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A descriptive analysis of the search features of general electronic encyclopedias

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Abstract

This research study is a descriptive analysis of the search features of general electronic encyclopedias in the CD-ROM format. This study describes the browse, analytical and hierarchical search features commonly found in seven electronic encyclopedias. The study found that browse search features are a linear index of titles or subjects, analytical search features offer simple and complex options while the software searches full text, and hierarchical search features offer subject breakdown from broad categories to specific articles. Common trends and variations are described through the use of text, screen shots and tables.

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Chapter I

The Problem

Introduction

Computers have become an integral part of the school library media center. Library information is stored electronically and many library functions are performed on computers. Patrons search for materials at computer work stations and these materials are checked out to them at a circulation computer. As the information center of the school, technology has changed the procedure in which students obtain materials in the media center. There has also been a transformation in the materials themselves. Many information sources are still found in the traditional format and, also in new forms such as CD-ROMs. (Reid, 1992, p.223)

The general encyclopedia is one of the material sources that is available in more than one format. General encyclopedias all have the same goal: "to present an encapsulation of our knowledge of our world in all fields of study." (Sader and Lewis, 1995 p.29). The encyclopedia has long been the general source from which students derive information for assignments and projects. "A good encyclopedia summarizes basic factual information on important subjects; the goal is not comprehensive treatment but provision of a frame of reference for initial understanding or a starting point that might serve as a springboard to further investigation." (Kister, 1994 p.4) That purpose of the encyclopedia has not changed, but the form has changed.

In the last 12 years most of the major encyclopedia companies have

embodied the CD-ROM format in addition to their print format. "The first CD-ROM encyclopedia, a text-only version of Grolier Electronic Publishing's The Electronic Encyclopedia appeared in 1985." (Kister,1995 p.42) Other major encyclopedias were quick to follow. Compton's Multimedia Encyclopedia, at the time owned by Encyclopedia Britannica, was the first multimedia CD-ROM encyclopedia. "Four years later, Compton's caused a sensation in the then staid world of reference publishing with its pathbreaking Compton's Multimedia Encyclopedia, the first encyclopedia to include sound and moving pictures." (Kister, 1994 p.272) Funk & Wagnalls is the original text source for both Encarta and Infopedia. Both have been changed and enhanced since the original versions. World Book released its first CD-ROM encyclopedia (text only) in 1989 as Information Finder and has since developed multimedia versions. CD-ROM versions of Encyclopedia Americana, Collier's and Britannica are now available. (Whitley, 1995 p.640)

Many believe the print format will be something of the past. "If enough libraries cancel the print version of a product, print will no longer be an economic distribution medium for the publisher. . . (and) some print versions will disappear . . ." (Tenopir, 1991). The entire twenty-six volumes of the 1991 Compton's Encyclopedia fits on one small disk. (Nicholls, 1993 p. 269) Size is not the only consideration in choosing the electronic version. The CD-ROM versions have three other advantages: "1) speed, 2) keyword searching, and 3)multimedia features." (Shoemaker, 1994 p.31) Using an electronic encyclopedia involves more than just seeing the text of an encyclopedia on a computer screen.

The capability of the CD-ROM makes it possible to store text, audio, still images and video. Beyond that, CD-ROM systems include searching software to

arrange and locate information. " A CD-ROM product usually consists of a database and associated access software." (Nicholls, 1993 p.31) There are three basic pieces of software involved in the CD-ROM encyclopedia:

-**build/indexing engine**-used to create and index the database

-**search engine**-the program that searches out and retrieves the required information in the database.

-**user interface**-what is actually seen on the screen that allows the searcher to send instructions to the search engine and view the results, and those devices which permit user interaction. (Nicholls, 1993 p. 63)

Searchers access the database through the user interface that activates the search engine. The interface is comprised of two components:

1. physical components-input devices such as keyboards and mice and output devices such as the visual display on the screen
2. conceptual components- selection methods including menus and screen layout. (Marchionini, 1991)

Searchers use the interface of the electronic encyclopedia to locate information. Screen design as a part of the user interface is critical to the success of the searcher. " The visual display of information is an important aspect of program design. The visual organization of information for display on computer screens is crucial to its optimal use." (Reilly and Roach,1986 p.36) Screen design and user interface along with the search engines of the various encyclopedias enable searchers to locate information and use the software effectively.

The Problem

Searchers are familiar with the basic format of the print encyclopedia. Searching in a print encyclopedia is a linear process. The search follows a

straight line or path. The articles are arranged alphabetically, usually with tables of contents, indexes and cross references to help locate information. When searching a print encyclopedia, the patron looks for one topic in an alphabetical linear arrangement. If the search is not fruitful, or a cross reference is given, the searcher must start over, down a new straight path. When using the index, the searcher looks for the search term in an alphabetical list. If the search term is located, a reference to a page number is given. If the search term is not included, a cross reference may be given, requiring the searcher to refer to another section of the index. If no cross reference is given, the searcher must identify a new search term and start the process all over again.

CD-ROM encyclopedias embrace an entirely new format which does not look, act or feel like a book. The search can be compared more to a web rather than a path. All electronic encyclopedias offer searching choices. These choices include (a) browse searching, (b) analytical searching, and (c) hierarchical searching. A *browse* search involves viewing an alphabetical list that displays all the articles or topics in a given encyclopedia. The searcher can manually scroll through the list or type in the article or topic being sought. Browse searching is often used to help the searcher choose appropriate terms for a more detailed search. (Pappas, 1996) "The purpose of browse searching is to find the appropriate terms for a search." (Jasco, 1992 p.36) An *analytical search* allows searchers to combine search terms or phrases using Boolean Logic.

Boolean operations allow the user to define a logic by which the set of records to be retrieved is defined. Three operators are widely used: OR, AND, and NO. The OR operator between two or more search terms

> creates a set in which the records include at least one of the terms specified. The AND operator creates a set in which the records include all the terms combined. The NOT operator creates a set whose records do not include the term(s) specified after the NOT operator. (Jasco, 1992 p.41)

The combining of terms allows the searcher to broaden or limit the search as needed. Analytical searching can also involve strategies such as truncation and proximity. "Truncation is the facility that allows users to enter only the root of a term followed by a special character, the truncation symbol." (Jasco, 1992 p. 39) (eg: geolog* will yield articles on geology, geologist, geological and geologically). "Proximity operation. . . allows you to define the exact or maximum distance between two or more terms." (Jasco, 1992 p. 45) In an *hierarchical search*, the searcher begins with broad topics, eventually narrowing down to a more specific topic that will satisfy the search need, or to backtrack if information has not been found. (Pappas, 1995)

These search features are not identical in each electronic encyclopedia. In some products the searches can be entered as phrases or even as questions. Some offer hypertext links to find related topics. No two encyclopedias are exactly the same. Searchers using electronic encyclopedias must learn these new searching features to be successful in their search process. The search features which enable browse, analytical and hierarchical searches vary from one electronic encyclopedia to another.

Electronic and print encyclopedias serve the same purpose, but the advantage of an electronic encyclopedia is the search engine that searches in a non linear manner through the full text and indexes to locate specific information. "One of the most useful benefits of computerized reference works-

-they can take advantage of the quick and thorough search capabilities of the computer's processor to allow the user to locate all mentions of a key term or concept of the electronic work." (Sader and Lewis, 1995 p. 409) There are many similarities and differences in the way searches are carried out and the features various products offer. "Like all competitive products, these encyclopedias possess individual strengths, weaknesses, and capabilities that distinguish one from another." (Kister, 1995 p.43) Each encyclopedia has a unique search engine that enables searchers to locate specific information. "The most important quality of a search engine is the power to search out complicated requests quickly and efficiently. Search power includes speed and features such as Boolean searching, phrase searching and truncation." (Nicholls, 1993 p. 63) Regardless of how wonderful or powerful the search engine is, in order for it to be productive, searchers must learn how to operate it.

> It is important, then, for the user to become familiar with how searches are conducted in a given program--how matches are listed, how near-matches are treated, how the entries in a list can be accessed, and how searches can be focused.(Sader and Lewis 1995, p.413)

Electronic encyclopedias present several challenges to the library media specialist. First, searching a CD-ROM encyclopedia is very different from searching the print encyclopedia. Secondly, searching the various electronic encyclopedias varies from one product to the next. Third, there are several ways to search within each encyclopedia. "Most CD-ROM databases allow the user to search in at least two ways-the browse search and the analytical search. A browse search will allow the user to look through an alphabetical index of words or titles. The analytical search is more complex and allows the user to

combine keywords to narrow the search." (Baumbauch, 1990) The library media specialist must be familiar with all searching aspects of all electronic encyclopedia products in order to help patrons in their quests for information.

The Purpose:

The purpose of this study was to examine and describe the browse, analytical and hierarchical searching capabilities within the search engines of current general electronic encyclopedias. The features which enable searches were described for each product. It is important for library media specialists to know the search features within each electronic encyclopedia so that information can be passed on to patron searchers. "Reference librarians must be able to help users, at any point of their search, with the features and peculiarities of the whole range of products". (Tenopir 1991, p. 109). Similarities and differences were identified and explained.

Research Questions:

1.What are the search engine characteristics of browse searching when performed in each encyclopedia?

2. What are the search engine characteristics of analytical searching when performed in each encyclopedia?

3. What are the search engine characteristics of hierarchical searching when performed in each encyclopedia?

Significance of the problem

This descriptive research can be used by media specialists to more fully understand the search features of electronic encyclopedias and assist patrons

in their searches for information. The features in electronic encyclopedias were identified which enable browse, analytical and hierarchical searching. CD-ROM electronic encyclopedias are not the only searchable informational sources. Many other CD-ROM products have been developed which use similar search features. Search engines available on the Internet also offer these types of search features. Identifying and describing common search features in electronic encyclopedias will provide a framework that can be applied to other electronic resources.

Assumptions

In this study certain assumptions have been made:

1. Valid and useful comparisons of the electronic encyclopedia searching features can be made from user analysis.
2. Comparisons of these searching features can be helpful for instruction, purchasing and evaluation.

Limitations of the study

This study examined general electronic encyclopedias in the CD-ROM format on a Macintosh platform. The latest available versions were examined: The study was limited to the following electronic encyclopedias:

1997 Grolier Multimedia Encyclopedia (Version 9) [Electronic database]. (1997). Danbury, CT: Grolier Interactive Inc. [Producer and Distributor]

Compton's Interactive Encyclopedia (Version 3) [Electronic database]. (1995). Carlsbad, CA: Compton's NewMedia, Inc. [Producer and Distributor].

Encyclopedia Americana (Version 3) [Electronic database]. (1997). Danbury, CT: Grolier Educational. [Producer and Distributor].

Encyclopedia Britannica (Version 1) [Electronic database]. (1997). Chicago, IL: Encyclopedia Britannica, Inc. [Producer and Distributor].

Infopedia 2 (Version 2) [Electronic database]. (1996). Cambridge, MA: Softkey International, Inc. [Producer and Distributor].

Microsoft Encarta 97 Encyclopedia [Electronic database]. (1996). CA: Microsoft [Producer and Distributor].

World Book Multimedia Encyclopedia [Electronic database]. (1997). Chicago, IL: World Book, Inc. [Producer and Distributor].

All of these were classified as general electronic encyclopedias. All were examined in the CD-ROM format. This descriptive study examined the browse, analytical and hierarchical search features. The study was subjective in that the description relied on the researcher's observations and explanations. Electronic encyclopedias offer other features such as: pictures, sound, animation and video clips. Content, depth, accuracy and quality of the electronic encyclopedias were not considered in this study.

Definition of terms

analytical search feature- a searching feature that can be simple or complex. A simple analytical search can be performed by entering a search term and the search engine will retrieve all articles containing that term. A complex analytical search can be performed by combining two search terms using the connectors AND, OR and NOT. If using AND the resulting article will contain both terms. If using OR the resulting article will contain the first term, the second term or both. If using NOT the resulting article will exclude any article

containing the word followed by the word not.

Boolean logic- "a searching feature that allows researchers to connect more than one term using *and, or* and *not* in order to narrow or expand the search parameters and help ensure that the matches retrieved are appropriate." (Sader and Lewis 1995, p. 413)

browse search feature-involves viewing an alphabetical, scrollable list that displays all the article titles or topics in a given encyclopedia. The searcher can manually scroll through the list or type in the article or topic being sought.

CD-ROM- a 4.75-inch optical disk capable of holding 300,000 pages of information and capable of including video, audio, text and graphics. (Mendrinos, 1994, p.57)

database-information that has been collected, organized and recorded into some structure. (Jasco,1992 , p.2.)

documentation- any printed material, such as a manual or instructional book accompanying an electronic encyclopedia.

electronic encyclopedia-encyclopedia available either on CD-ROM or online (Internet , Prodigy, American Online, e.g.)

general encyclopedia- "an encapsulation of our knowledge of our world in all fields of study". (Sader and Lewis 1995, p. 29)

hierarchical search feature-presents a list of broad concepts or disciplines. The searcher selects from the broad concepts, the list of related topics, which lead to a list of articles. Each choice narrows the topic until searchers determine they have reached their topic or abandon their search.

hypertext-occurs when a searcher makes a connection between a word or phrase in one article to another article in the resource. The text is highlighted, and the searcher selects the word and the related article opens.

interface- "refers to the software and hardware peripherals which enables the searcher to access and interact with the computer application system." (Ravden& Johnson, 1989, p.15)

proximity- in searching, setting a limit as to what distance terms are apart in the resulting article, for example, within ten words.

screen design- "purposeful organization of presentation stimuli in order to influence how students process information". (Haag & Snetsigner, p.3)

search- the act of a person looking for information.

search engine- the built-in software of the electronic encyclopedia that dictates how the encyclopedia retrieves information.

search strategy- a methodical process used to find information

truncation- involves the use of a symbol in the middle of a word or at the end of a word to locate all forms of the word. If the symbol is in the middle of the word, it is referred to as embedded truncation. If used at the end of the word, it is called right truncation.

Chapter 2

Literature Review

Since the entrance of the electronic encyclopedia on the market in 1985 there has been much research conducted regarding different aspects of electronic databases. This literature review focused on research about the searching capabilities of electronic encyclopedias, screen design and user interface, and searching similar databases.

Searching Electronic Encyclopedias

Researchers have studied the (a) comparisons between searching the print and CD-ROM versions, (b) the success students have in searching electronic encyclopedias, (c) descriptions of the types of searches available, and (d) student information seeking strategies with CD-ROM encyclopedias.

One of the earliest research studies conducted on searching electronic encyclopedias was done by Barlow, Karnes and Marchionini (1987). In their case study they focused on the Grolier's Electric Encyclopedia which utilizes both the browse and analytical search modes. Their findings were based on a cooperative research project between faculty of the University of Maryland's College of Library and Information Services and the faculty of Surrattsville, Maryland, High School and provided a summary of their experiences using the CD-ROM format in the school's library media center. The subjects were high school students from Surrattsville, Maryland. This school is a comprehensive high school with a population of 1,285. Students involved included ninth grade Earth science students, advanced placement English students and humanities students studying mythology. Minimal training was provided on operating the system, but no training was provided on searching features. Most students used

only the browse searching mode because their ability to construct a search strategy using combinations of key words or phrases appeared to be limited. The researchers found that minimal instruction was needed for technical operation of the electronic encyclopedia. They also concluded that instruction should focus on searching strategies for browsing, filtering and using analytical features including Boolean searching, scope and proximity. (Barlow, Karnes & Marchionini, 1987 p. 68)

In a similar study Liebscher and Marchionini (1988) compared the browse and analytical searching features in Grolier's Electric Encyclopedia. In this comparative study the researchers hypothesized that the analytical searches would be more efficient than the browse searches.

Two groups of high school students were given short training sessions in the two searching features and then asked to complete an assignment using the electronic encyclopedia. The results showed little difference in the retrieval performances of the two search strategies. This raised questions among the researchers about the quality of training of the search strategies and the time frame between the training and actual use, which in some cases was three weeks. There was some evidence that the training for the analytical model was inadequate. The results suggested that students were successful in retrieving information, but may need more training in analytical searching. (Liebscher & Marchionini, 1988 p.232)

Edyburn (1991) based his research on fact retrieval by students with and without learning handicaps using print and electronic encyclopedias. This comparative study involved thirteen junior high learning handicapped students and fifteen non handicapped students the same age. Each student conducted four fact retrieval tasks with a print encyclopedia, an online electronic

encyclopedia with menus, and an online electronic encyclopedia with commands. In the menu-driven encyclopedia, searchers were prompted to enter a search term. Search command cards were placed next to searching stations using the command-driven encyclopedias so students could clearly identify which letter abbreviations would enable their searches. Patterns of performance were similar between students with and without learning handicaps, but distinction in the abilities of the two groups were maintained. The research concluded that teachers should place more emphasis on developing information-seeking skills which will enable students to fully utilize the power of information technology.

In 1989 Marchionini continued his research on CD-ROM encyclopedias using elementary students and full-text electronic encyclopedias. This descriptive research involved observing twenty-eight third and fourth grade and twenty-four sixth-grade students searching the Grolier's Electric Encyclopedia. The students conducted two assigned searches, one open-ended, the other closed, after two demonstration sessions. The closed search involved students finding the first year speed skating was introduced in the Olympic games. The open-ended search involved students searching for information about women who had traveled in space. The purpose of the study was to find out how successful novices would be when searching electronic encyclopedias. It was hypothesized that success, the time taken to complete the search, and total number of moves made would be dependent on user group and task. Subjects were judged successful in the closed search if they found the correct fact. In the open search success was determined if information on a minimum of one female astronaut was located. Marchionini concluded that the students were successful, but did not make full use of the powerful search features of the

encyclopedia. "Although the system provided powerful search features, most novices accepted the system defaults. System designers should carefully consider what features are made explicit to users and which are hidden and how defaults are set if they expect novices to take full advantage of a system." (Marchionini, 1989 p. 64)

In additional research, Marchionini (1989) did a case study of sixteen high school students for three 1-hour sessions over a 7-week period. The results of three of the students were used for an in-depth study. Marchionini was interested in how these students adapted their mental models of print encyclopedias to the searching strategies needed to find information in the electronic version. The findings suggested students could adapt their mental models from print to electronic. They also suggested that instruction, whether through teachers or machines, can help by providing examples of how print-based strategies apply and how they do not apply, and what new ones are possible.

Large, Beheshti & Renaud (1994) conducted a comparison of the information retrieval from print and CD-ROM versions of an encyclopedia by elementary students. Forty-eight sixth-grade students from four elementary schools in Montreal were used to compare retrieval results using the print and CD-ROM versions of Compton's Encyclopedia.

The results were intended to shed some light on how young novice searchers actually used the two types of encyclopedias. These students were quite successful in their information seeking tasks in both print and CD-ROM. Retrieval time in both had a direct relationship with the complexity of the search. Researchers noted that the CD-ROM group were more willing to experiment with a new approach if their first search was not successful, than their

counterparts in the print group. (Large Beheshti and Renaud, 1994)

Oliver & Oliver (1996) conducted a case study to investigate the search strategies employed by novice users of electronic encyclopedias and to analyze the problems and issues they encountered. This study involved a class of twelve year old students that had been instructed in the use of an electronic encyclopedia. "The study found that students tended to employ inefficient search strategies and experienced difficulty in creating search requests for information related problems. A major factor influencing the ease of use of the search strategies was the level of assistance provided by the interface." (Oliver & Oliver, 1996, p.33) He found that students chose search strategies by ease of use rather than appropriateness of task. His results suggested that there is a need for more training for electronic interactive formats. Students need new skills to make intelligent use of new technologies and new strategies to make use of new capabilities.

Most current electronic encyclopedias include some type of hierarchical searching. "A hierarchical structured document should help facilitate information searching as it reduces time spent on category selection by trimming unlikely branches." (Lai and Waugh, 1994 p.3) In 1994, a study done by Lai and Waugh, examined the influences of three different combinations of document structures and menu designs on users' attitude, performance, and learning in five different search tasks. The research questions were based on how the search tasks were broken down.

The three types of combinations studied were: (1) an explicit menu signaling hierarchical structure where cross-referencing was not supported; (2) an explicit menu signaling hierarchical structure in which cross-referencing was embedded; and (3) an embedded menu signaling both hierarchical structure

and cross-referencing capability. The five types of searches were: (1) simple and fully known; (2) simple but partially unknown; (3) complex and fully known; (4) complex but only partially known; and (5) complex and the condition for terminating the search was unclear.

The hypotheses were:

1. For search task 1 explicit menus will produce higher search scores and faster searches than the embedded menu.
2. For search task 2 explicit menu and cross-reference will produce the best search score and the fastest search. Embedded menu will produce the worst search scores and the slowest search.
3. For search tasks 3 and 4 document set 2 will result in the highest search score and the fastest search.
4. For search task 5 document sets with cross-references will produce higher score and faster search.

Sixty-nine undergraduate students from the Department of Education Psychology at a major university in the Midwest volunteered to participate in the study. Results showed that providing cross-reference links in small- or medium-sized online documents can improve search accuracy but not efficiency. The hierarchical structure of the system promoted more in depth searching when the search task was more complex supporting the hypotheses. (Lai and Waugh, 1994)

A study done by Stevenson (1993), examined the degree to which fourth and fifth grade children can master the skills needed to operate a full-text CD-ROM database, the New Grolier Electronic Encyclopedia. The subjects were fourth and fifth grade students at Robert Frost Elementary in Westerville, Ohio. Results showed that students of the fourth and fifth-grade level were capable of

utilizing the searching modes of the Grolier's Academic American Encyclopedia in the CD-ROM format. Results seem to support teaching them browse searching first, followed by the more complex Boolean searching.

Screen Design

Research relevant to electronic encyclopedias has been done in the area of screen design and user interface. This research deals with location of information and its effects on learning, along with problems searchers encounter with the interface design.

Research done on screen design is another important aspect of electronic resources. A causal comparative study done by Aspillaga in 1991 examined screen design, the location of information and its effects on learning. It was hypothesized that consistency between location of information and pictorial representation facilitates the transfer of presented material into memory. Sixty undergraduate students were randomly assigned to one of the three treatment conditions: displaying text (a) relevant to graphical information, (b) at the upper middle section of the screen, and (c) randomly. Results indicated that displaying information at a consistent location or relevant to graphical information facilitates learning. (Aspillaga, 1991 p.90)

In a case study done by Puttapithakporn (1990), human problems and errors using the computer interface were examined. The purpose of the study was to analyze the problems searchers have with computer interfaces and to provide insights into potential improvements in the design of systems and training programs. Thirty-three students from Indiana University-Bloomington participated in this study. All were familiar with the use of computers and had experience searching other databases, but not with the database being used in

this research, ERIC on Silver Platter. The participants were asked to do a search, display results on the screen and print some records as hardcopy. Results were gathered by: direct observation, self-administered questionnaire, and selective interviews. Results showed these areas of computer interface should be addressed: completeness of menu, organization of menu, use of abbreviations, command assistance, error and prompting messages and online tutorial. Recommendations were that designers and trainers look closely at these areas of computer interface. (Puttapithakporn, 1990 p.202)

Databases

An additional area of related research deals with searchers' use of similar electronic databases. Data compiled on searching other databases is valuable when examining the searching strategies of electronic encyclopedias. The searching features found in electronic encyclopedias can be seen in other electronic databases and in searching the Internet. Research done in other searching databases is applicable to searching electronic encyclopedias.

A survey study of the online search techniques of 50 university students was done by Anderson in 1995. This study was conducted to examine the types of searching used, use of library personnel and help screens, exposure to library instruction and length of the search. Fifty graduate and undergraduate students at Arizona State University were observed as they conducted searches in the library on a variety of databases. Results of the survey showed that almost all students make use of simple searching features rather than more complex features. This correlates directly with other findings dealing with searching electronic encyclopedias. (Anderson, 1995 p.366)

A similar study done by Wells in 1992 in the library at the University of

South Florida in Tampa, analyzed the needs of users of CD-ROMS during a twenty day period. Results of this case study revealed types of help searchers needed when using CD-ROM databases. The most frequent problems dealt with technical questions, selecting an appropriate database, and search strategy. The researcher concluded that additional training should be offered in these areas. (Wells, 1992 p.8)

Summary

In light of the previous studies concerning searching electronic encyclopedias and other databases, important points have become evident. Electronic encyclopedias are not automatically better than print encyclopedias. The studies tend to show equal success with print and electronic encyclopedias. Students generally use the browse method of searching to obtain information, ignoring more sophisticated searching methods. The students transferred their previous knowledge of using a print encyclopedia to the lowest level of searching in the electronic encyclopedia, the browse search. To understand and take advantage of the analytical and hierarchical search features of these electronic encyclopedias, users need additional information and training in electronic search features.

Chapter 3

Methodology

Research Design

The research design chosen for this study was nonexperimental qualitative descriptive research. This descriptive research described and interpreted what existed at that point in time. It was concerned with conditions or relationships that existed. It did not manipulate variables, rather dealt with the development of generalizations that have universal validity. (Best and Kahn, 1993) This design allowed for in-depth description and illustration of the searching features of CD-ROM electronic encyclopedias. In this descriptive research, the researcher closely examined the subjects, in this case, CD-ROM electronic encyclopedias, and described the way they were at that point in time.

Data Gathering

The data for this research was compiled by three methods: (a) written description, (b) screen shots, and (c) tables. Written description was noted for each search feature. Screen shots were produced to further illustrate the search features. Tables showing the details of browse search features, simple analytical search features, complex analytical search features and hierarchical search features were developed to show patterns of characteristics related to features.

Procedure

All electronic encyclopedias were examined in the CD-ROM format on a Macintosh 5200/75. The CD-ROM drivers of the electronic encyclopedias were installed on the hard drive of the computer. The researcher examined each of

the three searching features by viewing the screens and entering searches. Screen shots were taken and printed to further illustrate the screen design. Common patterns and variations of the three search features were compiled and explained in the the text, screen shots and tables.

Browse

The browse search features examined in this study include (a) the browse search label, (b) browse search selection, (c) the manner in which searches are conducted, (d) the number of articles visible in the article list box, (e) the types of article lists that are available, (f) the availability of the article list box at all times, (g) the filters available to narrow a browse search, (h) whether the search engine searches through article titles or subjects, or both.

Analytical

Both simple and complex analytical search screens were described. Search features described in both simple and complex analytical searching were: (a) analytical search label, (b) simple or complex label, (c) number of search boxes, (d) use of word, phrase or both in a search, (e) Boolean operators, (f) truncation choices, (g) proximity choices, and (h) filters

Hierarchical

Hierarchical searching involved starting with broad subject categories narrowing those down to subcategories and eventually to specific articles. Hierarchical searching was described by (a) the hierarchical search label, (b) how the hierarchical search is completed (c) the availability of the subject breakdown, (d) the option of backtracking to modify a search, and (e) the

number of general subject categories.

Population

The population used in this research included general electronic encyclopedias produced on CD-ROM utilizing the Macintosh platform. Every effort was made to use the latest version available. See Appendix A.

Chapter 4

Data Analysis

Three search features were available in most general electronic encyclopedias. They were: browse, analytical and hierarchical. The intent of this study was to answer these research questions:

1. What were the search engine characteristics of browse searching when performed in each encyclopedia?
2. What were the search engine characteristics of analytical searching when performed in each encyclopedia?
3. What were the search engine characteristics of hierarchical searching when performed in each encyclopedia?

The definitions in Chapter 1 gave a general description of these searches. A browse search was defined as viewing an alphabetical, scrollable list that displayed all the article titles or topics in a given encyclopedia. The searcher manually scrolled through the list or typed in the article topic being sought. An analytical search was defined as simple or complex. In a simple analytical search a search term was entered and the software retrieved all articles containing that term. A complex analytical search was performed by combining two search terms and using Boolean logic. A hierarchical search was a subject breakdown from broad subjects to narrow topics. Results of this descriptive study found patterns that reflected the features for browse, analytical and hierarchical searching and defined and described them in more detail.

These search features were accessed by making a selection from the main screen. In most electronic encyclopedias this was the first screen encountered. In others, there was an introductory screen preceding the main screen. The description of the screen design and search features in this study

used that main screen as a common starting point. See Appendix B for screen shots of the main screens and search features for further illustration.

There were similarities of screen design in most electronic encyclopedias. Boxes were used to enter search terms, to show article lists and to show selected articles. The box in which a search term was entered was labeled a **search box**. The basic screen was laid out in boxes which operated in an independent or dependent manner relative to the specific function. Search boxes enabled users to enter words or phrases. Articles were often selected from a listing of article titles. The alphabetical listing of article titles were found in a box called the **article list box** on the left side of the screen. Text of articles that were selected from the **article list box** appeared on the right side of the screen. This screen was labeled the **article box.** These terms were used throughout the study to describe which boxes were available during various points of the search. As selections were made, some boxes became inactive while others remained active.

The search features were selected from the row of buttons or icons across the top, the bottom or the side of the screen. This was labeled the **tool bar** and buttons are labeled **buttons**. Others allowed selection from tabs, which were labeled **tabs**, or hypertext, which were labeled **hypertext links**. Some allowed the selection from both an icon or hypertext links. A **filter** was used to limit a search by subject or category before entering search terms.

Browse Search Features

What were the browse search engine characteristics of browse searching when performed in each encyclopedia? Close examination of the electronic encyclopedias in this study revealed the following information about browse

searching (a) the browse search label, or the name given to browse search in each encyclopedia, (b) selection of the browse search feature, such as the particular button, tab or icon selected to choose this type of search, (c) conducting browse searches, or the actual selections made to carry out the search, (d) the number of articles visible in the *article list box* that the searcher can view without scrolling, (e) the types of article lists that were available, such as pictures, sounds or video, (f) the availability of the *article list box* at all times during the search process, even after an article is selected, (g) the filters available to narrow a browse search, such as narrowing the browse list to a category or subcategory, and (h) the text searched by the browse search feature, such as titles or subjects. The results of the examination of the browse search features of these encyclopedias were described in Table 1 as a comprehensive chart and in the following text. (See Table 1 on page 27.)

1997 Grolier Multimedia Encyclopedia

The browse search feature was labeled *browse* in the 1997 Grolier Multimedia Encyclopedia. The browse search was activated by selecting the *Browse* tab on the main screen. (See Figure B1) This feature had four options in the 1997 Grolier Multimedia Encyclopedia which were; to browse the entire *article list box*, to enter a term or phrase in the *search box*, to use the browse filter feature, or to browse an article list of available media. The *article list box* was on the left side of the screen and the *article box* was on the right side of the screen. In all options the *article list box* showed ten titles at once. The searcher scrolled the list to view more titles. When an article was selected from the *article list box*, it appeared in the *article box*. The *article list box* always remained visible.

Table 1. Browse Search Features

Electronic Encyclopedias	Browse Search Features						
	Browse search label	Browse Search Selection	Number of articles visible in article list	Types of article lists available	Article list always visible	Filter available to narrow search	Search article titles, subjects or both
1997 Groliers Multimedia Encyclopedia	Browse	Select browse tab	ten	titles, categories, and media	yes	category and subbcategory	both
Comptons Interactive Encyclopedia	Article List	Select article list on tool bar	twenty-two	titles, pictures, sounds and movies	yes	no	titles
Encyclopedia Americana	Index	Default on main screen	seventeen	Titles, full text, bibliography, contributors, subject, geography, art form and maps	yes, unless searcher chooses to close window	Bibliography, contributors, subject, geography, art form and maps	both
Encyclopedia Britannica	No browse search available in Encyclopedia Britannica						
Infopedia 2	Index	Default on main screen	nineteen	titles and media	yes	Photos, videos, maps, animations, sounds and Quick Facts	titles
Microsoft Encarta 97	Article List	Default on main screen	fourteen	Titles, media + more	yes	animations, charts, interactivities, maps, pictures, sounds ,tables, collages, videos, 360 views, web links, Yearbook	titles
World Book Multimedia Encyclopedia	No actual label given	Select Search on main screen, then title only on following screen	Number varies with search	Title list available for searching, not viewing	no	no	titles

The first option was to browse the entire article list. This list appeared when the *Browse* tab was selected and allowed the searcher to view all the article titles of the encyclopedia.

The second option was for the searcher to enter a term or phrase in the search box which showed the closest appropriate alphabetical article title. The search term, or the closest to that term in alphabetical order, was highlighted and positioned at the bottom of the *article list box*..

A third option was the *filter*. When the searcher selected the *filter button*, the browse search was limited to a category or subcategory. A screen opened which gave a list of ten categories, each with subcategories. (See Figure B2) To limit the *article list box* to a category the searcher selected the button next to the category and then *apply*. To further limit the *article list box*, the searcher selected the *button* next to the category, then selected a subcategory, and *apply*. The searcher was limiting the *article list box* to that subcategory. The advantage of this filter was the searcher was browsing through a shorter *article list box*. A search term was not entered when using the filter feature. The feature was actually a combination of a browse and hierarchical search feature.

The fourth browse search feature in the 1997 Grolier's Multimedia Encyclopedia allowed the searcher to view titles from the *article list box* of all the multimedia in the *Gallery*. The searcher selected the *Browse* tab and the *Gallery* button located above the *Browse* tab in the tool bar. A screen appeared listing all the media types and categories. (See Figure B3) The searcher had two options; choose the media type and *apply* or choose the media type and the category and *apply*. This limited the article list box to media only in that category.

Compton's Interactive Encyclopedia

The browse feature in Compton's Interactive Encyclopedia was called *article list* . This feature was opened by selecting the second *button* from the left in the *tool bar*, and the *article list box* appeared on the left side of the screen. (See Figure 1).When an article was selected, it appeared in the *article box* on the right side of the screen.

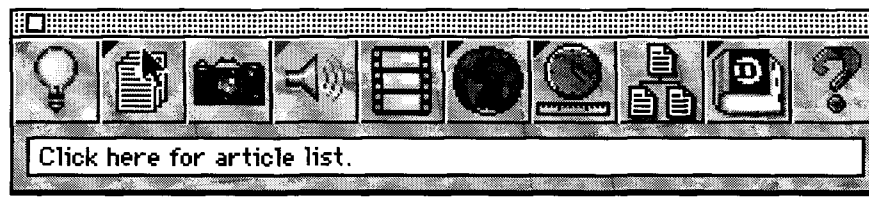

Figure 1. Toolbar for selecting browse search feature in Compton's Interactive Encyclopedia.

The browse search feature had three options in this encyclopedia; to browse the entire article *list box*, to enter a search term or phrase in the search *box*, or browse article lists of pictures, sounds, or movies. Twenty-two article titles were visible at one time in the *article list box*. (See Figure B4.)

In the first option, the searcher scrolled through the *article list box* which included the title of all articles in this encyclopedia.

In the second option, the searcher typed a term or phrase in the search box to locate an article title. The *article list box* changed to show the appropriate alphabetical spot where the term or the closest alphabetical match appeared.

In the third option, the searcher selected, *Picture List, Sound List or Movie List* from the *tool bar*. They were indicated by the camera, speaker and film icons. (See Figure 1).

Encyclopedia Americana

The browse search feature in the Encyclopedia Americana was labeled *index* and was the default on the main screen. (See Figure B5) There were seventeen articles visible in the *article search box* on the left side of the screen. Other articles were visible by scrolling. When an article was selected, it appeared on the right side of the screen in the *article box*. The searcher could close either of these boxes to enlarge the other box. The first step in this browse search was to choose one of eight indexes from the pull down menu above the search box: (a) article titles, (b) full text, (c) bibliography, (d) contributors, (e) subject, (f) geography, (g) art form, and (h) maps. After the index was chosen, the searcher scrolled the alphabetical list or entered a search term or phrase. (See Figure B6)

The Encyclopedia Britannica CD 97

There was no browse search feature available in The Encyclopedia Britannica CD 97. (See Figure B7.) There was no alphabetical article list available to view or scroll and the searcher could not enter a search for an article title.

Infopedia 2

Infopedia 2 was comprised of The Funk & Wagnalls Encyclopedia along with several other reference resources. The search features of The Funk & Wagnalls Encyclopedia were described here.

The browse search feature was labeled *Index* in Infopedia 2 and was chosen by selecting the Index *button* located in the *tool bar* above the article list box. (See Fig. B8) The *article list box* was located on the left side of the

screen with the *article box* on the right side of the screen. Nineteen articles were visible at one time in the *article list box*. This *article list box* was visible at all times during the browse search options.

There were three options to the browse search feature found in this encyclopedia; scrolling the *article list box*, entering a search term, or scrolling *article list boxes* of media.

The first option was scrolling the entire *article list box*. The searcher scrolled through the article title list and selected an article which appeared in the *article title box*.

The second option was to enter a word or phrase in the *search box* which caused the article list to shift to show the search term or the closest term in the *article list box*. The article title, or closest term, was highlighted in the *article list box*. The highlighted term did not appear in a consistently ranked spot in the article list box. To open a particular article, the searcher selected the highlighted title and the article appeared in the *article box* on the right side of the screen.

The third type of browse search available in this encyclopedia enabled the searcher to browse through an *article list box* of media titles. To use this feature, the searcher selected the *Media button*, then selected the media type *buttons*. (See Fig. B9). The searcher selected any number, or all of the media types to appear in the *article list box*. To choose the article, the searcher scrolled up or down the *article list box*, then selected the article desired.

Microsoft Encarta 97 Encyclopedia Deluxe

The browse search feature was the default on the main screen a searcher encountered when opening the Encarta 97 Encyclopedia and was

referred to as the *Article List* in the *documentation* . (See Fig. B10). The *article list box* was available on the left side of the screen of this encyclopedia and the *article box* was on the right side. Fourteen articles were visible at one time in the *article list box.* When an article was selected from the *article list box*, it appeared in the *article box.*

There were three options: scrolling the *article list box*, entering a search term in the *search box* and, viewing article list boxes of available media.

In the first option, the searcher scrolled the article list box and selected an article.

The second option was to enter a search term or phrase in the *search box* located above the *article list box.* The searcher was directed to type in an article title. As a search term or phrase was entered, the list moved to the closest appropriate alphabetical listing in the *article list box.* The entered title, or the closest to that term or phrase in alphabetical order, was highlighted and positioned in the center of the article list box. The searcher scrolled the list and chose an article by selecting the title from the *article list box.*

In the third option, the searcher selected *Media + More* from the tool bar to the right of the article list box. A screen appeared with media type selections. When a selection was made, the *article list box* for type of media appeared on the left. (See Fig. B11)

World Book Multimedia Encyclopedia

The browse search feature was not functional in the same way in the World Book Multimedia Encyclopedia as the previous encyclopedias examined. There was no alphabetical title list to view or scroll. The World Book Multimedia Encyclopedia did allow searching through a title only feature, which resembled

the entering of search terms in browse searching in previously examined encyclopedias. This *Title Only* selection in The World Book Multimedia Encyclopedia was not actually labeled on the screen or in the documentation. The search feature was enabled in this encyclopedia by selecting *Search* from the main screen or by selecting the binoculars *button* in the *tool bar*. (See Figure B12). A new screen appeared showing three search boxes. (See Figure 2)

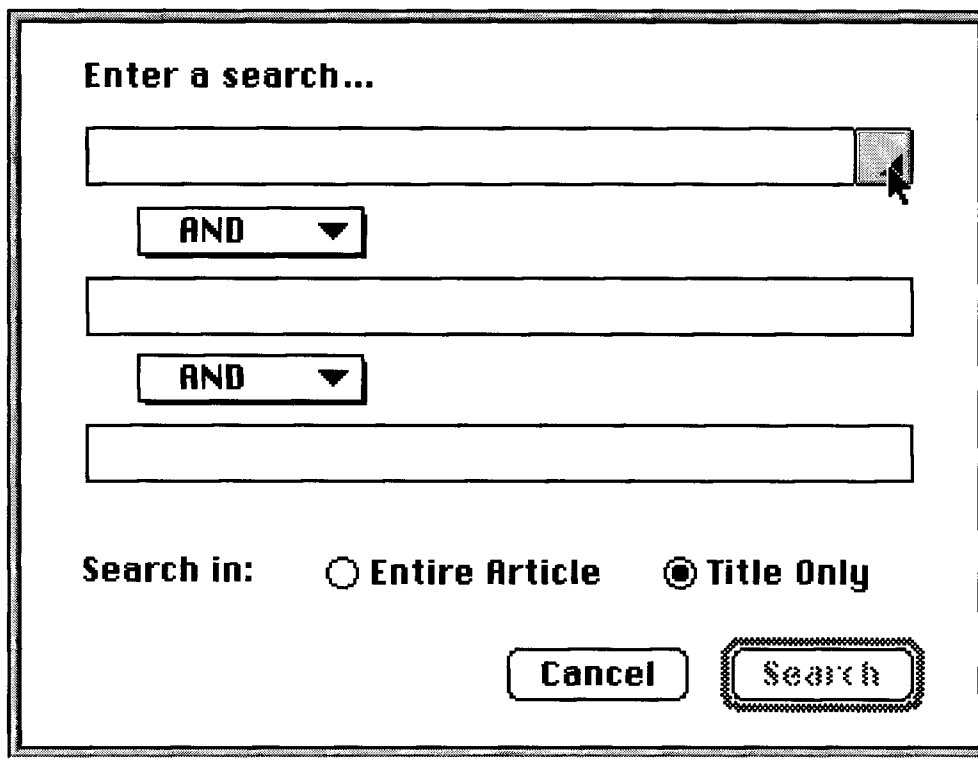

Figure 2. Search selection in the World Book Multimedia Encyclopedia

The searcher entered a search term in the top box that identified what term should appear in the title. The searcher selected *Title Only* to enable the search function. A new screen appeared showing an article that matched the search. Other articles were available by selecting the *Search Results button* in

the *tool bar.* The search engine searched for titles of articles in the browse feature of this encyclopedia.

Analytical Search Features

What were the search engine characteristics of analytical searching when performed in each encyclopedia? Close examination of the electronic encyclopedias in this study revealed the following information and additional details about analytical searching. Most encyclopedias offered simple and complex analytical searching features. A simple analytical search was performed by entering a search term or phrase and the software retrieved all articles containing that term or phrase. A complex analytical search was performed by combining two or more search terms or phrases and using Boolean logic. The analytical search could be modified by using proximity, truncation or filters. Search features that were described in both simple and complex analytical searching are: (a) the analytical search label, or the name given to the analytical search feature in each encyclopedia, (b) the simple or complex label or name given to the two types of analytical search features in each encyclopedia, (c) the actual number of search boxes on the screen used to enter search terms or phrases, (d) the use of one word, a phrase or both in a search, (e) which Boolean operators are available in each encyclopedia, (f) the truncation choices, involving the use of a symbol in the middle of a word or at the end of a word to locate all forms of the word. If the symbol is in the middle of the word, it is referred to as embedded truncation. If used at the end of the word, it is called right truncation. (g) the proximity choices or how close search terms or phrases must be in the resulting articles, and (h) the use of filters, which limit the categories the software searches. The results of the examination of the

simple and complex analytical search features of these encyclopedias were described in Tables 2 & 3 as comprehensive charts and in the following text. (See Tables 2 &3 on pages 36-37.)

1997 Grolier Multimedia Encyclopedia

The analytical search feature in the 1997 Grolier Multimedia Encyclopedia was labeled *Search*. To activate this feature, the searcher selected the *Search tab* from the *main screen*. (See Fig. B13) All of the following details remained the same whether using the simple or complex analytical searching in this encyclopedia. The *article list box* contained a list of the hits resulting from a search of a term or a phrase was located on the left side of the screen. The list was scrollable to view all hits. The *article box* which displayed a selected article was located on the right side of the screen. The icon to the left of the article in the *article list box* indicated whether the article contained text, pictures, movies, fact boxes, maps, tables, sounds, animations or essays . The number of hits containing that search term were noted below the *article list box* and all search terms were highlighted in the selected article. Grolier Multimedia Encyclopedia used two types of truncation, embedded and right. This could be used with any search term in any of the four search boxes in simple or complex analytical searching. In embedded truncation, the symbol *"?"* was placed in the middle of the word when a searcher was unsure of a character. In right truncation, the symbol " *" was placed at the end of a word to locate all forms of that word. There were differences in simple and complex analytical searching.

In the first type, simple analytical searching, a search term or phrase was entered in the *search box* and the searcher selects *Search*. The search engine

Table 1. Browse Search Features

Electronic Encyclopedias	Browse Search Features						
	Browse search label	Browse Search Selection	Number of articles visible in article list	Types of article lists available	Article list always visible	Filter available to narrow search	Search article titles, subjects or both
1997 Groliers Multimedia Encyclopedia	Browse	Select browse tab	ten	titles, categories, and media	yes	category and subbcategory	both
Comptons Interactive Encyclopedia	Article List	Select article list on tool bar	twenty-two	titles, pictures, sounds and movies	yes	no	titles
Encyclopedia Americana	Index	Default on main screen	seventeen	Titles, full text, bibliography, contributors, subject, geography, art form and maps	yes, unless searcher chooses to close window	Bibliography, contributors, subject, geography, art form and maps	both
Encyclopedia Britannica	No browse search available in Encyclopedia Britannica						
Infopedia 2	Index	Default on main screen	nineteen	titles and media	yes	Photos, videos, maps, animations, sounds and Quick Facts	titles
Microsoft Encarta 97	Article List	Default on main screen	fourteen	Titles, media + more	yes	animations, charts, interactivities, maps, pictures, sounds ,tables, collages, videos, 360 views, web links, Yearbook	titles
World Book Multimedia Encyclopedia	No actual label given	Select Search on main screen, then title only on following screen	Number varies with search	Title list available for searching, not viewing	no	no	titles

Table 3. Complex Analytical Search Features

Electronic Encyclopedias	Complex Analytical Search Features								
	Analytical Search Label	Complex analytical search label	Number of search boxes	Word, phrase or both	Boolean operators	Truncation	Proximity choices	Filters	Searches full text
1997 Grolier Multimedia Encyclopedia	Search	Complex	Four	Both	AND, OR, NOT	Right and embedded	Same paragraph, titles, within 1-100 words	Media type and category	Yes
Comptons Interactive Encyclopedia	Idea Search	Extensive	One	Both	None	None	None	Articles, Pictures and Facts	Yes
Encyclopedia Americana	Advanced Search	Detailed Search	One	Both	AND, OR, NOT	Right and embedded	Any number	Titles, bibliography, contributor, subject, geography, article form, maps and previous search	Yes
Encyclopedia Britannica	Britannic CD Articles	Enter word, phrase or question	One	Both	AND, OR, NOT	Right	Within 15 characters	None	Yes
Infopedia 2	Search	More Choices	Four	Both	AND, OR	None	None	None	Yes
Microsoft Encarta 97	Word Search	Find All Articles and Enter a Search String	Three	Both	AND, OR, NOT	Right	Use NEAR for within 8 words	None	Yes
World Book Multimedia Encyclopedia	Entire Article	Select Search on main screen, then Entire Article on following screen	Three	Both	AND, OR, NOT	Right	None	None	Yes

searched the text of the entire encyclopedia and listed all articles and media that contained the search term in the *article list box.* (See Fig. B14). Both right and embedded truncation were offered in the simple analytical search.

The second type, a complex analytical search was available to narrow or broaden the search. To activate this type of search, the searcher selected the *Search* tab and then the *Complex* button. Four search boxes appeared offering Boolean searching, proximity, truncation and limiting by categories. (See Fig. B15).

Boolean searching involved entering a search term or phrase in the top *search box.* The searcher entered additional search terms to limit or broaden the search using the Boolean operators; *AND*, *OR* and *NOT* in the other three search boxes.

Proximity, called *scope* in this software involved identifying how close the search terms must be to each other. The choices were: (a) all text, (b) in the same paragraph, (c) in the title, or (d) within a certain amount of words from one to 100. The searcher employed only one of these choices in a search.

A search can be limited by any number of media types or categories. Directly below the lists of media types or categories were check boxes to choose *All* or *NONE.* If *ALL* was selected, everything in the list of media types or categories was chosen. If *NONE* was selected, the searcher selected the media types or categories individually.

At this point, *SEARCH* was chosen, and the search engine searched for the desired information, taking into account all the selections made.

Compton's Interactive Encyclopedia

The analytical search in this encyclopedia was called *IDEA SEARCH.* This was activated by selecting the light bulb. (See Fig 3).

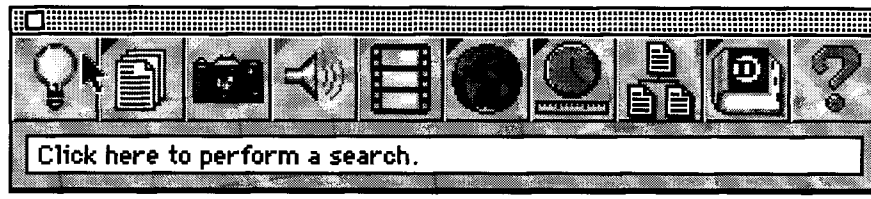

Figure 3. Toolbar for selecting analytical search feature in Compton's Interactive Encyclopedia.

A screen appeared showing the options for analytical searching in this encyclopedia. (See Fig. 4.)

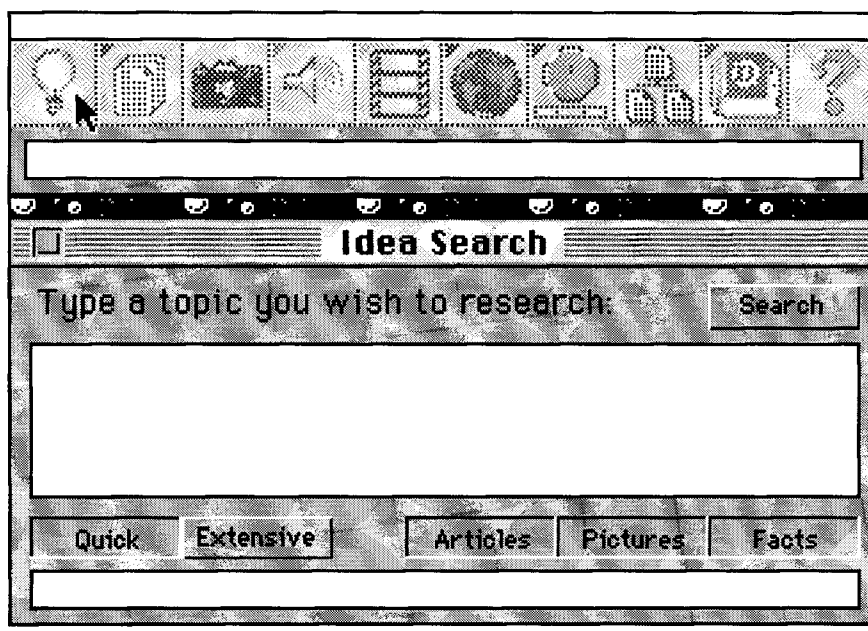

Figure 4. This is the analytical search box for Compton's Interactive Encyclopedia.

The analytical search feature in Compton's Interactive Encyclopedia had only one search box. The search was entered in the search box in any of the following forms; one or more words describing the search, a phrase, a sentence

or a question. After the words or phrase were entered, the searcher chose *Quick* or Extensive. The documentation did not identify what text the search software searched through to make the distinction between *Quick* and *Extensive.* Technical support was unable to offer an answer as to what articles the software searched through in the two search choices. If the searcher selected *QUICK*, the search engine searched a shorter list of articles. This resulted in a quicker search, with fewer results in the hit list. If the searcher selected *EXTENSIVE*, the search engine searched the full text of the encyclopedia. This search took longer, but resulted in a lengthier hit list. After the choice of *Quick* or Extensive was made, the searcher filtered the search by choosing any combination of *Articles, Pictures,* or *Facts.* This choice determined which kind of articles the search engine would retrieve. After these choices were made, the searcher selected *Search.* The *article list box* appeared on the left in the article box. The searcher scrolled the list and selected an article. The article appeared on the right side of the screen in the *article box* with the *article list box* still visible on the left. Truncation and proximity were not offered.

Encyclopedia Americana

The analytical search feature in the Encyclopedia Americana was selected by the *Advanced Search* button in the *tool bar* on the main screen (See Figure B6.) and selecting *detailed search* in the pull-down menu in the following screen. (See Figure B16.)There was no differentiation between simple and analytical searching in this encyclopedia. A search term, phrase or sentence was entered in the single search box. Boolean operators *AND, OR, NOT* were chosen from a *tool bar* at the bottom. Both embedded and right truncation were available using the symbol *"*"* for right truncation and the

symbol *"?"* for embedded truncation. Proximity was available by placing the *"#"* symbol and any number between two search terms to determine how near or far apart the search terms must be in the resulting articles. The searcher filtered the search by choosing from these categories: (a) titles, (b) bibliography, (c) subject, (d) geography, (e) article form, (f) maps, and (g) previous searches. These were available from a pull-down menu above the search box. After all search choices were entered, *Search* was selected. The search engine searched through the full text of the encyclopedia for the search selections. The results appeared in a hit list on the left side of the screen. A selected article appeared in the *article box* on the right side of the screen.

Encyclopedia Britannica

Analytical searching was available in the Encyclopedia Britannica from the *main screen* in one *search box*. (See Figure B17.) Simple and complex analytical searches were not separate choices. The search could be in the form of a word, phrase or question. Boolean operators, AND, OR and NOT were used to broaden or limit searches. Truncation was used by placing an asterisk after a common word root to cover a range of closely related words that differ only in their endings. Proximity, called adjacency, used the operator, *ADJ* to limit the space between search terms to 15 characters. This encyclopedia offered the option of setting the number of articles the software retrieves. The default was set at ten, which was the minimum number of articles retrieved, and the maximum was 500. This option was available from a pull-down menu below the search box. All of these search feature options were entered on the main screen and used one *search box*. After the searching term or terms were entered in the search box, the searcher selected *Britannica CD Articles* . When

the search was completed, the *article list box* appeared on a new screen. (See Figure B18) The *article list box* included the number of articles found and listed the articles with the first paragraph displayed. This encyclopedia used the same screen design as the Netscape software, an Internet browser.

Infopedia 2

The analytical searching feature in Infopedia 2 was labeled *Search* and was activated by selecting *Search* on the main screen in the *tool bar*. (See Fig. B19). This encyclopedia allowed both simple and analytical search features. There were similarities in these two features. The article list box appeared on the left side of the screen with the number of results directly above the list. An article that was selected appeared on the right side of the screen. The article list box remained visible on the left side of the screen.

To use the simple analytical searching feature, the searcher typed in the search term or phrase in the one search box then selected *Find* . The software searched through the entire text for occurrences of the search term or phrase.

To utilize the complex analytical searching feature in this encyclopedia, the searcher selected *More Choices* found directly beneath the *search box* and four search boxes appeared. (See Fig. B20). To enter a complex analytical search, up to four search terms or phrases were entered in the search boxes to the right of the word *FIND* and used Boolean operators *AND* and *OR* in any combination to broaden the search. *AND* and *OR* are *button* selections. The search was again activated by selecting *FIND*. Infopedia 2 did not utilize the Boolean operator *NOT,* truncation, proximity or filters.

Microsoft Encarta 97 Encyclopedia

Analytical searching in the Microsoft Encarta 97 Encyclopedia was activated by selecting Word*Search* from the *tool bar* on the *main screen* . (See Figure B21.) Both simple and complex analytical search features were available in this encyclopedia. The following procedures remained constant in both simple or complex analytical searching. The *article list box* appeared on the left side of the screen, listing the search term or phrase below the list and the number of articles retrieved. Fourteen articles were viewed at one time, while the others appeared by scrolling. An article was opened by selecting the title and it appeared on the right side of the screen in the *article box* with the search term or phrase highlighted. When an article was opened, the *article list box* disappeared, but could be reactivated by selecting the back arrow at the top in the *tool bar.* After doing so, both the selected article and the *article list box* could be viewed.

The simple analytical search was activated by the searcher selecting the button preceding the words, *Find all articles that include the word,* entering a term or phrase in the *search box* and selecting *search.* Even though it indicated only one word may be entered, a name or phrase could be entered. Proximity was available in this search feature.The search terms appeared within the same sentence in the resulting articles. This was not indicated on screen directions or in the documentation, but was verified by calling technical support for this encyclopedia. Right truncation was also available.

Complex analytical searching was available in two options. The first option of the complex analytical search feature employed the Boolean operator AND with two search terms or phrases to broaden a search. To utilize this search feature, the radio button preceding the words, *Find all articles that*

include the words , was selected, two search terms were entered and the *Search* button was selected. The second option of the complex analytical search feature involved using phrases for searching. The *button* preceding the words *enter a search string* was selected. Boolean operators, *AND* , *OR* , and *NOT,* truncation and proximity were used with search terms and phrases. (See Figure B22.) Truncation involved using a word stem or root followed by an asterisk searching for all forms of that word root. Proximity involved entering two search terms separated by the word NEAR and the resulting list included articles in which the search terms were within eight words of each other. When all search options were entered, *Search* was selected.

World Book Multimedia Encyclopedia

The analytical search screen was activated by selecting *Search* from the main screen of the World Book Multimedia Encyclopedia. A box appeared containing three search boxes. (See Fig. 5.) Simple and complex analytical searches were not separate choices as in other encyclopedias.

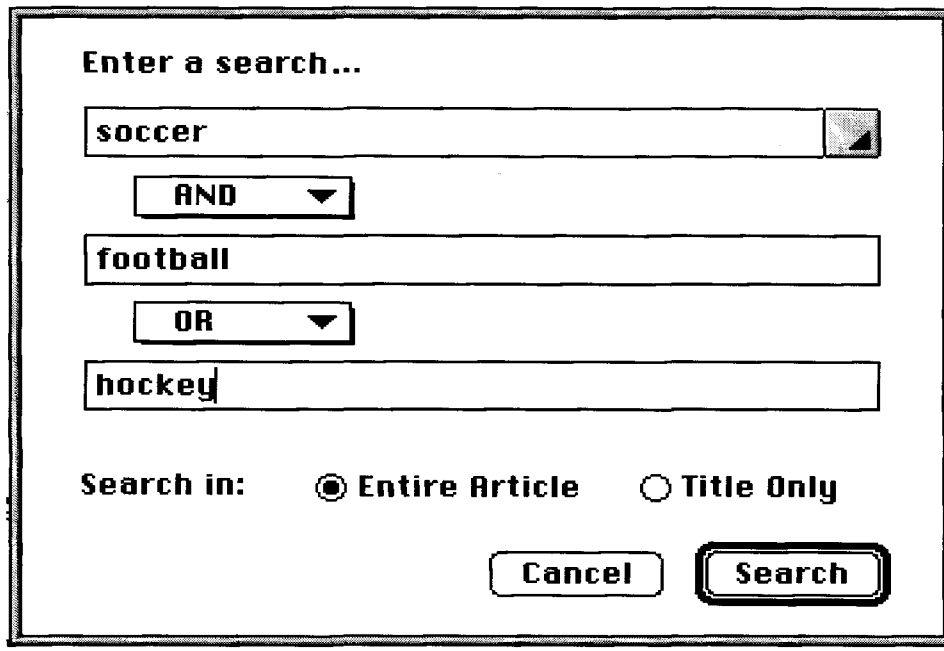

Figure 5. The search boxes in World Book Multimedia Encyclopedia.

One to three search terms or phrases were entered. They were connected using any combination of the Boolean operators, AND, OR and NOT. Truncation was used by entering a root word or stem followed by an asterisk. The search engine software searched for all occurrences of the word with any possible endings. After all search choices were made, *Entire Article* was selected. A limit of 500 articles were retrieved in any one search. The article with the most occurrences of the search term or terms appeared on the full screen. The search term or terms were highlighted. To see an article list box, a pull down screen on the tool bar at the top entitled *Search Results* was selected. This article list box was ranked in order of search term occurrences. Proximity and filters were not search feature choices in this encyclopedia.

Hierarchical Search Features

What were the search engine characteristics of hierarchical searching

when performed in each encyclopedia? Close examination of the electronic encyclopedias in this study revealed the following information about hierarchical searching. Hierarchical searching involved starting with broad subject categories narrowing those down to subcategories and eventually to specific articles. Hierarchical searching was described by (a) the hierarchical search label, (b) how the hierarchical search is completed (c) the availability of the subject breakdown, (d) the option of backtracking to modify a search, and (e) the number of general subject categories. The results of the examination of the hierarchical search features of these encyclopedias were described in Table 4 as a comprehensive chart and in the following text. (See Table 4 on p.47.)

1997 Grolier Multimedia Encyclopedia

The hierarchical searching feature in the 1997 Grolier Multimedia Encyclopedia was called *Knowledge Tree*. When *Knowledge Tree* was selected, the searcher chose from six subject categories. (Fig. B23) After that selection was made, the searcher chose subsequent subcategories narrowing down to a specific article. The hierarchical breakdown was shown on the left side of the screen. There were six general subject categories. The category and subcategory choices were shown on the right side of the screen. (See Fig. B24) After all choices were made, the searcher selected *View* located at the bottom of the selection box, which opened a specific article. When an article was selected, it appeared on the full screen. To return to the hierarchical search results, the searcher again selected *Knowledge Tree*. The subject breakdown was available to the searcher to backtrack and modify a search.

Table 4. Hierarchical Search Features

Electronic Encyclopedias	Hierarchical Search Features			
	Hierarchical search feature label	Subject breakdown available	Backtrack available to modify search	Number of broad subject categories
1997 Grolier Multimedia Encyclopedia	Knowledge Tree	Yes	Yes	Six
Comptons Interactive Encyclopedia	Topic Tree	Yes	Yes	Nineteen
Encyclopedia Americana	Subject	Yes	Yes	Nine
Encyclopedia Britannica	Propaedia	Yes	Yes	Ten
Infopedia 2	Subject	Yes	Yes	Twelve
Microsoft Encarta 97	Category	Yes	Yes	Nine
World Book Multimedia Encyclopedia	Infotree	No	No	Eight

Compton's Interactive Encyclopedia

Hierarchical searching was called *Topic tree* in Compton's Interactive Encyclopedia. It was activated from the tool bar which appeared when the encyclopedia was opened. (See Fig. 6).

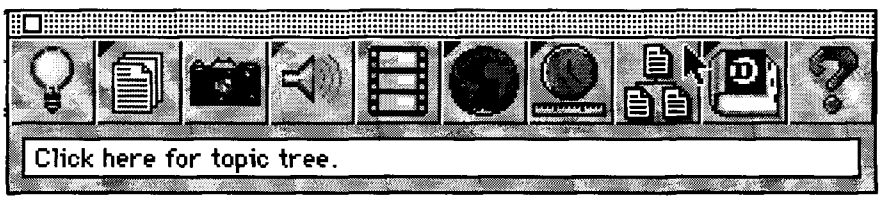

Figure 6. Selection of hierarchical searching in Compton's Interactive Encyclopedia.

When *Topic tree* was selected, a box appeared on the left side of the screen with a choice of 19 general topics. Selecting a broad topic opened another box of more specific topics. (See Fig. B25) The topics were broken down into subtopics and generated a list of articles. When an article was selected, it appeared on the right side of the screen in the *article box* with the topic tree choices visible on the left side of the screen. The searcher referred back to the choices of the hierarchical search by selecting the search box at the top of the article list box. This showed the path the searcher had taken. The searcher could backtrack to alter the search without starting completely over.

Encyclopedia Americana

The hierarchical search feature in Encyclopedia Americana was labeled *Subject* and was selected from the pull down menu on the *main screen* . (See Figure B26.) Nine broad subject areas appeared, which were broken down into topics, subtopics and articles. When an article was chosen, it appeared on the right side of the screen in the *article box*. The subject breakdown was still

available on the left side to backtrack and modify the search.

Encyclopedia Britannica

The hierarchical search feature in Encyclopedia Britannica was enabled by selecting *Propaedia* from the *buttons* in the *main screen.* (See Figure B7) When this selection was made, the screen changed to show ten general subject topics. A topic was selected showing subtopics. This process continued until a list of articles was shown beneath the subtopics. All selection choices were visible above the articles giving the searcher the opportunity to back track in the the searching process and make different selections. (See Fig. B27) When the article was selected it appeared on the full screen. The searcher had the option of returning to the previous choice in the search by selecting "related Propaedia topics" located directly below the article.

Infopedia 2

Hierarchical searching in Infopedia 2 was labeled *Subject.*. When that selection was made from the main screen, two pull down menus appeared entitled, *Topic* and *Subject.*. *Topic* included twelve broad categories. The searcher selected first from the twelve categories in the pull down menu. Secondly the searcher narrowed the category by choosing from the pull down subject menu. There was not a constant number of subjects in this pull down menu. It varied by the choice of categories. That selection resulted in a list of topices in the *article list box.* (See Fig. B28) When an article was selected it appeared on the right side of the screen with the *article list box* still visible on the left side of the screen. The searcher could back track to change selections by returning to the pull down menus.

Microsoft Encarta 97 Encyclopedia

The hierarchical searching feature in Microsoft Encarta 97 Encyclopedia was labeled*Category* and when selected from the *main screen* the next screen changed to show nine areas of interest. (See Fig. B29) An area of interest was selected and categories appeared in a box on the right and the searcher selected a category which opened a list of articles. The number of articles were noted below the results list. (See Fig. B30) When an article was selected it appeared in an *article box* on the full screen. The hierarchical subject breakdown was made visible by selecting the *Back Arrow* on the tool bar. The searcher returned to the hierarchical list by selecting *Category*.

World Book Multimedia Encyclopedia

The hierarchical searching feature in World Book Multimedia Encyclopedia was referred to as *Info tree*. It was selected in two ways; the tree in the *tool bar* at the top of the main screen or the *Info tree* hypertext selection near the middle of the *main screen*. (See Fig. B13). When that selection was made, the screen changed to show eight general subject categories. (See Figure B31.) The searcher chose one of those and the screen changed to show subcategories. This process continued with the selection of subcategories until an article was chosen and that article appeared on the full screen. The searcher returned to previous screens by selecting the green arrow in the *tool bar*. The searcher initiated a new hierarchical search by selecting the tree in the tool bar.

Chapter 5

Summary, Conclusions and Recommendations

Summary

This study revealed a detailed description of the options offered in the browse, analytical and hierarchical search features of electronic encyclopedias. Following is a summary of the search features and the options they offered.

Browse Search Features

The browse search features examined in the electronic encyclopedias varied from no browse search feature to a browse search feature with filters for searching categories and subjects. Browse search was the default on the main screen of some electronic encyclopedias, while on others it was not such an obvious choice. In most encyclopedias the article list was visible at all times to the searcher .

Analytical Search Features

Four of the six encyclopedias examined had simple analytical and complex analytical searching. Each of these searching features will be summarized separately.

Simple Analytical Search Features

The simple analytical search features examined in this study ranged from no simple analytical search to a simple analytical search that uses truncation, proximity and filters. All employed the use of words and phrases for search terms. All except one searched full text.

Complex Analytical Search Features

All encyclopedias examined exhibited some type of complex analytical search. The number of search boxes ranged from one to four. The use of

Boolean operators ranged from none to all three. In all encyclopedias, a single word, phrase or both could be entered in the search box to search full text. Truncation ranged from none to both right and embedded. The number of available filters varied from none to eight choices. Proximity ranged from none to within 100 words.

Hierarchical Searching

All encyclopedias examined offered a hierarchical search. In most, the subject breakdown was visible and in all but one, a backtrack was available to the searcher. The number of broad subject categories ranged from six to nineteen.

Conclusions

This study resulted in the following conclusions concerning various types of searches in electronic encyclopedias:

The electronic encyclopedias that were easiest to use and understand included search features fully detailed in print documentation, help screens and thorough technical support.

Search options as a default on the main screen simplified search selection. Presenting those choices on subsequent screens made search selection difficult and confusing.

Information about whether the software searched titles, subjects or full text was valuable in choosing the type of search.

In a hierarchical search the visibility of the subject breakdown and the availability of backtracking enhanced this search feature.

Most of the electronic encyclopedias examined allowed the searcher to view the article list box and the article at the same time. Selection of another article from the list was simple. This type of search selection was complicated

when the searcher had to either close and shorten the article box to see the article list box.

To use an electronic encyclopedia to the fullest extent, the searcher needs to become familiar with all search features and options.

Recommendations

By examining the results of this study, The 1997 Groliers Multimedia Encyclopedia and Encyclopedia Americana exhibited all the search features described. The 1997 Groliers Multimedia Encyclopedia was easier to navigate because Encyclopedia Americana required the changing of window size to view the entire screen. In looking at the results of this research, these two encyclopedias offered the most options in all searching features.

To be effective users of electronic resources, searchers must learn and understand browse, analytical and hierarchical searching. Examination of electronic resources, such as electronic encyclopedias is recommended to searchers to discover all the search features and options offered. This examination will uncover the capabilities of the searching software and help the searcher understand what kind of results are expected. Library media specialists can assist their patrons by learning and understanding the search features of electronic encyclopedias. Learning about options in electronic resources allows consumers to fully understand what features a product possesses before purchasing. This knowledge of the search features in electronic encyclopedias can also be applied to other electronic resources such as Internet search engines and other electronic databases. Library media specialists have the opportunity to share this information with teachers and students in their schools. In collaboration with classroom teachers, library media

specialists can plan lessons that teach students to search electronic resources using all search features and their options. Learning to use the various search features can extend the use of an electronic encyclopedia to include higher order thinking skills and touch a variety of learning styles.

Future research possibilities for similar studies are examining other electronic resources such as dictionaries, specific subject encyclopedias or periodical databases in the same manner. Another similar study might examine the search features of online electronic encyclopedias. A longitudinal study of electronic encyclopedias over time might make an interesting study. A related study might entail entering the same search term using the three search features in all seven encyclopedias and comparing the results. Another possibility is a focus on the searcher's perspective of the usefulness of the on screen help and the documentation in assisting the searcher in understanding the search features of the encyclopedia.

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Appendix A

BIBLIOGRAPHY OF ELECTRONIC ENCYCLOPEDIAS

1997 Grolier Multimedia Encyclopedia (Version 9) [Electronic database]. (1997). Danbury, CT: Grolier Interactive Inc. [Producer and Distributor].

Compton's Interactive Encyclopedia (Version 3) [Electronic database]. (1995).
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Microsoft Encarta 97 Encyclopedia [Electronic database]. (1996). CA: Microsoft [Producer and Distributor].

World Book Multimedia Encyclopedia & Information Finder [Electronic database]. (1997). Chicago, IL: World Book, Inc. [Producer and Distributor].

Appendix B Electronic Encyclopedia Screen Shots

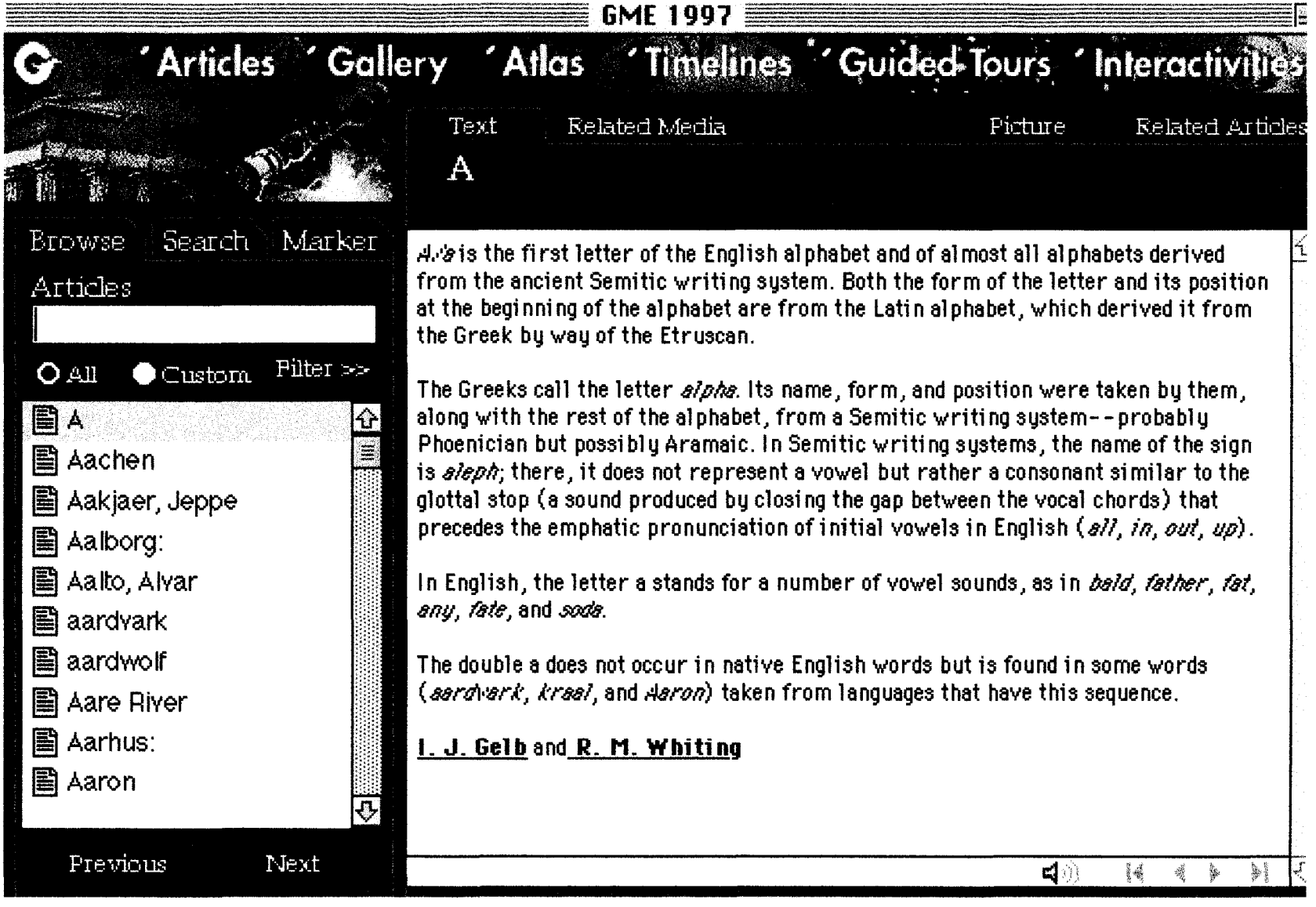

Figure B 1. This is the main screen of The 1997 Grolier Multimedia Encyclopedia.

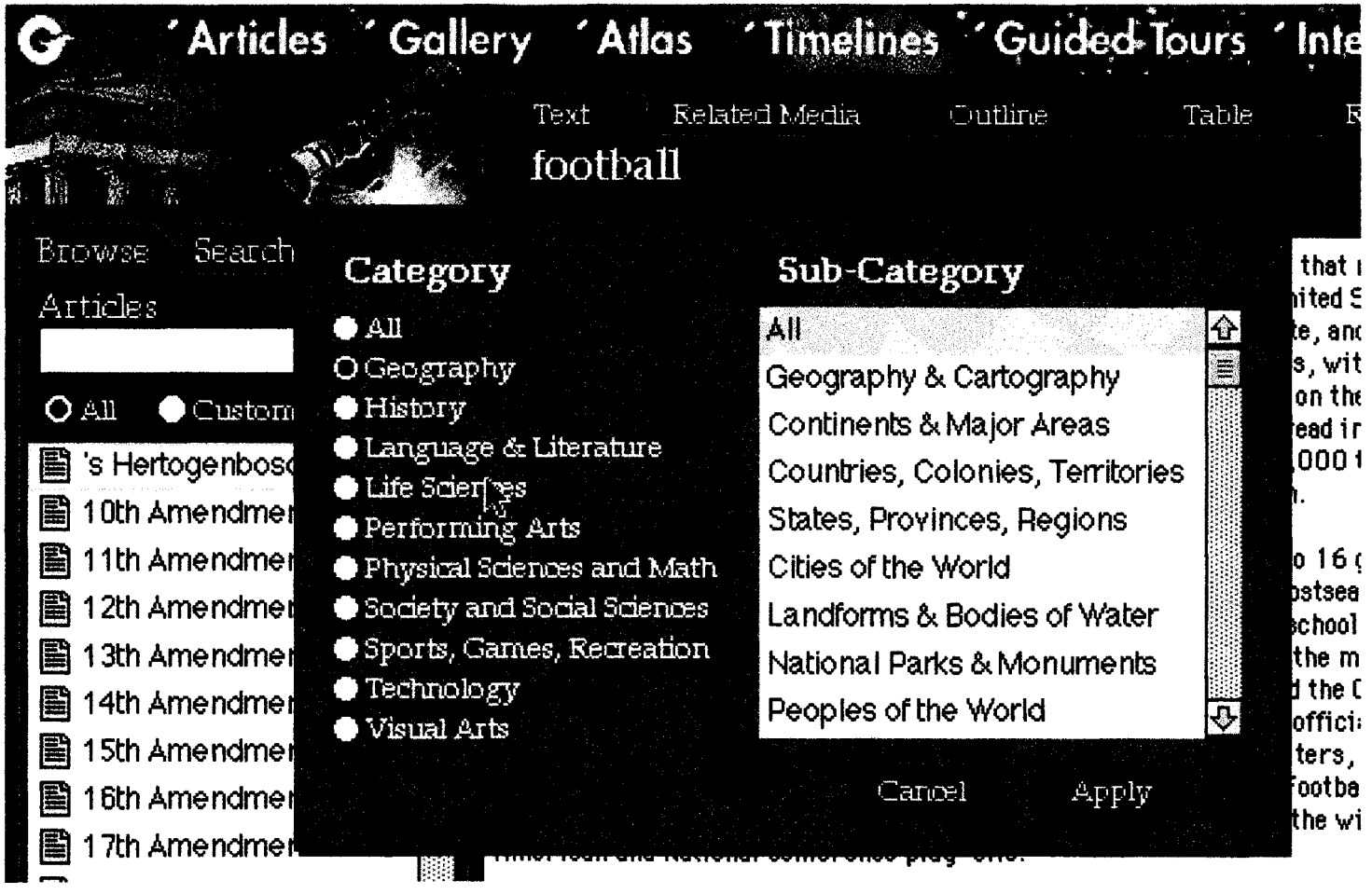

Figure B2. This shows the browse filter feature of The 1997 Grolier Multimedia Encyclopedia.

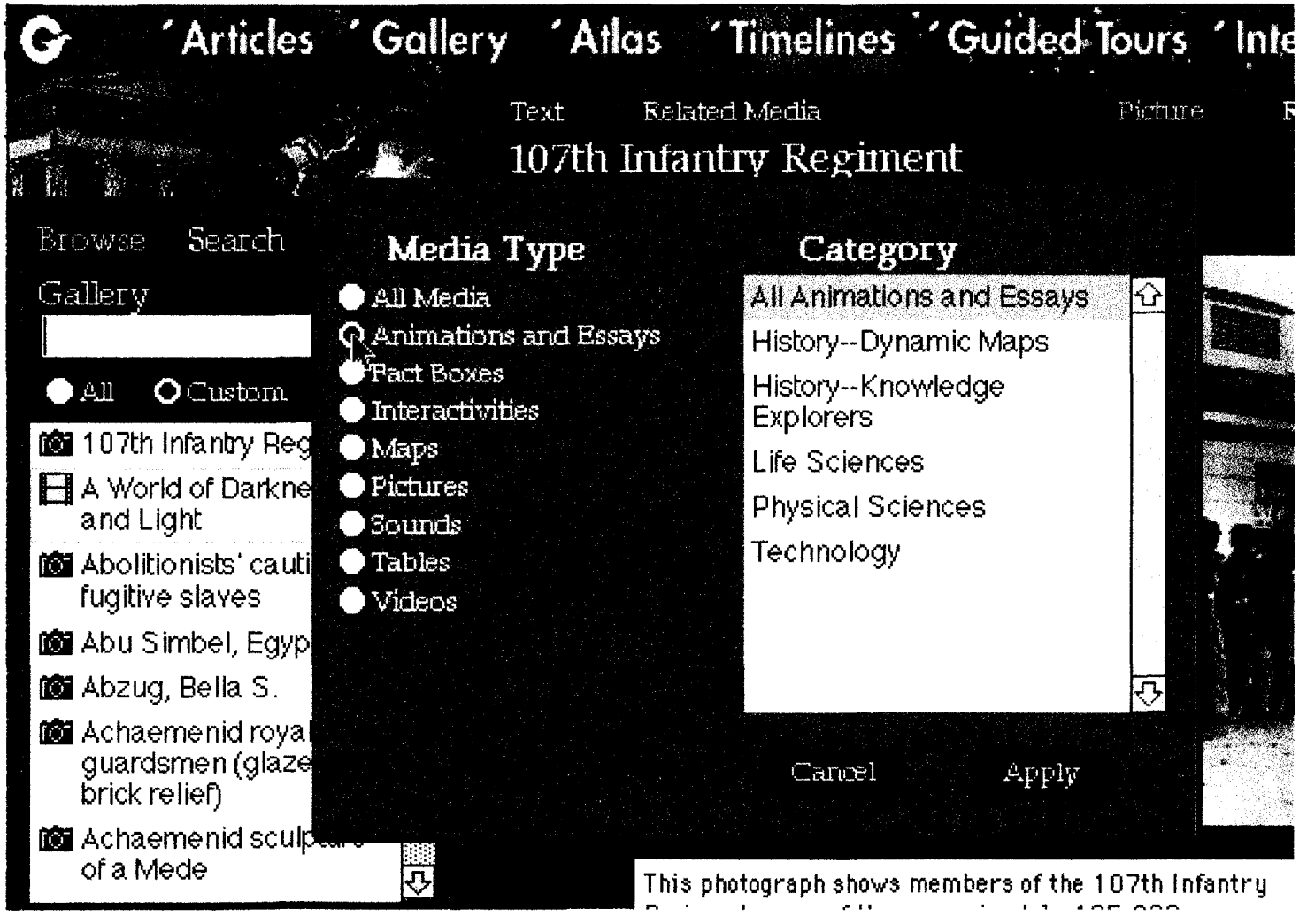

Figure B3. This shows the browse media feature of The 1997 Grolier Multimedia Encyclopedia.

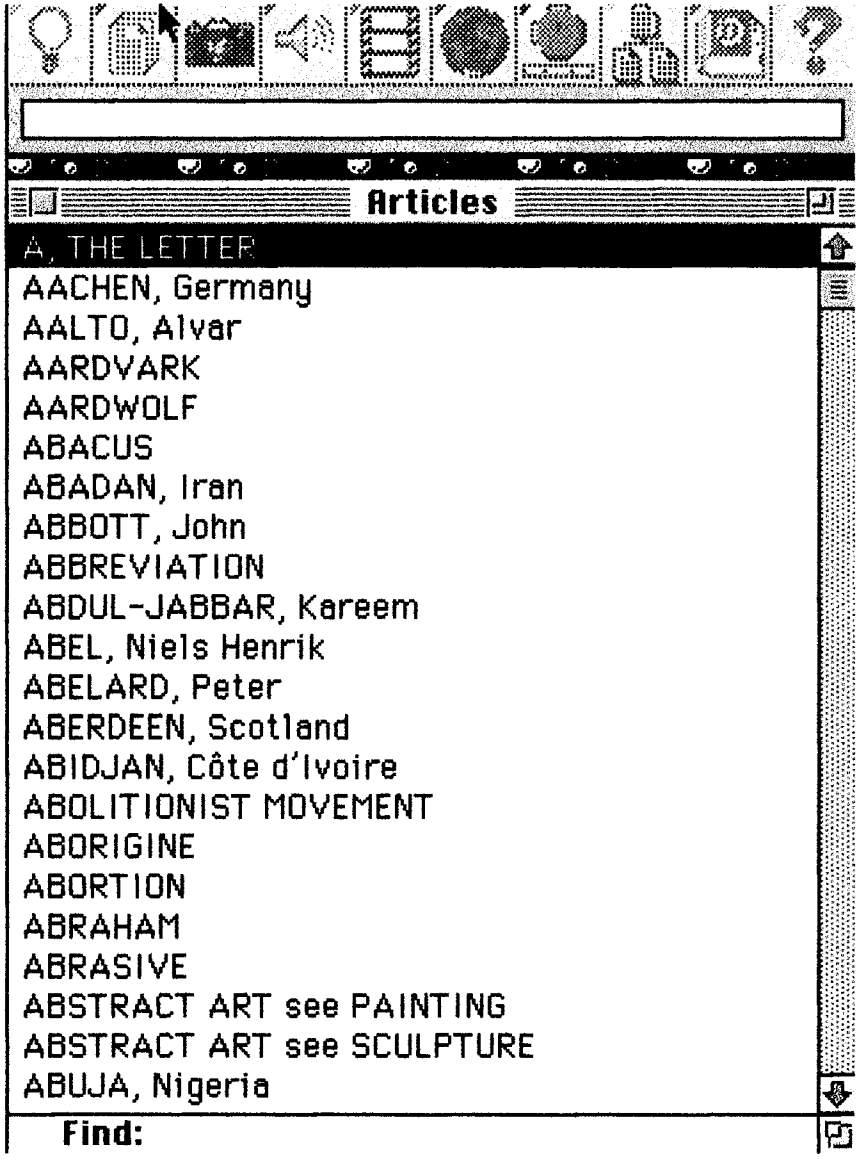

Figure B 4. This is Compton's browse search article list.

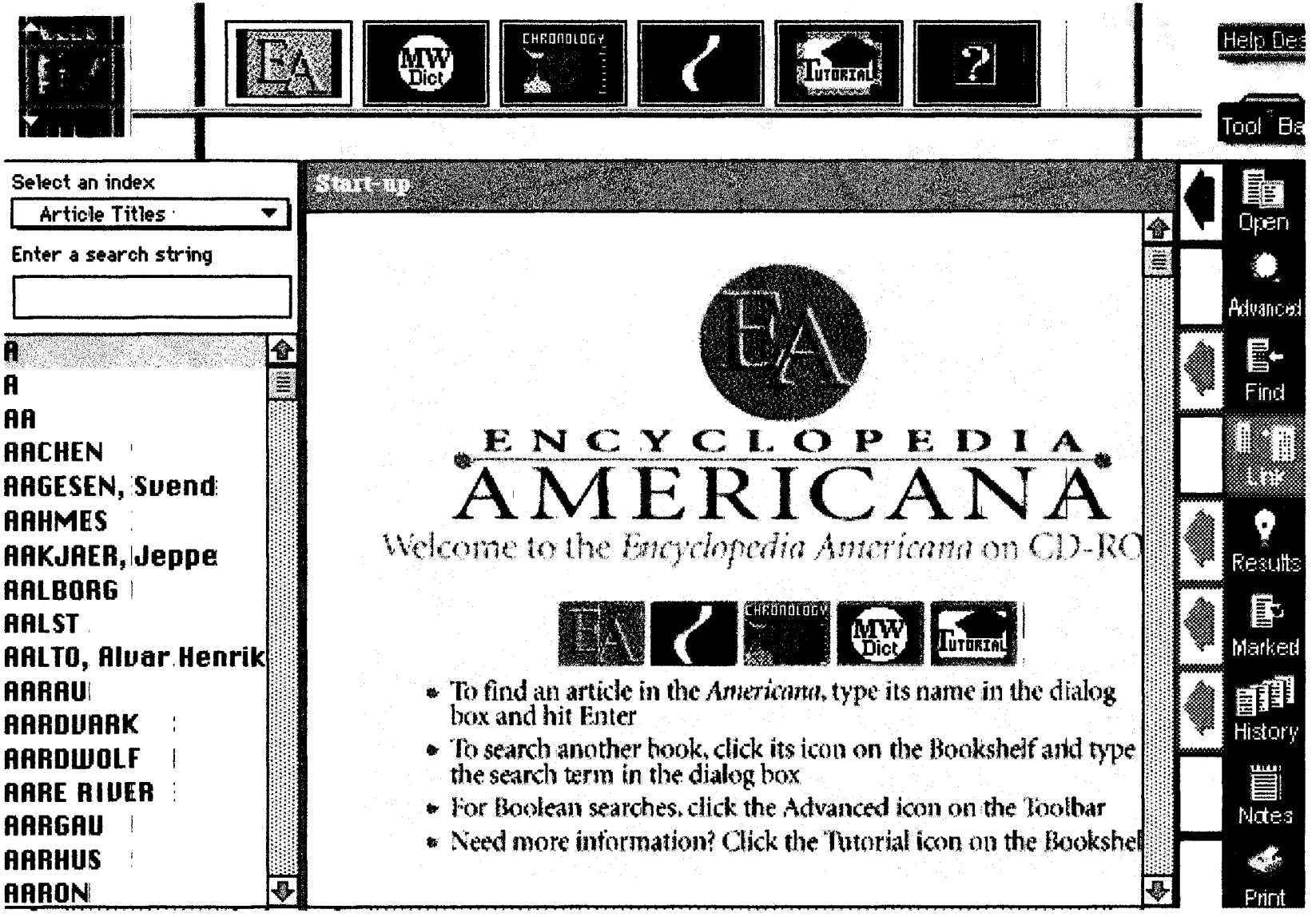

Figure B5. This is the Encyclopedia Americana main screen.

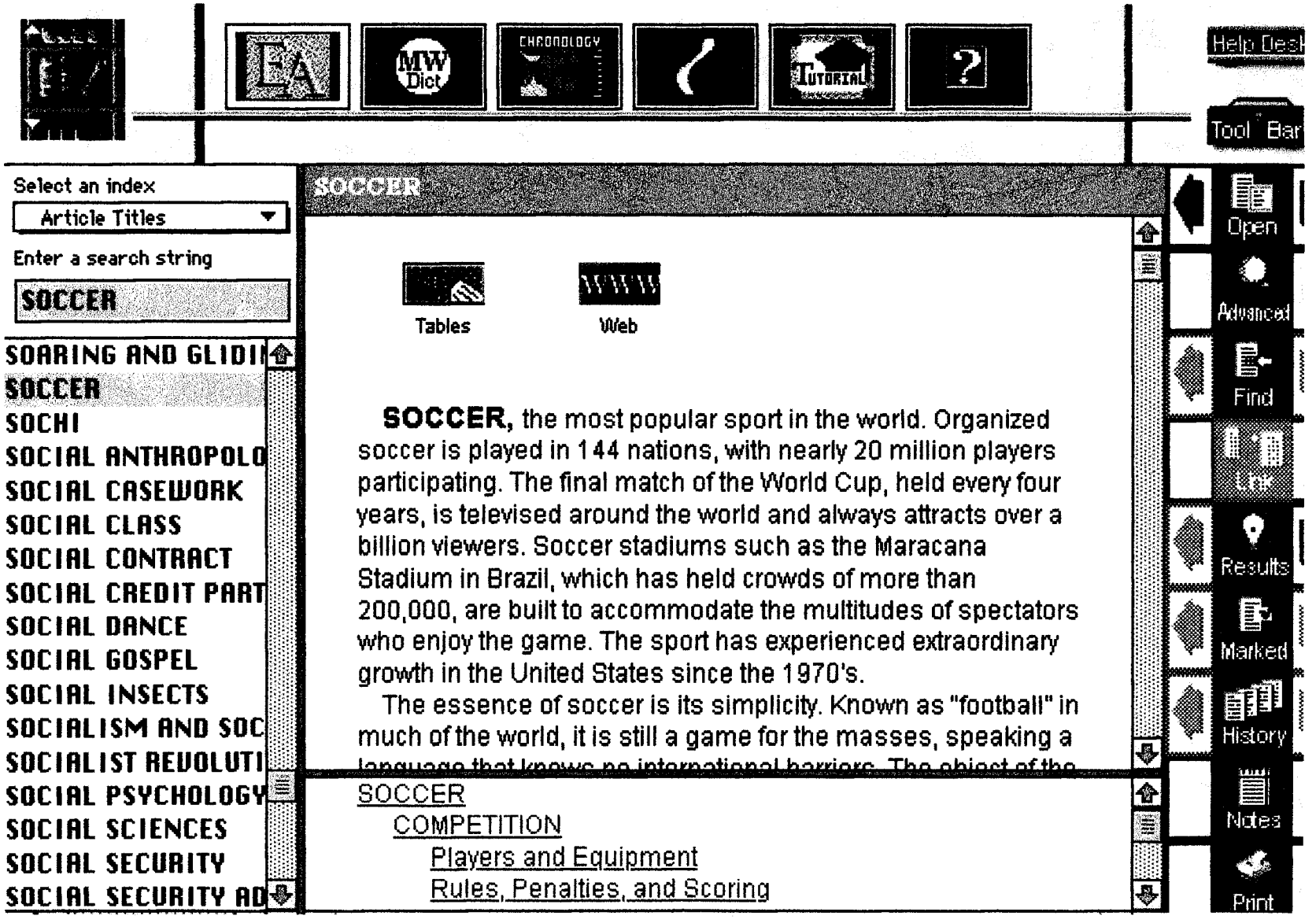

Figure B6. Encyclopedia Americana browse search screen.

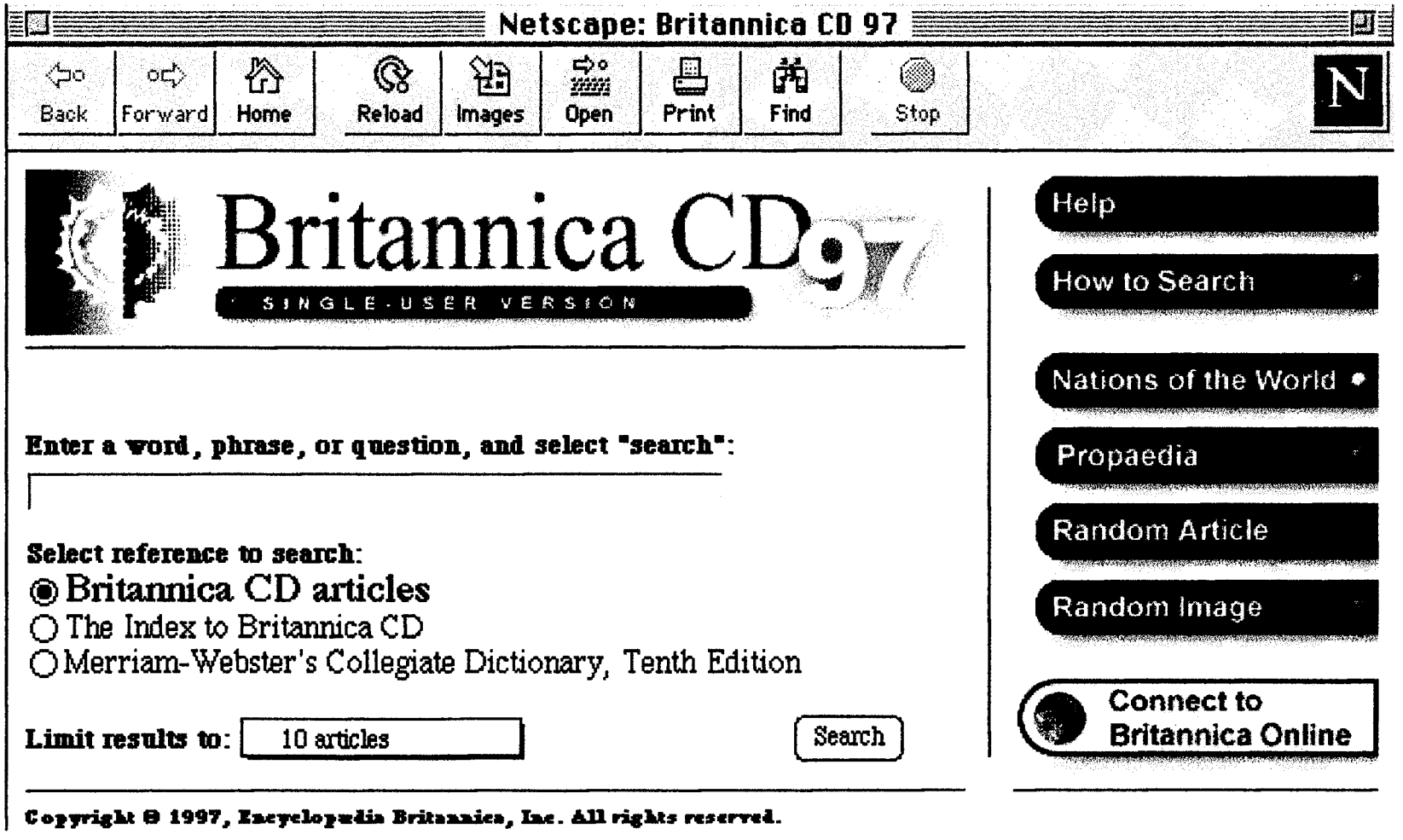

Figure B7. This is the main screen of Encyclopedia Britannica CD 97.

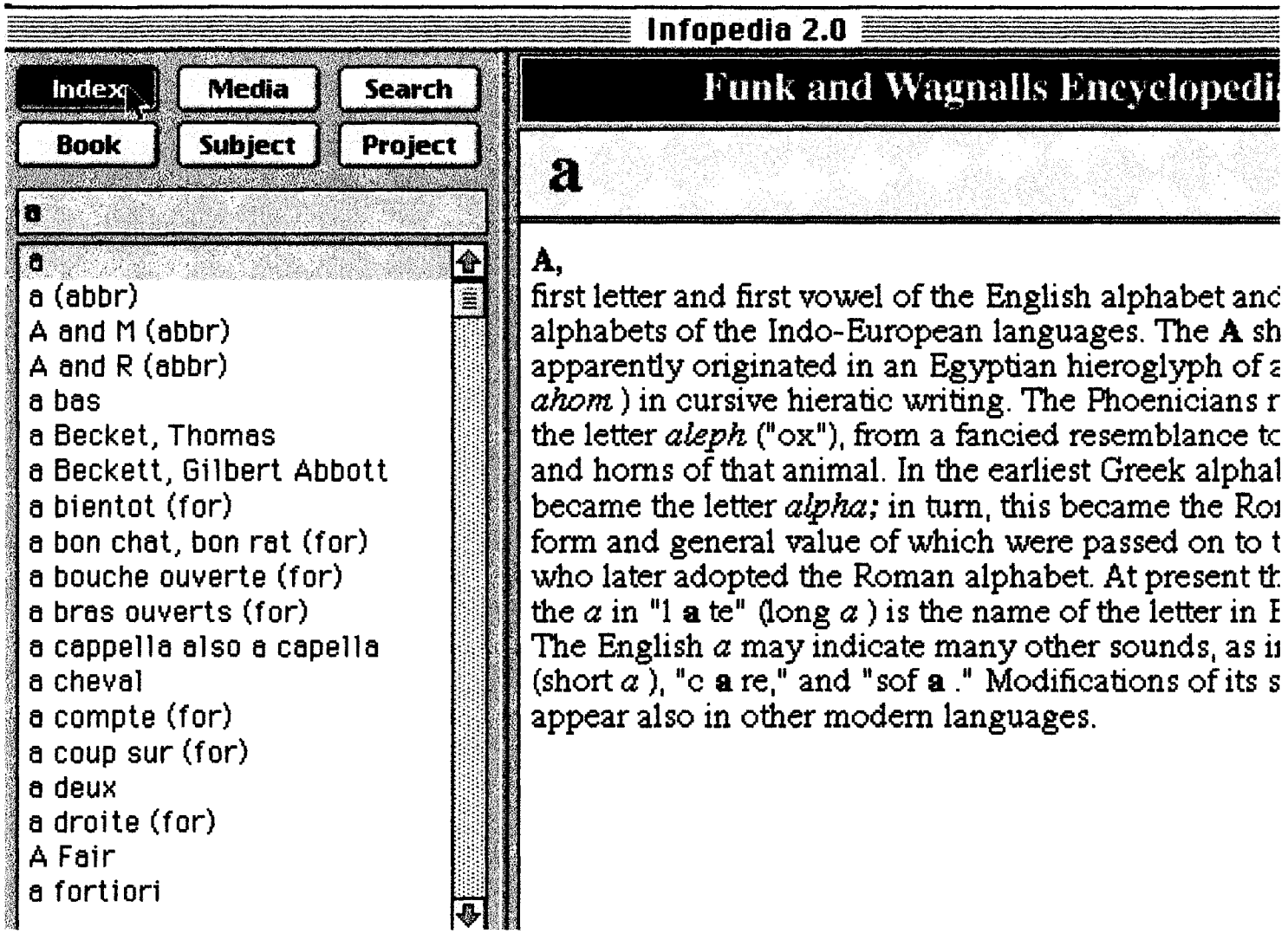

Figure B8. This is the browse search box and article list in Infopedia 2.

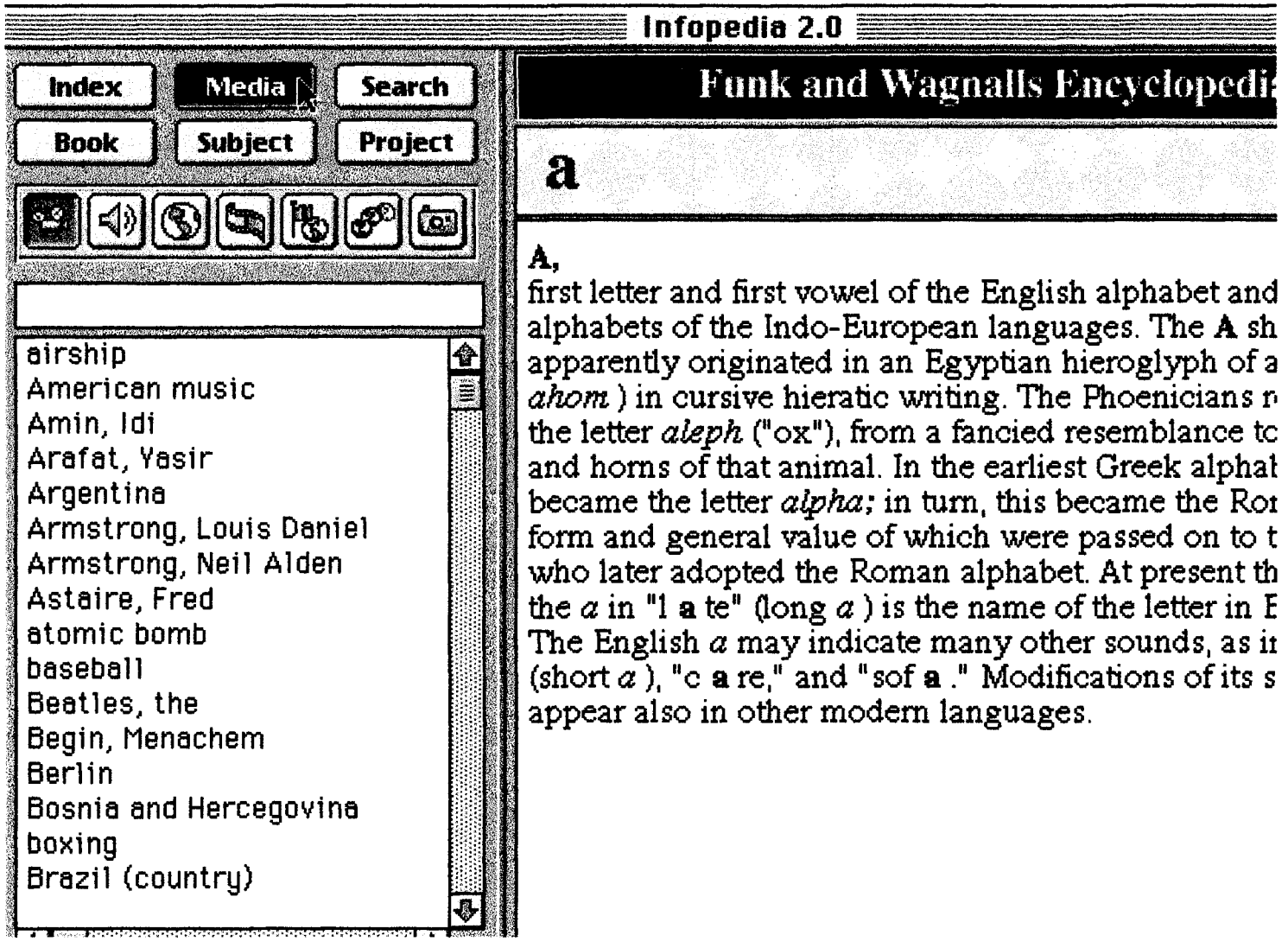

Figure B9. This is the browse article list of media in Infopedia 2.

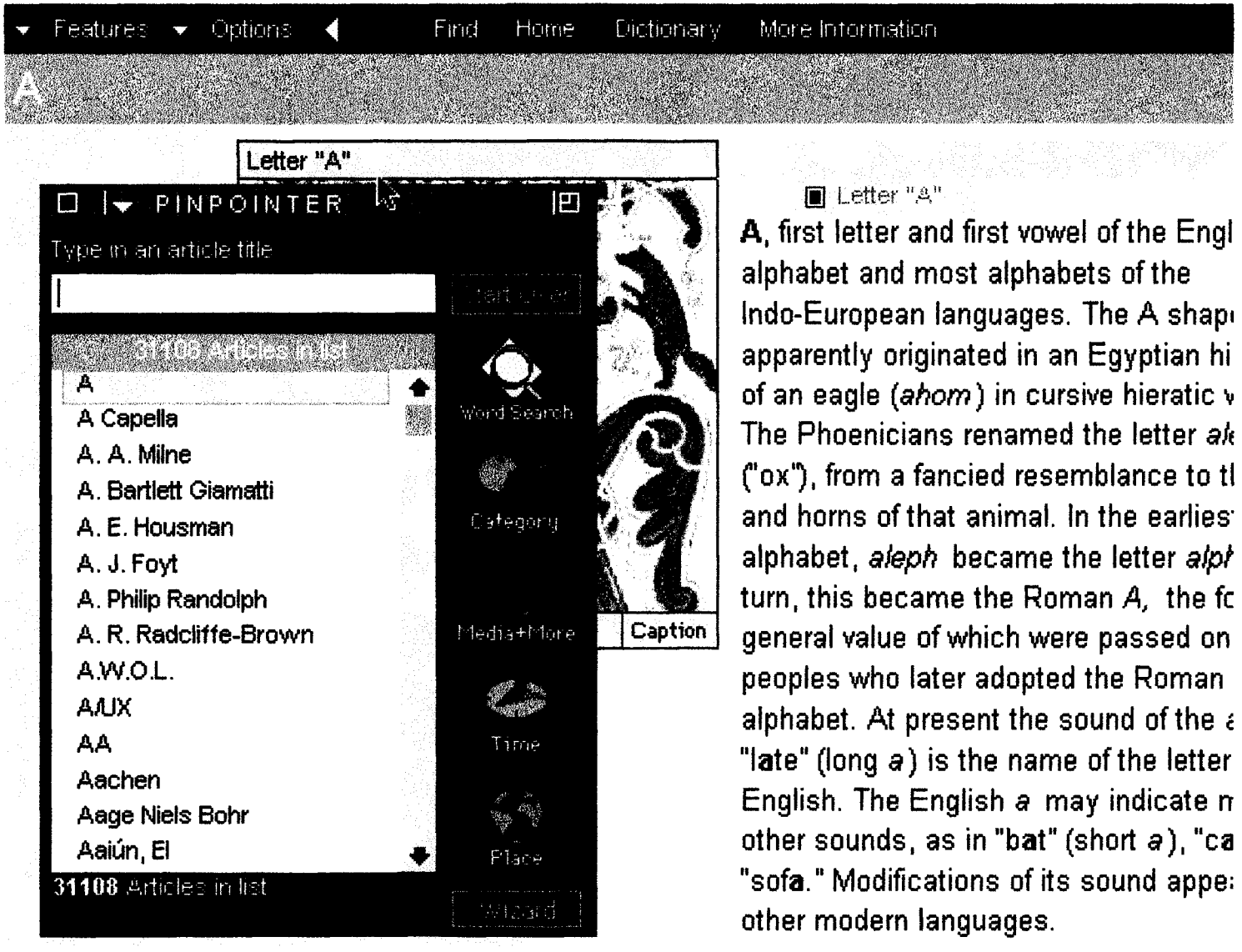

Figure B10. This is the main screen for Microsoft's Encarta.

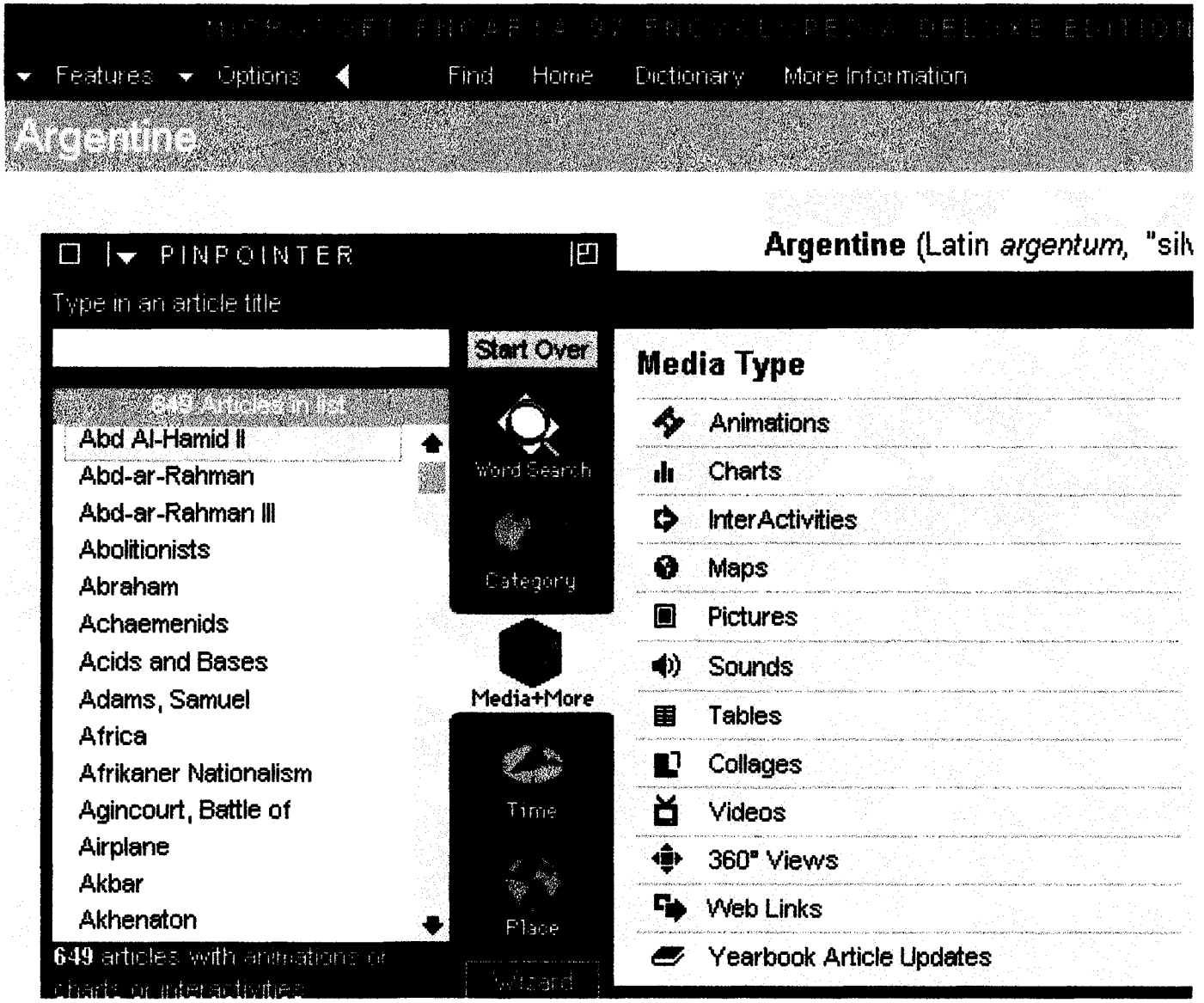

Figure B11. This illustrates the browse media feature in Microsoft Encarta.

IBM Presents

WORLD BOOK™

Multimedia Encyclopedia

Standard Edition

1997

Search | Atlas | Dictionary | Info Tree | Gallery | Timeline

Figure B12. This is the main screen of the World Book Multimedia Encyclopedia and Information Finder.

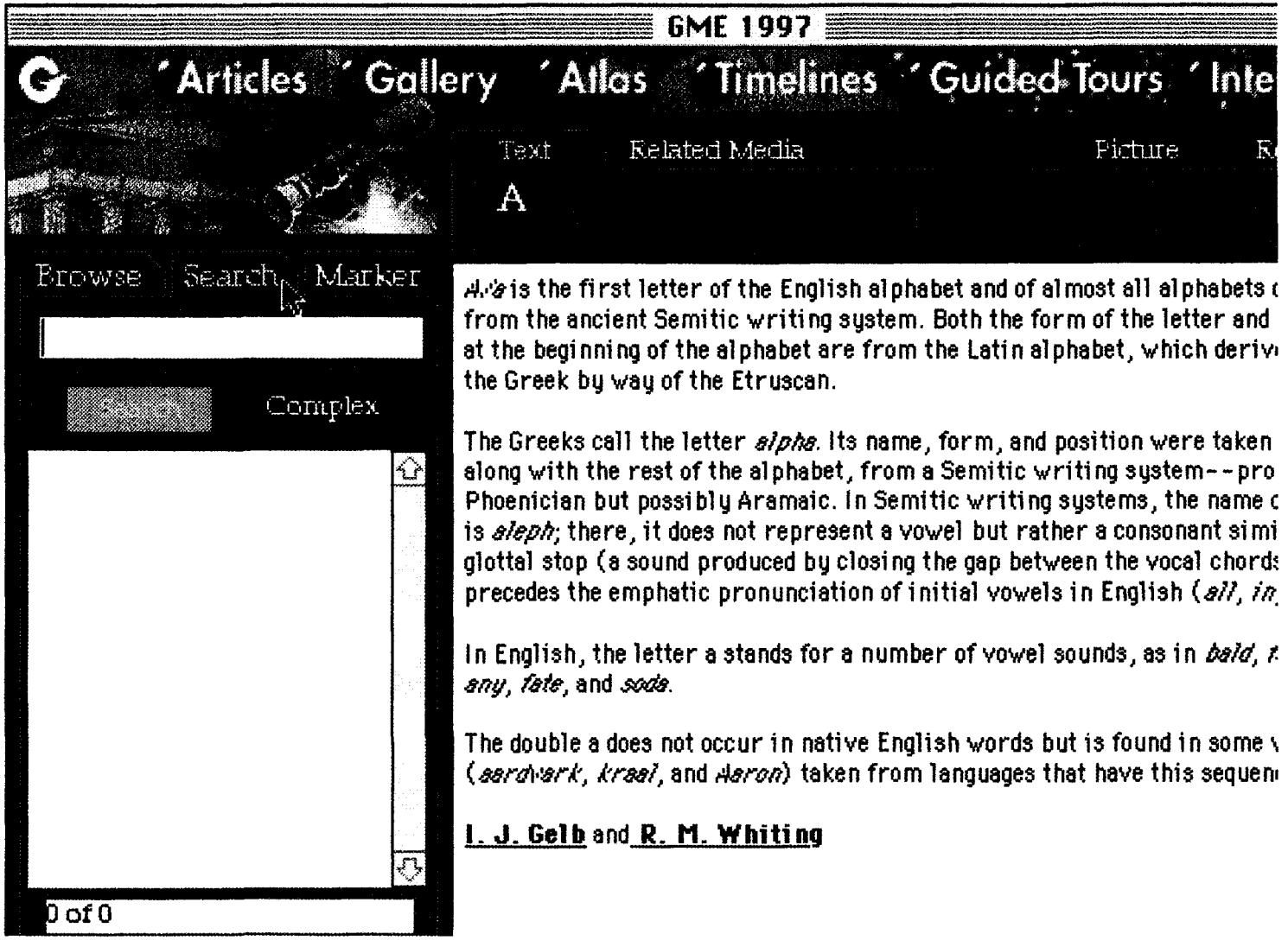

Figure B13. This shows the simple analytical search box in the 1997 Grolier Multimedia Encyclopedia.

Figure B14. This is an example of a simple analytical search in the 1997 Grolier Multimedia Encyclopedia.

Figure B15. This is the complex analytical search box for The 1997 Grolier Multimedia Encyclopedia.

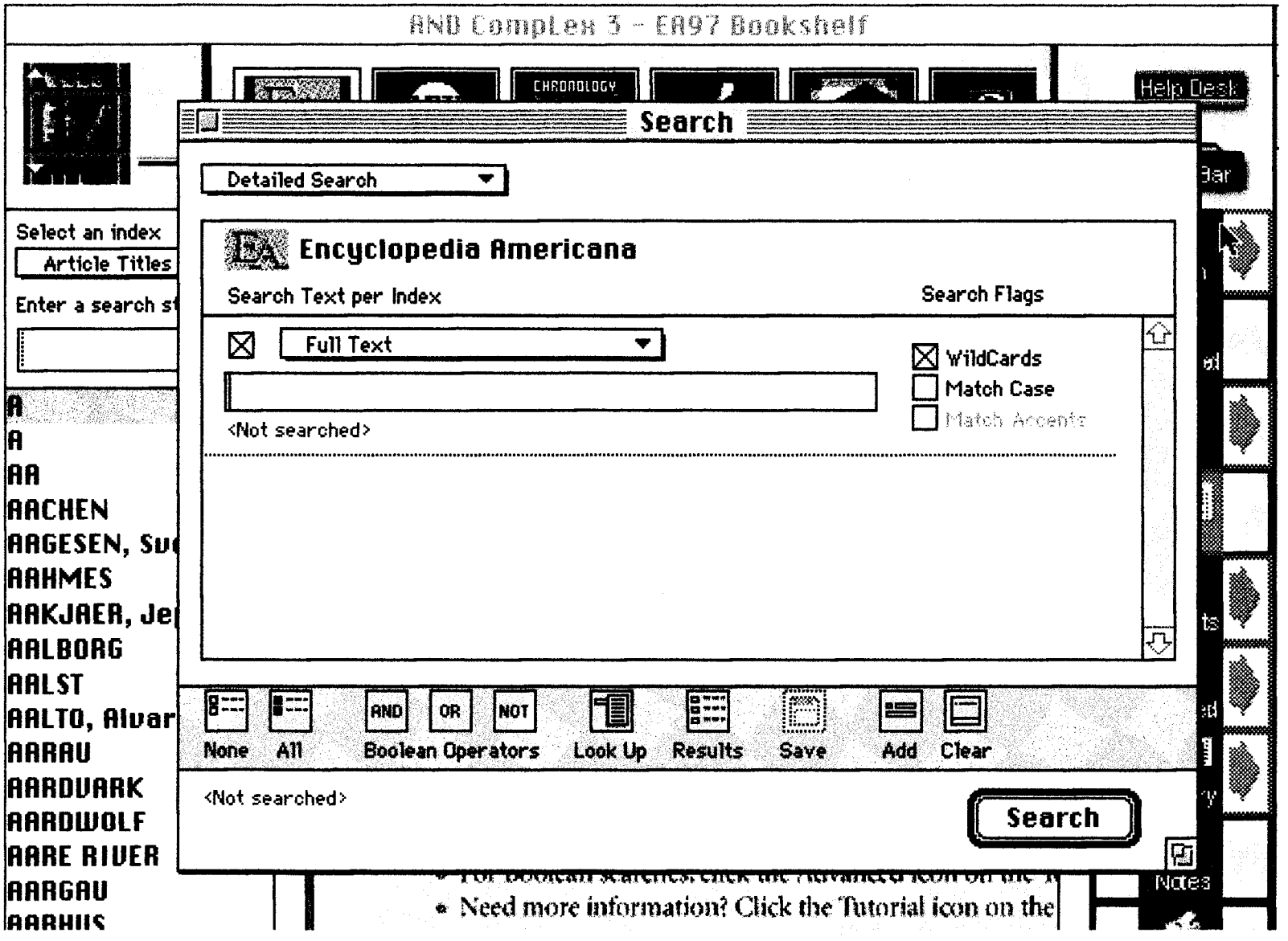

Figure B16. Encyclopedia Americana analytical search feature choices.

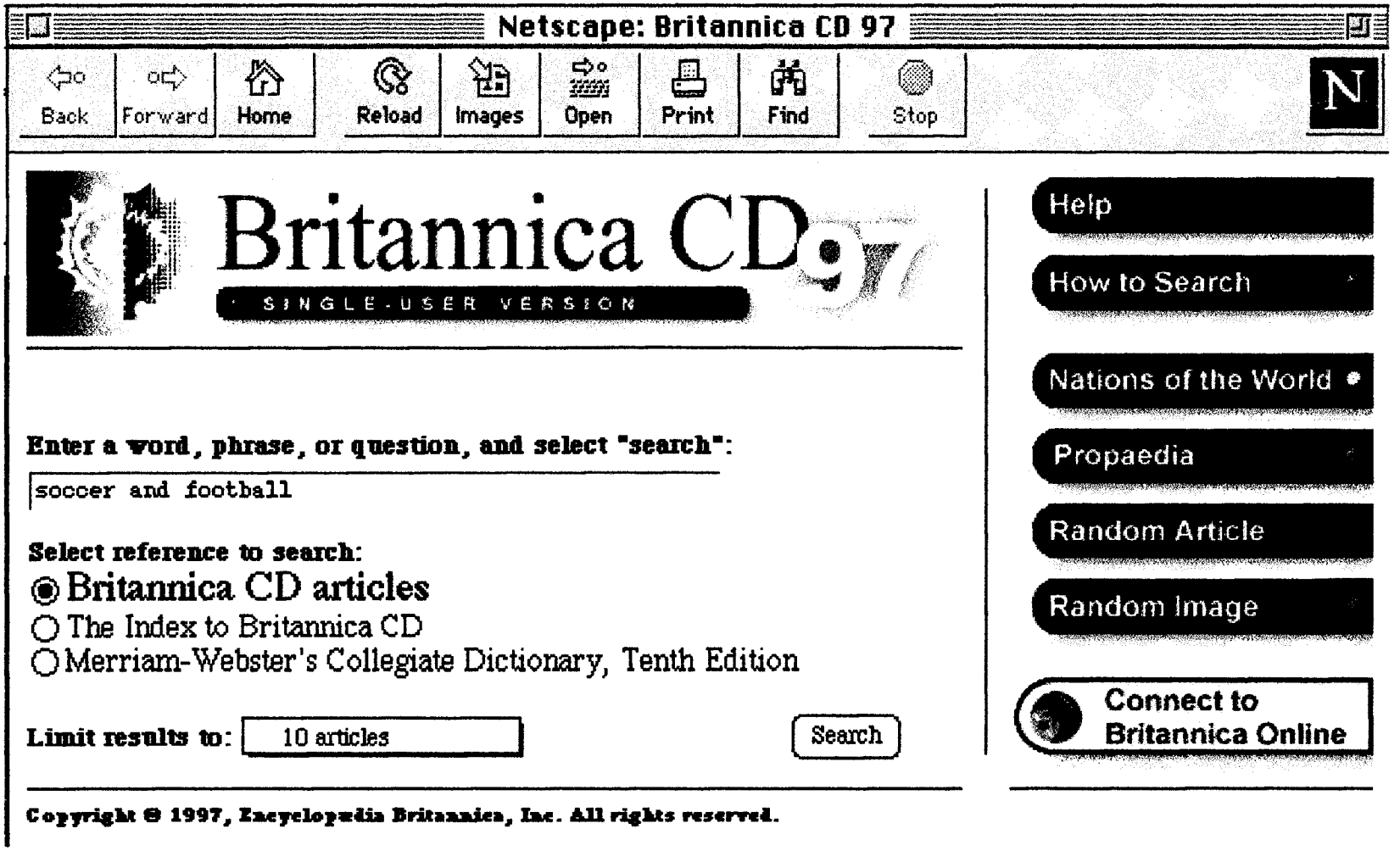

Figure B 17. An analytical search in Britannica CD 97.

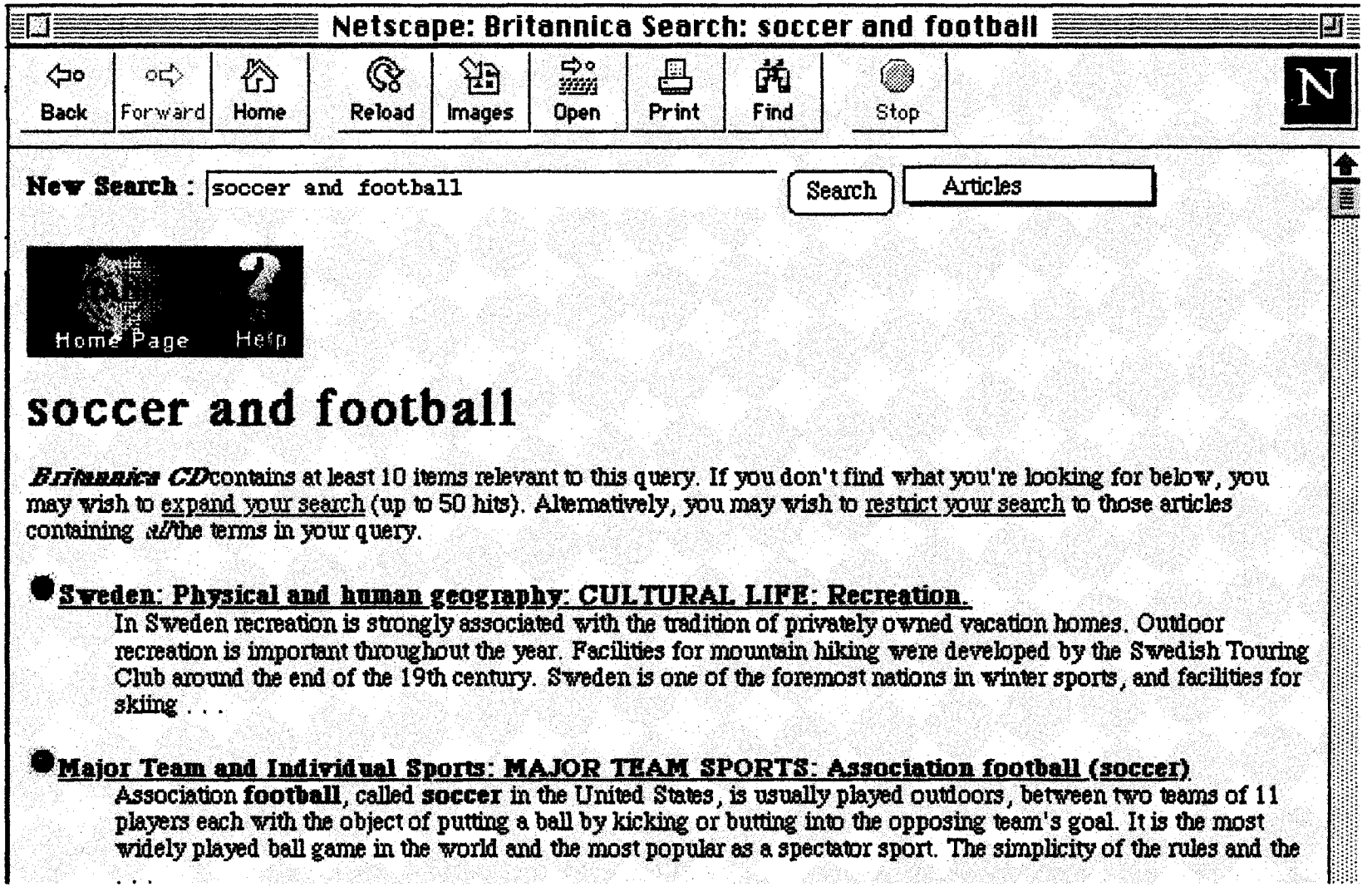

Figure B18. Britannica CD 97 analytical search results.

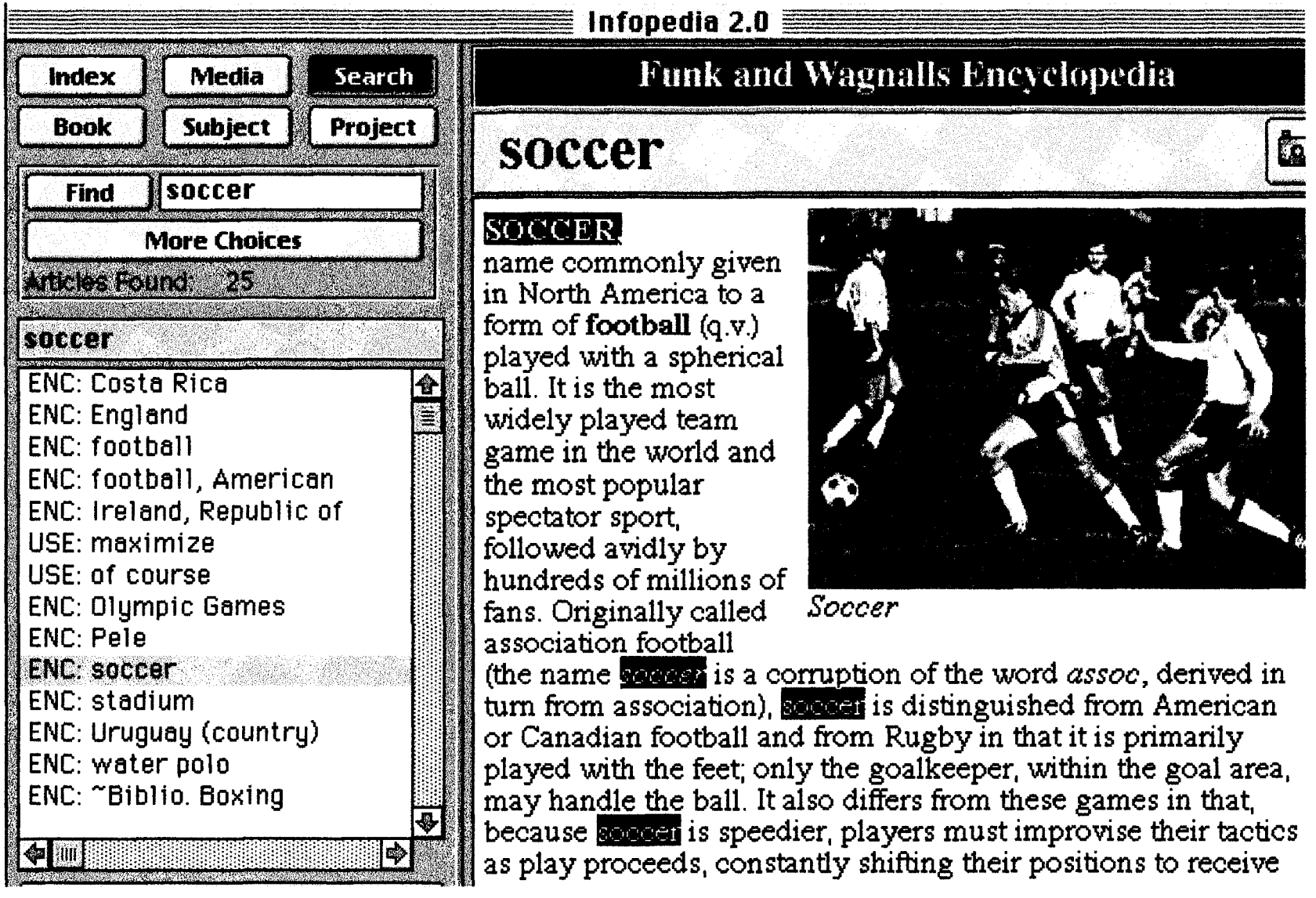

Figure B19. This shows the simple analytical search box in Infopedia 2.

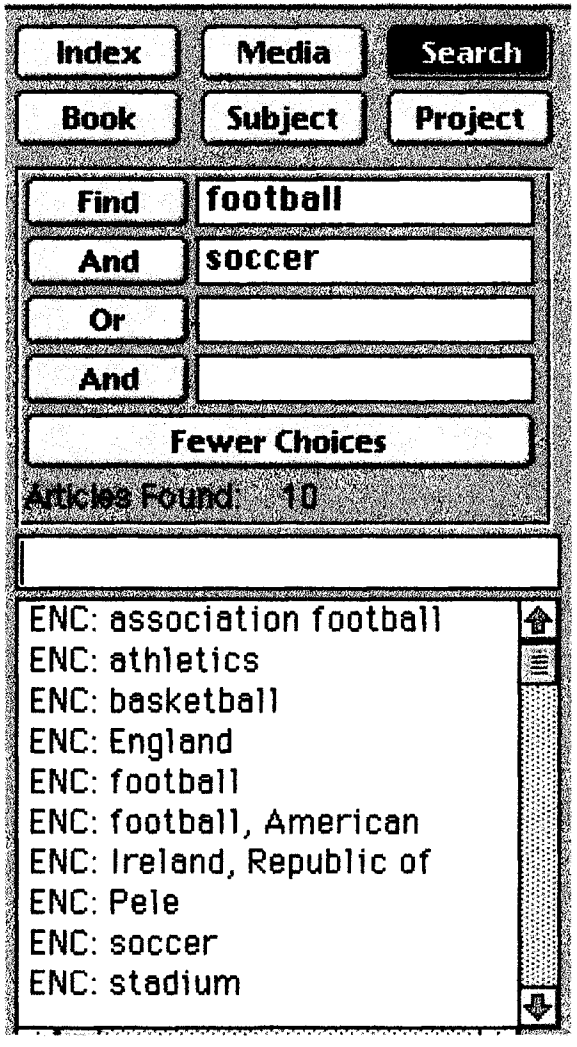

Figure B 20. The complex analytical search box in Infopedia 2.

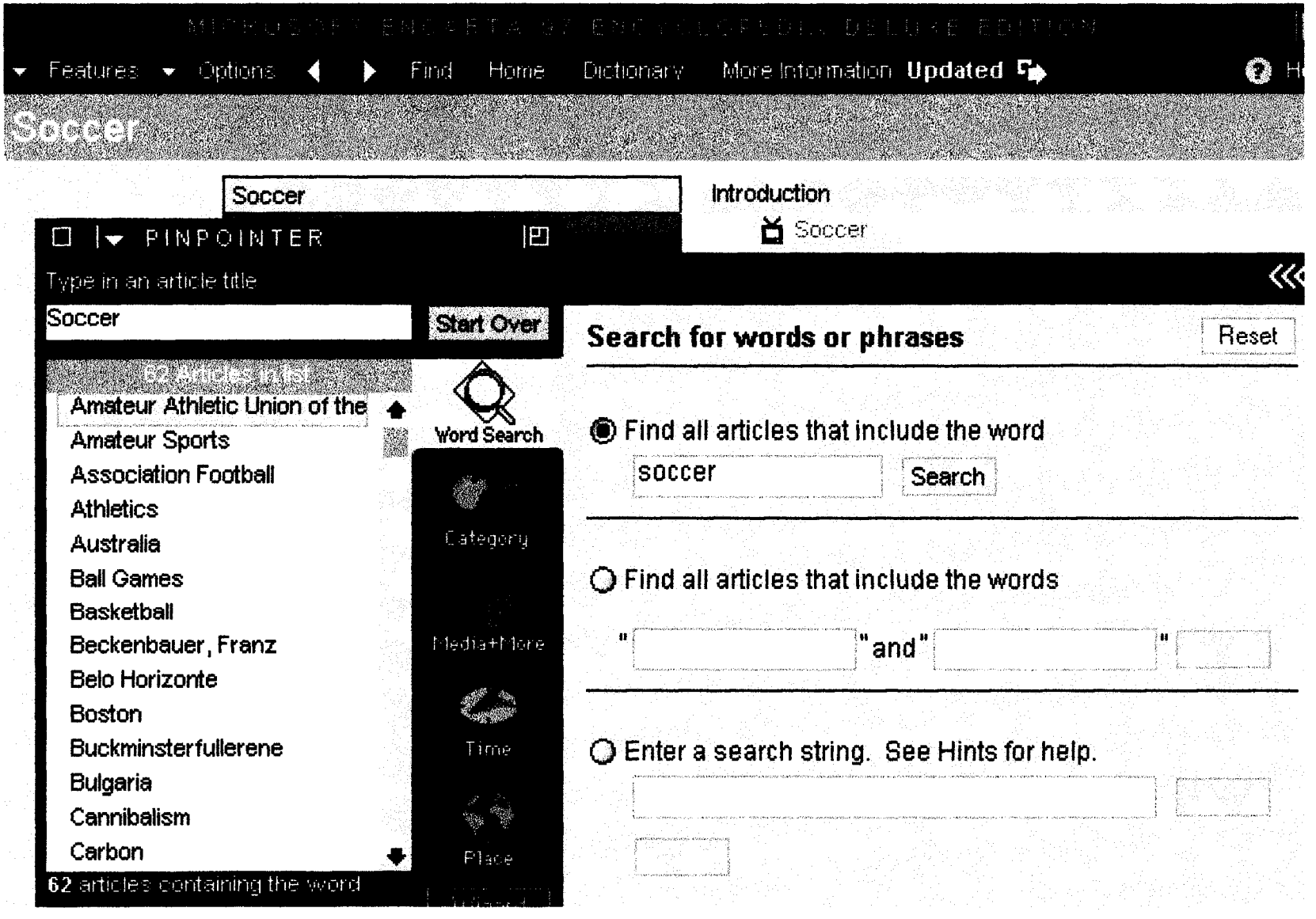

Figure B 21. The complex search boxes in Microsoft Encarta 97.

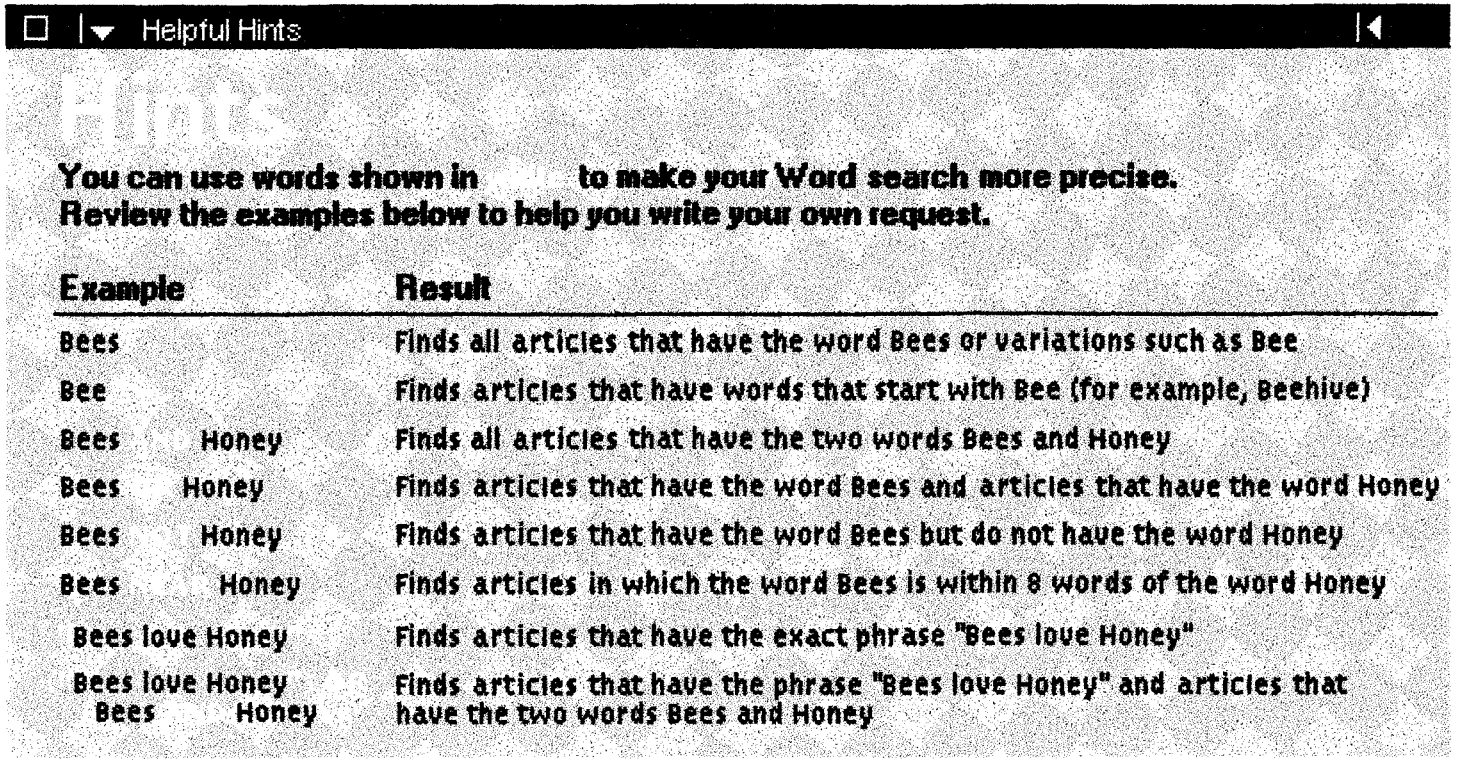

Figure B22. These are the Boolean operators, truncation and proximity features used in the complex analytical search in the Microsoft Encarta CD.

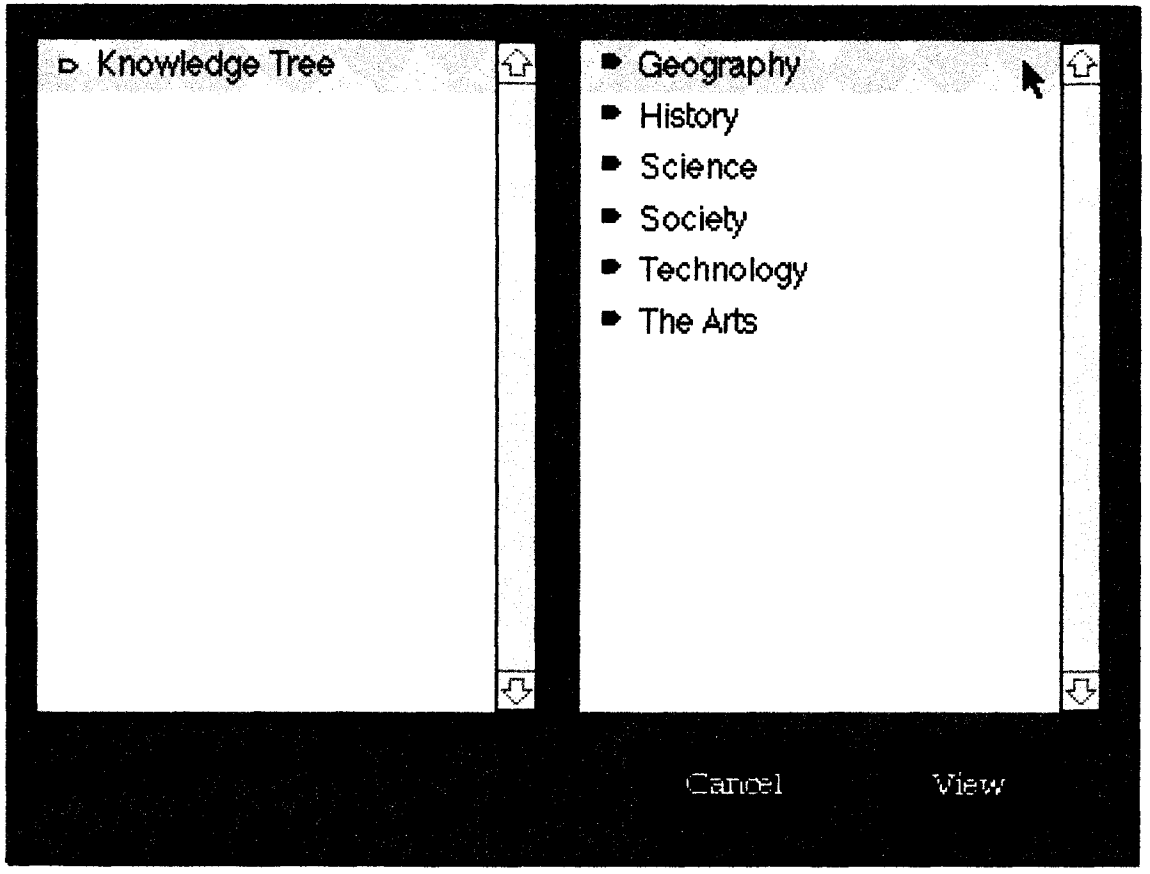

Figure B23. This shows the hierarchical search boxes in the Grolier Multimedia Encyclopedia.

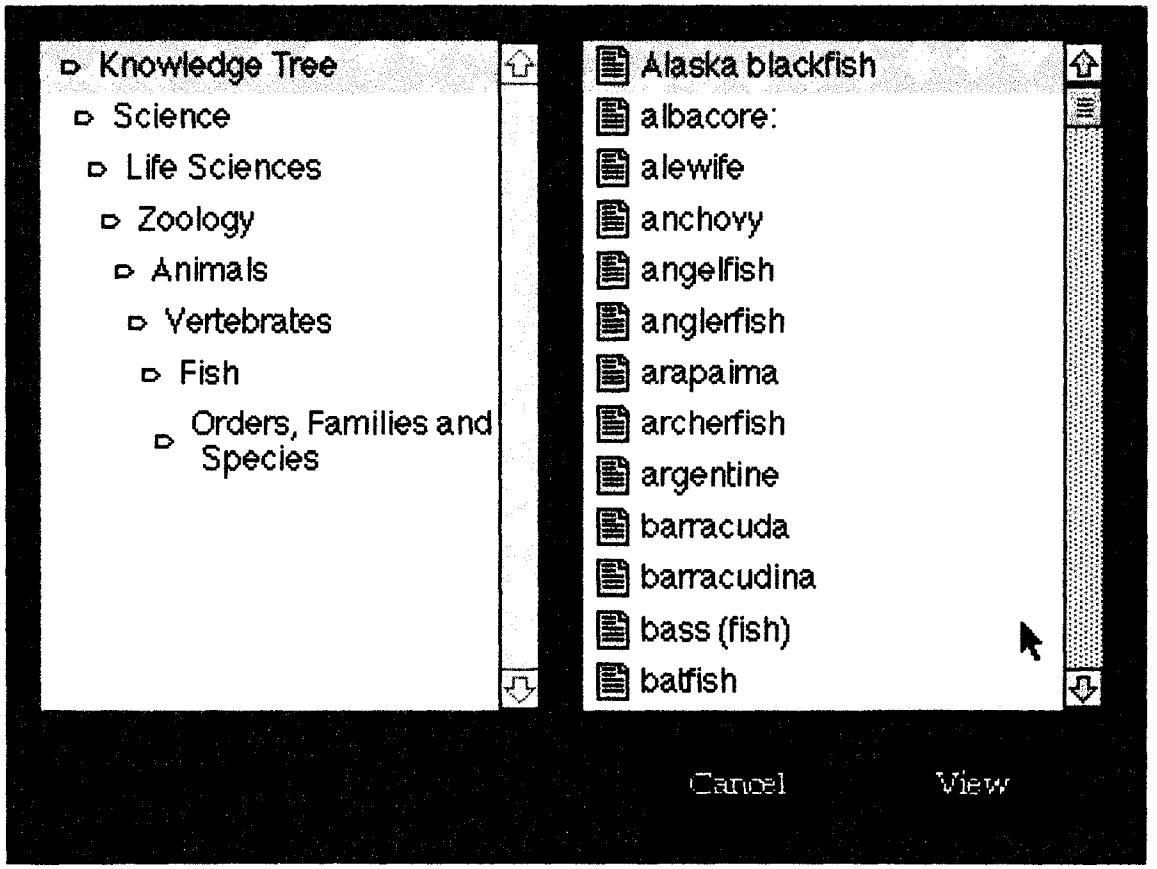

Figure B24. This shows the categories and subcategories in the hierarchical search boxes in the 1997 Grolier Multimedia Encyclopedia.

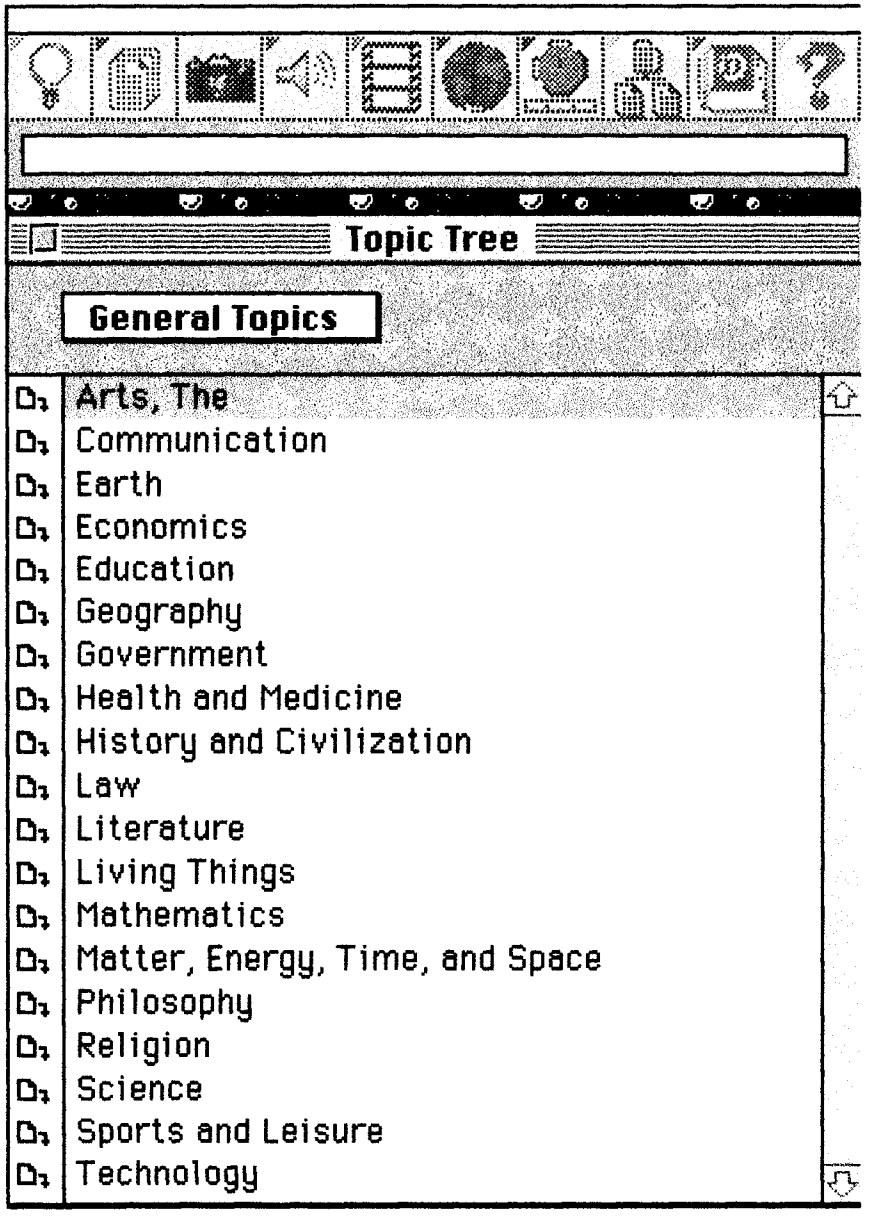

Figure B 25. This is the hierarchical search box in Compton's Interactive Encyclopedia.

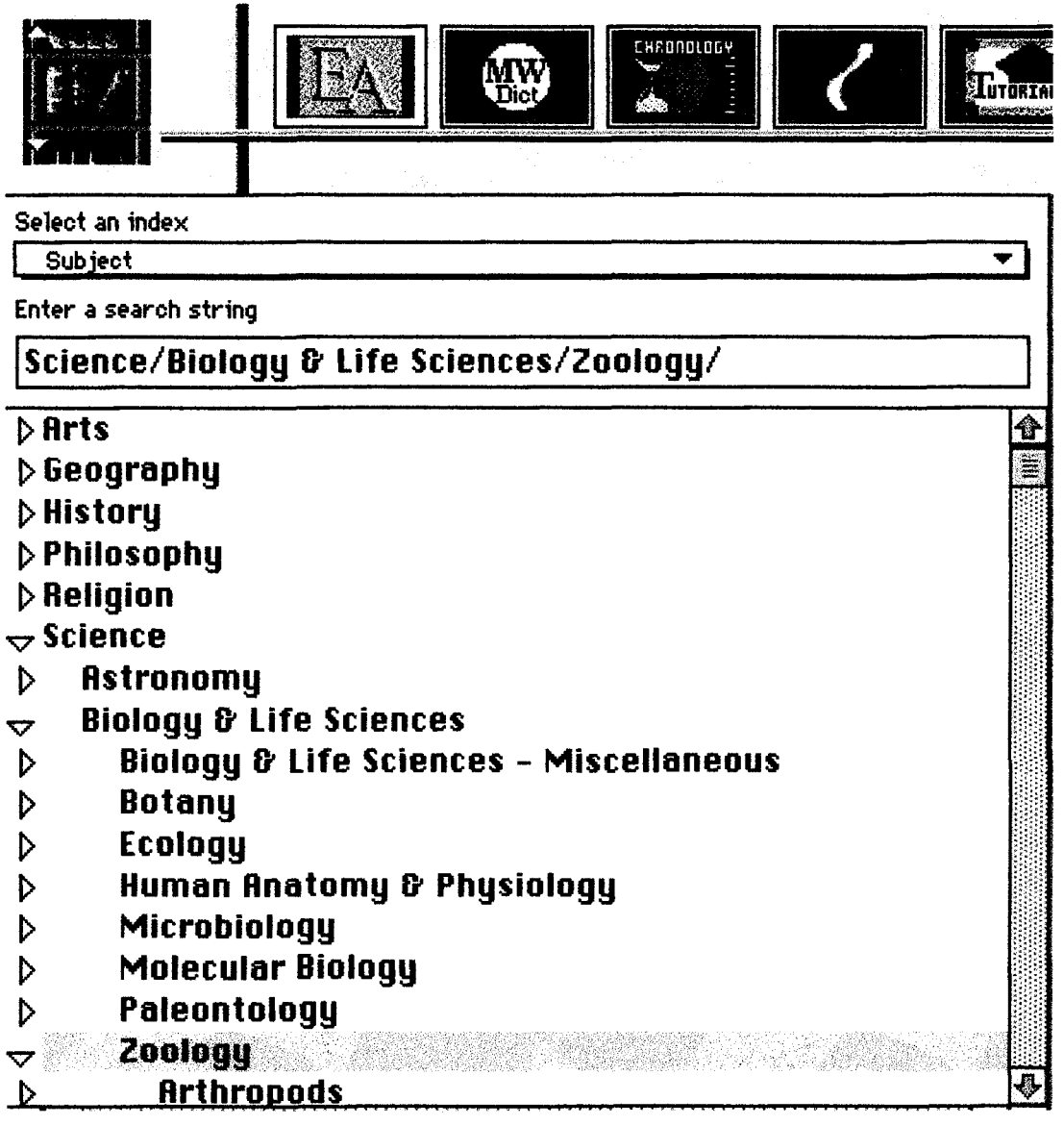

Figure B26. This is the hierarchical search screen of the Encyclopedia Americana.

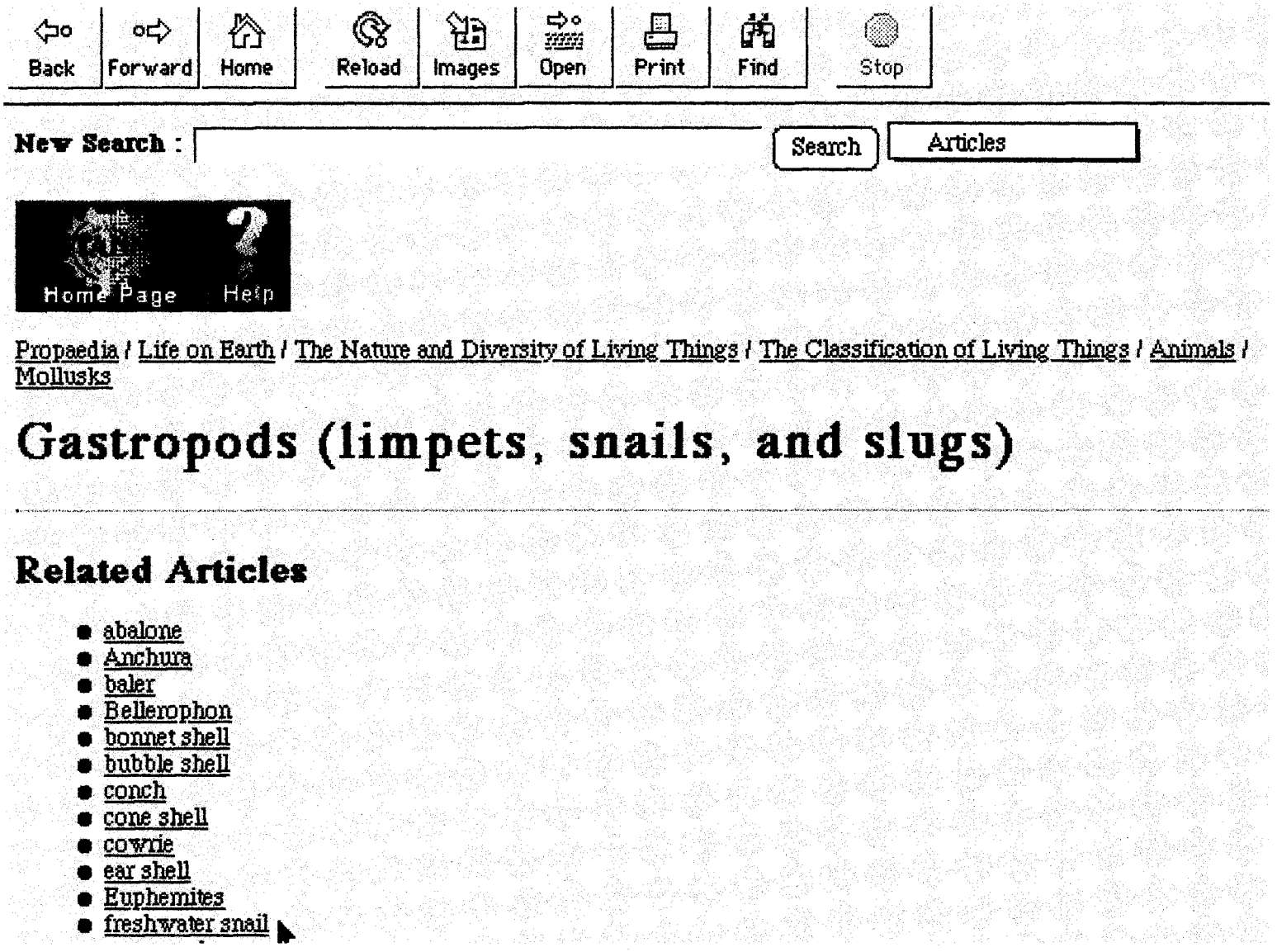

Figure B27. This shows hierarchical search results in Encyclopedia Britannica CD 97.

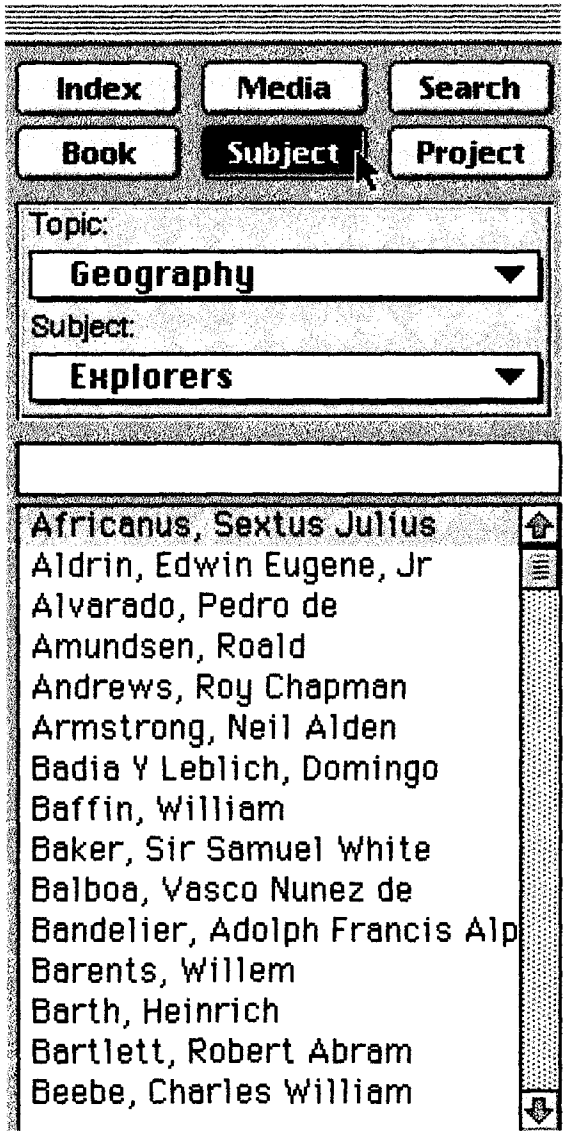

Figure B28. This shows the hierarchical search box in Infopedia 2.

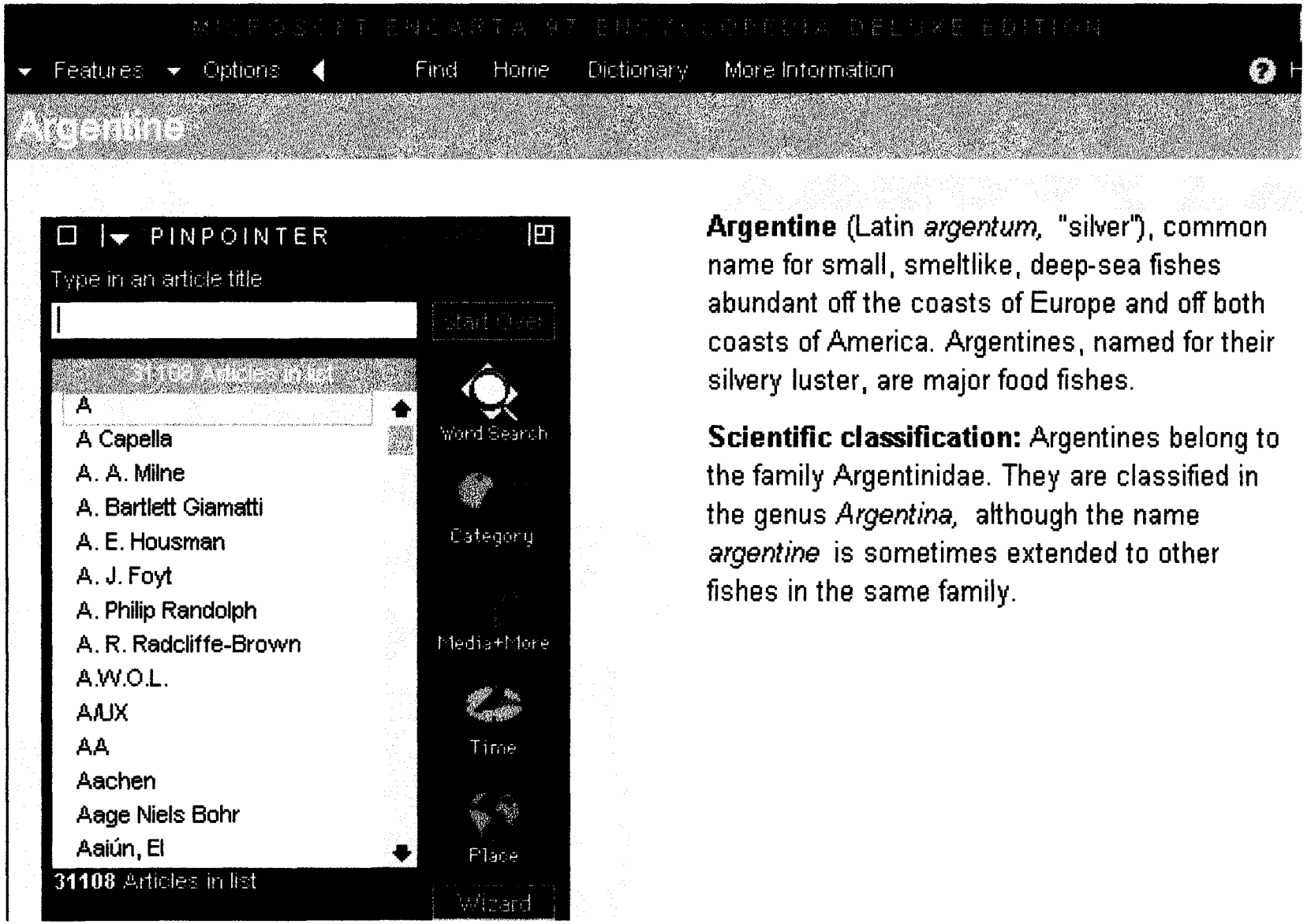

Figure B29. This is the main screen in Microsoft Encarta 97 Encyclopedia.

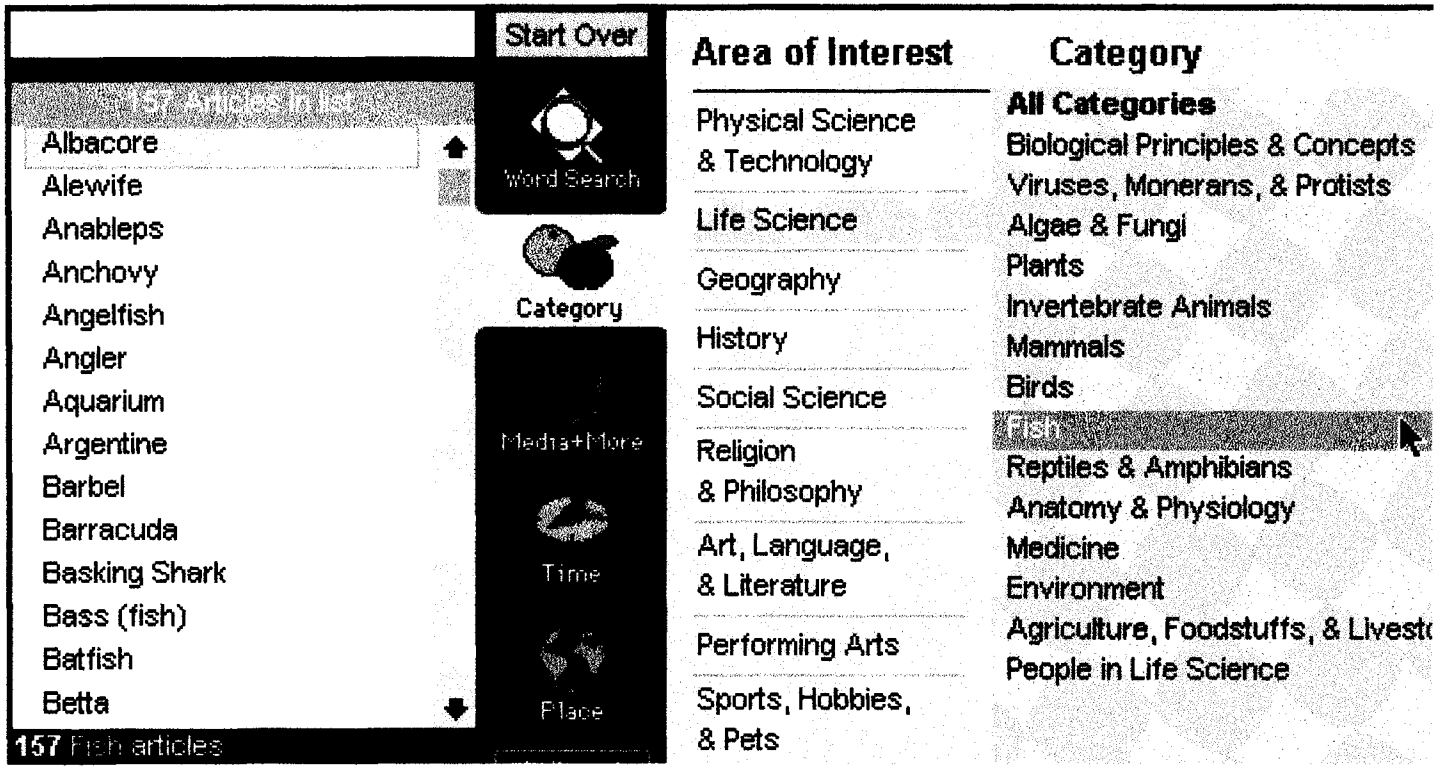

Figure B30. This shows the hierarchical search boxes in Microsoft Encarta 97 Encyclopedia.

Geography

History

Humanities

Industry & Technology

Life Science

Physical Science & Math

Figure B31. Hierarchical search in the World Book Multimedia Encyclopedia.