of the hypertext document, a decision must be made as to which words or pictures (if you decide to add pictures to the original pages) will have a link to a window. A hypertext lesson from a content area text or basal reader might use the new vocabulary words, important people or events, timelines, etc. These decisions are the basis for the instructional design of CAI lessons or the focus of an informational document.

Decide the Type of Enhancements. Graphic windows, explanatory or clarifying text, graphic or text combinations, or computer generated speech or music are all options for enhancements. Text enhancements will be assigned FIELD buttons, and graphic or graphic/text enhancements will use the GRAPHIC buttons. Speech can be added to either of the button types or used alone.

> Graphics, explanatory text, graphic and text combinations, or computer- generated speech or music are all options for enhancements.

Boldface the Words That Will Be Buttons. Return to the text mode of the graphics tool. Use COMMAND-T to return to the font and style window. Choose the same font and size as before, but in boldface, non-extended type style. (Boldface and regular spacing between letters takes up the same space horizontally as non-boldface with extended spacing between letters.) Returning to the page of original text, the words which have been chosen for buttons are darkened by typing over them in the boldface style. This is a key for the reader that a window exists for that word.

Position Buttons and Size Them Over the Words. The four buttons that were created in the template are stacked somewhere on each original text page. To relocate them over the boldface words, the BUTTON mode from the TOOLS menu first must be activated. It is the middle-top square next to the BROWSE (finger pointing) mode box. Selecting a button now causes the "marching ants" to mobilize. The button can be moved by the CLICK AND DRAG method to the proper word where it can be resized by grabbing a corner and adjusting it. The name of the button now overlays the word. Double click on the button and un-select SHOW NAME and click on OK. The button name is now invisible. Returning to BROWSE mode (click on the finger box under the TOOLS menu) makes the entire button disappear. It is now active and ready to work.

Enter Text into Text Fields.   The two FIELD buttons on each page are now linked to two corresponding but empty text fields. To enter text into the fields, the FIELD mode from the TOOLS menu first must be activated. It is the box on the top-right, next to the BUTTON mode box. Now get the message bar (COMMAND-M), enter SHOW CARD FIELD 1, and press return. Card Field 1 will now show on the screen.

To enter text, activate the BROWSE box in the TOOLS menu and place the cursor into the top-left corner of the FIELD box. Enter your text into the field. The field may be re-sized by activating the FIELD box again and grabbing a corner of the field. This may be necessary to make the field size fit the amount of text. When finished, activate the BROWSE box on the TOOLS menu and type into the message bar HIDE CARD FIELD 1. Follow the same process for Card Field 2.

Create Graphic Windows. There is no graphic window function in HyperCard as there is for text. This must be simulated. First, copy the text portion of the original text page using the "marching ants" tool in the TOOLS menu and the EDIT menu COPY command. Next, check your list for the CARD ID number of Window #1 for this page. Get the message bar (COMMAND-M) and enter GO TO CARD ID (the number from the list). An identical page, though empty of text, appears.

Paste the text from the original onto the new page with the EDIT menu PASTE command. Using the graphics tools create an empty shadow box where you want the graphic window to appear. The upper right corner is a good spot. Copy the graphic you want from the SCRAPBOOK (clip art or your own design) and paste it into the empty box you just created. Return to the original page by entering in the message bar, GO TO CARD ID (the number of the original page).

Putting Sounds into Hypertext. HyperCard handles playing sounds, voices, and music very well. The Macintosh SND (sound) resource can be activated from a HyperCard stack with the PLAY command followed by the SND name or number. ResEdit, a resource editor from Apple Computer, allows SND resources to be easily added or deleted from stacks. A device such as the MacRecorder, from Farallon Computing, creates SND resources through a microphone or a standard audio output device. The MacRecorder software can pasted sound buttons directly into HyperCard stacks but the process is much slower than using ResEdit if more than two or three sound buttons are needed. It might be noted that SND resources require lots of disk space.

A word of caution for users without hard disk drives. The SND resources, when read from a 3.5 inch disk and channeled through the HyperCard PLAY command, can be full of distortion. This distortion seems to be related to the slower read time on the 3.5 inch medium. The distortion can be circumvented by adding a WAIT command directly after the

There is no graphic window function in HyperCard 1.2 as there is for text.

HyperCard handles playing sounds, voices, and music very well without extra hardware.

PLAY command in the script. The longer the sound being played, the longer the WAIT command should be.

Final Check. Browse through the stack, stopping on each page and utilizing every button on the page. Make sure the windows are linked to the proper words and that transitions are smooth.

A Template Is Provided

Building a hypermedia template as outlined in the previous section of this manual is probably the best way to familiarize one's self with the HyperCard commands, functions, and programming code. For those who can't wait that long to get started, however, a fully functional template is provided on the accompanying 3.5 inch diskette. Please make a copy of this HyperCard stack using COMMAND-D (duplicate) and work only on a copy. This will provide you with a clean template each time you want to build a lesson.

This template, like the one outlined for you to build, has 10 pages linked sequentially with the capability for paging both forward and backward. Each page is linked for three graphic windows and five text windows. Sound is also available. The comprehension strategies and pronoun referent enhancements are not available on this template, however, the stack will keep track of all user actions and will write the file to the disk on which the stack is resident. The disk must be named *lesson* for this to function properly.

The following are the four most important functions of this template:

1. <u>Text window</u>. Each page has five text window buttons linked to five text fields (FBUT1 thru FBUT 5).

2. <u>Graphic window</u>. Each page has three graphic window buttons linked to three additional cards for simulating a graphic window.

3. <u>Computer speech</u>. Two digitized sounds are available: PRESTO and DOES NOT COMPUTE.

4. <u>User log</u>. The "path/time" file written by the stack when the user quits using the STOP sign can be imported by a spreadsheet or word processor that can read text files.

Make a copy of the TEMPLATE stack using COMMAND-D, and drag the new stack to a blank diskette that you have named LESSON.

Double click on the TEMPLATE stack to begin. Click the right arrow button from the TITLE PAGE to progress to PAGE ONE.

Select the MARCHING ANTS box from the TOOLS menu and surround the picture of the dog. Use the CUT command from the EDIT menu. Select the SCRAPBOOK from the APPLE menu. When the SCRAPBOOK appears use the PASTE command from the EDIT menu. Close the SCRAPBOOK to save the picture for later.

Select the TEXT box from the TOOLS menu. Type COMMAND-T and select HELVETICA as the font, and 24 PT as the size. Then type in the following text: *The quick red fox jumped over the lazy brown dog.*

Marching Ants Box

Text Box
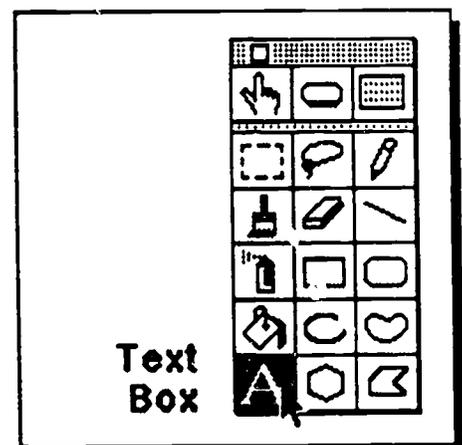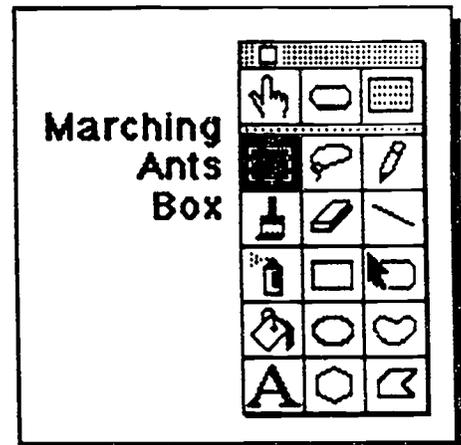
This is graphic text and will not wrap to the next line and
cannot be edited in the usual manner.

TEXT WINDOW

Get the MESSAGE BAR with COMMAND-M. Type in
SHOW CARD FIELD 1 and press RETURN. Resize
the field box that appears and move it to the
proper position on the screen.

Choose the BROWSE box in the TOOLS menu and
place the cursor into the top-left corner of the
field box. Enter the following text into the field:
QUICK means fast. Now activate the BROWSE
box on the TOOLS menu again and type into the
message bar HIDE CARD FIELD 1.

Select the BUTTON box from the TOOLS menu. Now
CLICK AND DRAG to reposition the FBUT1
button over the word QUICK. Double click on
the FBUT1 button to get an ATTRIBUTES
window. On this window type in the word
QUICK as the button name, and de-select the
SHOW NAME function.

Go back to BROWSE mode from the TOOLS menu and click
on the word QUICK. The field should appear. Click
again to clear the window.
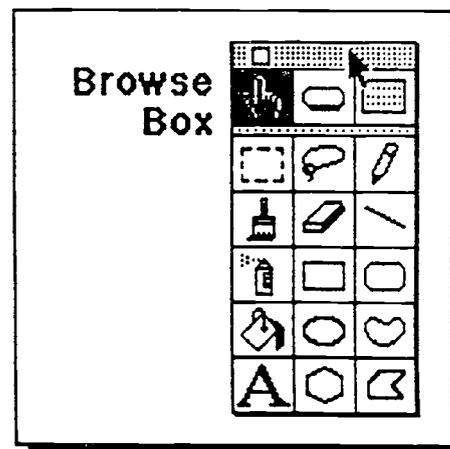
GRAPHIC WINDOW

First, copy the text portion of this page using the
MARCHING ANTS from the TOOLS menu and
the COPY command from the EDIT menu. Get
the MESSAGE BAR and type in the following:
GO TO CARD ID 6338 and press RETURN. On
this identical page, use PASTE from the EDIT
menu to put the text that you just copied onto this
new page. Using the graphics tools create an
empty box that will become the graphic window,
the upper-right corner of the screen is a good spot.
Now open the SCRAPBOOK, copy the dog
picture, and close the SCRAPBOOK again.
Select PASTE from the EDIT menu and then drag the
picture over to the window and position it. Select
BROWSE from the TOOLS menu and type into the
MESSAGE BOX: *GO TO CARD ID 3538* and press
RETURN. You are now back to the original screen
without the window.

Select the BUTTON box from the TOOLS menu. Now
CLICK AND DRAG to reposition the CBUT1 button
over the word DOG. Double click on the CBUT1
button to get an ATTRIBUTES window. On this
window type in the word DOG as the button name, and
de-select the SHOW NAME function.

Go back to BROWSE mode from the TOOLS menu and click
on the word DOG. The graphic window should
appear. Click again to clear the window. The graphic
window is different from the text window in that the
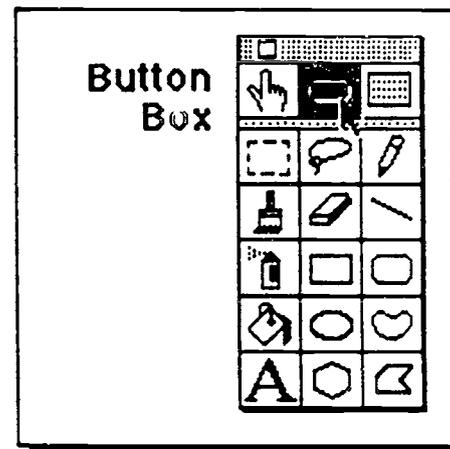
text window actually "pops up" over the original
screen. The graphics window is simulated by a script
that calls the card with the window to replace the
original. Since the only thing different in the two cards
is the graphic window box, it appears that the box is an
overlay to the original page rather than a full page
replacement.

COMPUTER SPEECH

Type the sentence: *Goofy said, "PRESTO," as he pulled
Donald from his hat.* using the TEXT box in the
TOOLS menu. Now select NEW BUTTON from the
OBJECTS menu (see Page 11). A NEW BUTTON
will appear on the screen. Position it over the word
PRESTO. Double click on the button to get to the
attributes window for the button. Type in PRESTO for
the button name. Select TRANSPARENT style and
de-select SHOW NAME. Click on the SCRIPT
button. When the scripting window appears, in
between the the ON MOUSEUP and END MOUSEUP
commands, type:

```
PLAY "PRESTO"
WAIT 2 SECONDS
```

Click the OK button. Go to the BROWSE box in the TOOLS
menu and then click on the word PRESTO. The word
will be spoken. The sound file for PRESTO was
loaded into the stack from MacRecorder.

USER LOG

The "path/time" file written by the stack when the user quits
using the STOP sign icons can be imported by a
spreadsheet or word processor that can read text files.
The disk on which the stack resides must be named
LESSON for this function to work. Use the IMPORT
FILE from the SPREADSHEET application in
MICROSOFT WORKS to read this file easily.

You have now completed all the major components of
a hypermedia document. Additional text can be added to fill
the entire page. Two more graphic windows and four more
text windows can be added to this page, plus you have nine
more pages with which to work.
The chart on the following page lists the CARD ID
numbers for the template that is on the diskette that
accompanies this manual. You will need these ID numbers
for making the graphic windows. For instance, if you are on
Page 4 of the template the three additional cards that are linked
to the three graphic window buttons (CBUT1, 2, 3) are CARD
ID 8471, 8800, and 8963 respectively. Text windows on each
page are simply numbered one through five to correspond with
the five text window buttons (FBUT1, 2, 3, 4, 5).

TITLE PAGE		2834
PAGE 1		3538
card button 1	6338	
card button 2	6573	
card button 3	6907	
PAGE 2		3730
card button 1	7030	
card button 2	7249	
card button 3	7439	
PAGE 3		3870
card button 1	7886	
card button 2	7950	
card button 3	8404	
PAGE 4		4293
card button 1	8471	
card button 2	8800	
card button 3	8963	
PAGE 5		4461
card button 1	9295	
card button 2	10180	
card button 3	10469	
PAGE 6		9648
card button 1	12769	
card button 2	13052	
card button 3	13134	
PAGE 7		10652
card button 1	13427	
card button 2	13719	
card button 3	13978	
PAGE 8		11165
card button 1	14114	
card button 2	14540	
card button 3	14765	
PAGE 9		11770
card button 1	15096	
card button 2	15151	
card button 3	15603	
PAGE 10		12239
card button 1	15861	
card button 2	15961	
card button 3	16279	
QUIT CHECK CARD		17381

Card ID numbers in the far right column identify the pages of original text. The numbers in the column on the left are cards to be used for simulating graphic 'pop-up' windows.

HyperCard 1.2 Vs. HyperCard 2.0

The new version of HyperCard is designated as 2.0 and is really quite different from the older, original HyperCard 1.2 versions. HyperCard stacks built in Versions 1.2 can be read by HyperCard 2.0 and converted to 2.0 stacks using the CONVERT command from the FILE menu. 2.0 stacks cannot be read by HyperCard 1.2. Period. So a stack that you create in HyperCard 2.0 will be useless to anyone trying to use it with their old version of HyperCard. So, is it worth the bother. Yes. Some of the improvements are:

1. Text fields can contain more than one size or style of text.
2. Text within a text field can easily be made into a button.
3. True pop-up graphic windows are possible. Even in color.
4. Menus can be created or deleted by the programmer.
5. Cards and windows are fully resizable.
6. More than one stack can be open and running at a time.

These are a few of the more obvious changes to HyperCard in version 2.0 that will likely affect a novice to intermediate level HyperCard programmer when building hypermedia stacks for education.

Glossary of Terms

Buttons Areas of the computer screen that when selected perform specific functions-- sometimes referred to as "hot text." The real "workers" in a hypermedia document, buttons allow the user to access information not directly available on the top screen.

Cards One screen in HyperCard is one card from the stack.

Card Fields Used to present editable text in windows in HyperCard.

Guide (Owl Software, 1986) Guide is a menu-driven authoring system for hypertext. Creation of a hypertext document begins with the entry of text in a format very similar to that of a word processor. Window overlays, replacements, and links between different parts of the text are incorporated into the document by menu-driven selection procedures. Guide's system of menus is very easy to use, giving powerful programming capability to relative novice computer users. Both text and graphics can be incorporated into Guide windows along with sound and videodisc control. Recent releases of the program will allow a record of user responses to be stored. Guide runs on both the IBM PC and the Macintosh. It is available from Owl Software.

HyperCard (Atkinson, 1987) HyperCard is a hypermedia authoring system for the Macintosh available from Apple Computer. Although more difficult to use than Guide, it is much more powerful as a hypermedia authoring tool. HyperCard includes its own programming language with full high-level computer language capabilities. Although using HyperCard requires programming skills for creation of sophisticated hypermedia documents, it is much easier and less time consuming than development of similar material in a more conventional programming language. HyperCard comes free with the purchase of a Macintosh.

Hypermedia designates a hypertext document that includes graphics, digitized speech, music, or video segments.

HyperScreen (Brackett, 1990) HyperScreen, a hypermedia product also for the Apple II line of computers, requires an alternate input device such as a mouse or joystick. It is similar in many way to Tutor-Tech in its reliance on the capabilities of the Apple II line of computers. Clip art and sound resources are also available for HyperScreen from Scholastic.

HyperStudio (O'Keefe, 1989) HyperStudio is an adaptation of HyperCard for the Apple GS computer with 1.25 megabytes of RAM. Available from Roger Wagner Publishing, HyperStudio is a hypermedia authoring tool providing access to the color video and enhanced audio capabilities of the Apple GS machines. Lesson design is similar to that of HyperCard but most programming is done through a menu-driven authoring system. Complete sound digitizing hardware is included with the software. This product provides easy to use yet sophisticated hypermedia capabilities for a computer that is very common in public schools.

Hypertalk general programming language included in HyperCard.

Hypertext the concept of non-sequential text presentation.

Links Along with nodes, links are the most fundamental componenets in a hypertext/ hypermedia document. Links are defined by the author of the document and are explicit in that they connect the anchor node with the destination node.

Linkway (Kheriaty, 1989) This product is IBM's version of HyperCard. It incorporates the mouse-controlled format of the Macintosh into the operation of the IBM and compatible computers. Linkway relies on the use of icons for linking information in the text. These icons indicate that different types of additional information are available to the reader. A special speech adapter is necessary for adding computer speech capabilities to the hypermedia documents created with Linkway.

MacRecorder   A sound digitizing device (Farallon Computing, 1987).

Nodes   A unit of information in a hypertext/hypermedia document. Nodes are connected to other nodes by links. There are typically two types of nodes in a document: (a) anchor node--the node from which more information is accessed and (b) destination node--the node that contains the extra information.

ResEdit   Software for the Macintosh developer to edit specific sound, icon, and interface resources (Pope, 1986).

SuperCard (Appleton, 1989) This product took the HyperCard idea and provided several additional capabilities not available in HyperCard. SuperCard gives a hypermedia author an improved graphics tool, a special animation capability, and the ability to create buttons in shapes other than the rectangles provided in HyperCard. It is produced for the Apple Macintosh computer yet unlike HyperCard, SuperCard comes from an independent software developer, Silicon Beach Software.

Ted Nelson   Nelson coined the term "hypertext" in 1965. He has been in the process of developing a hypertext/hypermedia system called Xanadu ever since. The basic concept behind the Xanadu system is that it will become a repository for everything that has ever been written.

Toolbook (Asymetrix Corporation, 1990). Toolbook is another IBM compatible hypermedia product. It requires the Microsoft Windows 3.0 graphical user interface. Toolbook, from Asymetrix Corporation is currently the most HyperCard-like of the hypermedia programs for the IBM compatible machines.

Tutor-Tech (Techware Corporation, 1988). This is a hypermedia authoring product available for the Apple II line of computers. Lessons are created in a page by page fashion using multiple fonts and a built in graphics tool. Buttons are available for controlling text presentation and viewing the hypermedia

enhancements. No programming experience is necessary to build lessons with Tutor-Tech. Student lessons can be controlled through the keyboard as well as a mouse. Tutor-Tech is available from Techware Corporation.

Vannevar Bush (1890-1974). Considered to be the "grandfather" of hypertext, Bush was the science advisor to President Roosevelt during World War II. In 1945 he described the Memex (memory expander) System in an article in *Atlantic Monthly* entitled "As We May Think." Though never actually produced, the system was envisioned as a mechanized private file and library.

Window A mini-screen containing either text or graphics that overlays the main computer screen or another window.

Publishers of Hypermedia Software

Activision
P.O. Box 3048
Menlo Park, CA 94025-3047
(415) 329-7699

Bright Star Technology, Inc.
14450 NE 29th Pl., Ste. 220
Bellevue, WA 98007
1-800-243-4200

Broderbund Software
17 Paul Drive
San Rafael, CA 94903-2101
1-800-521-6263

Chariot Software Group for the Macintosh
3659 India Street
Suite 100C
San Diego, CA 92103
1-800-CHARIOT

ComputerWare
490 California Avenue
Palo Alto, CA 94306
(415) 496-1003

Data Disc Int.
1430 Willamette, Ste. 577
Eugene, OR 97401

Educational Activities, Inc.
P.O. Box 392
Freeport, N.Y. 11520
1-800-645-3739

Friedman Computing and Publishing
2347 Pine Ter.
Sarasota, FL 34231-4433
(813) 924-3238

GAMCO Industries, Inc.
P.O. Box 310J5
Big Springs, TX
1-800-351-1404

Heizer Software
1941 Oak Park Blvd., Suite 30
P.O. Box 232019
Pleasant Hill, CA 94523
1-800-888-7667

32

Highlighted Data
6628 Midhill Pl.
Falls Church, VA 22043
(703) 533-1939

ICOM Simulations, Inc.
648 S. Wheeling Road
Wheeling, IL 60090
(312) 520-4440

Idea Form, Inc.
P.O. Box 1540
Fairfield, IA 52556
(515) 472-7256

Intellimation Library for the Macintosh
130 Cremona Drive
P.O. Box 1922
Santa Barbara, CA 93116-1922
1-800-3-INTELL

Kinko's Academic Courseware Exchange
4141 State St.
Santa Barbara, CA 93110
1-800-235-6919

Learning Services
P.O. Box 10636
Eugene, OR 97440-2636
1-800-877-9378

MacWarehouse
P.O. Box 3013
Lakewood, N.J. 08701-3013
1-800-255-6227

MicroMaps Software, Inc.
P.O. Box 757
Lambertville, NJ 08530
(609) 397-1611

National Collegiate Software Clearinghouse
 Duke University Press
6697 College Station
Durham, N.C. 27708
(919) 684-6837 ext.54

Nordic Software, Inc.
3939 North 48th St.
Lincoln, NE 68504
1-800-228-0417

Perseus Project
Department of the Classics
Harvard University
Cambridge, MA 02138

Print and Graphics Educational Systems
450 Taraval St., #235
San Francisco, CA 94116
(415) 665-3924

SmartBook
James Hardie Industries Limited
65 York Street
Sydney, NSW 2000
Australia

Software Excitement!
P.O. Box 3097
6475 Crater Lake Highway
Central Point, OR 97502
1-800-444-5457

Springboard Software, Inc.
7808 Creekridge Cir.
Minneapolis, MN 55435
1-800-654-6301

Ztek Co.
Interactive Videodiscs & CD-ROM for Education
P.O. Box 1055
Louisville, KY 40201-1055
(502) 584-8505

CD-ROM Publishers

Facts on File
460 Park Ave. South
New York, NY 10016
(212) 683-2244

Highlighted Data
P.O. Box 17229
Washington, D.C. 20041
(703) 241-1180

Optical Media International
485 Alberto Way
Los Gatos, CA 95032
(408) 395-4332

Quantum Access
1700 West Loop South
Ste. 1460
Houston, Texas 77027
(713) 622-3211

Xiphias
13464 Washington Blvd.
Marina del Rey, CA 90292
(213) 821-0074

Videodisc Publishers

Apple Programmers and Developers Association
290 SW 43rd St.
Renton, WA 98055
(206) 251-6548

American Folklife Center
Library of Congress
Washington, D.C. 20540
(202) 287-6590

CEL Educational Resources
515 Madison Ave.
New York, NY 10022
1-800-235-3339

Grolier Electronic Publishing, Inc.
95 Madison Ave.
New York, NY 10016
(212) 696-9750

Great Plains National ITV Library (GPN)
P.O. Box 80669
Lincoln, NE 68501
1-800-228-4630

Info-Disc Corp.
Four Professional Dr., Ste. 134
Gaithersburg, MD 20879
(301) 948-2300

Interactive Media Corp.
55 River Rd.
Grand View, NY 10960
(914) 358-1899

John Wiley and Sons
605 Third Ave.
New York, NY 10158
(212) 850-6000

LaserDisc Corp. of America
200 West Grand Ave.
Montvale, NJ 07645
1-800-526-0363

Minnesota Educatioaal Computing Corp.
3490 Lexington Ave. North
St. Paul, MN 55126
1-800-228-3504

Media Learning Systems
120 West Colorado Blvd.
Pasadena, CA 9115
(818) 449-0006

National Geographic Society
Education Services Box 88
Washington, D.C. 20036
1-800-368-2728

Optical Data Corp.
Box 97
Florham Park, NJ 07932
1-800-524-2481

Pioneer Communications of America
600 East Crescent Ave.
Upper Saddle River, NJ 07458
(201)327-6400

Smithsonian Press
Hamden Station
P.O. Box 4866
Baltimore, MD 21211
(202) 357-3133

Videodiscovery, Inc.
P.O. Box 85878
Seattle, WA 98145-1878
1-800-54V-DISC

The Voyager Co.
2139 Manning Ave.
Los Angeles, CA 90025
1-800-446-2001

Books, Directories, and Newsletters

Computer Applications in Reading, Third Edition
Book No. 785
by J.S. Blanchard
International Reading Association
800 Barksdale Rd.
P.O. Box 9139
Newark, DE 19714-8139

Discusses research, programs, uses of computers, and related media in reading.

HyperAge: The Journal of HyperThinking
HyperAge Communication, Inc.
5793 Tyndall Ave.
Riverdale, NY 10471-2113
(212) 601-2832

HyperLink Magazine
Publishers Guild, Inc.
P.O. Box 7723
Eugene, OR 97401
(503) 484-5157

The focus of this magazine is on HyperCard stacks. They feature a companion HyperLink StackSolutions disk with scripts that may be copied.

HyperMedia: The Guide to Interactive Media Production
145 Natoma St.
San Francisco, CA 94105
(415) 243-0775

Interactive Multimedia: Visions of Multimedia for Developers, Educators, and Information Providers
Edited by S. Ambron and K. Hooper
1988 Microsoft Press
16011 NE 36th Way
Box 97107
Redmond, WA 98073-9717

Documents the results of an Education Advisory Council conference that was held to discuss issues and recommendations for the use of multimedia in education.

MIX Magazine
6400 Hollis St., #12
Emeryville, CA 94608
(415) 653-3307

This audio and music magazine specializes in the integration of multimedia. It features an annual directory of multimedia educational resources.

Should Schools Use Videodiscs?
National School Boards Association
1680 Duke St.
Alexandria, VA 22314
(703) 838-6722

Presents issues concerning the effectiveness of videodiscs in a
school setting and cites case studies of teachers who have used
videodiscs in their classrooms.

**The Educator's Handbook to Interactive Videodisc, Second
Edition**
by E. Schwartz
Association for Educational Communications Technology
1126 16th St., NW
Washington, D.C. 20036
(202) 466-4780

Provides information concerning the selection of interactive
video equipment and videodiscs.

The Videodisc Monitor Newsletter
Future Systems Inc.
P.O. Box 26
Falls Church, VA 22046
(703) 241-1799

A monthly newsletter that covers the educational application
of interactive video and compact-disc technologies.

Videodiscs for Education: A Directory
by R.A. Pollak
3490 Lexington Ave. North
Saint Paul, MN 55126-8097
1-800-228-3504

A directory that contains listings of videodisc products
appropriate for educational use.

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Asymetrix Corp. (1990). *Toolbook* [Computer program]. Bellevue, WA: Author.

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Brackett, G. (1990). *Hyperscreen* [Computer program]. New York: Scholastic, Inc.

Bush, V. (1945). As we may think. *Atlantic Monthly,* 176, 101-108.

Farallon Computing, Inc. (1987). *MacRecorder* [Computer program]. Berkeley, CA: Author.

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