6 SEARCH TECHNIQUE

This chapter introduces many of the major concepts and basic mechanics of searching. Again, we will use the DIALOG system's commands as illustrations but also include a discussion of current Internet-based search technique at the end. As a framework for presenting the particular commands and ideas, we outline an eight-step procedure, really a codification of common sense, which we hope will help formulate effective search strategies and conduct successful searches. We will also use a particular search as an example to walk the reader through these steps.

1 Read the query.

1a Listen to the query.

1b Understand the query.

This is only somewhat flippant. Whatever triggers a search—a phone call or electronic mail message from a patron, a written search request form, a panicky visit to the reference desk—this is the first, best resource. No matter how much the person requesting the search knows about the actual topic, he or she is the one requesting the search, and so is the only one who knows how many documents they want, what kinds of documents, what focus to put on the search, and so on. We will talk more about the search interview process later on, but for now, know that any information that can be obtained from the user could be very helpful. Examples include potential search terms, known authors or titles of good documents (but be careful—these could do more harm than good, especially if the names are wrong), the results of any previous search attempts they made, and so on. Many search services use forms to elicit this sort of information; here are a couple of samples following on pages 76–78.

An important note: it is entirely possible that a query presented for an "online search" really does not belong there. It might be more of a traditional ready-reference question, or one for which a manual or Internet search would be quicker or more appropriate or more successful. Do not get seduced into believing that online searching will answer all questions, because it will not. There are situations in which a search via a commercial online service would be faster and cheaper, but this is not always the case.

On page 79 is the sample query we will use as a demonstration. It is a real query from a psychology doctoral student working on the literature review for her dissertation.

Fig. 6.1. Sample search request form.

Online Search Request Form

Please give a brief narrative description of your topic (use back if necessary):

Do you know of any index terms, vocabulary terms, or search terms that would be useful in searching for documents on this topic? Please list them here, or underline them in the above description.

Do you know of any authors or documents relevant to this topic? Please specify them here.

Types of materials of interest to you (circle):

Journal Articles	Y	N	Conference Papers	Y	N
Reports	Y	N	Dissertations	Y	N

Other (specify): _____

Years to be covered: _____

Languages of interest (list): _____

Please give any other information you think might be helpful in formulating a search strategy on the back.

Fig. 6.2. Internet Public Library reference question form.

the Internet Public Library

IPL Ask A Question Form

IPL Reference Question

Reminder:

We are not able to perform lengthy research. However we can provide brief answers to factual questions or suggestions for locations and sources which might help to answer your question.

PLEASE READ! About the IPL Ask-A-Question Service

Before you ask a reference question, please check to see if your question is in the Frequently Asked Reference Questions list. You could save yourself, and us, a lot of time.

1 **What is your name?**

What is your email address?

If you don't give us your correct, complete Internet email address (example: fluggly@aol.com), we can't send you an answer to your question.

Where do you live? (City/State/Country)

We can usually help you better if we know where you live, and how far away you are from the resources we may recommend to you.

2 **I won't need this information after:** (date)

Click here if you are in a hurry.

3 **The Subject Area of the Question:** (click to see list -- choose one)

(None Selected)

4 **Please tell us your question.**
A human being will read your question -- please use complete sentences!
The more you tell us, the better our answer will be. What do you already know about your subject or question?

(Fig. 6.2 continues on page 78.)

Fig. 6.2. Internet Public Library reference question form (continued).

5 **How will you use this information?** Why are you asking your question?

It really helps librarians to know this part! Sometimes we can use our subject knowledge and imaginations to think of other places to look for answers and information, if we know how you will use it.

Will you use this information for a school assignment? ○ Yes ○ No

Are you: ☐ A librarian? ☐ A teacher? ☐ A businessperson?

6 **Type of answer preferred:** (choose one of the following)

○ A brief factual answer to your question
○ Some ideas for sources to consult for exploration:

☐ Internet sources ☐ Print sources ☐ I don't care which kind

Sometimes the information you want isn't available on the Internet, but might be available through a library near you. We can almost always get you started, at least.

7 **Sources Consulted:**
Please list any places on the Net or off that you've already checked regarding your question. We don't want to duplicate your attempts. Don't forget to try using our Ready Reference Collection and your local library to answer your question.

Reminder: Please take a moment to re-check the e-mail address you are submitting to us, since it is **impossible** for us to communicate with you unless it is correct. Thanks!

8 **SEND IT!**

Submit Question to IPL Librarians | Reset Form To Default Values

If you have problems using this form, you can also submit a question by e-mail. For instructions, consult the E-Mail Guidelines.

Return to Ask a Question | IPL Reference Center | IPL Lobby

the Internet Public Library - = - http://www.ipl.org/ - = - ipl@ipl.org
Last updated Jul 24, 1997.

Fig. 6.3. Completed search request form.

Online Search Request Form

Please give a brief narrative description of your topic (use back if necessary):

> I am interested in information about the psychosocial and behavioral effects of traumatic brain injury in children, and about effective methods of psychological intravention with brain injured children.

Do you know of any index terms, vocabulary terms, or search terms that would be useful in searching for documents on this topic? Please list them here, or underline them in the above description.

traumatic brain injury
closed head injury
children
adolescents
pediatric
psychosocial
behavioral
neuropsychology
intravention

Do you know of any authors or documents relevant to this topic? Please specify them here.

> The following have been recommended but I haven't yet read them:
>
> —Rutter, Chadwich and Shaffer (1985). Head injury. In M. Rutter (Ed.). *Developmental Neuropsychiatric.*
>
> —Klonoth, Lon and Clark (1977). Head injuries in children. *Journal of Neurology, Neurosurgery and Psychiatric* 40,1211–1219.

Types of materials of interest to you (circle):

Journal Articles	(Y)	N	Conference Papers	(Y)	N
Reports	(Y)	N	Dissertations	(Y)	N

Other (specify): book chapters

Years to be covered: 1975-present

Languages of interest (list): English only

Please give any other information you think might be helpful in formulating a search strategy on the back.

A quick read of the request form gives us the sense that the user has thought about this topic quite a bit. In fact, she has given us two known documents with authors and several potentially good search terms. These may well be helpful in the search. We will talk more about the search interview process in a later chapter; for now we shall assume that the conversation reinforces what we see on the form, and that the student is looking for as much as we can possibly give her. This makes sense for a doctoral student in the bibliography-building stage, so we should be looking for larger rather than smaller sets—a *high-recall search*. She is not sure how much is out there but thinks it might be as many as 100 or 150 documents, perhaps more.

2 Identify the major concepts in the query.

Most requests for information that can be searched most effectively online involve more than one concept. One-concept searches can certainly be searched online, but often there is a second concept lurking in the user's mind. For example, a patron seeking information on bilingual education may actually be interested in bilingual education in elementary schools, or materials used in bilingual education, or the controversy sometimes raised about such education.

It is not always easy or straightforward to identify these concepts, sometimes called *facets*. Different people will find different concepts and act on them differently, and there is often no one "right" analysis.

Concept Analysis

We decide that an online search would help answer this query—it does indeed have multiple concepts, and the user is looking for articles, conference papers, and other materials that are included in online databases—so we begin to analyze the concepts it contains.

> *Concept means the abstract idea of a thing, regardless of what it may be called in a given instance. This is because often a single concept (e.g., teacher) will have more than one recognizable name (e.g., instructor, tutor, professor, lecturer, master, coach).*
>
> *The controlled vocabulary in an information retrieval system is an attempt to standardize these words to one preferred term that will always be used to represent a single concept, so that we will not find the same subject entered under different headings. A golden rule for most retrieval systems is to try to gather together under one heading all the material on one subject. – GW*

For this search, we identify three concepts: *traumatic brain injuries*, *their effects*, and *children*. Again, there is nothing magical about this process; it is something you get better at with practice and experience, and you probably thought of the same words when you first looked at the query. If not, don't worry, but look at your analysis and ours and see how they differ. Are they roughly similar? Did you see two concepts, or even four? How might the way you conceptualized the search affect how you do the search? This set of concepts makes sense to us, but it is not the only one, and different ones might well produce equally good results.

Building Blocks

Most searchers use a technique called *building blocks* in constructing their search strategies. It might help to think of a search strategy as a structure, built up from individual pieces, each of which corresponds to a concept derived from the analysis of the query. A good analogy is Lego. Each term is an individual Lego block; put a number of them together, and they form a bigger block. Then put those bigger blocks together and make something even more complicated. If a particular piece looks wrong, or if it is in the wrong place, it can be moved or even taken out. Searching is like that—finding terms that might work, putting them together in concept blocks, combining the concept blocks to see what they produce, and revising the search as necessary. The steps below will follow that process through our sample search.

3 Identify potential terms to correspond to those concepts.

Term Selection

We have identified three concepts, so all we need to do is go into the database, look them up, put them together, and go home, right? Unfortunately, the process is not so simple. Remember what we said in the last chapter: We want to look for concepts, but we are forced to search for words. There is often no obvious way to go into a database and pull out only the documents about a particular concept. In some cases one can, when the concept is very specific and there is really only one way to refer to it. But most of the time that is not the case, so we have to try to find multiple terms that might be used to represent each concept. Several might be identified but only one is chosen for strategic reasons, but we will get to that later.

In this case, the user appears to be a good source of terms: TRAUMATIC BRAIN INJURY, CLOSED HEAD INJURY, PSYCHOSOCIAL, PEDIATRIC, and so on. But the terms are really all over the place. It would help to have a way to organize the process and make it easier to keep track of all of this. Have a look at the search grid (see fig. 6.4, p. 82).

It is a bit overwhelming at first, but if you look at it for a time, it will start to make some sense. Look first at the boxes marked "Concept 1," "Concept 2," and "Concept 3." In these boxes we have written in the concepts we previously identified. Right below each of these is a series of lines marked "S#" and "Terms." These are spaces for recording potentially good terms, and we have taken the user's terms and phrases and entered them under the corresponding concepts. (Although we have not quite gotten there yet, the "S#" spaces can be used to record set numbers to help in keeping track of what's what.)

A couple of things to point out. First of all, in a couple of cases, we have terms that are exactly the same as our concept names. Nothing special about this; sometimes it happens and sometimes it does not, as with the second concept.

Second, a few terms are recorded here in a slightly different way. Look at BEHAVIOR(AL) and CHILD(REN), and ADOLESCENT(S). This is Joe's shorthand and is a note to remember that there may be varying forms of these terms. Documents might use the word "behavior" or "behavioral," "child" or "children," "adolescent" or "adolescents." This can be a way to remind oneself about plurals or other variant forms. We just suggest finding a comfortable way of working that helps one get quality results.

Fig. 6.4. Search grid.

File # 11

Concept 1 traumatic brain injury

S#	S#	Terms	S#	Terms
		TRAUMATIC BRAIN INJURY		ACCIDENT?
		CLOSED HEAD INJURY		TRAUMA?
				BRAIN AND INJUR?
				HEAD AND INJUR?

OR

AND

Concept 2 effects of brain injury

S#	S#	Terms	S#	Terms
		PSYCHOSOCIAL		
		NEUROPSYCHOLOG?		
		BEHAVIOR(AL)		

OR

AND

Concept 3 children

S#	S#	Terms	S#	Terms
		CHILD(REN)		
		PEDIATRIC		
		ADOLESCENT(S)		

OR

S#	ADDITIONAL INDEXES	S#	LIMITS	OTHER FEATURES (NOT,etc.) S# command
	LA =		/ENG	
	PY =		/	
	AU =		/	GOOD SETS
	=		/	
	=		/	

There is also no one right way to pick terms. In a group of five searchers working on the same query, they might identify five different sets of terms. There would be some overlap, to be sure, but there is rarely only one way to go about doing a search.

> *I often tell my classes that there's no right way to do a search, but there are bad ways. Some conceptualizations and terms will just work better than others in producing sets of documents that the user actually wants and will find useful. It's a very difficult process shot through with ambiguity at more than one level. Don't be intimidated—just keep at it and keep improving. – JWJ*

4 Select alternative (narrower, broader, or related) terms to use if the original strategy needs help.

When doing term selection, terms may come up that are possibly or marginally useful but do not immediately seem ideal. They may in fact be good, but if the initial instinct is ambivalent, hold them out as reserves or alternatives and perhaps put them in the right-hand column of the grid. One's initial, beautifully honed crafted search strategy might not be perfect. More terms, narrower terms, broader terms, different terms, or even fewer terms may be needed. Thus, it is usually a good idea to have a few additional terms up one's sleeve—just in case.

In this search, we have a couple of really interesting (and specific) terms from the user in the first concept, but they might not work, or they may be too specific. We may try a few other ideas, combining some of the same words but in different ways.

5 Determine logical (Boolean) relationships between terms.

We have a good list of terms to use in finding documents for our patron, but we cannot just enter them all and have the answers come out. We have to group them by concepts and then combine those concepts in the appropriate ways. There is a specific way to do this, based on the logic that underlies the construction of many information retrieval systems. This logical understructure comes to us from set theory and is usually called *Boolean logic*.

Boolean Logic and Boolean Searching

Boolean logic is part of a set of techniques used in mathematics for manipulating sets in a rigorous, logical fashion. It is named for the English mathematician George Boole, who developed the framework on which it is based. Boolean logic provides three ways in which sets can be combined, and online systems use all three.

When a search term is entered, a set of documents that contain that term is created. Boolean search techniques allow the searcher to manipulate and combine these sets to provide the user with a set that corresponds to the logic of the initial query. We will discuss each of these three Boolean operators in turn. Before we begin, though, know that the use of Boolean logic and searching is neither universal nor identical across information retrieval systems. Most commercial systems like DIALOG use them in very similar ways, but most Internet-based systems at present have only fragmentary and simple Boolean search capabilities. We will talk about Internet-based systems more at the end of this chapter, but

be aware that although full Boolean capability has many advantage, it is not the only game in town.

OR

We could, if we wanted to, go through the database and find all the documents with, say, the word "trauma" in them, another set with the word "psychosocial," and a third with "children," and then compare them to see which terms they all have in common. If we were doing the search manually, using print indexes, we would do precisely that, but it would be tedious and time consuming and we would make lots of mistakes. Using Boolean search tactics with the inverted file for the database will make it much easier and quicker.

We have several terms for the "effects of brain injury," and we want to use them all. Look again at the grid where we have recorded these terms; specifically, look on the right-hand side of that box. See the brace and the big OR there? This tells us that we should use the Boolean operator OR to combine those terms and create a concept block, and that is precisely what we will do.

OR is used to *build up concepts* and can be helpful in several circumstances:

- For *synonyms* or *equivalent terms*

  GARBANZOS **OR** CHICK PEAS
  STUDENTS **OR** PUPILS
  OCCUPATIONS **OR** JOBS **OR** CAREERS

- For *spelling variations*

  HONOR **OR** HONOUR
  ORGANIZATION **OR** ORGANISATION
  JUDGMENT **OR** JUDGEMENT

- For *related terms*

  CLOSED HEAD INJURY **OR** TRAUMATIC BRAIN INJURY
  PSYCHOSOCIAL **OR** NEUROPSYCHOLOGICAL **OR** BEHAVIORAL
  CHILDREN **OR** ADOLESCENTS **OR** PEDIATRIC

This is necessary for a variety of reasons. Authors may use different forms of these words or variant spellings. Words in titles or abstracts may also be slightly different from those used as subject headings. Finally, there simply may be more than one term or word used to represent a single concept or idea. We want the *concept* to be present in the documents we retrieve—the concept of "dogness" or "children" or "Europe"—but human languages are ambiguous and permit multiple ways of saying the same thing. So, once again, we often have to use alternative words to get at a single concept.

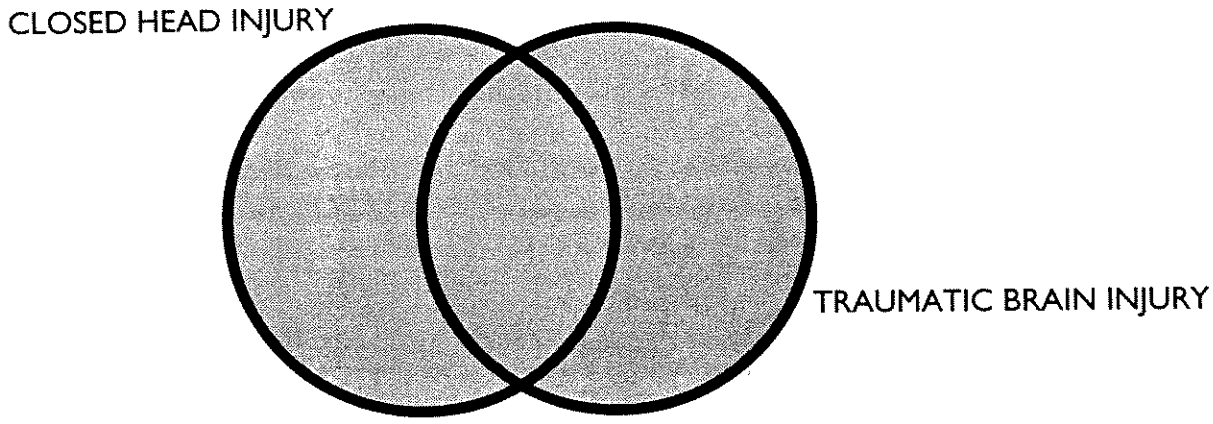
For example, suppose a patron is looking for documents about the trade policies within Europe. To represent the concept of "Europe," we might look for "Europe" but also "EC" (an abbreviation for the European Community), "EEC" (the European Economic Community), "EU" (the European Union, the more recent name for the economic community) or even the names of individual countries. In the *ABI/Inform* database, which covers periodicals in business, we find the following postings figures:

EUROPE	80371
EC	16007
EEC	2663
EU	6757
EUROPE OR EC OR EEC OR EU	86934

Notice that the final number is less than the sum of the individual sets due to overlap between them.

A tool known as a *Venn diagram*, named after John Venn, is often used to represent sets and Boolean operations. The figure below is a Venn diagram that represents our first ORed concept:

Fig. 6.5. Venn diagram for OR.



OR will create a set that will retrieve any documents that contain any individual term or any combination of the terms. Because it can only add documents, it will retrieve more documents than any term individually would, and it makes sets bigger.

Be careful, though, of individual terms that *dominate* a concept set. In the Europe example above, most of those documents are probably about Europe in general and not the EU specifically, because the "Europe" set is so much larger than the others. This is not necessarily a problem, but can be. If results seem to be too general, not specifically about a particular concept, a concept set may need to be restructured, dropping a dominant term and using only the more specific, focused terms.

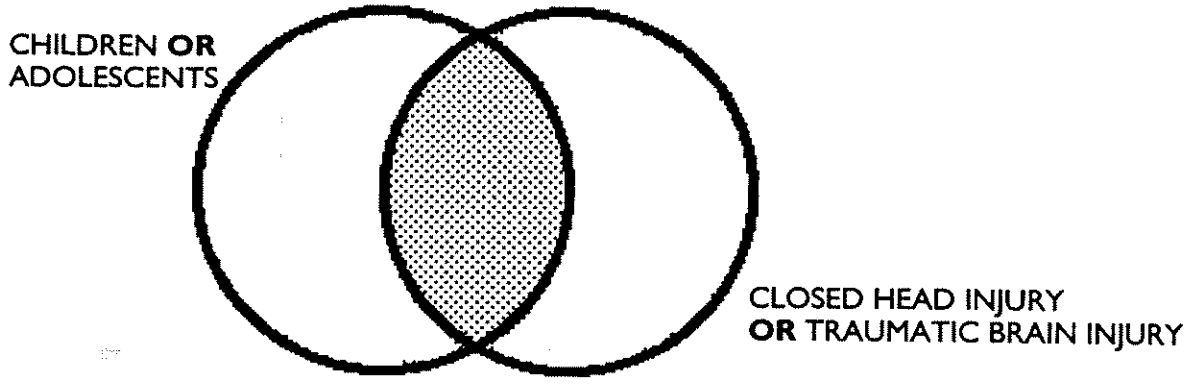
AND

Once we have constructed sets for the individual concepts, we need some way of connecting them so we can find documents that (we hope) are "about" all of them. The way we do this is by use of the Boolean operator AND. Look again at the grid and notice the big ANDs between the concept boxes. This is a reminder that we use AND to pull these concepts together and see what they have in common.

Combining two or more sets with AND will produce a set that contains documents in all of those sets only. That set must be smaller than the individual concept sets, and will therefore produce fewer documents. We call this set the *result set.*

Here is a Venn diagram illustrating how AND works, with two or three concept sets.

Fig. 6.6. Venn diagram for AND.



Another word of caution: Before performing an AND operation, look at the sizes of the individual original concept sets. Because AND can only reduce size, if one or more of the concepts sets are small (e.g., fewer than 50 documents, or about the size that the user said they wanted), the AND may not need to be done. For example, the user says she wants about 60 documents, and one of your concept sets has 47. Before ANDing it in with one or two other sets, it might be prudent to first have a look at it. Maybe *that's* the result set desired, or maybe more terms or broader terms are needed in there. If the set is ANDed in with other concept blocks, the result is likely to be a very small result set. It might even come up with no documents at all. So just take a second and look at those numbers before continuing.

NOT

The third Boolean operator is also the least often used, at least in the same way as AND and OR, for a couple of reasons. It is not even on the search grid, or at least is only tucked down in the corner under "other features." Many beginning searchers do not fully appreciate NOT and its uses, though it is a very powerful tool. Too powerful, in many situations. NOT is used to *exclude* items from a set, but it is a blunt instrument and can have unintended and quite nasty consequences, especially if used in haste or panic.

It is difficult to come up with a good example of its fruitful use in working with concepts, because it does have such power. (We will see it used in another way shortly.) In the next chapter, we will do a search about distance education in library schools in the United States. It turns out that there is no good search term for "United States" in the ERIC database because so many of the documents in there cover it. But there is a term, *foreign countries*. So, to eliminate documents from abroad, we could NOT out the ones with *foreign countries*. Even here, we could lose good documents that are about both U.S. and foreign programs because any document that has that term will be eliminated, but in this case it is appropriate and we will not lose too many documents.

So, NOT should not be a first thought. If you find yourself wanting to use NOT to eliminate a concept, think first whether there might be another way. If a term is making trouble, maybe the concept set should be reconstructed without it. For example, go from

```
OCCUPATIONS OR JOBS OR CAREERS
```

to

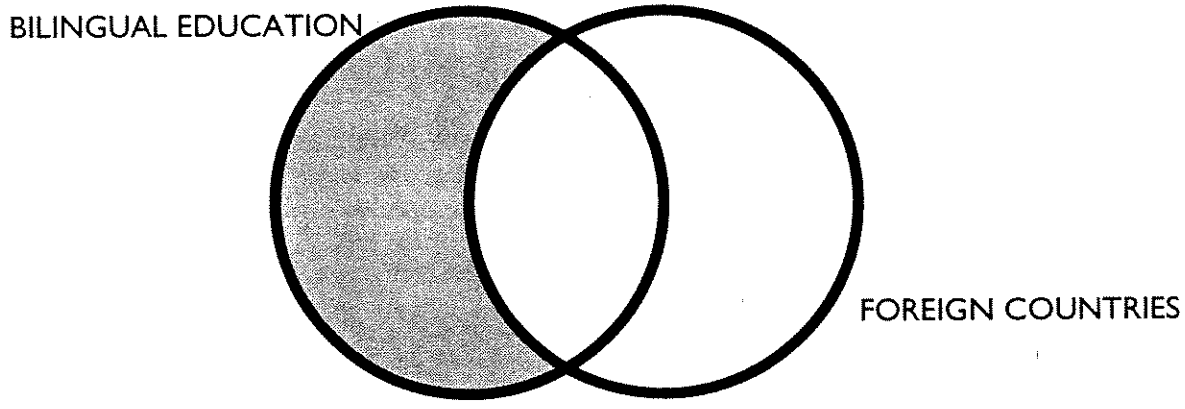
```
OCCUPATIONS OR CAREERS
```

if "jobs" is producing junk, like documents about Steven Jobs.

Or perhaps something new needs to be ANDed in, a new concept or focusing mechanism like date or language. There are places to use NOT, but it should almost always be a second choice.

Here's a Venn diagram for NOT:

Fig. 6.7. Venn diagram for NOT.



Order of Operation

Also take care in the order in which search terms are entered. Terms from more than one concept can be entered in a single search statement. We do not recommend this tactic, especially for beginning searchers, because it can be confusing, but one should know how to do it correctly. Most (but not all) retrieval systems will perform NOTs first, followed by ANDs, and finally ORs, and will allow the use of parentheses to override this order.

Thus, a statement such as

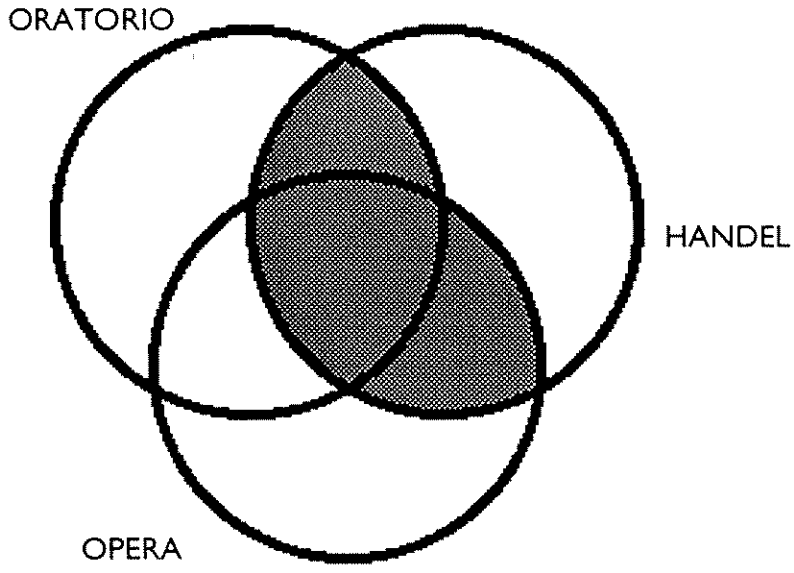
```
(ORATORIO OR OPERA) AND HANDEL
```

would be different from

```
ORATORIO OR OPERA AND HANDEL
```

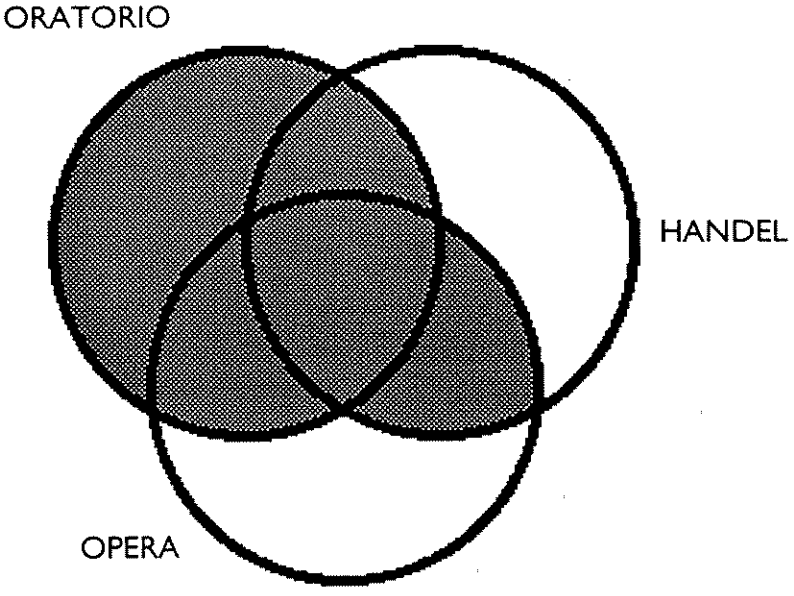
The first (correct) statement would be interpreted this way: Things in parentheses are done first, so the system would find all documents with either the word ORATORIO or OPERA or both. Then, those would be ANDed with the documents that have HANDEL. This produces a set that, we hope, contains documents about vocal works of Handel. Here's the Venn diagram for that (see fig. 8, p. 88):

Fig. 6.8. Handel's vocal work.



The second statement, though, would be interpreted quite differently. Because there are no parentheses, the AND goes first, so the system would find all documents that satisfy OPERA AND HANDEL. Then those would be ORed with all the documents with ORATORIO. The resulting set would consist of all documents about Handel's operas mixed in with everything about oratorios—not what we had in mind. See how different this Venn diagram is:

Fig. 6.9. Oratorios, with Handel's operas.



There is nothing really wrong with doing something like the first statement, and most experienced searchers would be quite comfortable doing it, especially for something with only three terms and a simple relationship between them. Just be sure the word order is right!

6 Begin the search.

Here is where to find out if a well-planned strategy will work or not. Even the most experienced and skillful searchers have times when it just does not work, when they just cannot find anything of use, or when the search comes up dry. Sometimes there is nothing to be found—there are no documents in that database in the area the user wants. And sometimes, the right search terms or combinations to pull up the good stuff are elusive.

> *Actually, there are times when the user probably doesn't want anything to come up. There are circumstances, for example in patent searching, when finding something is a bad sign. Someone else has patented your device, or written a book on your dissertation topic, so your work has gone for naught. Another reason why it's good to know what the user wants, and why. – JWJ*

It will probably be most effective to enter all the terms (ORed together) for each concept block together, see how many hits each concept block retrieves, and then AND the remaining sets together to produce a result set. In some cases, that result set will be a good one and will contain useful documents for the patron. Often, though, it could be improved (more about that in step 8). These early stages should provide a good idea of possible steps for refining the search if necessary.

Most Specific First

It might seem that it does not really matter which concept block is entered first because they will all be ANDed together shortly anyway. Although that is true, there is more to it than that. An important and widely used convention is *most specific first*, which can be very helpful. Imagine doing a search on the reliability of children as witnesses in child abuse trials in the *Criminal Justice Information System* (CJIS) database. Here are three concept blocks: children, witnesses, and child abuse. (They could also be two: child-witnesses and child abuse, and if there is a subject heading for child-witnesses, that might well work.)

In a database that covers criminal justice, there are likely to be many more documents on child abuse and witnesses than on children per se. If we search for "child abuse" first, we will get a large set and not learn very much. However, if we search for "children" first, it will be a smaller set and will give us some indication of how many documents we are likely to end up with. If the database supported controlled vocabulary searching, a term like "child witnesses" would be an ideal first choice.

If that first and most specific set is really small (say, 10 documents or less), we might decide to stop right there and either try new terms, reevaluate the search overall, or just inspect that first set—it might be easier than continuing the search. If, though, we get several hundred documents, we proceed, but with the knowledge that our overall result set is likely to be smallish. Experienced searchers can use this kind of information to help guide how they will search from that point on.

Note, though, that if we were doing this same search in, say, *Child Abuse & Neglect & Family Violence*, we would probably enter the "witnesses" concept first because it is probably the most specific. Computer searching is by no means an exact science, and if the broadest concept set is searched for first, it probably will not hurt, but "most specific first" can be very helpful in many circumstances, especially in small databases or with narrow topics.

Logging-On Protocols and Choosing a File (BEGIN)

The major online search services, such as DIALOG, LEXIS/NEXIS, and Dow Jones, are accessed via telecommunications networks or the Internet, as described in chapter 3. When one connects to the service, one must log on in order to start the search. To do this, one must have established an account with the system; they will provide an account number and password used to authenticate your access to the system. This prevents unauthorized use of the service (i.e., freeloading).

We begin our sample search with this login procedure. In search transcripts, we will show what the user types in *italics*, and the system's responses in Roman type.

```
DIALOG INFORMATION SERVICES
PLEASE LOGON:
 ********
ENTER PASSWORD:
 ********
Welcome to DIALOG

Dialog level 98.04.30D

Last logoff:   26may98 12:23:59
Logon file001  26may98 12:28:41


File  1:ERIC  1966-1998/Mar
      (c) format only 1998 The Dialog Corporation

    Set  Items  Description
    ---  -----  -----------
?
```

Notice that in the above, only the system's responses are shown. The searcher has typed in her password, but the system does not display it for security reasons.

The greeting tells us that the last use of the system from this user number was on May 26, 1998, and that we are in the ERIC database, which is file 1 in DIALOG. This is the *default database* selected by the user, meaning that when she logs in, this is the file she will be in, usually selected as being the file she searches most often.

Typically, at this stage, system news will come up: new databases that are available, files not working at present, revisions or reloads of older files, and so on. After this system news (here omitted) comes the *file header*. This tells us what we are currently searching in (ERIC), with the dates of coverage of that file (1966 to March 1998). Then come the headings Set, Items, and Description. The results that appear after these will tell us the numbers of the sets we create, how many documents are in them, and what they represent. Finally, we get a question mark, which is DIALOG's system prompt. This tells us that the system is ready and waiting for us to give it a command.

The first command should always tell the system in which file you want to search. It is quite possible that ERIC, which covers education, will have documents of interest to our user (and indeed, it does), but our intention was to search in PsycINFO, as it is likely that documents in psychology will be more helpful. To move to PsycINFO, file 11 in DIALOG, we use the BEGIN command to change files. The form of the command is

begin ≤file-number≥

where "≤file-number≥" is the number of the file to be entered. If in the middle of a search, the BEGIN command is given, it will clear out all the previously created sets and move to the file requested. BEGIN is also good to use if you make some horrible mistakes and wants to start over; give the BEGIN command for the same file to achieve a blank slate and recommence the search with Set 1.

Many of the most common DIALOG commands can be abbreviated, so we could also just say

b ≤file-number≥

which is what we do here:

```
?b 11

26may98 12:29:51 User007659 Session D172.1
            $0.50    0.033 Hrs File1
     $0.50  Estimated cost File1
     $0.10  INTERNET
     $0.60  Estimated cost this search
     $0.60  Estimated total session cost  0.033 Hrs.

File 11:PsycINFO(R)  1967-1998/May
      (c) 1998 Amer. Psychological Assn.

    Set  Items  Description
    ---  -----  -----------
?
```

Now that we are in PsycINFO, we can proceed with our search by starting to create sets based on the terms we selected.

Choosing Search Terms (SELECT)

The command use to search for a given term is SELECT. Its form is

select ≤what-to-search-for≥

and is often abbreviated as

s ≤what-to-search-for≥

When the SELECT command is issued, the system searches through the inverted file (DIALOG calls this the *Basic Index*) for all the documents that contain that term. SELECT can be used to search for individual words

```
?s children
```

or phrases

```
?s traumatic brain injury
```

but those phrases will only work in phrase-indexed fields. Recall our discussion about word- and phrase-indexing in the section on inverted files. The descriptor "traumatic brain injury" could be found this way, but if the phrase appears in a title or abstract, we will not get it by entering the phrase. We can get it, but we have not learned how to do that quite yet.

Another form of the SELECT command is useful if one is searching for several terms at once. It is known as SELECT STEPS and abbreviated SS. The format is

select steps ≤what-to-search-for≥

and its abbreviated form is

ss ≤what-to-search-for≥

When SELECT STEPS is used, it performs the same operations as SELECT. The terms requested are searched for in the inverted file, and a set is produced. The difference between this and SELECT is that when SELECT STEPS is used, sets are created for the individual terms in the statement as well as for the overall statement. These intermediate sets can be useful if, as the search continues, the searcher decides to use these terms in other combinations. The sets have already been created, so typing and time (and money!) can be saved by using the set numbers rather than reentering the terms.

SS can be used anywhere S can be used, but it is not necessary when searching for single terms or phrases. Notice that a lot more sets are created this way, and many beginning searchers find that a bit difficult to contend with, especially when it comes to deciding which sets to use later in a search. Some people like it, others do not, and some wind up using it after they gain some experience. Try it a few times, to learn it and get comfortable with it.

AND, OR, and NOT can be used inside SELECT statements in several ways. As we have seen, two or more terms can be joined by a Boolean operator, as in

```
?s children or pediatric or adolescents
```

Set numbers can be used in place of terms, as in

```
?s s3 or altruism
?s s9 and s12
```

Also, more than two components may be searched for, as in

```
?s s3 and s8 and s17
```

A few cautionary words about SELECT: Always be sure to put a space after the word SELECT or S or SS. The system expects it, and if the space is omitted, there may be unexpected results, such as

```
?ssystem
```

DIALOG sees the SS, searches for the remainder of the statement (YSTEM), and gets zero hits.

Also be careful about spelling and typing errors. Computers are very literal beasts, and a mistake such as this will, more than likely, achieve no hits:

```
?s infomation
```

Beginning searchers often either fail to notice such an error or find it difficult to recover from it. If this sort of mistake is made (and we all do it), just enter the correct word and proceed as planned, but check the set numbers carefully.

> *One of the golden rules of online searching is stated thus: Always be suspicious when you get a set with zero postings. Have you spelled the term or terms correctly? Have you entered the command correctly? Notice the computer responds by repeating your requested term or terms, so see that it received what you intended. When using set numbers, check that the postings look consistent with what you have previously seen. – GW*

Another common error among new searchers occurs during searches involving previously created sets. Sometimes, instead of the statement:

```
?s s5 and france
```

the searcher enters

```
?s 5 and france
```

or even (more commonly)

```
?s5 and france
```

In both these cases, it is not set S5 that is ANDed with FRANCE; it is the numeral 5, and only documents containing that number somewhere in the indexed fields will be retrieved. Again, if this should happen, simply reenter the statement. These errors are especially pernicious and difficult to catch because they create sets that may look right. However, if an error like this is carried through an entire search, it will probably result in an almost useless set of citations. One might be able to spot the error later if the result set seems to be fine but is missing one concept altogether; it is usually far easier, though, to catch this mistake as it happens and correct it then.

Truncation (?)

One last piece of DIALOG mechanics before we get into the actual search. Imagine we are doing a search on the effects of technology on libraries, librarians, and the profession of librarianship. We could, of course, search for this second concept by entering

```
?s libraries or librarians or librarianship
```

or something similar. But look at those three words. They're very similar and, in fact, differ only in the ways they end. It would be nice if there were a shortcut way to search for each of those terms (and perhaps other variants) without having to think of them all and ORing them together. Conveniently enough, there is such a shortcut, using the truncation operator, which in DIALOG is the question mark:

```
?s librar?
```

This statement will retrieve any document that contains any word that begins with the letters LIBRAR; the words listed above, plus LIBRARY, and so on. There will be only one set, and the system will not explain what the precise words searched on were. Take care, then, not to truncate too far to the left or inadvertently include a word with an enormous

number of postings. Go as far to the left as necessary, but the farther one goes, the more records are retrieved, and the greater the potential for irrelevant terms.

> *I vividly recall a search I was doing in a large full-text database of newspaper articles, looking for things about fast-food companies trying to reduce the fat content of their foods. Everything was fine until I was trying to do the FAT part, and I blithely searched on*
>
> `?s fat?`
>
> *and as soon as I'd done it, I knew I had blown it. I got FATE and FATHER and who knows what all else. Took forever, and cost a fortune. Learn from my terrible example. – JWJ*

The "fat" error could probably have been avoided by using a variation of the truncation operator. The general one, as illustrated above, will get all words that begin with the specified characters, regardless of how much comes after. You can control that by using, for example

```
?s statistic? ?
```

which will retrieve STATISTIC itself and any word that begins with STATISTIC and has *one* additional character. Thus, it will retrieve STATISTIC and STATISTICS, but not STATISTICAL, STATISTICALLY or STATISTICIAN.

If more than one extra character is desired but still a limited number, use as many question marks as characters. Thus,

```
?s retriev??
```

will get RETRIEVE, RETRIEVAL, RETRIEVED, and RETRIEVER, each of which has two or fewer characters after the stem, but not RETRIEVING, which has three.

The question mark may also be useful inside a word to retrieve variant spellings. Perhaps the most common example of this use of truncation is

```
?s wom?n
```

which will retrieve WOMAN and WOMEN as well as the less-frequent WOMYN. Such a use of truncation would not work for most British or Canadian spelling variations, seen in such words as COLOUR and HONOUR; they must be searched using OR, since embedded truncation only allows for a single letter:

```
?s behavior or behaviour
```

So now let us begin our search and see what we get. Our most specific concept is probably the head injury terms, and we had two good ones (or at least they looked good) from the user, so we shall see what they produce:

```
?s closed head injury or traumatic brain injury

          0  CLOSED HEAD INJURY
        370  TRAUMATIC BRAIN INJURY (1997)
S1      370  CLOSED HEAD INJURY OR TRAUMATIC BRAIN INJURY
```

Maybe the search terms were not all that good. It would appear, because everything is spelled right, that CLOSED HEAD INJURY is not a subject heading in this database, and that TRAUMATIC BRAIN INJURY is a new term in this database and thus has not had many documents indexed with it. In either event, this 370-document set is probably too narrow, so we will have to fall back on alternative terms right away. Now we try this:

```
?s (brain or head) and (trauma? or injur?)

         67917  BRAIN (1967)
         11676  HEAD
         15436  TRAUMA?
         15539  INJUR?
    S2    8103  (BRAIN OR HEAD) AND (TRAUMA? OR INJUR?)
```

These results are better, but the documents we get will be far less specific on "head injuries" than we'd hoped. What we'll get is any document with the word BRAIN or HEAD that also has some form of TRAUMA or INJURY, but these words do not necessarily have to be together or even connected in the document. Still, the set of results is bigger than S1. Our other terms work somewhat better:

```
?s psychosocial or behavioral

         28364  PSYCHOSOCIAL
         81543  BEHAVIORAL
    S3  107312  PSYCHOSOCIAL OR BEHAVIORAL

?s children or pediatric or adolescents

        207327  CHILDREN (1967)
          3395  PEDIATRIC
         57731  ADOLESCENTS (1967)
    S4  243078  CHILDREN OR PEDIATRIC OR ADOLESCENTS
```

Note that in S4, the number of documents with the word CHILDREN is dramatically larger than the others. Does CHILDREN dominate that set? Perhaps, but the terms are otherwise good, and the user is interested in both. It probably means that the result set will have more in it about children than adolescents, but that may just be the way it is.

So now let us connect them with an AND and see how big our result set will be:

```
?s s2 and s3 and s4

          8103  S2
        107312  S3
        243078  S4
    S5     268  S2 AND S3 AND S4
```

7 Have a look at a few documents.

We know that this original strategy (somewhat modified) produced 268 documents—documents that have one or more of the terms from each concept set. But now we really need to find out whether those documents are any good or not, and we can do that by having a look at a few.

Viewing Results (TYPE)

The DIALOG command used to display records from a set is TYPE, which can be abbreviated as T. The format of the TYPE command is

TYPE ≤set-number/format/records-to-see≥

T ≤set-number/format/records-to-see≥

So this command

?t 5/8/1-9

will show us the first through the ninth documents of set 5, in format 8. In DIALOG, documents usually come out in reverse chronological order (actually, the reverse of the order in which they went into the database), so asking for the first few will result in the most recent, newest ones. Here is an example of format 8:

```
 5/8/1
DIALOG(R)File 11:(c) 1998 Amer. Psychological Assn. All rts. reserv.

01532776        1998-07266-014
Parent training.
SERIES TITLE: The LEA series in personality and clinical psychology.

DESCRIPTORS: *Behavior Modification; *Daily Activities; *Disorders; *Parent
  Child Relations; *Parent Training; Adults; Children; Developmental
  Disabilities; Head Injuries; Schizophrenia
IDENTIFIERS: planned activities parent training behavioral technique,
children & adults with normal intelligence or developmental disabilities
or head injuries or schizophrenia or other disorders
SUBJECT CODES & HEADINGS: 3200 (Psychological & Physical Disorders); 3312
  (Behavior Therapy & Behavior Modification)
```

This is sometimes called the "searcher's format" because it gives quite a bit of information that can be useful as the search progresses. It includes not only the title but also the subject headings (here descriptors and identifiers). These will help you to know whether or not the documents are likely to be of value to the user and also can be sources of good potential terms to use if the search needs to be expanded.

There are many other potential formats to use in TYPEing out documents, and they can all be found in the DIALOG Bluesheets, either in print or on the Internet at www.dialog.com. A few, though, are worth mentioning here. Format 6 is often useful for getting a quick sense of what is in a set because it gives only titles of documents. Format 2 is usually bibliographic citation, which may be what the user most wants (although it is always good to ask). Formats 5 and 9 are called "full format"; they will display all the information in the record. Take care with these formats because the records could be quite long and using these formats usually carries an additional charge. More databases are including full-text records, so being able to get the full record in this way is a great time-saver, but be sure that is what is wanted!

At this stage you're looking both to evaluate the quality of the set and think of ways to modify the search to improve it. Look at the rest of this set and do both: see what you think **and** try to find some new good terms to try in the search.

5/8/2

01532586 1998-07195-000
Neuropsychology.
SERIES TITLE: Human brain function: Assessment and rehabilitation.

DESCRIPTORS: *Human Development; *Nervous System Disorders; *Neuropsychological Assessment
IDENTIFIERS: developmental considerations & aspects of specialized assessment in & how disorders in brain function relate to neuropsychological assessment
SUBJECT CODES & HEADINGS: 3297 (Neurological Disorders & Brain Damage); 2225 (Neuropsychological Assessment)

TABLE OF CONTENTS:
(Abbreviated)

5/8/3
DIALOG(R)File 11:(c) 1998 Amer. Psychological Assn. All rts. reserv.

01532208 1998-07011-014
Oncologic disorders.

DESCRIPTORS: *Distress; *Illness Behavior; *Neoplasms; *Pain; *Treatment; Adjustment; Children; Coping Behavior; Family Relations; Physical Treatment Methods
IDENTIFIERS: medical treatment & individual & familial psychological adjustment & coping & distress due to & treatments for coping with acute painful medical procedures, children with oncological disorders
SUBJECT CODES & HEADINGS: 3360 (Health Psychology & Medicine); 3293 (Cancer)

5/8/4
DIALOG(R)File 11:(c) 1998 Amer. Psychological Assn. All rts. reserv.

01532201 1998-07011-007
Traumatic brain injury.

DESCRIPTORS: *Diagnosis; *Measurement; *Traumatic Brain Injury; *Treatment; Children; Epidemiology
IDENTIFIERS: description & psychological & psychiatric assessment issues & epidemiology & medical & psychological & behavioral & pharmacological treatments, children with traumatic brain injury
SUBJECT CODES & HEADINGS: 3297 (Neurological Disorders & Brain Damage); 3360 (Health Psychology & Medicine)

5/8/5
DIALOG(R)File 11:(c) 1998 Amer. Psychological Assn. All rts. reserv.

01532194 1998-07011-000
Handbook of pediatric psychology and psychiatry, Vol. 2: Disease, injury, and illness.

DESCRIPTORS: *Child Psychiatry; *Child Psychology; *Injuries; *Mental Disorders; *Physical Disorders; Adolescent Psychiatry; Adolescent Psychology; Adolescents; Children
IDENTIFIERS: issues & disease & injury & illness, children & adolescents with psychological conditions & serious mental illness, handbook
SUBJECT CODES & HEADINGS: 3200 (Psychological & Physical Disorders)

TABLE OF CONTENTS:
Foreword
Preface
About the editors and contributors
Part one: General issues
SEE - Pain management / Kenneth J. Tarnowski, Ronald T. Brown, Arden D. Dingle and Elizabeth Dreelin
SEE - Preparation for medical procedures / Barbara G. Melamed
SEE - Child maltreatment / Robert T. Ammerman and Matthew R. Galvin
SEE - Family adaptation to childhood disability and illness / Alexandra L. Quittner and Ann M. DiGirolamo
SEE - Treatment adherence and compliance / Sharon L. Manne

Part two: Pediatric disease, injury, and illness
SEE - Feeding and growth disorders / Frances J. Wren and Sally E. Tarbell
SEE - Traumatic brain injury / Jacques Donders and Andrea Kuldanek
SEE - Burns / David S. Chedekel, Lisa P. Rizzone and Alia Y. Antoon
SEE - Gastrointestinal disorders / Ingemar Engstroem and Bo L. Lindquist
SEE - Neurological disorders / Wun Jung Kim and Michael P. Carey
SEE - Endocrine disorders / Alan M. Delamater and Margaret Eidson
SEE - Pulmonary disorders / Marianne Z. Wamboldt and Leslie Gavin
SEE - Hematologic disorders / Robert J. Thompson, Jr., Kathryn E. Gustafson and Russell E. Ware
SEE - Oncologic disorders / James W. Varni, Ronald L. Blount and Daniel J. L. Quiggins
SEE - Infectious diseases / John P. Glazer, Johanna Goldfarb and Regina Smith James
SEE - Organ transplantation / Margaret L. Stuber and Robert D. Canning
Author index
Subject index

5/8/6
DIALOG(R)File 11:(c) 1998 Amer. Psychological Assn. All rts. reserv.

01529215 1998-00039-003
Social and behavioural effects of traumatic brain injury in children.

DESCRIPTORS: *Adaptive Behavior; *Loneliness; *Self Esteem; *Social Behavior; *Traumatic Brain Injury; Adolescence; Aggressive Behavior; Antisocial Behavior; Childhood; School Age Children
IDENTIFIERS: traumatic brain injury, self-esteem & loneliness & maladaptive & adaptive & aggressive/antisocial behavior, 6.5-17.7 yr old patients, England
SUBJECT CODES & HEADINGS: 3297 (Neurological Disorders & Brain Damage)

5/8/7
DIALOG(R)File 11:(c) 1998 Amer. Psychological Assn. All rts. reserv.

01529200 1998-00036-003
Homeostasis, stress, trauma, and adaptation: A neurodevelopmental view of childhood trauma.

DESCRIPTORS: *Childhood Development; *Emotional Trauma; *Neurobiology; Children; Emotional Adjustment; Homeostasis; Psychological Stress
IDENTIFIERS: neurobiological impact of traumatic experiences on development, children
SUBJECT CODES & HEADINGS: 2800 (Developmental Psychology)

5/8/8
DIALOG(R)File 11:(c) 1998 Amer. Psychological Assn. All rts. reserv.

01523141 1997-38757-001
Head injury in children.

DESCRIPTORS: *Brain Damage; *Head Injuries; *Literature Review; *Traumatic Brain Injury; Children
IDENTIFIERS: head injury in children, literature review
SUBJECT CODES & HEADINGS: 3297 (Neurological Disorders & Brain Damage)

```
 5/8/9
DIALOG(R)File 11:(c) 1998 Amer. Psychological Assn. All rts. reserv.

01522928          1997-38595-016
Predictors of family functioning after traumatic brain injury in children
  and adolescents.

DESCRIPTORS: *Family; *Prediction; *Psychosocial Readjustment; *Traumatic
  Brain Injury; Adolescence; Childhood; Followup Studies; School Age
  Children
IDENTIFIERS: predictors of family functioning after traumatic brain injury,
families of patients aged 6-14 yrs at time of injury, 3- & 6- & 12- & 24-mo
followups
SUBJECT CODES & HEADINGS: 3297 (Neurological Disorders & Brain Damage)
```

These results do not in fact look very good. They are close—at least a few of them are in the general area of head injuries to children—but they do not really seem to focus on the areas the user mentioned in the search request. Document 6 looks pretty good, and a couple of others (9, 7) may also be good. Document 8 looks to be a literature review on head injury in children overall, and may be of interest. We also see a couple of potentially good terms: NEUROPSYCHOLOGICAL ASSESSMENT (in document 2) and HEAD INJURIES (in document 8). Other than these, there is not much else here.

8 Revise and refine the search based on those initial results.

Now you get to play around a bit and try to improve your first search strategy.

If your first result set has *very few* documents, fewer than you expected or wanted, you probably want to get more. Think of what you know now that will produce more documents. You might want to try some of your alternative terms and see if they produce useful results. You might truncate a bit further to the left. You might even think about dropping a concept set (going from three concepts to two, for example), eliminating the least specific one first. Also check for errors in spelling or technique. You might use conceptually broader terms (as we did in going from S1 to S2).

If your first result set has *too many* documents, though, you should think about what you know that will produce fewer documents. Use fewer or narrower terms, truncate further to the right, add a concept (but only if you have a good one to add), or NOT something out (but only if you feel reasonably certain you will not lose useful material this way).

If you have the *wrong* results, you may have made a technique error (using a digit instead of a set number), or you may just have picked poor terms. In the real world, there is no sin in doing some initial searching to see what is available, and then logging off to re-evaluate, find some new terms, talk with the user, and get back in and try again.

We seem to be close, but not quite there. We will now try a couple of terms we spotted from the initial set. This is a tactic called *pearl growing*, and it is a very useful and efficient way of getting new search terms, especially controlled vocabulary terms that the user might not know.

```
?s head injuries
    S6    2323  HEAD INJURIES (1973)

?s neuropsycholog?
    S7   14928  NEUROPSYCHOLOG?

?s s7 and s2 and s4
         14928  S7
          8103  S2
        243078  S4
    S8     238  S7 AND S2 AND S4
```

We are now using our new term for "effects" with our old children/adolescent set, and we get 238 documents. We could look at this set right away, but we may well be getting a number of the same documents we have already seen. We can avoid this by using NOT in a "non-conceptual" way—if we NOT out the previous result set, then we will get just new documents that we did not have in the previous set.

```
?s s8 not s5
          238  S8
          268  S5
    S9    156  S8 NOT S5
```

and we see that there are 156 of these. Let's have a look.

```
?t 9/8/1-7

 9/8/1
DIALOG(R)File 11:(c) 1998 Amer. Psychological Assn. All rts. reserv.

01532592        1998-07195-006
Evaluation of head trauma.
SERIES TITLE: Human brain function: Assessment and rehabilitation.

DESCRIPTORS: *Head Injuries; *Neuropsychological Assessment; Adults
IDENTIFIERS: neuropsychological concepts & methods in evaluation &
management of head trauma, adults
SUBJECT CODES & HEADINGS: 3297 (Neurological Disorders & Brain Damage);
  2225 (Neuropsychological Assessment)

 9/8/2
DIALOG(R)File 11:(c) 1998 Amer. Psychological Assn. All rts. reserv.

01529581        1998-00573-015
The neuropsychiatric rating schedule: Reliability and validity.

DESCRIPTORS: *Neuropsychological Assessment; *Personality Disorders; *Test
  Reliability; *Test Validity; *Traumatic Brain Injury; Adolescence;
  Adulthood; Childhood; Diagnosis; Organic Brain Syndromes; Rating Scales;
  School Age Children
IDENTIFIERS: reliability & validity of Neuropsychiatric Rating Schedule
interview for diagnosis of organic personality syndrome or personality
change, 6-18 yr olds with traumatic brain injury
SUBJECT CODES & HEADINGS: 2224 (Clinical Psychological Testing); 3290
  (Physical & Somatoform & Psychogenic Disorders)
```

9/8/3
DIALOG(R)File 11:(c) 1998 Amer. Psychological Assn. All rts. reserv.

01528403 1998-00645-004
Predicting premorbid neuropsychological functioning following pediatric traumatic brain injury.

DESCRIPTORS: *Cognitive Ability; *Neuropsychological Assessment; *Predictive Validity; *Reading Skills; *Traumatic Brain Injury; Academic Achievement; Childhood; Parents; Racial and Ethnic Differences; School Age Children; Socioeconomic Status
IDENTIFIERS: maternal ethnicity & SES & retrospectively rated school performance & word reading skill, prediction of premorbid neuropsychological functioning, 6-12 yr olds with orthopedic vs traumatic brain injury
SUBJECT CODES & HEADINGS: 3297 (Neurological Disorders & Brain Damage); 2225 (Neuropsychological Assessment)

9/8/4
DIALOG(R)File 11:(c) 1998 Amer. Psychological Assn. All rts. reserv.

01512432 1997-36680-006
Frontal lobe dysfunction following closed head injury in children: Findings from neuropsychology and brain imaging.

DESCRIPTORS: *Brain Disorders; *Head Injuries; *Literature Review; *Neuropsychological Assessment; *Tomography; Children; Neuropsychology; Prefrontal Cortex
IDENTIFIERS: neurobehavioral sequelae of & neuroimaging techniques for & performance on neuropsychological tests & prefrontal brain dysfunctions following closed head-injuries, children, literature review
SUBJECT CODES & HEADINGS: 3297 (Neurological Disorders & Brain Damage)

9/8/5
DIALOG(R)File 11:(c) 1998 Amer. Psychological Assn. All rts. reserv.

01507523 1997-43861-011
Predictors and indicators of academic outcome in children 2 years following traumatic brain injury.

DESCRIPTORS: *Educational Placement; *Neuropsychological Assessment; *Traumatic Brain Injury; Adolescence; Childhood; Followup Studies; School Age Children
IDENTIFIERS: neuropsychological predictors & indicators of school placement, 9-15 yr olds with traumatic brain injury, Australia, 24 mo followup
SUBJECT CODES & HEADINGS: 3297 (Neurological Disorders & Brain Damage)

9/8/6
DIALOG(R)File 11:(c) 1998 Amer. Psychological Assn. All rts. reserv.

01507522 1997-43861-010
Concept formation and problem-solving following closed head injury in children.

DESCRIPTORS: *Head Injuries; *Neuropsychological Assessment; *Severity (Disorders); Adolescence; Adulthood; Childhood; Longitudinal Studies; Preschool Age Children; School Age Children
IDENTIFIERS: Twenty Questions Test & Tower of London & Wisconsin Card Sorting Test performance, 5-18 yr olds with mild vs severe closed head injury, 36 mo study
SUBJECT CODES & HEADINGS: 3297 (Neurological Disorders & Brain Damage)

```
 9/8/7
DIALOG(R)File 11:(c) 1998 Amer. Psychological Assn. All rts. reserv.

01507520        1997-43861-008
Longitudinal neuropsychological outcome in infants and preschoolers with
  traumatic brain injury.

DESCRIPTORS: *Cognitive Ability; *Neuropsychological Assessment; *Traumatic
  Brain Injury; Childhood; Infants; Longitudinal Studies; Preschool Age
  Children; School Age Children; Severity (Disorders)
IDENTIFIERS: neuropsychological outcome, 4 mo to 7 yr olds with severe vs
  mild to moderate traumatic brain injury, 24 mo study
SUBJECT CODES & HEADINGS: 3297 (Neurological Disorders & Brain Damage)
```

These results are better. A few (3, 6, and 7) look pretty good; the rest are more unfocused. We will look at a few more, in format 6 (titles only):

```
?t 9/6/8-15

 9/6/8
01495176        1996-93914-001
Kognitives Funktionstraining in der neurologischen Rehabilitation von
  Schaedel-Hirntraumen.
TRANSLATED TITLE: Functional cognitive training in neurological
rehabilitation of severe head injury.

 9/6/9
01493175        1996-93801-001
Planning skills in head-injured adolescents and their peers.

 9/6/10
01488860        1997-95021-100
Polysubstance abuse and traumatic brain injury: Quantitative magnetic
  resonance imaging and neuropsychological outcome in older adolescents
  and young adults.

 9/6/11
01487809        1997-95017-369
Performance of children with and without traumatic brain injury on the
  process scoring system for the intermediate category test.

 9/6/12
01482579        1997-30097-007
Pediatric neuropsychology.

 9/6/13
01481491        1997-09033-004
The role of neuropsychology in educating students with ABI.

 9/6/14
01481326        1997-08987-021
Rehabilitation of calculation disorders.

 9/6/15
01479639        1997-08457-008
Treating traumatic brain injury in the school: Mandates and methods.
SERIES TITLE: Critical issues in neuropsychology.
```

The titles are not getting much better. We are still really close, and there must be relevant documents available, but we just have not found the right way to get at them yet. This can be pretty frustrating, but we are not done yet. First, we will review and see what we have done so far.

Viewing Searches (DISPLAY SETS)

This is an extremely helpful command. After one starts creating sets, it gets increasingly difficult to remember what exactly you have done, and especially difficult to remember the numbers of particular sets. Just type **DS** (for **DISPLAY SETS**) to get a listing of all the sets created so far.

```
?ds
```

```
    Set  Items  Description
    S1     370  CLOSED HEAD INJURY OR TRAUMATIC BRAIN INJURY
    S2    8103  (BRAIN OR HEAD) AND (TRAUMA? OR INJUR?)
    S3  107312  PSYCHOSOCIAL OR BEHAVIORAL
    S4  243078  CHILDREN OR PEDIATRIC OR ADOLESCENTS
    S5     268  S2 AND S3 AND S4
    S6    2323  HEAD INJURIES (1973)
    S7   14928  NEUROPSYCHOLOG?
    S8     238  S7 AND S2 AND S4
    S9     156  S8 NOT S5
```

> *It pays to try to determine what set numbers you expect before you get online, and then check the numbers as they come up on the screen. I find this very helpful. – GW*

So what now? We used all the terms we got from the user, and there do not seem to be any new ones to pearl grow with. If we think a bit about what we have been getting, and what we have not, we might get an idea. The documents seen so far have been fine in many respects; they are mostly about children and mostly about head injuries, but the other concept, the effects of those injuries, does not seem quite right. And if we look back at the search, we find a word, BEHAVIORAL, that does not seem to be helping much. Maybe if we get rid of it, we might get some better-quality documents. It is worth a try, so we will reconstruct the "effects" concept set and try the descriptor HEAD INJURIES:

```
?s psychosocial or neuropsycholog?
```

```
         28364  PSYCHOSOCIAL
         14928  NEUROPSYCHOLOG?
    S10  42859  PSYCHOSOCIAL OR NEUROPSYCHOLOG?
```

and create a new result set

```
?s s6 and s4 and s10
```

```
          2323  S6
        243078  S4
         42859  S10
    S11    111  S6 AND S4 AND S10
```

and have a look

```
?t 11/6/1-15

 11/6/1
01532592        1998-07195-006
Evaluation of head trauma.
SERIES TITLE: Human brain function: Assessment and rehabilitation.

 11/6/2
01523141        1997-38757-001
Head injury in children.

 11/6/3
01512432        1997-36680-006
Frontal lobe dysfunction following closed head injury in children:
  Findings from neuropsychology and brain imaging.

 11/6/4
01507522        1997-43861-010
Concept formation and problem-solving following closed head injury in
  children.

 11/6/5
01495176        1996-93914-001
Kognitives Funktionstraining in der neurologischen Rehabilitation von
  Schaedel-Hirntraumen.
TRANSLATED TITLE: Functional cognitive training in neurological
rehabilitation of severe head injury.

11/6/6
01493175        1996-93801-001
Planning skills in head-injured adolescents and their peers.

 11/6/7
01483092        1997-42970-002
A typology of psychosocial functioning in pediatric closed-head injury.

 11/6/8
01482579        1997-30097-007
Pediatric neuropsychology.

 11/6/9
01471818        1997-05606-001
Mild head injury in children and adolescents: A review of studies
  (1970-1995).

 11/6/10
01471169        1997-05423-010
A review of mild head trauma: I. Meta-analytic review of neuropsychological
  studies.

 11/6/11
01470273        1997-05105-003
The influence of age and education on neuropsychological performances of
  persons with mild head injuries.
```

```
 11/6/12
01426537        1996-04605-005
Appraising and managing knowledge: Metacognitive skills after childhood
  head injury.

 11/6/13
01426534        1996-04605-002
Dimensions of cognition measured by the Tower of London and other cognitive
  tasks in head-injured children and adolescents.

 11/6/14
01411695        1997-85262-001
Applicazione della Batteria Neuropsicologica Luria Nebraska nell'analisi
  funzionale di soggetti con pregresso trauma cranico e coma.
TRANSLATED TITLE: Application of the Luria-Nebraska Neuropsychological
Battery in the functional analysis of subjects with head injury and
subsequent coma.

 11/6/15
01411183        1997-06130-003
Age at injury as a predictor of outcome following pediatric head injury:
  A longitudinal perspective.
```

Much better indeed. Many of these titles seem to be really close to what the user wanted, and the whole set just seems better overall. We have lost the "behavioral" aspect, but obviously we just did not have the right term or combination of terms for that, so we might try other ideas later. But we do have a good solid set of documents that the user can evaluate to see what she thinks.

Here's a review of the whole search:

```
?ds

    Set   Items   Description
    S1      370   CLOSED HEAD INJURY OR TRAUMATIC BRAIN INJURY
    S2     8103   (BRAIN OR HEAD) AND (TRAUMA? OR INJUR?)
    S3   107312   PSYCHOSOCIAL OR BEHAVIORAL
    S4   243078   CHILDREN OR PEDIATRIC OR ADOLESCENTS
    S5      268   S2 AND S3 AND S4
    S6     2323   HEAD INJURIES (1973)
    S7    14928   NEUROPSYCHOLOG?
    S8      238   S7 AND S2 AND S4
    S9      156   S8 NOT S5
    S10   42859   PSYCHOSOCIAL OR NEUROPSYCHOLOG?
    S11     111   S6 AND S4 AND S10
```

Leaving the System (LOGOFF)

We conclude the search by logging out of the system. (In a real search, of course, we would type out the whole result set for the user, in format 2 or perhaps format 5). The command to get offline is **LOGOFF**, although lots of other words will also work (e.g., BYE, QUIT, EXIT, OFF).

```
?logoff

26may98 12:23:59 User007659 Session D171.4
                $0.50    0.033 Hrs File11
                   $0.00 23 Type(s) in Format 6
                   $0.00 16 Type(s) in Format 8
                $0.00 39 Types
          $0.50  Estimated cost File11
          $0.10  INTERNET
          $0.60  Estimated cost this search
          $2.62  Estimated total session cost 0.145 Hrs.
Logoff: level 98.04.30 D 12:23:59
```

When this message appears, the user is off the system and the search is completed. The sets created are gone, and unless the search was saved (which we will talk about later), it would have to be re-run to get the results back. There is a version of this command, though, called **LOGOFF HOLD**, that allows the user to get off and think about the search for a bit. This version will save your sets for about a half hour, so if the user logs back in with the same account number and password during that time, the sets should still be there.

The Internet

So far, we have talked only about how to search using large-scale, well-established, well-organized commercial information retrieval systems such as DIALOG. There are other such systems (e.g., LEXIS, Dow Jones), and while they are all different, they bear substantial similarity to each other. So, if some other system is going to be used, the commands will be somewhat different from those we have discussed here, but the concepts will be very much the same.

The Internet, though, is a different matter. In this section we will talk about searching using the Internet, focusing on the World Wide Web and emphasizing similarities and differences to what we have talked about already in DIALOG. There is much more to the Internet than the Web; it supports E-mail, discussion groups (listservs and Usenet), and other means of moving information around, but in this context, it makes the most sense to concentrate on the Web. To learn more about the Internet in general, there are a great many books and websites available for you to consult.

The *World Wide Web* (sometimes abbreviated as the WWW; we will call it the Web) has been around since 1989. It was thought that it would be helpful to have an easy way for people to make documents and information available in the distributed, networked environment of the Internet. Until that point, it was very difficult to "publish" on the Net. One could create an archive of files that could be accessed using the FTP file transfer protocol, but that was difficult and nonintuitive. One could build a menu-driven, text-only system called a gopher, but that was also limiting. Allowing people to create documents that could include images, text, and links to other documents (we call this *hypertext*) was the real breakthrough, and the Web has grown to global proportions in a few short years.

What was developed is what network people call a *protocol*, really a set of standards that define what is needed to make a document available on the Web so that it can be retrieved and displayed by other, remote machines. This protocol is called *HTTP*, for *Hypertext Transfer Protocol*, and it is this set of standards that forms the backbone that makes the Web work. Recall the HTML document we saw in the previous chapter. If a computer is connected to the Internet, and the user writes an HTML document and decides to put it in a

central location to make it available (this is called *serving* the document, and a computer which does that is a *server*), then anybody else in the world who is similarly connected and has the right software can find it and display it (this computer is called a *client*, and the arrangement is called a "*client-server* architecture") .

There are a few other important things to know about this environment. First, it is often referred to as *distributed* or *decentralized*. This means that there is no single "Internet"; the Internet, such as it is, is made up of connections between thousands of individual networks in schools and businesses all over the world. So there is no center, no central authority (other than the protocols we all agree to), and nobody to really "run" it. Thus, one cannot stop anybody from making anything available (including potentially offensive material), and one cannot force anybody to, for example, include indexing or subject headings.

Second, because the Web was developed at a time when lots of people had access to computers, it was taken for granted that any search mechanisms that would work in this environment had to be easy to use and take little if any time to learn. When DIALOG was started in the 1970s, computing was dominated by large, expensive mainframe computers, so that not many people would or could use them. Thus, DIALOG is a large, centralized system, and its command structure, while very sophisticated and permitting powerful searching, is intricate and difficult to learn.

Further, the HTML structure was never really intended to be a help in organizing and searching information, as was the structure of a bibliographic record. So, while we can take advantage of that structure in searching, as we saw in the previous chapter, it will be in different ways than in DIALOG. Typically we will be able to search based on what something *is* (an image, a link, an address) rather than what it *means* (an abstract, a subject heading, an author).

Also, DIALOG contracts with producers of commercial databases to make them available. This information is professionally produced, edited, organized, and indexed, and users can have a great deal of confidence in what they find there. The Internet is not like that. There is quite a bit of interesting and worthwhile material freely available on the Net, and the amount and quality of the "good stuff" is increasingly rising. But there is an enormous amount of what might politely be called trivia and things that are downright wrong, and it all sits there together. There is no "collection development" or "selection" on the Net—it just happens. Users and searchers, therefore, have to be much more vigilant in reading and evaluating the results of searches to decide whether what they get is worth anything.

So the picture that emerges is one of a world where there is a very large collection of "documents" (but certainly not as large as the entirety of DIALOG-accessible databases) available to computers all over the world, searchable in full text but with somewhat cruder search techniques, and using systems that require no training and make few demands on the users.

To further illustrate these points, let us go back through the eight steps we outlined above, commenting on how they might best work in the Web, and discussing a few specific search engines. Keep in mind that the network environment is very volatile; not only can documents and entire resources change without a moment's notice, but search systems can change and add new features and new ones can arise very quickly as well. It is entirely possible that much of the specific discussion of features and technique that follows will be radically different from what is available when you read this.

What is important, though, is the *concepts* we are looking at. If one understands how to think about searching and take advantage of the searching environment, be it DIALOG or the Web or whatever comes next (and something *will* come next), all will be well.

1 Read the query.

1a Listen to the query.

1b Understand the query.

2 Identify the major concepts in the query.

There is certainly nothing wrong with these steps. Understanding exactly what is being sought does not get any less important in the Internet environment. What might get *more* important is understanding exactly what might be found there. Although the information available there is getting better, it is probably never going to be of the same quality or comprehensiveness (at least not while things are still free) as in a commercial search system. The best way to know what is out there, as with any retrieval system or collection, is experience, so an investment in time just to browse will certainly pay off.

3 Identify potential terms to correspond to those concepts.

Term selection is still part of the game, but because there is very little of what we would think of as indexing or subject description, and no consistency whatsoever, it will be harder to find "standard" or "preferred" terms. (We will talk more about the uses and benefits of controlled vocabulary in the next chapter.)

It is also worth mentioning that one has to take into account the style of writing involved in the documents being searched. We will say this again when we discuss full-text searching in DIALOG later; newspaper files, for example, will be searched differently from more academic records. The same thing applies here. You will find scholarly papers and children's stories and everything in between all mixed together, along with many things in languages other than English. Again, one will gain a better appreciation for this as one gains experience with the environment, but keep an eye out for writing style and especially word choice.

4 Select alternative (narrower, broader, or related) terms to use if the original strategy needs help.

Still a good idea as well, but many of these will not appear in most circumstances. This is because the searching environment is significantly constrained, compared with what we have seen in DIALOG.

5 Determine logical (Boolean) relationships between terms.

Boolean searching is possible in most Web search engines, and it will work in much the same way as we have seen in DIALOG. OR can be used to search for one or more related terms, AND to require all terms to be present, and NOT to exclude terms, and most systems will allow you to use parentheses to affect the order in which these operators are interpreted, as we also saw in DIALOG.

Internet Search Engine Technique

There are a couple of important variations in the use of Boolean operators, however. Some systems require the use of AND NOT rather than simply NOT. Strictly speaking, from a set-theory point of view, this is correct, but commercial systems typically do not

make the user do this. Be aware of it, though, because leaving AND out of that expression means searching on the word "not" rather than using NOT as a command.

Some systems also allow the use of the + and - signs in searching. Putting a + in front of a word or phrase requires it to be in documents (like AND); putting a - there excludes it (like NOT). So a search such as this is possible in AltaVista:

```
+noir +film -"pinot noir"
```

which would retrieve documents with both the words "film" and "noir" but not the phrase "pinot noir."

This illustrates another technique: the use of quotes to define a phrase. Although there are almost never subject headings or descriptors in Net documents, the search engines are able to retrieve based on phrases anywhere in those documents. (We'll discuss how to do this in DIALOG later.) Therefore, a search such as

```
"stupid pet tricks"
```

in Infoseek will retrieve documents with those three words exactly in that order.

Capitalization is an issue on the Net. Notice that we never discussed it in DIALOG; that is because all characters are treated as capitals regardless of how they appear in original documents. That is not the case on the Internet. Typically, searches are conducted in lowercase, but if you wish to search on a word or phrase that contains capitals, you may do so. Thus, searching on

```
Turkey
```

in AltaVista will retrieve precisely that—the word "Turkey," capitalized. Many such documents will likely be about the country Turkey, but some will be references to other kinds of turkeys where the word is somewhere capitalized, as in the first word of a sentence. It will not, though, retrieve documents where the word "turkey" appears but is never capitalized. This might be useful in a number of situations, including of course searching on proper nouns.

There is one large difference between searching on the Internet and in commercial systems that dramatically affects the way in which one searches. So far, search engines in the Net world do not allow one to create and manipulate sets.

> *Now, of course, since we've said this, the day the book goes to press, some system will announce this as a new feature! – JWJ*

Every search in the Net is a one-shot affair. One cannot create separate concept sets and combine them into a result set. This is not as dramatic as it sounds; one can certainly create a sophisticated search in a single statement and then redo it when results have been reviewed, but it is certainly a different way of thinking about constructing and performing searches.

Given the nature of the Net and the information found there, it is often best to do shorter and more specific searches anyway. One is more likely to find searches like

```
fish AND ("America Online" or AOL)
```

on the Web than the extended strategy used for the head injury search on DIALOG.

6 Begin the search.

In discussing searching in commercial services, our first piece of advice was to search on the most specific concept block first to give some idea of how many items one is likely to retrieve. That advice is also useful here. Because it is not possible to create and manipulate sets, and because many other pieces of technique might not be available, it makes sense to search on the most specific aspects of what is being sought. Decide on the narrowest terms, the ones that will retrieve the fewest things that are still of interest.

Subject Directories

There is an exception to this strategy. If a group of documents is being sought on a particular topic, it might be more productive to use a service like Yahoo!, the Argus Clearinghouse, or the Internet Public Library (IPL).

If, say, one is trying to find documents about the TV show *ER*, one might think about using Yahoo!, searching through its general-to-specific menus on Entertainment, Television, Shows and so on, down to the category for *ER* to find all the sites it knows about. Searching on "ER" alone would be difficult if not impossible—some search engines will not search on anything shorter than three or four letters.

Other sites that serve to collect and organize related information resources might be helpful in similar ways. The IPL (http://www.ipl.org) can point visitors to sites about philosophy, for example, in its Ready Reference Collection, selecting ones of high quality and useful content, describing each, giving author and publisher information, and collecting them to make them easier to find and access.

The guides to subject-oriented resources in the Argus Clearinghouse (http://www.clearinghouse.net) are an excellent way to know more about what is available in many topics, and act in many ways as pathfinders do in libraries. Each guide is evaluated on a series of criteria, including the resources involved, the guide's design and organizational scheme, and evaluative techniques it uses.

Both of these resources do some of the things that libraries and librarians usually do (and, in fact, both are staffed by people with library educations and backgrounds): that is, find, evaluate, describe, and organize information resources so they can more easily be found and used.

Ranking of Retrieved Documents

In DIALOG, we said that documents would be retrieved in reverse order of input to the database, so one gets the most recent ones first. That is not the case here. Typically, Internet search engines use some algorithm to rank the documents according to how closely they think they match your query. This sounds like a great method, but it is not without problems, and it does not always work the way the searcher necessarily wants it to or thinks it should.

AltaVista will raise the score of a document (i.e., put it towards the top of the list) if the words searched are in the first few words of the document, if the query words are "close to one another" in the document, and if those words appear more than once. Infoseek uses very similar criteria, but rather than looking at proximity, it will score words higher if they are relatively rare in the database of all documents—in other words, uniqueness helps.

> *The use of these kinds of rating schemes has led to a fascinating phenomenon: trying to influence how search engines rank pages. For a while, people could simply add hundreds of occurrences of words and phrases to their pages to inflate their scores when those words are searched. Sometimes those words were relevant to the actual content, sometimes not. The search engine people got wise and changed their procedures, and then people came up with new ideas. Amazing stuff, really—a cottage industry devoted to trying to "fix" information retrieval. Who knew our field could be so intriguing? – JWJ*

Excite says that it is able to search by concept rather than simply by words, and can look "for ideas closely linked to the words in your query." In their description of how to use their service, they say "Our search engine can figure out that relationships exist between words and concepts—that the term 'elderly people' is related to 'senior citizens.' It learns about related concepts from the documents themselves and learns more from each new document it indexes."

When it presents results, it also presents the opportunity to do a new search for "more like this" for each document to find what it thinks are similar documents.

In no case do you get any further information on what actually goes on. Ranking of documents in relation to queries is an old idea from information retrieval research but has only recently been implemented in commercial systems because it requires yet more overhead, and results have been less than perfect.

> *It is perhaps worth noting that DIALOG-type systems are binary—records either match the search strategy, or they do not. The Web, on the other hand, is a partial match system. The search retrieves anything that matches your search statement or any part of your search statement, so postings are large. And don't expect that the document you consider to be most relevant will necessarily be output first, or even towards the top of your results! – GW*

The increased investment and attention that the Internet has brought to the world of information retrieval means that ideas such as these will probably appear with some regularity. This could well be a major boon to the search for information, and these systems do work reasonably well at present. It will, however, take some time before they can do the kind of reasoning and interpretation we take for granted in people.

Truncation

There are a few more mundane details about searching on the Web to be discussed. The first is truncation. Most systems permit it, but in different ways. AltaVista uses the * as the truncation operator, either at the end of words or in the middle, and in all cases it will match an arbitrary number of characters. So here one can search on

```
col*r
```

to get both "color" and "colour" (but also "collector" and "collider"; perhaps

```
colo*r
```

would be better) and

```
antiq*
```

will get "antique," "antiques," "antiquities," "antiquated," and so on.

Lycos, on the other hand, will automatically interpret words given it as being truncated, unless it is told otherwise. So a search on

```
match
```

here will get "match," "matches," "matching," "matchless," and so on. To get only "match" (to stop truncation) the word must end with a period:

```
match.
```

Searching Using Structure

There is structure in HTML documents, as we saw in the last chapter, and some systems allow you to take advantage of it in searching. Because the kind of structure here is different from that we find in bibliographic records (remember it is used here to describe the internal components of a document, not the fields that describe a document), the searching will also be different. But HTML structure can also be of great help.

AltaVista permits searching on a number of these parts of documents, including the title tag, image tags, links to other documents, and the URL address of a page. Therefore, searches like these are possible:

```
title:"ESPNET" and "Steffi Graf"
```

to get pages with ESPNET in the title and the phrase "Steffi Graf" anywhere

```
image:cow
```

will get things with "cow" in an image tag, not necessarily images of cows!

```
link:albany.edu
```

will get pages with at least one link to any Web site at the University at Albany.

```
echinacea and url:*.org
```

will get documents containing the word "echinacea" that come from not-for-profit organizations.

7 Have a look at a few documents.

One typically has less control over what is displayed when the results of searches on the Web are reviewed. Rather than seeing simple counts of number of hits (although AltaVista permits this), a list of the first 10 or so documents will come up. It is possible to ask for more at a time and to indicate how much information to see about each: the document's title (from the title tag, which many documents do not use), the URL, and perhaps its size, when it was last visited by the search engine, and a line or two from the document.

In many cases, it will be possible to make initial decisions about which of the retrieved documents will be of interest, but these documents almost always will have to be inspected more closely, which is easy to do by simply clicking on the link.

8 Revise and refine the search based on those initial results.

Many search engines provide, along with the list of retrievals, an active window showing the search entered. This makes it easier to make changes to that search or simply clear out the window and try again, without having to go back to the main screen. This is rather different from the process we suggested for DIALOG searching but is a convenience for the searcher.

As we mentioned previously, this is a fluid and rapidly changing area. The best way to know what kinds of searching are possible and the techniques to use is to look at the documentation the service provides: help pages, sample searches, and so on. Knowing what needs to be done and experience in searching in all kinds of environments will greatly assist in understanding what is available and how to use it most effectively.

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