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The Design of Knowledge-rich Browsing Interfaces for Retrieval in Digital Libraries

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ABSTRACT

The Design of Knowledge-rich Browsing Interfaces for Retrieval in Digital Libraries

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One of the most challenging problems in the field of information science is developing effective retrieval interfaces for digital libraries. Solutions to this problem must provide interfaces that mediate between the retrieval needs of library users and any available collection materials in an intelligent and tractable manner. The majority of research in this area has focused on the development of information retrieval systems that attempt to match users' textual queries to library records. An alternative approach is to build retrieval interfaces that allow users to direct their own searches by browsing through an organization of a library's materials. This dissertation specifies the design characteristics of browsing-based retrieval interfaces for digital libraries. This design has been implemented in *Déjà vu*, a computer program that solves the retrieval problem in the following ways. First, rather than browsing through library materials directly, users of *Déjà vu* browse through an organization of the thesaurus terms that library archivists have used to index collection materials. Second, a tight integration between thesaurus terms and library records allows *Déjà vu* to provide information about the availability of materials in a collection throughout the browsing process. Third, *Déjà vu* provides a rich browsing space to users by utilizing new knowledge structures called Expectation Packages. Expectation Packages cluster sets of terms from a thesaurus into fully interconnected groups, forming simplified cognitive science knowledge representations. By creating a set of these Expectation Packages for a particular thesaurus, developers can efficiently create a rich browsing space that reflects the knowledge that is common to the intended users of a digital library. A full set of Expectation Packages were developed for one thesaurus which is used by many photographic libraries. *Déjà vu* was then evaluated in the context of its use as a retrieval interface for large digital collections.

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CHAPTER 1: INTRODUCTION



Figure 1.1. "Harlem 1958" by Art Kane. Photograph © Art Kane estate.

It took me years to find this photograph (Figure 1.1). Perhaps the single most famous piece of jazz photography, Art Kane's "Harlem 1958" was taken in the Summer of 1958 in New York City for Esquire magazine. It captured 57 of the greatest jazz musicians (as well as a dozen neighborhood children) including Charles Mingus, Thelonious Monk, Dizzy Gillespie and Count Basie. I'd first heard about it many years ago when I was reading an article about some famous jazz musician, but having forgotten the name of the photographer, the title of the photograph, and even the location of the article I had read, I had little information to track it down. Whenever I happened to stumble across an

anthology of jazz photography, I'd flip through the pages looking for something like what I had imagined this photograph to look like, to no avail. When photograph collections started appearing on the World Wide Web, I tried to locate this photograph using my favorite Internet search engine, but the few choice descriptors that I thought would work (e.g. *jazz*, *photography*, or *jazz*) typically retrieved hundreds of thousands of web sites on their own, and zero in conjunction with each other. After repeated attempts to track it down, I finally gave up the search. Recently, I was in a video rental store, and I was happy to find that the managers had put together a special collection of all of the videos about jazz music, one of my favorite topics of interest. Browsing through the video boxes, one title jumped out at me: "A great day in Harlem." Seeing the title immediately jogged my memory, and I realized that the topic of this 1995 documentary film produced and directed by Jean Bach was on exactly the photograph that I had sought for the last several years. After seeing the movie, I typed "A Great Day in Harlem" into my favorite Internet search engine, and quickly located several digitized versions of this historic image.

1.1 Is this the dark ages of Information Retrieval?

Why was it so hard to locate this photograph? This isn't exactly the dark ages of information retrieval; the wealth of search engines and resource organizations available through computer networks should have made this search task trivially easy. Still, there

were no computer search tools available that could adequately address my particular retrieval need. Was my request so peculiar? Admittedly, I only had a rough idea of what I was looking for: a famous photograph of a bunch of famous jazz musicians. Still, I expect that most people have information needs that are equally non-specific. That is, it is often that people have a very loose idea of what exactly it is that they are searching for.

Sadly, the vast majority of retrieval systems have not been designed to adequately support users with only a loose idea of what they are looking for. Modern Information Retrieval systems, which almost exclusively operate under a model of query-based search, work best when users can be precise and discriminating in their requests. The best queries for these systems are those composed of proper names, the worst queries are composed of generic terms that fail to specify a specific topic area. Sometimes users are lucky with these systems, and the resulting retrieved set of materials is of a manageable size and includes the most relevant material from the system's collection. Unlucky users are faced with an empty set of retrieved items, or even worse, an enormous set of non-relevant material to sort through. For the user with only a loose idea of what they are looking for, the task of specifying a suitable query to these systems is difficult, indeed. If they don't know what they are looking for, then how can they ask a system to locate it?

Part of the underlying problem with modern Information Retrieval systems is a misunderstanding of the retrieval task. The job of these systems should not be the very specific task of matching a user's textual query to items in the systems' databases. The more appropriate understanding of the Information Retrieval task is the satisfaction of user's retrieval needs. The best systems will work with users to find the materials that best meet the users' retrieval needs by any means possible. As researches in the field of Information Retrieval, we should be looking for the best methods that can achieve these design goals, and not limit our work to the improvement of text-based querying of databases. The best Information Retrieval system may not utilize queries at all.

What techniques should we explore to improve the utility of Information Retrieval systems for users with retrieval needs that cannot be easily specified? One answer to this question can be found in the non-technological solution that actually worked in my story about Art Kane's "Harlem 1958." The place where I was ultimately able to locate this photograph was in the video store, and I found it largely through the process of browsing through the video store offerings. I wasn't looking for jazz photography as I looked around the video store; I was there to find an interesting video to watch. I typically hate video stores. The ones in my neighborhood are enormous and poorly organized. Often a few hundred of the new releases are separated out from the shelves

of older videos, which are loosely organized into broad categories such as drama, action, or foreign films. I don't have favorite actors, actresses, or directors, so I normally choose videos based on what the topic they center around. It usually takes me a long time to find a video about something that I am interested in, but on the day that I found "A Great Day in Harlem," I was greatly assisted by the work that the store managers had done. They had identified all of the videos that were about a topic that I was interested in (jazz), and assembled them in one place where I could quickly browse through what was available. The number of videos about jazz was not too high, and so I could quickly scan the titles in search of something interesting. This was the one time that the video store was tailored specifically to my retrieval needs, and this led to a fortuitous finding.

The success of this browsing incident highlights a need that remains neglected in today's computerized search tools: the ability to browse through an organized collection of materials. Ideally, there would exist some set of tools that I could have used to search the web or online photographic collections for "Harlem 1958." These idealized tools would have provided me with an intuitively organized browsing space that I could have explored to determine, with great confidence, whether or not this photograph was available to me. Usually in the business of providing computer information technology, any sizable market need is quickly addressed by the development of new products. In this case, however, satisfying a need for browsing-based retrieval systems remains a

challenge. What is the reason that developing effective browsing-based retrieval systems is so difficult?

Part of the reason is a lack theoretical tools which can be utilized to develop effective browsing-based retrieval systems. In particular, there are two major theoretical deficiencies that must be overcome before these systems can be engineered. First, we lack a good theory of what interface functionality should be incorporated to support the browsing process. That is, it is unclear what an effective browsing system would look like, how it would operate, and how the interface components addressed the requirements of the browsing task. Second, we lack a good theory of how the materials that users browse through should be organized to support users' browsing behavior. That is, it is unclear how to organize large collections of unorganized materials in a way that is functional for users of the retrieval system.

This thesis addresses both of these theoretical deficiencies. In this thesis, I elaborate a theory of the interface functionality necessary to support the browsing task. This theory is embodied in a new retrieval system, entitled *Déjà vu*, which allows users to locate materials in online digital libraries by browsing through the subject terms used to catalog library materials. In addition, this thesis provides a theory of how these subject terms should be organized to provide an intuitive and functional browsing space for users.

This theory of organization applies cognitive science theories of human memory organization to the task of linking subject terms in a manner that is consistent with people's expectations about the interrelationships between concepts. This theory is embodied in a new and efficient method of developing a browsing space of subject terms. This method identifies groups of subject terms called Expectation Packages, which collectively represent some commonsense knowledge that is shared by library users. This thesis provides the theoretical tools necessary to develop browsing-based retrieval systems that effectively solve difficult information retrieval problems. In support of this claim, this thesis describes how these theories were used to develop a browsing-based retrieval system for online collections of photographic materials. The resulting system was installed for use at two institutions with large online photograph collections for the purpose of identifying the critical issues surrounding the application of this new technology.

1.2 Browsing as a method of retrieval

Typically when we use the term *browsing*, we are referring to a cursory examination of a collection of items in hope of locating some that spark an interest or satisfy a need. People browse through merchandise at department stores with the intent of finding something they like and are would purchase. People browse through the shelves of a library or bookstore in hope of finding a good book to read. The way that these

materials are laid out determines how a person can move between materials, which we can refer to as the *browsing space*. In a department store the browsing space consists of isles of merchandise displays organized by the customers' purchasing needs, price range, or possibly by manufacturer. In a bookstore, the browsing space consists of rows of bookshelves and special displays which direct buyers toward books of a certain literary style or topic. In these cases, providing a well organized browsing space may have a direct result on the ability of store customers to locate materials they want to buy, resulting in higher sales.

The browsing process typically consists of a number of key steps. People must first locate a portion of the browsing space that they feel is likely to have interesting materials. For the shopper in a bookstore, this means locating an area of the bookstore where books of a certain type are shelved. Personally, when I enter a big bookstore, I typically consult a map of the bookstore's layout (when available) or look for big signs near each bookshelf which indicate their topical area. This first step takes the person from the null-context to a conceptual or physical area of the browsing space where the second step can begin. Once the person is at the point where they are being directly presented with candidate materials, they can begin the process of navigating the browsing space in the direction of more satisfying materials. In this step, the person repeatedly asks themselves, "Will the available materials suit my retrieval needs?". When

the answer is negative, they ask the follow-up question, “What direction should I look to find something more appropriate?” For bookstores, where the materials are essentially laid out along one dimension of a bookshelf, there are only two different directions that a person can look, but unfortunately the choice is often rather arbitrary. A better browsing space would give users some expectations about the kind of materials they will likely find when they move in any of the directions afforded by the browsing space. By iterating through this evaluation and redirection process, the person eventually arrives at a place where the browsing space no longer offers them a direction which will move them closer to their retrieval needs, at which point the person must determine if the materials offered at this location are satisfactory. If not, then the person must compromise along some dimension, and it is here again that the directions offered by the browsing space provide the users with choices.

In bookstores and department stores that are poorly organized, customers always have the option of expressing their needs to a salesperson in the store. Asking a salesperson for help requires that the customer can adequately describe what they really want and that the salesperson understands their needs and is familiar enough with their merchandise that they can determine what would best meet the customer’s needs. This process is analogous to using traditional query-based retrieval systems, where users must describe their retrieval needs in the form of some text-based query, which the system

analyzes and compares to records of the materials in the current collection. While this process is sometimes successful in a department store, where salespeople process customer requests in a very intelligent manner, the inherent stupidity of modern computers confounds every stage of this process in query-based retrieval systems. The most popular research approach for improving query-based retrieval systems is making them more intelligent - giving them the intelligent reasoning skills that salespersons and other retrieval assistants possess. Aside from the enormous artificial intelligence hurdles presented by this approach, we would ultimately expect these system to be about as good as their human counterparts, i.e. they would fail to assist the user in a significant number of cases, due to the inherent communication and language barriers that this approach must overcome. These barriers can best be understood by contrasting the process of query-based search to browsing-based methods.

There are several fundamental advantages of browsing as a retrieval method over query based techniques. First, users of browsing-based retrieval systems are not required to codify their retrieval needs to the system at all. Like the customer browsing through the bookstore, the user need not understand what it is that they are looking for until the moment that it appears before their eyes. Second, by not accepting text-based queries, browsing-based systems are not in danger of misunderstanding users' requests. While we have made impressive strides in the area of natural language understanding, the best

of these systems are a far cry away from the abilities of real people, who themselves must suffer from misunderstandings all the time. Third, browsing-based systems do not require computers to make guesses about the suitability of given materials for some expressed retrieval need. The best query-based systems, as well as human sales personnel, must use their knowledge and experience to guess which materials their users will find relevant to their retrieval needs. However, even the smartest salespeople have trouble putting themselves in the shoes of their customers. Judgments of relevance are best made by those who actually have the needs. In browsing-based systems, users can see what is available, and make their own decisions about the suitability of those materials to their particular task.

1.3 Constructing browsing spaces from indexes

In some cases, browsing-based retrieval may seem like the wrong idea. It is reasonable to be cautious about the use of browsing as a retrieval technique for very large collections. Bookstores and department stores may be able to successfully construct a browsing space for the thousands of items that they sell, but what happens when we try create a browsing space for a digital library of tens of thousands, or even millions, of electronic media items? In these cases, the complexities of building a browsing space of that size may be insurmountable. In other cases, these collections may be very dynamic in nature, with new materials constantly being added while others are removed. In these

cases, the browsing space might be easily constructed for one particular state of the collection, but could be troublesome to maintain as materials shift in and out of it.

The straightforward solution to this problem is to organize the indexes of materials into a browsing space, rather than the materials themselves. Indexes, like the subject file in library card catalogs, place individual materials into distinct subject categories, each signified by a single keyword or key-phrase referring to some subject or topic. Recently, collections of subject terms, collectively known as thesauri, have proliferated as the library science community has adopted standards for their specification and use. The thesauri that are used to catalog collections are typically much smaller than the size of the collections themselves, nearly static in size and content regardless of the dynamics of the collection, and can be used by completely different collections with a minimal amount of modification. These qualities give designers of browsing-based retrieval systems an attractive option for constructing a browsing space of subject terms. The resulting browsing spaces will be significantly more compact than the collections themselves, will remain constant even as collections change, and can be used for multiple collections, allowing designers to amortize the cost of building the browsing space over multiple applications.

Organizing browsing spaces of subject terms is the approach taken in this research. This thesis discusses the theoretical and implementation issues surrounding the development of retrieval interfaces that employ browsing spaces of subject terms. Users of these systems are primarily engaged in the task of browsing through the browsing space of subject terms to locate those that correspond to materials that they are interested in retrieving. Constructing systems that operate in this manner requires that a number of challenging design problems be overcome. The main focus of this thesis is specifying and engineering systems that support this mode of retrieval, and includes a theory of how to organize a browsing space of collection subject terms to best support the browsing process.

1.4 Supporting the functional requirements of the browsing process

As part of this research, a computer program was developed that supports the browsing process in collections of digital media items. This retrieval system, named *Déjà vu*, attempts to satisfy each of the functional demands that the browsing process presents. In *Déjà vu*, users engage in the retrieval task by browsing through the subject terms that have been used to catalog individual items in the collection. Users browse through these terms by traversing a set of links provided between individual terms in order to locate ones that meet their particular retrieval needs and are being used to index available materials in the collection.

Figure 1.2 shows the main screen of the Déjà vu interface as presented to a user searching for materials in a digital library. The screen is divided vertically into two main sections. The top section organizes and displays the thesaurus subject terms, and allows users to browse through these terms to locate the ones in which they are interested. At any given time, there will be one subject term, the *focus term*, which is displayed near the upper left corner of this section (*airplanes* in Figure 1.2). All of the other lists displayed in the top section contain subject terms that are related to the focus term in some way. The left side of the top section contains lists for all of standard thesaurus relationships, including Broader, Narrower, and Related terms, as well as any notes attached to the focus term by thesaurus developers. The right side of this section displays a list of Expectation Packages, a new organizational structure introduced in this research. The bottom section provides users with a way of directly accessing digital materials indexed by terms presented in the top section.

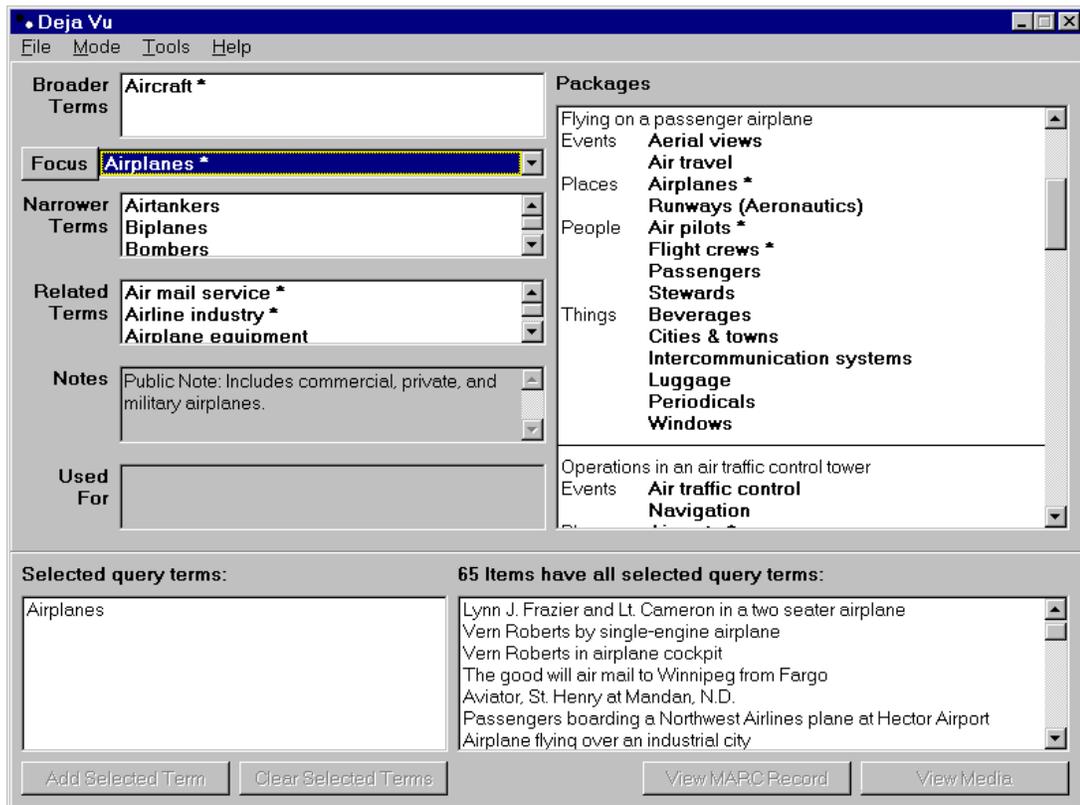


Figure 1.2. The Déjà vu Retrieval Interface

To understanding how the Déjà vu interface supports the browsing process, it will be useful to examine each of the interface components shown in Figure 1.2 with regard to the functions that they support. As an example, consider how the Déjà vu interface would be useful in supporting a hypothetical retrieval situation. Imagine that Déjà vu is being used to support a user of an online photography collection in finding pictures for use in a slide show that they were creating. The topic of this hypothetical slide show concerned advances in the aviation industry, and the user hopes to locate pictures of

airplanes, airports, and jet engines, or anything else related to the topic to spice up their presentation.

Specifying an area of interest: The first task that users of Déjà vu face is to let the system know what general topic area they are interested in. To do this, users must identify a subject term in the thesaurus that is somehow related to their retrieval needs, and select it as the focus term. For this purpose, users can set the focus term to any term in the thesaurus in one of three ways. First, users can select a specific term from an alphabetical list accessible as a drop-down menu attached to the interface item that displays the current focus term. Second, users can type the first few characters of a term using the keyboard, causing the focus term to change to the first term in the alphabetical ordering of terms that matches the given input. Third, users can open a special search window that allows them to enter a string of characters, causing the system to list all of the thesaurus terms that contain the string, any of which can be selected as the new focus term. For our example user who is looking for images on the topic of advances in the aviation industry, typing the characters “airplane” would generate a list which would include the term *airplanes*, which has been selected by the user as the focus term in Figure 1.2.

Browsing through thesaurus terms: Once the user has changed the focus term to one that is in their area of interest, their next task is to examine the other terms that are linked to the focus term to locate the ones that are the most appropriate for their retrieval task. If unsatisfied with the choice of subject terms presented, users can browse to a related area of interest by changing the focus term. Double-clicking on any of the terms displayed to the user will cause it to become the new focus term, and each of the associated lists of terms will be updated. Our example user who is looking for images on the topic of advances in the aviation industry is presented with a large number of associated subject terms when the term *airplanes* is in focus. However, they could choose to change the focus term to something more specific to their interests, such as the Related Term, *airline industry*, or the Expectation Package term, *air travel*, by double-clicking on either of them.

Selecting terms to retrieve materials: Subject terms that are being used to index materials in the library's holdings display an asterisk next to the text of the terms. These terms can be selected by the user in order to retrieve the materials that use the term as an index. When the user finds a term that is both selectable and meets their retrieval needs, the term can be selected by clicking on the term where it is displayed in the top section, and pressing the *Add Selected Term* button. This action adds the selected term to the list at the left side of the lower section. On the right side of this section, the titles of all of

the library items that use the selected term as an index are immediately displayed. Figure 1.2 shows what the interface would look like after our example user selected the subject term *airplanes*.

Narrowing the set of retrieved materials: Often a single index term will result in the retrieval of too many library items. Déjà vu allows users to continue to browse for subject terms which can be used to narrow the set of retrieved items to a more reasonable number. To make browsing for narrowing terms easy, Déjà vu automatically updates the display of asterisks when a term is added or removed from the set of selected terms. Asterisks are only displayed next to subject terms that are being used as indexes for some subset of the materials that have been returned by the current set of selected terms. Since only terms displayed with asterisks can be selected, the user is prevented from over-specifying their request by selecting an unavailable conjunction of terms. Notice that in Figure 1.2, the 65 items retrieved by the term *airplane* could be reduced to a smaller number by selecting one of the other terms marked with an asterisk (*aircraft*, *air mail service*, *airline industry*, *air pilots*, or *flight crews*). Our example user could choose one of these terms, or change the focus term to another term such as *runways* (*Aeronautics*) in order to find selectable terms related to this topic that they could use to narrow the retrieved set.

Selecting materials to view: In order to view one of the items returned by the selected terms, the user simply clicks on one of the titles presented to them in the lower right and presses the *View Media* button. This action can have a number of different effects depending on the digital media type of the item and how Déjà vu is connected to the library's digital records. Déjà vu is set up to launch a helper application to display digital media items that exists as accessible files. A number of device drivers can be used as well to control various multimedia devices such as laserdisc players in order to access materials not stored as computer files. For our example user, selecting on one of the titles (as seen in Figure 1.2) such as *Airplane flying over an industrial city*, and pressing the *View Media* button would cause Déjà vu to load the digital image file for this record and display it using a graphics viewer application. Alternatively, the catalog record for the retrieved item can be viewed by pressing the *View MARC Record* button. After this, the user can continue viewing other returned items, or retrieve different items by adding or removing subject terms from the selected list.

1.5 Developing effective, richly interconnected browsing spaces

The utility of a browsing interface depends entirely upon the quality of its links. In a retrieval system like Déjà vu, where users traverse a browsing space of thesaurus terms, it is necessary to provide users with a rich set of interconnections between terms to support the browsing process. There are three primary browsing functions that these

interconnections serve. First, the browsing space must provide a set of links that a retrieval user can traverse in order to locate a term when they do not know its particular textual label. This allows the user to locate the best term for their retrieval needs once they have entered a portion of the browsing space that is close to their area of interest. Second, the browsing space should offer users reasonable possibilities that they hadn't considered. When presented with terms that are closely related to the ones they were initially going to use, users may refine or change their retrieval goals to take advantage of an opportunity facilitated by a rich browsing space. Third, the browsing space must offer users alternative terms when the ones they hoped to use do not retrieve adequate materials. A good browsing space will link the desired term to all of the terms in the thesaurus which may be used to index other materials which are relevant.

These functions each require that the browsing space be well organized and richly interconnected. However, the degree of interconnections found in existing thesauri often leave much to be desired. A recent release of the Library of Congress's Thesaurus for Graphic Materials (LCTGM) consisted of 4,421 reflexive taxonomic links (Broader and Narrower term pairs) and 5,888 reflexive associative links (Related term pairs) (Library of Congress Prints and Photographs Division 1995). Added together, there are a total of 20,618 unidirectional links divided amongst 5,760 authorized terms, or only 3.58 links per term on average. If existing thesauri like the LCTGM are to be used as a basis for

browsing interfaces to digital libraries, the degree of interconnections between terms must be improved.

Designing appropriate and numerous links between thesaurus terms is a labor-intensive task, even for a moderately-sized thesaurus like the LCTGM. The best that developers can hope to do is maximize the payoff of every bit of work that goes into interconnecting thesaurus terms. One way to greatly reduce the amount of work necessary to provide a rich browsing space is to change the way that developers link terms. Currently, thesaurus developers generate one-to-one connections between thesaurus terms (specified as lists of Broader, Narrower, or Related Terms). An alternative approach is to generate connections by clustering thesaurus terms into fully connected groups. That is, designers can identify groups of terms where each member of the group should be linked with every other member. For every fully-connected cluster that is assembled of size n , the number of new unidirectional links created is equal to $n(n - 1)$. In contrast, identifying n number of one-to-one relationships generates only $2n$ new unidirectional links (assuming thesaurus links are reflexive).

Clustering thesaurus terms to create richly interconnected browsing spaces requires an organization theory to assist knowledge engineers in determining which terms should be grouped together. Different organizational theories may be appropriate for different

thesauri, but each should be based on the commonsense expectations that library users have about the relationships between thesaurus terms. These clusters, which are referred to as Expectation Packages in this research, should group together terms based on our best understanding of how their corresponding concepts are represented and organized in the minds of library users. Accordingly, creating Expectation Packages is a process similar to the knowledge representation task in the field of Artificial Intelligence, where theories of memory organization guide the representation of knowledge used in intelligent reasoning systems.

In the Déjà vu retrieval system, an Expectation Package is displayed to a user when any of its member terms are selected as the current focus term. Figure 1.2 shows an example of an Expectation Package, entitled *Flying on a passenger airplane*, which appears because one of its member terms, *Airplanes*, is the current focus term. In Déjà vu, each Expectation Package is represented and displayed as a simple structure consisting of a distinguishing textual title and a list of thesaurus terms. The list of thesaurus terms is divided into a set of labeled sub-lists, which categorize the terms by the roles that they play in the Expectation Package. In the example Expectation Package displayed in Figure 1.2, these sub-lists are labeled *events*, *places*, *people*, and *things*. The sub-lists are displayed in a fixed order for each Expectation Package to provide a consistent layout. These sub-lists are constant for each of the Expectation Packages developed for

a given thesaurus, and are determined by the particular organizational theory used to guide Expectation Package development.

The Déjà vu system incorporates a set of tools to be used by thesaurus designers for the purpose of creating a set of Expectation Packages for a particular thesaurus. The basic process for creating Expectation Packages requires that designers analyze each of the thesaurus terms to determine if they belong to an Expectation Package which has not yet been created. Each new Expectation Package is specified in full when the first member term is identified, which promotes a development cycle where the majority of Expectation Packages for the entire thesaurus are created after the first fraction of terms have been analyzed. That is, in the beginning of the process, each new thesaurus term may spark the creation of several new Expectation Packages, but later in the process, the remaining terms will have already been assigned to appropriate Expectation Packages created earlier.

As an example of the use of Déjà vu with a standard thesaurus, the retrieval system was outfitted with the subject terms from the LCTGM and a full set of Expectation Packages was created to enhance the browsing space that this thesaurus provides. The resulting Déjà vu system offers an effective retrieval interface for any visual media archive that uses the LCTGM for cataloging purposes.

Developed by the Library of Congress Prints and Photographs Division, the LCTGM contains over five thousand authorized subject terms for indexing graphic materials such as photographs, drawings, posters, cartoons, and other still image media formats. It contains terms that refer to visual elements that can be found in graphic materials, including people, place, things, and activities, as well as the topics or abstract ideas which these materials address. The vocabulary of the LCTGM was developed on an as-needed basis while indexing materials in the Prints and Photographs Divisions' collections and continues to grow with contributions from the many institutions that use the LCTGM for their own image collections.

To guide the development of Expectation Packages for the LCTGM, an appropriate organizational theory was necessary. Given the topic area of the LCTGM, this organizational theory needed to capture the conceptual interrelationships between everyday activities, things, people, and places in the world. Schank and Abelson's theory of scripts (Schank and Abelson 1977) was selected, which postulates that expectations about everyday activities, things, people, and places are organized by representations of culturally shared knowledge about common and ritualized activities. Initially developed as a means of controlling inference in natural language processing

programs, the theory of scripts is well suited to the task of guiding Expectation Package development.

The original representations of scripts were very detailed, as they were to be utilized directly by natural language processing programs. Each script described the series of events that would take place in common activities such as going to a restaurant for a meal, attending a wedding at a church, or flying on a commercial airplane. Turning these rich representations into Expectation Packages requires that thesaurus designers identify terms which are semantically identical to the concepts contained in these scripts. The thesaurus terms that correspond to concepts in a particular script are then categorized into sub-lists which identify the role that each term plays in the Expectation Package. For the Expectation Packages developed for the LCTGM, the five roles were used to categorize thesaurus terms. These were *Places*, *People*, *Things*, *Events*, and *Misc*, each of which correspond to components of the original representations of scripts.

Figure 1.3 shows a collection of sample Expectation Packages of LCTGM terms in the Déjà vu system. What unifies these examples is that they all include the LCTGM term *coins* as a member. Accordingly, each of these would appear in their entirety in the list of packages displayed to the user when the subject term *coins* was the current focus term.

A total of 770 Expectation Packages were created for the LCTGM. The development work was done by one computer science graduate student working half time over four months (approximately two person-months). On average, each Expectation Package contained 12 terms. The set of Expectation Packages generated just over 100,000 unique unidirectional links, adding an average of over 17 addition links for each authorized term in the thesaurus. While no attempt was made to verify the psychological validity of any of the particular Expectation Packages that were created, an effort was made to exclude Expectation Packages that were not thought to be shared by the intended population of users.

<p>Begging for money on a city street</p> <p>Events <i>Pleading (Begging)</i></p> <p>Places <i>Business districts, Commercial streets</i></p> <p>People <i>Amputees, Beggars, Blind persons, Homeless persons, Mentally ill persons</i></p> <p>Things <i>Coins, Tin cups</i></p> <p>Misc <i>Charity</i></p>	<p>Going gambling in a casino</p> <p>Events <i>Card games, Gambling, Victories, Wagers</i></p> <p>Places <i>Casinos, Flatboats</i></p> <p>People <i>Losers</i></p> <p>Things <i>Coins, Crossed fingers, Electric signs, Playing cards, Slot machines</i></p> <p>Misc <i>Organized crime, Wealth</i></p>
<p>Getting a soft drink or snack out of a vending machine</p> <p>Places <i>Automobile service stations, Cafeterias</i></p> <p>Things <i>Aluminum, Candy, Cans, Carbonated beverages, Chewing gum, Coins, Vending machines</i></p> <p>Misc <i>Beverage industry</i></p>	<p>Making a wish at a wishing well</p> <p>Events <i>Wishing</i></p> <p>Places <i>Wishing wells</i></p> <p>Things <i>Coins, Pails, Ropes</i></p> <p>Misc <i>Magic</i></p>
<p>Going to the bank to make a transaction</p> <p>Events <i>Banking, Document signings, Saving & investment</i></p> <p>Places <i>Banks</i></p> <p>People <i>Bankers, Guards</i></p> <p>Things <i>Cash registers, Coin counting machines, Coins, Identification photographs, Money, Security systems, Wages</i></p> <p>Misc <i>Paydays, Wealth</i></p>	<p>Taking your dirty clothes to the laundromat</p> <p>Events <i>Cleaning, Laundry</i></p> <p>Places <i>Apartments, Laundries (Rooms & spaces)</i></p> <p>Things <i>Baskets, Clothing & dress, Coin operated machines, Coins, Household soap, Washing machines</i></p> <p>Misc <i>Time</i></p>

Figure 1.3. Example Expectation Packages for the LCTGM.

1.6 Evaluating browsing-based retrieval systems in authentic environments

For the purpose of evaluative user testing, Déjà vu was installed at two sites containing large collections of digital images. The first installation was at the North Dakota

Institute for Regional Studies (NDIRS) at North Dakota State University where Déjà vu was used as an interface to over 11,000 images captured on a video laserdisc. The second installation was at the Library of Congress Prints and Photographs Division in Washington, DC, where Déjà vu was evaluated as an interface to a collection of over 25,000 digital images accessible online as part of the American Memory project.

NDIRS is a moderately sized historical archive associated with the library of North Dakota State University. It is dedicated to the preservation of the history and culture that is unique to the northern plains region of the United States. The institute's photographic archive is used by the university and the general public primarily for the purposes of historical research, commercial advertising, and book publishing. In 1988, the institute completed the production of a video laserdisc containing more than 15,000 of the 50,000 historical photographs in the institute's collection, each captured as an individual video frame and accessible by serial frame numbers. After completing the video laserdisc, the institute began the process of indexing each of the images on the video laserdisc using the LCTGM as the main source of subject terms. When Déjà vu was first installed at the institute in March of 1997, more than 11,000 of the images had been indexed.

After the institute provided the cataloging records for their video laserdisc collection, Déjà vu was installed on a computer at the institute where it could be used both by the institute's staff and by the general public. To integrate the Déjà vu interface with the images available on the video laserdisc, custom software was developed to allow computer control of the institute's laserdisc player for instant access to the collection.

The Library of Congress Prints and Photographs Division is the United States' premier archive for historical research involving graphic materials, with an estimated 13.5 million prints and photographs in its holdings. The Prints and Photographs Division has a sizable staff, which includes reference specialists who assist library users in locating materials, catalogers who process the materials in the library's collection, as well as a staff of collection curators. The collections are utilized primarily by historical researchers, publishers, and advertisers, who gain access to the collections via a variety of different electronic and traditional library search tools.

In order to reduce damage to prints and photographs due to handling, the library has invested heavily in digitizing its collections so that they will be available for online access in conjunction with the American Memory project. The Prints and Photographs Division provided the cataloging records for one of their largest digital collections consisting of over 25,000 photographs of American life from the years 1880 to 1920

obtained from the Detroit Publishing Company. Déjà vu was then installed at the Library of Congress where it is accessible to reference librarians assisting library users, as well as other library staff members. Déjà vu utilizes pointers to online images provided in the cataloging records to allow direct access to the collection over the Internet using a standard web browser interface.

To assess the value of Déjà vu, I compiled the written comments provided by the catalogers and reference specialists who examined and utilized Déjà vu system at these two institutions. The extent to which Déjà vu has been used by this population and the users that they support at these institutions is very different. At NDIRS, where the previously available search resources were modest, Déjà vu has been integrated as a primary tool to aid reference specialists and collection users in finding photographic materials. At the Library of Congress, whose large staff was well equipped to handle user requests before the introduction of Déjà vu, the system has not been significantly utilized as a search resource. Although the extent of use has differed greatly between these two institutions, the comments of the catalogers and references specialists at both institutions were consistent with each other.

The positive comments of these evaluators center primarily around the interface functionality of Déjà vu. Library catalogers and reference specialists typically must cope

with a sharp division between library materials and their cataloging records. In *Déjà vu*, the tight integration of cataloging information with digital media is viewed as the primary advantage of the system over existing search tools at these institutions. The functionality that this tight integration affords, mainly that users of the system can immediately see what is available to them in the archive while searching through the thesaurus terms, is seen as a significant improvement over current access techniques. In addition, these evaluators feel that the process of browsing through thesaurus terms improves users' understanding of the relationship between archive materials and the cataloging resources that archivists employ.

The primary criticisms of the *Déjà vu* system focus on its limited application to the full range of requests that reference specialists must service. Since *Déjà vu* was designed to facilitate topic-based searching of archive materials, it is of very limited value to users looking for materials created by a specific person, whose subject matter is best referred to by proper name, or that are distinguished by some information concerning their production. These types of retrieval needs account for a significant portion of the requests that these two institutions receive, and *Déjà vu* did little to improve access in these cases. Furthermore, because *Déjà vu* operates using a single thesaurus (in this case, the LCTGM) it does not effectively support topic-based searching for materials whose cataloging may have been supplemented with terms from other major thesauri or

(in the case of NDIRS) with terms that were created locally to meet retrieve needs specific to a particular collection.

These evaluators agreed that the Expectation Packages provided for the LCTGM enriched the browsing space significantly. When reference specialists offered *Déjà vu* as a tool to library users, they described Expectation Packages as an extension of the set of Related Term links. These evaluators report that they (and the users they support) found the Expectation Packages to be intuitive and helpful for finding particular terms that they would not have otherwise thought of. However, they were critical of the subjectivity of the provided set of Expectation Packages, which contrasts with the rather objective nature of the standard relationships found between thesaurus terms. Also, the Expectation Packages seem to capture a modern view of the world that is discordant with the historical nature of the particular collections used in *Déjà vu*'s evaluation. In addition, several evaluators expressed concern that the Expectation Packages would be difficult to maintain given that thesauri like the LCTGM are constantly being revised with new terms and new organization.

Many issues surrounding the transfer of this new technology to real world environments remain to be examined. However, these evaluative case-studies have demonstrated that

browsing-based retrieval systems, like Déjà vu, can significantly enhance an institution's ability to support the retrieval task.

1.7 Thesis Overview

The structure of this thesis has been designed to advance the particular theoretical and engineering claims of this research. After describing the problems that this research addresses and reviewing relevant previous research, the two main contributions of this research are described in detail, followed by an evaluation of their practical applications.

Chapter 2 begins by describing the Vocabulary Problem in information retrieval research. Simply stated, different people will refer stored materials using vastly different vocabulary. This problem, which stems from the ambiguity and redundancy of natural language, has plagued information retrieval systems since their inception. In an effort to get a handle on this problem, professions in the field of library science have turned to the use of controlled indexing vocabularies, known as thesauri, to standardize the way that library archivists refer to stored materials. Information retrieval researchers have begun to realize that these thesauri, which are becoming increasingly standardized and prolific, are valuable, knowledge-rich resources that can be exploited in the design of new retrieval systems. This chapter reviews the different ways that thesauri have been

integrated in retrieval systems, and highlights the deficiencies in the most recent approaches.

Chapter 3 describes a theory of the functional requirements of browsing-based retrieval systems. Of particular interests are the special demands of systems that incorporate standard thesauri as browsing spaces. After describing these requirements in detail, a retrieval system that meets these requirements is described. *Déjà vu*, the retrieval system developed over the course of this research, has been designed to support browsing-based retrieval of large online media collections by using standard thesauri as a browsing space for user-directed search.

Chapter 4 describes a theory of the organization of effective browsing spaces of thesaurus terms. The effectiveness of any browsing-based system is dependent on the quality of the browsing space. When the browsing space consists of thesaurus terms, it is necessary to provide users with a rich set of interconnections between terms that support the functional requirements of the browsing process. After discussing the requirements that the browsing process places on the design of the browsing space, an organizational theory is proposed that attempts to capitalize on the commonsense knowledge of collection users. A new organizational structure is proposed, called *Expectation Packages*, which groups together sets of thesaurus terms based on cognitive

science theories of memory organization. The use of Expectation Packages is argued to be a tractable way of developing a richly interconnected browsing space that is intuitive for collection users. Details surrounding the development of Expectation Packages for the Library of Congress Thesaurus for Graphic Materials are presented.

Chapter 5 describes the implementation and evaluation of the Déjà vu system at the North Dakota Institute for Regional Studies and at the Library of Congress Prints and Photographs Division. Rather than focusing on carefully controlled experimental evaluation, an effort was made to understand how this technology could be successfully integrated into an existing retrieval environment. Of particular interest was understanding exactly what value the Déjà vu system added to current retrieval practices, and where the technology did not meet the needs of these users.

Chapter 6 reviews the research contributions made in this dissertation by focusing on four central research claims. The first claim is that browsing-based retrieval systems avoid the pitfalls that are present in more traditional, query-based approaches. The second claim is that browsing spaces should be constructed from thesaurus terms rather than directly from library materials themselves. The third claim is that thesaurus terms should be clustered into Expectation Packages, which efficiently create a rich browsing space that is intuitive to the intended users. The fourth claim is that retrieval researches

should capitalize on the standards that exist in the library science community in order to facilitate the evaluation of their work in authentic, real-world retrieval environments.

For each of these claims, the relevant research findings from this dissertation are summarized, along with directions for future research.

CHAPTER 2: INFORMATION RETRIEVAL USING LIBRARY THESAURI

When I initially began this research, I started looking around for resources and publications that could give me some background on the challenge of organizing and providing access to large collections of materials. I was on my way to the university library to look up some materials when it dawned on me that this was a challenge that libraries have had to deal with since their inception. When I arrived at the library, instead of going directly to the suite of access tools that were available, I started talking with the librarians. After talking with archivists, curators, and reference librarians, I soon realized that I had been ignorant of the practices and research efforts that this community had developed throughout their existence. Previously, I had observed very little overlap between research in computer science and in the library sciences, but it was clear to me that for my particular research interest, advancing the state-of-the-art in information retrieval would require building on top of previous work in the library sciences. Primarily, I saw that there were library science resources available that could be exploited to produce new and innovative retrieval systems.

The thing that I found most interesting about the practices of library professionals was their attention to the classification and categorization of library materials. In the role of an archivist, library professionals are faced with the daunting task of acquiring,

analyzing, cataloging, and storing an unending stream of new materials. This process is governed primarily by resource constraints rather than by any theoretical ideals. In general, the process successfully meets the functional requirements presented by the constraints of the environment and the demands of library users. One of the ways that archivists have made this process tractable is by utilizing particular classification and categorization schemes that are shared across libraries. While many classification and categorization schemes have been designed primarily for the purpose of assisting archivists during the storage process, some of these tools can be exploited to tackle fundamental retrieval-side problems as well. This chapter focuses on how researchers are utilizing one classification and categorization tool, standard thesauri, to confront the primary challenge in retrieval system development, the Vocabulary Problem. It is argued that current research is progressing in the right direction, and lacks only the theoretical and design contributions presented in this thesis.

2.1 The Vocabulary Problem in information retrieval

Effectively managing the storage and retrieval of digital materials is the central focus of the field of Information Retrieval (IR). The main IR task is the design of systems that mediate between user needs and the materials available in a given archive. In designing these systems, researchers in the field of IR have consistently pursued the most obvious approach to this problem: matching textual descriptions of user needs (queries) to some

textual representation of the stored materials (records). By adopting this approach, IR researchers have been constantly confronted with the unyielding problem it brings up, the Vocabulary Problem.

As outlined by Furnas et al. (1987), the Vocabulary Problem is that different people will refer to the same item in many different ways, despite their best efforts to do otherwise. This observation becomes a serious problem in the design of computer front-ends to information archives, where agreement in the naming of items is critical to matching users' queries to the records of archive materials. In a set of studies, the authors found that if a single archivist assigns a name to a particular item, other untutored users of the archive will fail to access the item on 80 to 90 percent of their attempts. Throughout its history, the IR research community has sought to find innovative and intelligent methods of access that are more successful for users than this simple approach.

To judge their own progress in this endeavor, the IR community has developed a pair of metrics aimed at evaluating the utility of their approaches. These metrics, Precision and Recall, are the proportions of the number of relevant retrieved items to the total number of retrieved items and to the number of relevant items in an archive, respectively.

Decades of IR research has consistently shown a tradeoff between these two metrics. Narrow and highly specific queries yield high precision (few irrelevant items retrieved)

but cause many relevant materials to be overlooked. Broad and general queries successfully recall a large proportion of the relevant materials from an archive, but the retrieved set will also include large amounts of materials that are irrelevant to the user.

2.2 Standard thesauri

In an attempt to improve Precision and Recall levels, many archive managers have turned to the user of controlled indexing vocabularies, commonly referred to as thesauri.

Thesauri are lists of words or short phrases that archivists agree to use when cataloging archive materials. Primarily used to describe the subject matter of individual archive materials, thesauri attempt to solve the vocabulary problem by reducing the richness of natural language so that individual concepts are referred to by a single, authorized index term (descriptor). An outgrowth of work on traditional library classification schemes like the Dewey Decimal System, thesauri are comparable to their historical counterparts in many ways (Weinberg 1995). The primary advantage of thesauri over traditional classification schemes is that by separating the concepts of where an item should physically be located in a the linear stacks of a library from a classification of its content, a single item may be located by more than one access route. The intention of integrating a thesaurus in the retrieval process is to reduce the problem of matching two free-text expressions (expressions of user needs and expressions of material subject matter) to a more tractable problem of matching user needs to thesaurus terms. Still, some debate

remains whether thesauri are the most effective means of improving Precision and Recall (Maniez 1988) or if they simply serve to reduce the possibility that a user's query will locate relevant materials (Gomez et al. 1990).

The largest and most ubiquitous controlled vocabulary used for cataloging purposes, the Library of Congress Subject Headings (LCSH), has proven to be too unwieldy for archivists with specific cataloging needs. With over 234,000 terms, the LCSH is an invaluable resource for describing the subject matter of books and periodic series. For archivists of multimedia collections and individual journal articles, more specialized vocabulary tools are often necessary. With a recent national standard for thesaurus construction (American National Standards Institute 1993) and a host of authoring tools, the number of thesauri have increased tremendously over the last decade. Figure 2.1 shows a sampling of thesauri that have been created for specific archival needs.

Organization	Thesaurus	Authorized Terms
Getty Information Institute	Art and architecture thesaurus	120,000
Library of Congress	Thesaurus for Graphic Materials	6,000
National Library of Medicine	Medical Subject Headings	18,000
National Aeronautics & Space Administration	NASA Thesaurus	17,000
U.S. Department of Education	ERIC thesaurus	10,000

Figure 2.1. A Sample of Special Purpose Thesauri

Terms in standard thesauri are typically linked to each other via a set of associative relationships. Typically the reflexive Broader Term and Narrower Term relationships (BT/NT) are used to capture both taxonomic and part-whole connections between terms. The reflexive Use and Use For relationships (USE / UF) are employed to capture synonym relationships between a term that is authorized for use as a descriptor and synonym terms which are not. The Related Term relationship (RT) is less consistently used between different thesauri, but typically captures associative relationships between terms that are not synonyms and have no taxonomic or part - whole relationship. Example entries from the Library of Congress Thesaurus for Graphic Materials are shown in Figure 2.2.

<p>Handguns</p> <p>UF Pistols Revolvers</p> <p>BT Firearms</p>	<p>Gunfights</p> <p>UF Gun fights Gunfighting</p> <p>BT Fighting</p> <p>RT Firearms Shooting</p>
<p>Firearms</p> <p>UF Guns Small arms</p> <p>BT Arms & Armament</p> <p>NT Handguns Machine guns Rifles</p> <p>RT Artillery (Weaponry) Bullet holes Bullets Firearms control Firearms industry Gunfights Gunsmithing Shooting</p>	<p>Fighting</p> <p>UF Fisticuffs</p> <p>NT Children fighting Gunfights</p> <p>RT Boxing Gladiators Kicking Oriental hand-to-hand fighting Wrestling</p>

Figure 2.2. Four Interrelated Terms from the LCTGM

Several researchers have noted that there is little agreement between thesaurus developers on what these relationships actually mean. Willets (1975) analyzed the relational structure of eight different thesauri and concluded that “Most thesauri are intended as practical tools, but the results indicate a lack of consistency in the use of relationships, and emphasize the need to improve logical bases and classificatory structures.” This statement brings up the critical question: What is the practical utility of the relationships between terms in a thesaurus? Maniez (1988) argues that relationships between thesaurus terms should be made only when their connection serves the purpose

of pointing users towards other terms which have some implicit or probable relevance to the one that a user has selected. However, there is some evidence that this relevance heuristic may be impossible to apply in the organization of a thesaurus. A study by Green and Bean (1995) found that the types of relationships that account for topical relevance between terms is seemingly infinite.

Constructing a thesaurus by hand is a knowledge-intensive and time-consuming task. Accordingly, there has recently been a great deal of interest in techniques for automatically constructing thesauri from full-text document archives using statistical methods. Crouch and Yang (1992) and Chen and Lynch (1992) each describe experiments automatic thesaurus-generation techniques based on the statistical co-occurrence of words in text collections. The resulting thesauri differ from traditional, manually crafted thesauri in their structure. Rather than organizing terms by taxonomic, part-whole, or other specific relationships, these techniques produce weighted links between pairs of terms indicating their degree of co-occurrence. In accordance with Maniez's argument that relationships between thesaurus terms should be relevance-based (Maniez 1988), proponents of automated thesaurus construction techniques argue that relevant concepts often co-occur within the same document, and can therefore be identified with statistical methods.

2.3 Thesaurus use in information retrieval systems

In the eyes of a researcher in the field of Information Retrieval, thesauri appear as valuable knowledge resources that can be capitalized upon to build more effective systems. Of the many ways that thesauri can be utilized, the vast majority of systems choose to incorporate thesauri as a means of elaborating users' queries. That is, thesauri are employed as tools to aid in the classical information retrieval paradigm of accepting a text-based user query, searching for materials that the system deems relevant to the query, and returning a set of materials ranked by some metric. In the standard application, a strategy of query-expansion is employed. First, the system will accept a textual query from the user and identify terms in the query that match terms in a thesaurus. Second, the thesaurus structure is examined to identify the additional terms that are directly linked to these query terms in some way. Third, the additional terms are added to the original query, and the new expanded query is then matched against database records to retrieve materials.

Using a thesaurus in this manner has proven effective by a number of researchers. In similar sets of experiments, (Fox 1980) and (Wang, Vandendorpe, and Evens 1985) found that simple query-expansion techniques significantly improved precision and recall tradeoff assessments. In their experiments, users' queries were expanded to include terms that were adjacent to thesaurus terms found in the query, according the

relationships in the thesaurus structure. Both groups of researchers reported that different types of thesaurus relationships affected precision and recall in different ways. Each agreed that the best results could be obtained by excluding antonym terms from the expanded query, which by themselves were found to have a uniformly negative effect.

Several variations on this query-expansion technique have also been explored. One insightful advance in this line of research was to consider expanding query terms further than adjacent terms in the thesaurus structure. Rada and Bicknell (1989) and Kim and Kim (1990) each devised techniques that would traverse the entire hierarchical structure and calculate a distance metric between queries and individual archived materials. By calculating distances between queries and archive materials, retrieval systems can present to users a ranked list of retrieved items. Rada and Bricknell devised a distance metric that effectively calculated the mean path-length between all pairs of query terms and item indexes. Kim and Kim employed a modified distance metric that utilized weights that were manually assigned to thesaurus terms and relationships in order to more closely approximate human assessments. As the authors note, however, the task of assigning weights is a difficult and knowledge-intensive task, which may prohibit the application of these techniques in large-scale thesauri.

While these systems have found some degree of success, there is cause for concern about systems that solely employ automated thesaurus-traversal techniques. Rada & Bicknell and Kim & Kim have both attempted to mirror the distance assessments that humans make concerning pairs of thesaurus terms, however this may not directly correspond to the distance between archive materials and some user need. As Green (1995) has elaborated, the more appropriate concern in these systems should be identifying the relevant relationships that better match archive materials to an expressed user need. In an effort to understand these relationships, which Green refers to as *topical relevance relationships*, Green analyzed the potential user needs that various indexed items could satisfy. Green concluded, "... every relationship imaginable can serve as a topical relevance relationship. Since such relationships are only functionally distinguishable from others, no distinct set of relationships can be singled out as topical relevance relationships."

Without a functional understanding of the relationship between user needs and archive materials, the best that automated techniques can hope to do is capitalize on patterns that can be identified in successful thesaurus-traversal behavior that archive users exhibit when manually searching for materials. Unfortunately, recent studies have cast doubt on our ability to identify useful patterns. By observing users engaged in retrieval task involving thesaurus navigation, Jones et al. (1995) conclude: "We have certainly found

little evidence of patterns which could be used to justify strong rules or weighting algorithms, indeed even the basic assumption that thesaurus-based query expansion will improve retrieval performance has come under question.” These authors found that thesaurus navigation was most successful when users had plenty of terms to choose from, and when they had tight control over the navigation process.

Some researchers have taken the advice of Jones et al. to mean that users should have more control over the query-expansion process. In their attempt to adapt English-language query-expansion techniques to the retrieval of Chinese documents, Wan et al. (1997) developed an interface that allowed users to manually expand their queries by using all of the relationships available in the Chinese language thesaurus that they constructed. However, others have taken the idea of user-directed search more seriously. By placing users in control of thesaurus navigation, researchers are beginning to move away from traditional query-and-search interface designs in favor of highly interactive browsing-based interfaces.

2.4 Browsing through the Organization of Thesaurus Terms

In contrast to the query-based techniques, there has been some interest in devising new user-interfaces that better support the information retrieval task. Bates (1989), in particular, has argued for a new model of search where the user’s query continually

evolves during the search process, and where the retrieved materials are collected a bit at a time, rather than all at once in response to a single query. These search behaviors, which Bates refers to as Browsing and Berry-Picking, broaden the view of how a user interacts with a collection of materials. The recommendation is a shift from systems that focus exclusively on the user's query and the system's matching algorithms to those that support the user in an interactive manner throughout the search process.

Of particular interest has been the development of systems that engage the user in the process of browsing through collection materials. The idea of browsing-based interfaces got off to a rocky start in the IR community. In 1989, Bates noted "But there is still a lingering tendency in information science to see browsing in contrast to directed searching, to see it as a casual, don't-know-what-I-want behavior that one engages in separately from 'regular' searching." But eventually, several researchers in the field began to focus their efforts on supporting browsing as a mode of interaction for information retrieval. Allen (1994) began the move towards browsing interfaces with the HOPAC (Hierarchical Online Public Access Catalog) system, which allowed users to browse through the hierarchical organizations that libraries use to organize books on the physical shelves – in this case, the Dewey Decimal system. In a multi-paneled display, the HOPAC system showed the user interface components. One panel displays a portion of the Dewey Decimal system hierarchy that could be traversed. A second shows a list

of the titles of the books that could be found at the current location in the hierarchy. A third offers a search window that could be used to filter the book display according to text that is found or not found in the complete book record.

The HOPAC system had a number of features that represented good design choices for browsing-based systems. First, the HOPAC system utilized a classification system that could be separated from a particular archive. By utilizing the Dewey Decimal system, the HOPAC system could be used as an interface to any collection that employed this classification system. In his own experiments, Allen used a the records of over 50,000 books from the Bellcore Technical Libraries, but any collection organized by the Dewey Decimal system would work equally as well. Using a classification scheme as a browsing space is an attractive alternative to organizing the materials directly, where additions or deletions in the collection would cause insurmountable logistical problems for managers of very large collections.

The second favorable design decision of the HOPAC system was create a close integration of the browsing space that the user traverses and the records of the collection they are searching. In the HOPAC system, the user is shown the titles all of the available materials for each classification that they visit while browsing the Dewey Decimal system. By displaying this information while the user is engaged in the browsing

process, the user can quickly see if any materials are available in their area of interest.

This kind of close coupling of browsing space and collection materials allows users to bypass the guessing games that are played when dealing the query-based systems.

Rather than trying to construct a query that may or may not lead to a reasonable number retrieved materials, the user can instantly see if materials are available and at what quantity without committing to a query.

The third good design characteristic of the HOPAC system is that it allows users to browse through a specified subset of the entire collection. That is, a user may decide that they are only interested in viewing materials by a certain author, after a certain publication date, or some other feature that can be extracted from the records of the collection. Specifying this information in HOPAC's search window causes to the system to filter out all of the items that do not meet these constraints. This filtering is reflected in the panel that displays the titles of each of the books available at the currently selected location of the Dewey Decimal system. Also, the panel that displays the Dewey Decimal system itself indicates the number of items that haven't been filtered out of each sub-classification next to their textual display. This functionality allows users to make some commitments early in the browsing process in order to avoid browsing through materials that do not meet some necessary requirements. In this manner, the system can quickly

highlight what is available in the current collection that meets the users' requirements, while still allowing them to utilize the browsing interface.

The major disadvantage of the HOPAC system was its commitment to hierarchical classification schemes like the Dewey Decimal system. Classification schemes share many of the same properties as standard thesauri (see Weinberg 1995 for a thorough comparison), but have two important shortcomings. First, classification schemes require that collection materials be assigned to a single location in the classification hierarchy. While this may be acceptable for collections of books, this becomes increasingly problematic when trying to store journal articles, graphical material, or video clips, which typically have many possible ways to describe their content. Second, classification schemes like the Dewey Decimal system give users a browsing space that is strictly tree-structured. Using standard thesauri in this type of browsing system would open up the possibility for rich interconnections that were associative rather than hierarchical.

Johnson and Cochrane (1995) addressed these concerns in their system, which allowed users to navigate through the relationships of a standard thesaurus to construct a query. As in Allen's HOPAC system, Johnson and Cochrane's interfaces allows users to traverse through hierarchical relationships by expanding and collapsing various levels of Broader and Narrower terms in the thesaurus. However, because thesauri are used

rather than classification schemes like the Dewey Decimal System, these relationships do not necessarily form a strict tree structure. In addition, users may also traverse Related Term links by selecting a related term from a set that is displayed next to a hierarchical display. Johnson and Cochrane have a unique means of displaying this group of related terms. As the user browses through the space of terms, the current term is displayed in the center of the screen. The group of related terms is displayed as a cloud of terms floating in the space around the current term, some closer than others. The authors note: “[Related Terms] which appear closer to the current term are not in any way more ‘closely related’ to it than those which appear farther away; in the parlance of the crowd, they merely got there first.” Although the use of space in this manner may have the undesired effect of conveying meaning to the user that was unintended, the authors introduced the idea that related terms can be displayed in ways other than a simple list.

Schatz et al. (1996) furthered Johnson and Cochrane’s (1995) work in the design of thesaurus-browsing retrieval systems. In their system, a similar thesaurus-browsing interface was created, but the browsing space was supplemented with an algorithmically generated list of co-occurrence terms. When the user is browsing through the space of thesaurus terms, the system displays a list of terms that have been found to co-occur with each term in large text collections. Schatz et al. employed the algorithms of Chen et. al. (1995) to generate co-occurrence lists automatically by statistically analyzing the full text

documents that are in the same area of interest as the currently used thesaurus. The co-occurrence list includes terms that are not part of the thesaurus that is being used, but can effectively be used to find words and phrases which may be included as part of users' queries.

Lacking from both of the thesaurus-browsing systems of Johnson & Cochrane and Schatz et al. is integration between the thesaurus and the data itself. That is, these systems were designed to help users locate terms that could later be used in the formation of queries to a library collection. By taking this approach, users are unable to determine which terms in the browsing space are being used to index available materials until after a formal query has been made. This can be viewed as a step back from Allen's HOPAC system, which listed exactly which materials were available throughout the entire time that a user traversed the browsing space.

2.5 Lessons learned

There are several lessons that can be learned from the previous work in designing effective retrieval systems. First, using standard thesauri is an effective means of improving the vocabulary problem that exists in information retrieval tasks. By indexing collection materials with thesaurus terms, we can change the nature of the information retrieval task. Rather than working on ways to match users' free text expressions to the

free text of cataloging records or full document texts, we can focus our efforts on finding ways to help users identify the thesaurus terms that are closest to their area of interest. Whereas free-text matching nearly requires that the user interaction consist of query-based interfaces, identifying appropriate thesaurus terms can be achieved in a variety of different ways.

The second lesson to be learned is that user browsing should be favored over automated search techniques. Given the challenge of matching user needs to thesaurus terms, it is far more effective to provide users with the tools for finding what they need than building systems that are intelligent enough to make educated guesses regarding their requirements. Because there is little consistency in which links users find most relevant, it is difficult to imagine how automated link-traversal retrieval systems could be significantly improved. The best interfaces will give users plenty of options and give them tight control over the selection process.

The third lesson learned is that it is important to integrate the browsing space with the data itself. Tight integration of browsing space and data affords interfaces that display to the user what is available in an archive while they are browsing for thesaurus terms. In this way, the user has the impression that they are browsing directly through an archive, even though their search is mediated by the thesaurus terms. The unfavorable

alternative, which is to separate the browsing processes from the task of generating a database query, makes it difficult for users to see what retrieval options are available to them.

In the next chapter, the Deja vu system is described, which incorporates each of these lessons-learned in its user interface.

CHAPTER 3: THE DÉJÀ VU SYSTEM

As a method of search, browsing through collections of materials affords many advantages over query-based techniques. Users can see what is available before committing to a specification of their retrieval needs. They are presented with opportunities that they may not have considered before beginning their search. They are offered alternatives when items exactly matching their wishes are not available. But the browsing environment must explicitly support each of these advantages afforded by the browsing process. In computer-based retrieval interfaces, this requires that the retrieval system provide users with a specific set of interface components and functions designed to support the search task. Déjà vu is a system that was developed to provide the necessary interface components and functions necessary to support the browsing process in digital library collections.

Déjà vu supports a certain type of *mediated* browsing. That is, rather than browsing through collection materials directly, users of Déjà vu browse through the subject terms that are used to index collection materials. Déjà vu was designed as an interface for browsing through the terms of a single ANSI standard thesaurus. By browsing, users are able to retrieve materials from a single collection of materials that use that one thesaurus as its primary indexing reference. The great advantage of taking a mediated browsing

approach is that collections that use the same thesaurus for indexing can utilize the same instantiation of the Déjà vu system for retrieval purpose. That is, once that a complete Déjà vu system has been created for a particular thesaurus, it can be used for all of the collections that use that thesaurus as its primary indexing reference. While the Déjà vu system provides some indexing functions, it is assumed that Déjà vu's primary utility will be as a retrieval aid for collection that have been already indexed using traditional library cataloging tools.

3.1 Déjà vu interface overview

When a user first sits down to use the Déjà vu retrieval interface, they are presented with the main retrieval screen (Figure 3.1). The screen is divided vertically into two main sections. The top section organizes and displays the thesaurus subject terms, and allows users to browse through these terms to locate the ones in which they are interested. At any given time, there will be one subject term, the *focus term*, which is displayed near the upper left corner of this section (*Space flight* in Figure 3.1). All of the other lists displayed in the top section contain subject terms that are related to the focus term in some way. The left side of the top section contains lists for all of the relationships specified in the ANSI thesaurus standard (Broader, Narrower, Related, and Used For terms), as well as any notes attached to the focus term by thesaurus developers (including Facet indicators, Public notes, Cataloger's notes, and History notes). The

right side of this section displays the Expectation Packages associated with focus term, which are collections of terms grouped together in a particular format. Expectation Packages are described in detail later, but for now it suffices to say that these structures group together thesaurus terms that all have to do with some commonsense expectation. The list of Expectation Packages in Figure 3.1 begins with one labeled *A launch of a rocket for space flight*. This Expectation Package (as well as the ones that follow it) is displayed because it contains the term *Space flight*, which is the current focus term. Accordingly, all of the thesaurus terms that are displayed in each of the Expectation Packages are associated with the focus term in some way. The bottom section of this main screen contains some interface components that are necessary to retrieve materials from the collection that have been indexed using the thesaurus terms from the top section.

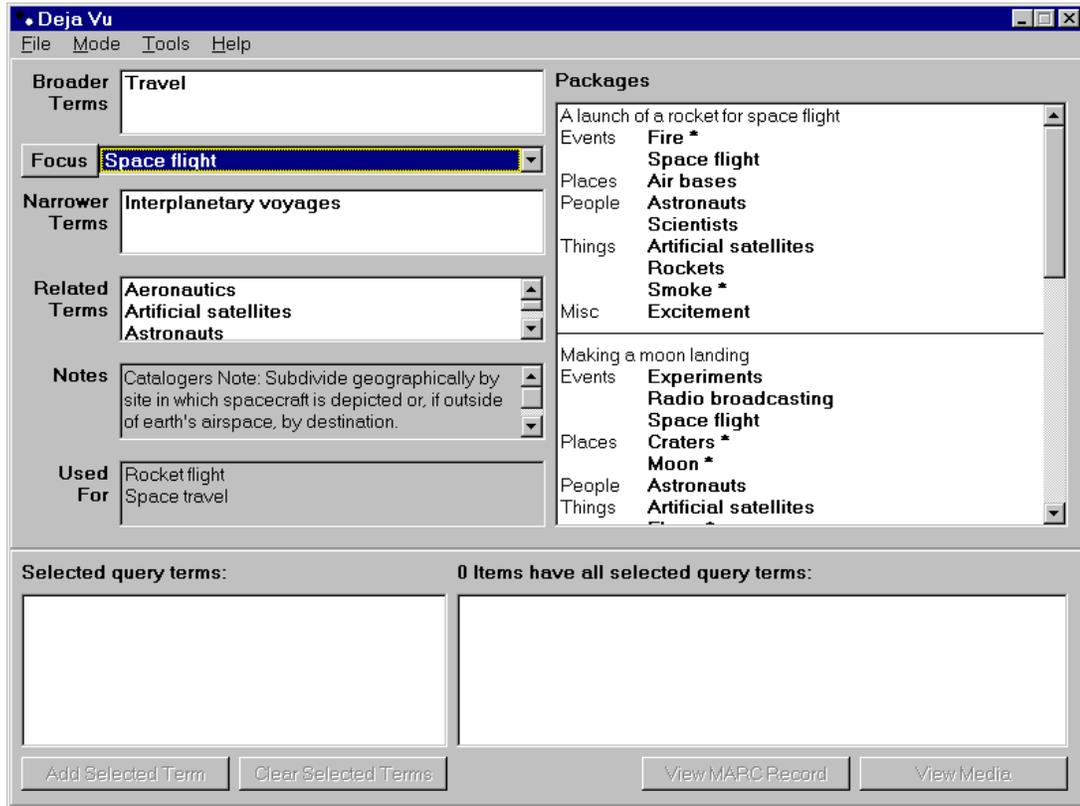


Figure 3.1. Déjà vu in Find Mode with the focus term *Space flight*

3.2 The retrieval task using Déjà vu

In the typical case, users retrieve materials using the Déjà vu system by completing the following six steps:

1. *Analysis of retrieval needs.* The user determines if the Déjà vu system is the appropriate retrieval tool for their task.

2. *Zooming to an area of interest.* The user enters the browsing space of thesaurus terms in an area that is related to their retrieval needs.
3. *Navigational browsing.* The user traverses the browsing space by following the links between terms to locate the ones that are most closely aligned with their retrieval needs.
4. *Selection of index terms.* After examining the options, opportunities, and alternatives, the user selects an index term to retrieve the materials to which it is assigned.
5. *Filtering the retrieved set of materials.* The user continues to select thesaurus terms that, when conjoined with the previously selected term, reduce the retrieved set to a reasonable size.
6. *Evaluating the retrieved set.* Once the retrieved set is of a manageable size, the user examines the materials by viewing their cataloging records and/or the media itself.

Each of these subtasks are supported by the interface functionality provided in the Déjà vu system, and are described below in more detail.

3.2.1 Analysis of retrieval needs

The first step that a user must undertake in any retrieval task is to do some amount of analysis of their own retrieval needs. The purpose of this analysis is to determine if a

particular search tool is appropriate for completing the search. Some search tools, including *Déjà vu*, are simply inappropriate for certain retrieval needs. *Déjà vu* is the appropriate search tool for the following classes of retrieval needs:

1. The user is searching for a specific and unique item, but only its subject matter or content is known.

For example, the user is looking for the famous old photograph taken of dozens of very important jazz musicians taken on some street in New York City (“Harlem 1958” by Art Kane). In these cases, the purpose of using *Déjà vu* is to determine if the item in question is located in the collection that is currently accessible. These users conduct their searches by browsing to the terms in the thesaurus that most closely align with the known subject matter or content of the item. Then users examine the materials indexed by those terms with some degree of confidence that they will recognize the item when it is presented to them.

A successful use of the *Déjà vu* system in these cases will either result in the retrieval of the item if it is available, or some degree of confidence that it is not available in the current collection. This confidence level relies on two factors, however. First, it is essential that the collection archivists did a quality job of cataloging and indexing the

collection materials; if the item's record is particularly sparse, then appropriate subject terms selected by the user may not retrieve the item. Second, the user must be able to recognize the item when it is retrieved and presented for inspection. While the user may have some means of assessing their own ability to recognize the item, they rarely have any indication of the quality of indexing for a collection. Because a user's confidence level depends on both of these factors, this type of search will always leave the user with some degree of uncertainty when the user cannot find the item in the collection.

2. The user is searching for nonspecific materials, which have specific subject matter or content requirements.

For example, the user is looking for photographs that must picture U.S. Presidents interacting with foreign statesmen. In these cases, the purpose of using *Déjà vu* is to determine if there are any materials in the collection that meets the particular constraints set by the users retrieval needs. These users conduct their searches in much the same way as those looking for a specific item – by browsing to the areas of the thesaurus that contain terms that correspond to the users' content requirements, and examining the materials retrieved by these terms. However, the success criterion is somewhat different. A successful use of the *Déjà vu* system will retrieve all of the

materials in the collection that meet the users requirements, or the set of materials that best compromises between the users requirements and the available materials – if the user’s retrieval needs afford compromise at all.

As in the case of searching for a specific item in a collection, there are several factors that contribute to a user’s confidence that the browsing process was successful.

When searching for nonspecific materials that meet specific criteria, the primary concern is whether the retrieved set contains all of the materials in the collection that meet the user’s criteria. This time, confidence levels are determined solely by the quality of the indexing in the current collection. If the indexing of content is sparse, then items that actually meet the requirements of the user may not be indexed as such, resulting in their exclusion from the retrieved set.

3. The user is searching for nonspecific materials that are related to one or more subject areas in task dependent ways.

For example, the user is looking for some photographs having to do with the health care industry for the purpose of creating a print advertisement for a health insurance corporation. With respect to this user, a successful retrieval session will result in some set of materials which the user feels will service their larger task of developing

an advertisement. This user may have had certain ideas about what they were looking for when they began the search, such as pictures of doctors and patients in a hospital setting, but may be satisfied with tangentially related pictures of fatal car crashes or pharmaceutical manufacturing plants. In these cases the retrieval conditions may remain unspecified, perhaps even unknown, until the user is presented with options to consider. These users will interact with *Déjà vu* by locating an area of the thesaurus that contains terms that pertain to their area of interest, and browse through the relationships between terms to see what is available. During the browsing process, these users will be constantly evaluating and considering the options that are presented to them to see if any of them may satisfy their specific task-dependent needs.

There are a couple of factors that affect users' confidence that they have found the best retrieval set in the archive. Primarily, as with every use of *Déjà vu*, the quality of the indexing of the collection directly effects the ability of the searcher to find the most appropriate materials for their needs. The second major factor is the quality of the browsing space. Users who are relying on the *Déjà vu* system to present the opportunities related to their area of interest must be provided with a browsing space that connects thesaurus terms in ways relevant to their tasks. The design of browsing spaces that support browsing in a task-relevant manner has been a major

focus of this research, primarily through the incorporation of Expectation Packages as a means of organizing groups of related thesaurus terms.

The most common types of retrieval needs which are not well serviced by Déjà vu are those in which the search requirements are not based on the subject matter or content of the materials. These include searches for materials that have specific proper names, or which can be identified by some proper name information that may be in their cataloging records apart from their lists of index terms. Examples include searches for the photographic works of a particular photographer, or searches for specific books or articles in which the authors and/or titles are known. In these cases, users are better off using traditional query-based search engines that commonly serve as the primary access tool for library collections.

3.2.2 Zooming to an area of interest

The second subtask that the user must complete when using Déjà vu for retrieval is to find an appropriate area of the browsing space in which to begin the browsing process. In small browsing systems, it may be possible to easily find what you are looking for regardless of where you begin the browsing process. As systems become larger, it becomes increasingly necessary to start the browsing process in an area of the browsing space that is more closely related to your area of interest. This requires that the software

provide some mechanism for moving the user from the null context to a related area of the browsing space by some quick and easy method.

The challenge of establishing context in browsing systems has been a major focus of research in hypermedia systems, especially in ASK systems (Ferguson et al. 1992; Osgood 1994). ASK systems are structured hypermedia systems that organize a browsing space consisting of stories and expert advice. Unlike traditional hypertext systems, which organize their content in a manner that parallels that of a well-indexed book, ASK systems organize their materials based on the metaphor of a conversation between a novice and an expert. Accordingly, each node in an ASK system's browsing space is an answer to a question, and pairs of nodes are linked by mapping the questions raised by a one to the questions answered by another. In ASK systems, system designers are also faced with the task of moving users from the null context to some area of the ASK system's browsing space where they are likely to find answers to their specific questions. In ASK system research, the mechanisms for establishing this context have been referred to as *zooming*, which is to be distinguished from the process of browsing that follows.

The numerous instances of ASK systems have explored a wide range of zooming approaches. ASK Michael (Osgood 1994) employed four approaches. First, the user

could choose from a list of abstract topical categories which group stories in the system, which were linked to specific starting stories in the system. Second, the user could select from a list of the titles of each of the stories in the system, a list that was just under 200 in the ASK Michael system. Third, the user could select from the list of abstract topical categories presented to the user in a way that emphasizes the relationships that exist between these topics. Forth, the user could select from a list of stories that fall into categories of interesting themes, based on theory of interestingness (Schank 1979), including stories of "strange warnings" and "odd opportunities." More recent work in ASK system zooming has focused on presenting starting stories based on an analysis of the users' tasks. Trans-ASK, an ASK system designed to provide information about military transportation planning (Bareiss and Osgood 1993), employed three zooming interfaces which would provide a starting point for user-browsing based on an analysis of the military transportation task. Users informed the system of either their role in the organization of people involved in military transportation, the specific step in the transportation task that they were working on, or the type of problem that they were currently having in completing their task. Each choice in each of the three zooming options was directly linked to a specific story that served as an appropriate starting point for user-browsing, as determined by the designers of the system.

The differences that exist between the Déjà vu system and ASK systems make the majority of these zooming options unrealizable. The primary problem in designing zooming interfaces for Déjà vu is that we have almost no information about the task in which our users are engaged in. Just as traditional libraries of books and periodicals must attempt to service an enormously broad range of users engaged in subtly unique tasks, a design-goal of the Déjà vu system was to be a truly task-independent retrieval system. That is, the system should be equally supportive of users retrieval needs regardless of the specific content of their search. Certainly, if enough was known about the retrieval needs of a particular population of Déjà vu users, a customized task-dependent zooming interface could be created. However, in the general case, only those zooming interfaces that do not presuppose the users' retrieval needs are appropriate. Therefore, only the simplest techniques have been employed in the Déjà vu system.

The zooming interfaces for the Déjà vu system have been designed to allow users to immediately reach any term in the browsing space from the null context. Three different zooming mechanisms have been incorporated into the interface, each of which requires the user to identify some term in the archive that is close to their area of interest. Also, each of these zooming mechanisms are incorporated into the main interface of the Déjà vu system as displayed in Figure 3.1.

1. The Pop-up Zoomer

The first mechanism is the *Pop-up Zoomer*, and is activated by pressing the button labeled *Focus*, which is located just to the left of the focus term display. Pressing this button causes a pop-up window to be displayed, as shown in Figure 3.2. The Pop-up Zoomer allows users to search the entire thesaurus for terms that contain some specific string of characters. Figure 3.2 shows the Pop-up Zoomer after the user has typed in the characters "emergency" and pressed the *Search* button. In this example, the Pop-up Zoomer displays five thesaurus terms from the Thesaurus for Graphic Materials, each of which contains this string of characters. Subsequently selecting any of these terms causes the Pop-up Zoomer to disappear, revealing the main Déjà vu screen with the selected term displayed as the current focus term.

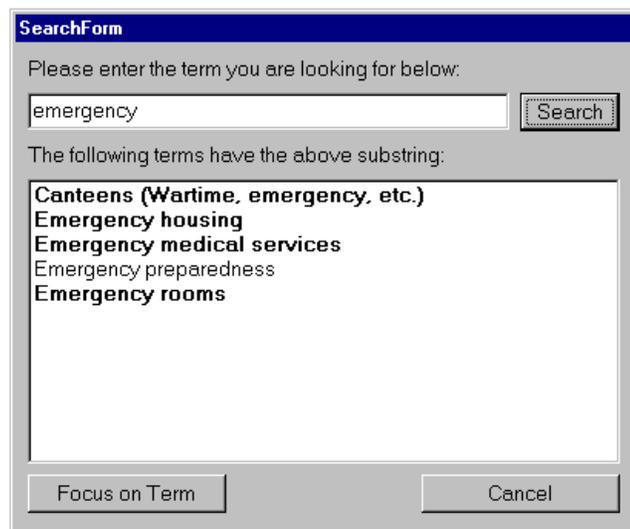


Figure 3.2. The Pop-up Zoomer.

2. The Drop-down Zommer

The second mechanism is the Drop-down Zoomer, and is activated by pressing the drop-down arrow that is at the right end of the Focus term display. Pressing this button causes a drop-down list to be displayed, as shown in Figure 3.3. The Drop-down Zoomer presents to the user a list of every term in the thesaurus in alphabetical order, displayed so that the user can scroll through the list eight items at a time.

Figure 3.3 shows the Drop-down display as it would be displayed when the previous focus term was *Emergency rooms*, from the Thesaurus for Graphic Materials.

Subsequently selecting any of these terms updates the current focus item and causes the Drop-down Zoomer to disappear.

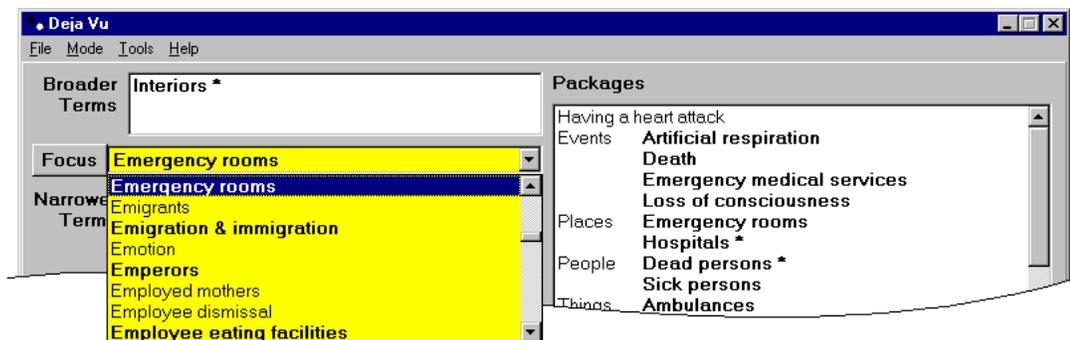


Figure 3.3. The Drop-down Zoomer

3. The Key-press Zoomer

The third mechanism is the Key-press Zoomer, which is simply activated by pressing any set of characters on the keyboard. This causes the focus term to immediately

change to the first thesaurus term that begins with the inputted set of characters, as determined by standard alphabetical order. For example, when the Thesaurus for Graphical Materials is being used, typing the character "E" causes the term *Eagles* to become the current focus term. Typing the characters "EV" causes *Evacuations* to be selected. Typing "EVO" causes *Evolution* to appear. Pausing for a moment after typing any character causes the Key-press Zoomer to be reset, allowing users to select a new set of characters. Typing any of the arrow keys on the keyboard causes the Key-press Zoomer to move to the next or previous term in the alphabetical ordering of terms.

Each of these zooming mechanisms makes the assumption that the user either knows the thesaurus terms well enough to select one in the area of their interest, or can quickly find an appropriate starting term in a reasonable number of guesses. While a major design goal of Déjà vu is to eliminate the guessing games that users are forced to play with text-based search engines, searching for an appropriate starting term is a substantially easier task than searching for an appropriate text-based query. In the former, the user need not be familiar with the intricacies of the entire thesaurus, but merely be able to identify some familiar words in their area of interest that are likely to be used as index terms. After finding any term that is in some way related to their retrieval goals, the burden is then

placed on the quality of the browsing space to ensure that the user finds the specific materials that they are looking for.

3.2.3 Navigational Browsing

After utilizing the zooming mechanisms provided by the Déjà vu system, the user's next task is to navigate through the browsing space of thesaurus terms to locate the best ones for their particular retrieval goals. To facilitate navigational browsing, the main screen of the Déjà vu interface displays a portion of the browsing space of thesaurus terms at all times. At any given moment, there is one thesaurus term, called the focus term, which signifies the user's current node, or location, in the space of terms. Déjà vu then displays all of the terms in the thesaurus that are directly linked to the focus term by some relationship. These include all of the relationships that exist in standard thesauri (Broader, Narrower, and Related Terms) as well as the set of Expectation Packages for which the focus term is a member. Double-clicking on any of these terms causes it to become the new focus term, which subsequently updates each of the lists of related terms.

The purpose of navigational browsing is to change the focus term from its current state, often the term selected through the zooming mechanisms, to the term that is most representative of the user's interests. In controlled vocabularies like library thesauri, the

natural language phrase that best describes the user's need may not be employed as an index term in the thesaurus. The process of navigational browsing helps the user locate the term that is closest to their ideal concept, if a suitable substitute exists in the thesaurus at all.

For example, a hypothetical user may need materials from an archive that are best described by the term *Improvisation*, which does not exist in the Thesaurus for Graphic Materials. Using the zooming mechanisms, the user chooses to start the process of navigational browsing at a term that is related to the practice of improvisation in the arts, such as the term *Musicians* (or equally appropriate, the terms *Jazz* or *Composers*). While the term *Musicians* is a poor substitute for the concept of improvisation, it is directly linked to terms that are somewhat closer to the users needs. This includes the term *Creation*, which is included in an Expectation Package entitled *Playing in a jazz band in a club*. The user the double-clicks on *Creation*, causing it to become the new focus term, and then examines the terms directly related to it to determine if a more appropriate term exists. Following this method, the user would find the terms *Inventions* and *Engineering*, which have something to do with the concept of improvisation as well. Trusting that the browsing space is rich and well-connected, the user can be relatively confident that the terms *Creation*, *Inventions*, and *Engineering* are as close as they are going to get to their ideal term.

3.2.4 Selection of index terms

Up until this point of the retrieval session, the interaction with the Déjà vu system has been entirely for the purpose of navigation. That is, the user should now be located at a portion of the browsing space of thesaurus terms that is closely aligned with their retrieval needs. Now the task changes to one of negotiation. That is, now the Déjà vu interface must help mediate between the needs of the user and what is available in the currently loaded archive. In Déjà vu, a passive role is taken by the system with regard to this negotiation process - there are no active processes running which bridge the gap between user needs and available materials. Instead, the system provides all of the information necessary for the user to be the sole active agent in the negotiation process. Taking a backseat role in the negotiation process facilitates three distinct types of negotiation results: options, opportunities, and alternatives. Each of these results is made possible by the way that Déjà vu displays thesaurus terms to the user during the browsing process. The display rules are enumerated in Figure 3.4.

Characteristics	Examples	Meaning
Boldface text, Asterisk present	Musicians * Concerts * Conductors *	The term is authorized for use as an index term and is being used to index materials in the current collection.
Boldface text, Asterisk absent	Rehearsals Tickets Audiences	The term is authorized for use as an index term but is not being used index materials in the current collections.
Normal text, Asterisk absent	Shows Bandmasters Noises	The term is not authorized for use as an index term and therefore is not being used to index materials in the current collection. These terms are linked to other terms only by the <i>Use</i> relationship, which indicates authorized substitute terms.

Figure 3.4. Thesaurus term display rules

These display rules facilitate the negotiation results of options, opportunities, and alternatives in the following ways:

1. Options

In the simplest case, the particular terms that the user is most interested in are also terms that index materials that are available in the current collection. In these cases, the user must simply select between these options, each of which are displayed in boldface type followed by an asterisk.

2. Opportunities

There are also times when the user may have identified precisely the set of terms that they originally believed would be most fruitful, but *Déjà vu* presents to the user

opportunities the user finds more attractive. The user could choose to use the terms that were, in fact, the most appropriate terms that they located during the navigational browsing stages of the retrieval task. However, there may be terms in the immediate neighborhood of these terms (defined by those terms to which they are directly linked), which cause the user to recast their retrieval needs. By examining those neighboring terms that are displayed with an asterisk (indicating that they index available materials), the user may make some fortuitous discoveries.

For example, imagine that a user looking for photographs in the manufacturing industry to use on a company's web page. This user employs the zooming mechanisms and browsing functionality to arrive at a couple of appropriate terms, *Assembly-line methods* and *Factories*, which likely index materials close to what the user had in mind. However, while the user has either of these terms as the focus term they notice that the system also has available materials indexed by the terms *Robots* and *Machinery*, which are directly linked to these terms via an Expectation Package. At this point, the user decides to change their conception of what kind of materials would satisfy their larger advertising goals. Instead of highlighting the company's manufacturing expertise with pictures of assembly lines and factories, the user decides to focus on the company's high-tech advantage with pictures of robots and machinery.

Taking advantage of opportunities requires that the user's retrieval needs are flexible. Offering appropriate opportunities, however, requires that the browsing space be constructed in a manner that directly links terms that are likely to be relevant with respect to users' larger retrieval goals.

3. Alternatives

There may be times in which the user locates terms that are closely aligned with their retrieval needs, but which are not being used to index any materials in the current collection (as indicated by the lack of an asterisk). This may be because, in fact, the collection really doesn't contain exactly the thing the user is looking for, or because appropriate materials in the collection are not indexed by the terms that the user believes they should be. In either case, it may be best to examine the immediate neighborhood of terms to identify some usable alternatives to choose from. By scanning the display of terms for those that include an asterisk, the user can quickly see what their alternatives are, and select the ones that take them the least distance away from their ideal conception. Just as in the case with opportunities, supporting the process of selecting alternatives requires that the browsing space be constructed in a manner that directly links terms that are likely to be relevant with respect to users' larger retrieval goals.

In each of these negotiation results, the user indicates their selection of an index term (which must be displayed with an asterisk) by clicking once on the term itself to highlight it, and the clicking on the Add Selected Term button in the lower left corner of the screen. The term then appears in the list of selected terms. On the lower right side of the screen, Déjà vu indicates how many materials are indexed by the selected term, and displays the titles of each of these items in a scrollable list.

3.2.5 Filtering the retrieved set of materials

In the simplest case, a single index term can be used to retrieve a set of materials that satisfy a user's retrieval needs. In very large collections, or with highly utilized index terms, this set of retrieved items could be quite large. For some retrieval tasks, a very large retrieval set is acceptable. But for the majority of tasks, it is unreasonable to require the user to manually search through hundreds or thousands of retrieved materials to find the handful that best meet their needs. Two common approaches to solving this problem are to rank-order the retrieved set using some intelligent sorting algorithm or to filter the retrieved set using some additional constraints. In Déjà vu the latter approach is taken. In keeping with the design philosophy of the Déjà vu system, control of the filtering process is given entirely to the user. Users filter out unwanted materials from the retrieved set by selecting additional index terms. These additional terms are then

conjoined with the currently selected term, and only those items in collection which are indexed using the entire set of selected terms are presented to the user.

In traditional online catalog systems, or even in keyword-based Internet search engines, composing a conjunctive query is often both necessary and extremely difficult. The problem is that it is difficult to determine the right level of specificity, i.e. how many terms or keywords should be included to retrieve a set of materials that is neither too large or too small (or empty). Users are forced to play guessing games where they repeated try to uncover the right combination of terms that will retrieve a reasonable set.

In a browsing-based system like *Déjà vu*, users can construct their searches in a progressive fashion. If the first term selected retrieves a very large set of materials, the user can continue browsing for terms that can be conjoined with the selected term to further reduce the retrieved set. Facilitating this progressive search, browsing systems must indicate to users the terms that can be conjoined with the currently selected terms to retrieve a non-empty set. In the *Déjà vu* system, this indication is made using the asterisks that are displayed next to thesaurus terms. After the user has selected the first term, the display rules for asterisks change to facilitate progressive browsing. Only those terms that can be conjoined with the current set of selected terms to retrieve a non-

empty set will be displayed with an asterisk. Figure 3.5 shows the thesaurus term display rules, revised from Figure 3.4 with changes indicated in italicized type.

Characteristics	Examples	Meaning
Boldface text, Asterisk present	Musicians * Concerts * Conductors *	The term is authorized for use as an index term and <i>can be conjoined with the currently selected terms (if any) to retrieve a non-empty set of materials.</i>
Boldface text, Asterisk absent	Rehearsals Tickets Audiences	The term is authorized for use as an index term but is not being used index materials in the current collection <i>or cannot be conjoined with the currently selected terms to retrieve a non-empty set of materials.</i>
Normal text, Asterisk absent	Shows Bandmasters Noises	The term is not authorized for use as an index term and therefore is not being used to index materials in the current collection. The terms linked to it by the <i>Use</i> relationship are authorized.

Figure 3.5. Thesaurus term display rules - Revised

By applying these display rules to thesaurus terms, the progressive search process become quite simple from the user's perspective. They need only to search for thesaurus terms that are displayed with an asterisk, continually selecting more terms until the retrieved set is small enough for them to examine each item.

Because the full range of zooming and browsing mechanisms are available to the user throughout the progressive search, users can locate materials that would be extremely difficult to find, at best, using traditional text-based queries. This is especially true when

users have retrieval needs that juxtapose concepts from very different areas. Examples include searching for photographs of U.S. presidents engaged in sporting events, elderly people working in the entertainment industry, or automobiles caught in a natural disaster. In these cases, users can first select a term from the first area of interest, e.g. *Presidents*, *Aged persons*, or *Automobiles*. Then, they can search for terms with asterisks in the area of the browsing space that concerns the second area of interest. Following this strategy, users can locate materials that they did not know existed when they began their search, e.g. a picture of a Volkswagen floating upside-down in a flooded river. The key to the success of this type of conceptual juxtaposition is a rich browsing space where all of the terms related to a particular area of interest are linked in close proximity to each other. Designing this type of browsing space has been a major interest of this research.

3.2.6 Evaluating the retrieved set

Once that the user has selected one or more terms that have retrieved a reasonable number of materials, the user's final task is to examine the retrieved set of materials to determine if they adequately meet the user's retrieval needs. *Déjà vu* allows users to examine both the cataloging records, which are typically specified by library archivists in Machine Readable Cataloging (MARC) format, and also the media itself if it is available online. Clicking on any of the titles of the retrieval set and pressing the *View Media* button causes *Déjà vu* to launch a viewer application for displaying the media to the user.

Déjà vu places no restrictions on the type of media that is accessible, and any viewer application can be specified. Déjà vu can easily be configured use viewer applications such as web browsers, word processors, and audio or video players. Custom software can also be written that allows Déjà vu to control external media players such as laser videodisc players and video jukeboxes.

3.3 An example retrieval session

To understand the Déjà vu retrieval interface, it will be useful to consider its functionality with regard to a particular retrieval task. For this purpose, consider how a user of an online image collection would use Déjà vu. Let us suppose that this user is a graphic designer at an advertising agency who is looking for photographs to use as part of a print-media campaign for a corporate client. Let us further imagine that the corporate client is manufacturer of nautical navigation equipment for use throughout the nautical industry. Accordingly, the graphic designer is looking for photographs that have something to do with the nautical industry, and they would be especially happy if they could find some that pertain directly to the topic of nautical navigation. In this example, Déjà vu is being used as an interface to a large collection of digital photographs that have been indexed according to their visual content using a standard graphic materials thesaurus, specifically the LCTGM.

The first thing to note is that Déjà vu is particularly well-suited to this type of retrieval task. Rather than searching for a particular image with a known name, the graphic design user's retrieval needs are entirely based on the subject matter of the ideas that they could evoke in the minds of their target audience.

After starting up the Déjà vu system, the graphic design user begins their search by changing the current focus term to one that is closer to their area of interest. To do this, the user decides to use Déjà vu's Pop-up Zoomer to locate a starting term related to the nautical industry. After pressing the button labeled *Focus* which is displayed next to the current focus item, the Pop-up Zoomer is displayed (See Figure 3.6). Typing the characters "Ocean" into the search box and pressing the *Search* button causes the system to display all of the terms in the current thesaurus (in this case, the LCTGM) that have "Ocean" as a sub-string. Seven thesaurus terms are found and displayed in the corresponding list. Notice that these terms are displayed to the user in a number of different ways, some displayed in boldface type and some followed by an asterisk. The Pop-up Zoomer uses the same conventions found in Figure 3.5 to notify the user which terms are authorized for indexing, and which ones index materials in the current collection. Our graphic design user is interested in nautical navigation, so they will select *Ocean travel* as the new focus term. The boldface quality of this term indicates that it is an authorized index term, but the absence of an asterisk indicates that this term is not

being used to index any of the materials in the online collection. This doesn't bother our user, however, for their goal at this point is simply to move the area of interest to one that is close to their retrieval needs.

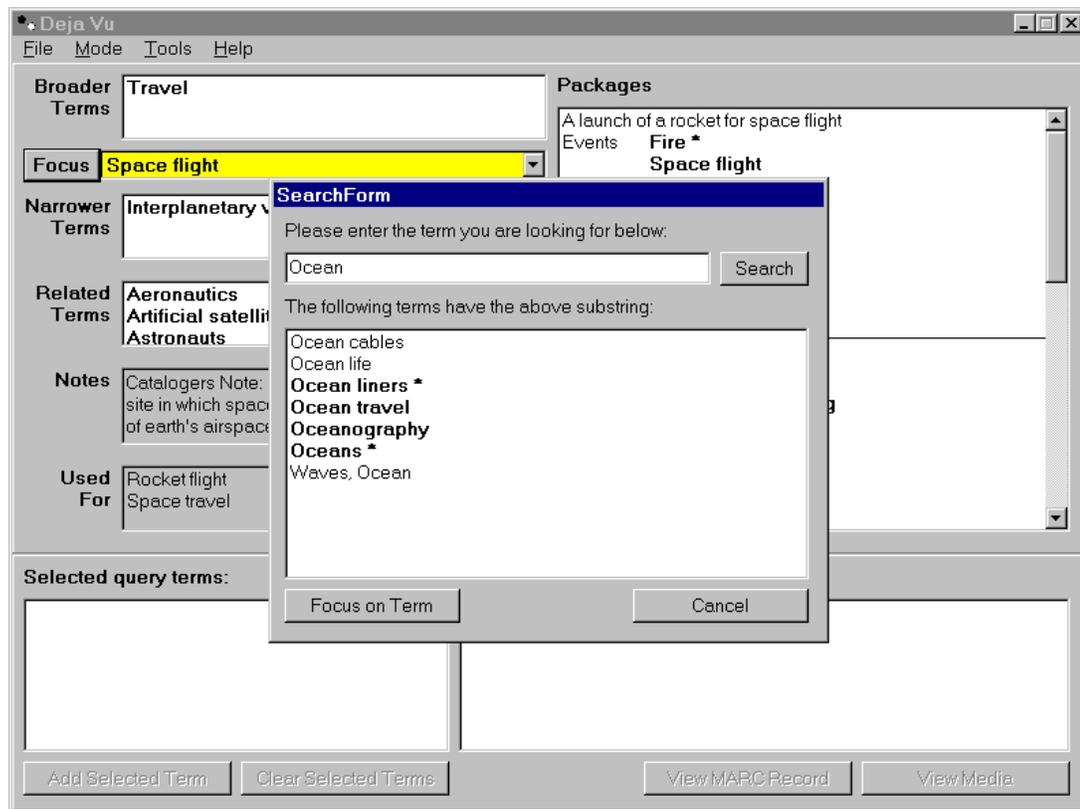


Figure 3.6. The Déjà vu search window

Figure 3.7 shows what the interface would look like after our example user has selected *Ocean travel* as the new focus term using the pop-up search window. It shows that *Ocean travel* has one broader term, *Travel*, and one related term, *Ships*, and is a member of several Expectation Packages that are listed in the upper right of the screen. Looking

through the list, our user finds one that is somewhat related to their retrieval goals, entitled *Exploring for new lands on a sailing ship*. Many of the terms on the screen are displayed with asterisks along side of them, indicating that those terms are being used to index materials in the online collection. As our graphic design user looks over these terms, they will notice that several of these terms look promising toward their goal of retrieving nautically related materials, including *Ships*, *Sailing ships*, *Seas*, *Waterfronts*, *Sailors*, *Maps*, and others which are displayed further up in the list of Expectation Packages.

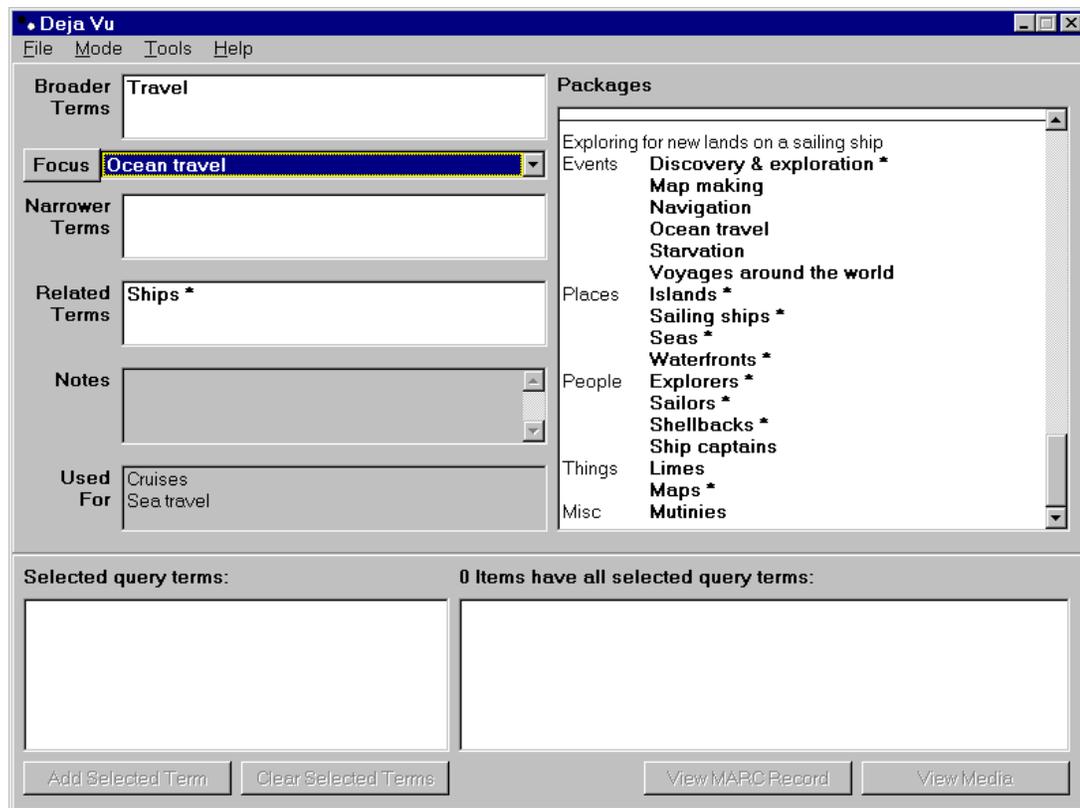


Figure 3.7. Déjà vu in Find Mode with the focus term *Ocean travel*

Although some of these terms may retrieve materials that may be suitable for the retrieval task, our user decides to see if there are any materials directly relevant to the topic of nautical navigation. Our user is happy to have found a very relevant term, *Navigation*, which is presented in the Expectation Packages shown in Figure 3.7. Although it appears that this term is not being used to index any materials in the collection (as indicated by its lack of an asterisk), changing this term to the focus term would be a good way to find out if any materials directly related to navigation exist. Accordingly, the user double-clicks on the term *Navigation*, causing it to become the new focus term. The system updates all of the other lists to reflect this change.

Figure 3.8 shows how the interface looks after the focus term has been changed to *Navigation*. It indicates that *Navigation* has one broader term (*Science*) and many Related terms dealing with both nautical and aerospace navigation. The new focus also has a number of Expectation Packages associated with it, including one that the user finds particularly relevant, called *Navigating at sea using stars and landmarks*. This Expectation Package groups together several terms that our user would be very happy to use to retrieve photographs, especially *Navigation*, *Compasses*, *Sextants*, each of which are directly relevant to their corporate clients area of business. Unfortunately, the user can select none of these terms. None of these terms have asterisks displayed next to them, indicating that none of these terms are being used to index materials in the current

online collection. While our user is somewhat disappointed, they do notice that some other unanticipated opportunities exist. Some of the terms that do have asterisks next to them have something to do with nautical navigation, particularly *Lighthouses*, *Lightships*, and *Maps*, and the photographs indexed with these terms may suffice.

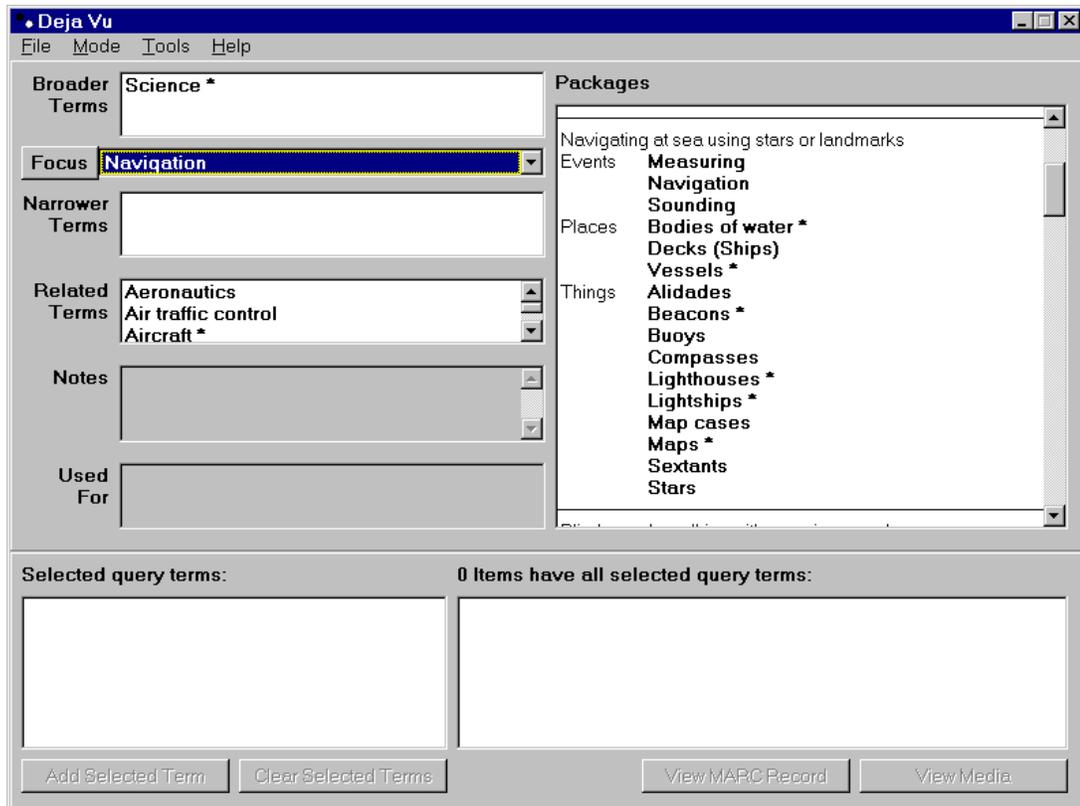


Figure 3.8. Déjà vu in Find Mode with the focus term *Navigation*

Figure 3.9 shows the Déjà vu interface after our graphic design user has selected *Lighthouses* to retrieve the materials indexed using this term. Notice that the term *Lighthouses* now appears in the left list in the bottom section of the screen. A text string

on the right side indicates that this term is being used to index 116 photographs in this collection, and the titles of those items are displayed in the list below it. A comparison of the top sections of Figure 3.8 and Figure 3.9 will reveal that many of the terms that were displaying asterisks now do not. These include the Broader term *Science* and the Related term *Aircraft*, as well as many of the terms in the Expectation Package list, including *Beacons*, *Lightships*, and *Maps*. This indicates that none of these terms are being used as indexes for any of the 116 items retrieved by the term *Lighthouses*. However, asterisks next to *Vessels* and *Bodies of water* indicate that these terms could be conjoined with *Lighthouses* to retrieve some non-empty set of collection items.

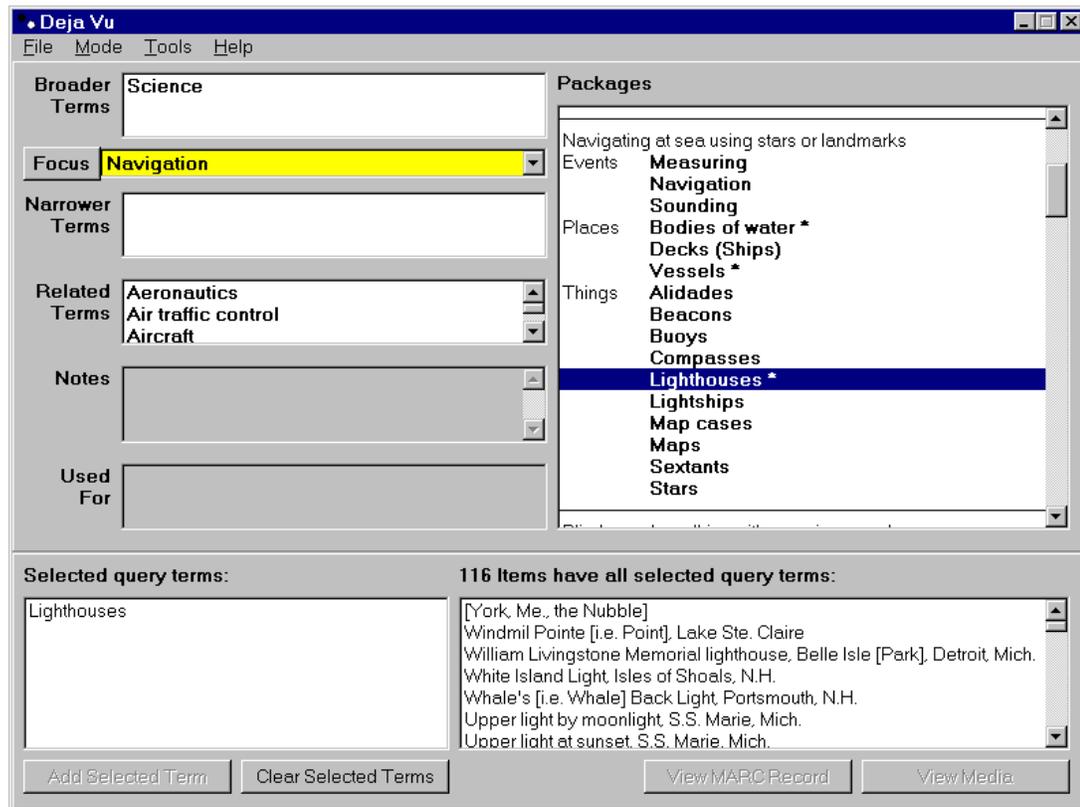


Figure 3.9. Déjà vu in Find Mode after selecting the term *Lighthouses*

116 photographs of lighthouses is a rather large amount of material to sort through, so it may be beneficial for our graphic design user to narrow their search down a bit by selecting an addition term to combine with *Lighthouses*.

It is at this point that the utility of a rich browsing space becomes particularly apparent. Given a large number of associated terms on the screen, each indicating whether or not they can be selected, the user can quickly see what opportunities are available for

reducing the set of retrieved items to a more reasonable number. Our graphic design user can quickly see that combining Lighthouses with *Vessels* or *Bodies of water* would reduce the retrieved set. Better still, the user may decide that none of the terms that reside on the current browsing screen are appropriate. If this is the case, the user could change the focus to a completely different portion of the browsing space to find materials that combine indexes from very areas of interest. By browsing around other areas, the user may be able to find pictures of lighthouses that contain elements associated with family life, the automotive industry, or even criminal justice. Of course, the user may not be able to find photographs indexed using very bizarre combinations of terms, but having a rich browsing space allows users to see what possibilities are available, and to easily locate the most appropriate images that the collection has to offer.

Our graphic design user is not looking for particularly bizarre photographs, but does have particular needs. While photographs of lighthouses are good, the best ones will depict scenes where their functionality as navigational aids is apparent. The user decides that lighthouse photographs that have vessels in them will be preferable to those without, so they click on the term *Vessels* and the *Add Selected Term* button to further refine the retrieved set. The system then updates the display as shown in Figure 3.10. Notice that *Vessels* conjoined with *Lighthouses* now retrieves 14 items, a much more reasonable amount to sort through.

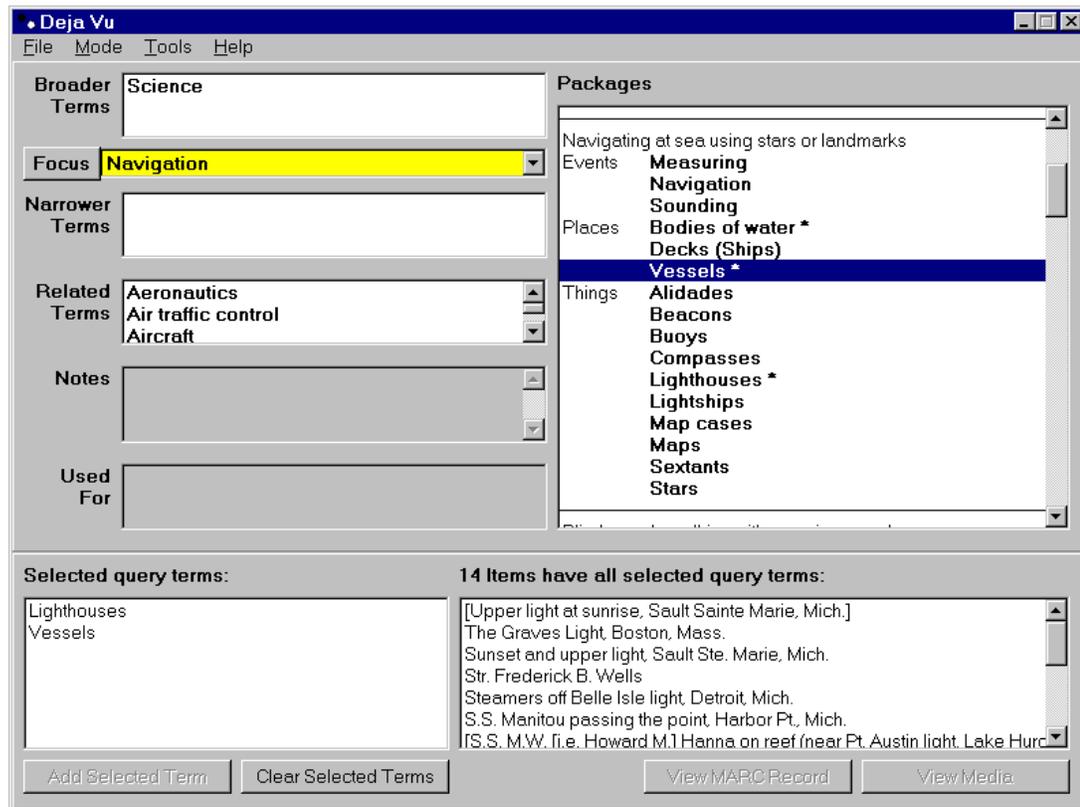


Figure 3.10. Déjà vu in Find Mode after selecting *Lighthouses* and *Vessels*

Our graphic design user can examine each of the 14 digital photographs that were retrieved using the terms *Lighthouses* and *Vessels*, looking for one that meets their secondary requirements of image quality, color schemes, or compositional creativity. In our example application, clicking on the item labeled *The Graves Light, Boston, Mass.* causes the system to launch a web browser to download an image from an Internet repository of digital photographs to display the image shown in Figure 3.11. If none of

the images are suitable, the user can begin a new search by clicking the *Clear Selected Terms* button at the lower left-hand corner of the screen.



Figure 3.11. Photographer unknown. c.1906. The Graves Light, Boston, Mass. Library of Congress, Prints and Photographs Division, Detroit Publishing Company Collection.

The functionality provided by the Déjà vu system supports this graphic design user at every point in the browsing process. Importantly, the success of this retrieval example also relies heavily on the quality of the browsing links that were provided at every step. Chapter 4 presents the second theoretical contribution of this dissertation: a theory of what constitutes an effective browsing space and a methodology for developing them in an efficient manner.

CHAPTER 4: EXPECTATION PACKAGES

The utility of a browsing interface depends entirely upon the quality of its links. In *Déjà vu*, where users traverse a browsing space of thesaurus terms, it is necessary to provide users with a rich set of interconnections between terms to support the browsing process. In this chapter, I argue that the set of links provided by standard thesauri is too sparse. I propose that an effective way of increasing the density of interconnections between terms is to cluster terms into groups. Expectation Packages are introduced, which are structured clusters of terms developed by applying a cognitive theory to a thesaurus. A methodology for developing a set of Expectation Packages for a particular thesaurus is offered. Finally, a list of heuristics are presented that were formulated while developing Expectation Packages for a particular thesaurus, the Thesaurus for Graphic Materials (LCTGM).

4.1 Developing a rich browsing space

There are three primary functions that a browsing space of thesaurus terms must serve for retrieval users. These three functions are listed below, with examples using the terms found in the LCTGM.

First, the browsing space must provide a set of links that a retrieval user can traverse in order to locate a term when they do not know its particular textual label. This allows the user to locate the best term for their retrieval needs once they have entered a portion of the browsing space that is close to their area of interest. For example, the LCTGM contains many terms which have somewhat arbitrary textual construction. For instance, the concept captured by the term *School meals* could have been indicated with the non-existent terms *School lunch* or *Lunchroom meals*. Rather than trying to guess the name of the term, a user who is unfamiliar with the thesaurus should be able to locate *School meals* by following direct links from related terms such as *School children*, *Cafeterias* or *Children eating and drinking*. This implies a particular strategy that users can employ to locate terms: using links from terms with less esoteric textual labels to locate those with more idiosyncratic labels.

Second, the browsing space offers users reasonable possibilities that they hadn't considered. While traversing the browsing space, users are presented with a number of terms that are not the ones they had initially thought of using to retrieve materials. However, upon seeing terms that are closely related to the ones they were initially going to use, users may refine or change their retrieval goals to take advantage of an opportunity facilitated by a rich browsing space. For example, a graphic design user may have been interested in retrieving images of school children to be used in a print media

advertising campaign. While focused on the term *School children*, a rich browsing space should offer them related terms that may also suit their retrieval needs. If presented with related terms such as *Buses* or *Busing (School integration)*, the graphic design user may decide that pictures of school buses would be more iconic than pictures of kids in the advertising they were constructing, and retrieve items using these terms instead of *School Children*. While some types of retrieval tasks do not afford this kind of spontaneity, a rich browsing space facilitates users who could benefit from this functionality without hindering those who do not.

Third, the browsing space offers users alternative terms when the ones that they hoped to use are inadequate. Sometimes, users will not be happy with any of the materials indexed by the term that best captures their retrieval needs. Other times, it may be the case that the best term is not being used to index any of the items in the current collection. In these cases, it will be necessary for the retrieval user to select different index terms to retrieve usable materials. A good browsing space will link the desired term to all of the terms in the thesaurus which may be used to index the same or very similar materials. For example, a book publisher may be interested in finding photographs of school children hard at work in academic studies, but using the term *School children* retrieves no usable items. Links to terms such as *Children reading & writing* and *Examinations* offer the publisher alternatives which may retrieve materials

that exactly meet their needs. This functionality is especially useful when retrieving materials from archives that are very sparsely indexed. In cases where catalogers chose single terms like *Children reading & writing* to capture multiple concepts (such as *School children, Education, Books, and Writing materials*), a good browsing space provides retrieval users with a means of finding materials that are not completely indexed by their content.

Accepting that these three functions are important components of a rich browsing space, it is easy to see that the links provided in standard thesauri that are in use today are not adequate for the browsing task.

4.1.1 Standard thesaurus links are too sparse

Although the syntactic structure of standard thesauri is designed to interconnect related authorized terms through taxonomic and associative links, the quantity of interconnections between terms in existing thesauri cannot be considered to be rich by any standard. A recent release of the LCTGM consisted of 4421 reflexive taxonomic links (Broader and Narrower term pairs) and 5888 reflexive associative links (Related term pairs). Added together, there are a total of 20618 unidirectional links divided amongst 5760 authorized terms, or 3.58 links per term on average.

The key question to ask here is: How many browsing links are enough? In the ideal case, each term in the thesaurus should be linked to all of the other terms in the thesaurus that support the three browsing functions listed above. Standard thesauri like the LCTGM are grossly under-connected by this criteria. Consider the links that are provided for the term *School children* in the LCTGM, as shown in Figure 4.1. This term has a total of five links, above the average for the LCTGM, consisting of a single broader term and four related terms.

School children
BT <i>Children</i>
RT <i>Classrooms</i>
<i>School Recesses</i>
<i>Schools</i>
<i>Students</i>

Figure 4.1. Taxonomic and Associative links for the term *School children*

However, it is clear that there are there other terms in the thesaurus that should be directly linked to the term *School children*. Just flipping through the list of terms in the LCTGM, it is easy to find terms that are at least as relevant to *School children* as the four related terms that are provided, including *Teachers*, *School discipline*, *School meals*, and *Children reading & writing*. If we consider all of the terms which should be directly linked to *School children* to support the three functions of a good browsing space, the list of possible linked terms becomes very large indeed. Figure 4.2 lists 50 terms that may be good candidates for direct links.

1. <i>Blackboards</i>	26. <i>Locker rooms</i>
2. <i>Bus stops</i>	27. <i>Music rooms</i>
3. <i>Buses</i>	28. <i>Musical instruments</i>
4. <i>Busing (School integration)</i>	29. <i>Nutrition</i>
5. <i>Cafeterias</i>	30. <i>Physical education</i>
6. <i>Calisthenics</i>	31. <i>Playgrounds</i>
7. <i>Children eating & drinking</i>	32. <i>Questioning</i>
8. <i>Children exercising</i>	33. <i>Queues</i>
9. <i>Children fighting</i>	34. <i>Raising hands</i>
10. <i>Children misbehaving</i>	35. <i>Rehearsals</i>
11. <i>Children playing</i>	36. <i>Religious education</i>
12. <i>Children playing musical instruments</i>	37. <i>School discipline</i>
13. <i>Children playing outdoors</i>	38. <i>School meals</i>
14. <i>Children reading & writing</i>	39. <i>School recesses</i>
15. <i>Church & education</i>	40. <i>School safety patrols</i>
16. <i>Church schools</i>	41. <i>Sports</i>
17. <i>Coaching (Athletics)</i>	42. <i>Sunday schools</i>
18. <i>Community service</i>	43. <i>Teachers</i>
19. <i>Conformity</i>	44. <i>Teaching methods</i>
20. <i>Crosswalks</i>	45. <i>Thinking</i>
21. <i>Desks</i>	46. <i>Traffic regulations</i>
22. <i>Discussion</i>	47. <i>Uniforms</i>
23. <i>Education</i>	48. <i>Writing materials</i>
24. <i>Examinations</i>	49. <i>Youth bands</i>
25. <i>Gymnasiums</i>	50. <i>Youth orchestras</i>

Figure 4.2. 50 LCTGM terms related to *School children* in some direct way

If the LCTGM is to be used as a browsing space for retrieval, direct links between the term *School children* and all of the terms listed in Figure 4.2 should be included. While it is difficult to argue that adding these links would be detrimental to the thesaurus, it is easy to see why these terms are not currently connected via Related Terms links. Even though the LCTGM is of relatively modest size (5760 authorized terms), significantly

increasing the number of interconnections between terms is a laborious task. Merely increasing the average number of links to five per term (the number that *School children* currently has) would require an additional 8,182 unidirectional links (4,091 additional Related Term pairs). At this rate, the thought of increasing the average number of links by just 10 extra terms seems impractical, requiring an additional 57,600 unidirectional links (28,800 additional Related Term pairs).

4.1.2 Clustering terms efficiently improves connectivity

There are no simple ways to instantly create a rich browsing space. The best that developers can hope to do is maximize the payoff of every bit of linking work that goes into a thesaurus. One way to greatly reduce the amount of work necessary to provide a rich browsing space is to change the way that developers link terms. Currently, thesaurus developers generate one-to-one connections between thesaurus terms (specified as lists of Broader, Narrower, or Related Terms). An alternative approach is to generate connections by clustering thesaurus terms into fully connected groups. That is, designers can identify groups of terms where each member of the group should be linked with every other member.

Clustering terms into fully connected groups has the potential to significantly increase the number of interconnections created for a given amount of linking work, as compared

to the one-to-one linking methods currently employed. For every fully-connected cluster that is assembled of size n , the number of unidirectional links created is equal to $n(n - 1)$. For example, creating a list of 10 Related Terms via traditional one-to-one linking generates 20 unidirectional links ($2n$). In contrast, creating a fully connected cluster of those 11 terms (including the term from which the links originate) generates 110 unidirectional links.

As an example of the advantages of clustering terms over developing traditional one-to-one connections, consider how the 50 terms in Figure 4.2 could be interconnected. Figure 4.3 shows the 50 terms in Figure 4.2 organized into eight reasonable clusters. The first cluster in Figure 4.3 provides seven new links to the term *School children*, but it also provides seven new links for each of the members of this cluster. The term *Discussion*, for example, would be linked using this cluster to the terms *School children*, *Blackboards*, *Education*, *Questioning*, *Raising hands*, *Teachers*, and *Teaching methods*. In this manner, this first clustering of eight terms (including *School children*) does not merely represent 14 new unidirectional Related Terms links for *School children*, but rather 56 unidirectional related terms links between all of the members of this cluster. With the term *School children* included as a member in each cluster, these 50 terms generate 368 new unidirectional links, compared to the 100 unidirectional links that

would be created if each of these terms served only as one side of Related Term links to *School children*.

Clustered Terms	Reason for clustering	terms	links
<i>Blackboards, Discussion, Education, Questioning, Raising hands, Teachers, Teaching methods</i>	Each of these terms have to do with the interaction between teachers and school children in a classroom setting.	8	56
<i>Children reading & writing, Writing materials, Examinations, Desks, Thinking</i>	Each of these terms have to do with the schoolwork that school children engage in a classroom setting.	6	30
<i>Cafeterias, Children eating & drinking, Nutrition, School meals, Queues</i>	Each of these terms have to do with school children eating lunch in a school cafeteria.	6	30
<i>Calisthenics, Children exercising, Coaching (Athletics), Gymsnasiums, Physical education, Locker rooms, Sports</i>	Each of these terms have to do with physical education and sports that school children engage in while in school.	8	56
<i>Bus stops, Buses, Busing (School integration), Crosswalks, Traffic regulations, Community service, School safety patrols</i>	Each of these terms have to do with school children traveling to or from school using buses or walking.	8	56
<i>Church & education, Church schools, Conformity, Religious education, Sunday schools, Uniforms, School discipline</i>	Each of these terms have to do with school children and religious education.	8	56
<i>School recesses, Children playing, Children playing outdoors, Children fighting, Playgrounds, Children misbehaving</i>	Each of these terms have to do with school recesses and school children playing outside on playgrounds.	7	42
<i>Children playing musical instruments, Music rooms, Musical instruments, Youth bands, Youth orchestras, Rehearsals</i>	Each of these terms have to do with school children participating in organized musical groups or instruction.	7	42

Figure 4.3. Eight clusters of fifty terms related to *School children*

While on the surface it is easy to see that clustering terms is a potentially efficient way of creating a richly interconnected browsing space, many issues must still be addressed. Most importantly, it is necessary to have some criteria for determining which terms in a thesaurus should be clustered into a particular fully-connected group. It would be unreasonable to assemble these clusters by randomly selecting member terms from a thesaurus. Accordingly, some organizational theory is required. In addition, some methodology for explicating a set of clusters for a given thesaurus must be devised. These two issues are discussed in detail in the next two sections.

4.2 Expectation Packages

The previous section argued that clustering terms into fully-connected groups is an efficient way to create a richly-interconnected browsing space. Missing from this discussion is any direction for how terms should be clustered, what size groups are appropriate, or how many clusters are appropriate for each term. This section begins to address these concerns by introducing Expectation Packages, a new knowledge structure for representing clusters of terms. Expectation Packages are structured clusters of terms developed by applying a cognitive theory to a thesaurus.

4.2.1 Clustering requires an organizational theory

While the number and content of the clusters listed in Figure 4.3 is debatable, it is difficult to argue that these groupings are unreasonable. In fact, it seems that people implicitly understand that these groups (or ones like them) are congruent with their expectations about the lives of school children. Taking a cognitive standpoint, there must be some underlying knowledge structures which account for the reasonability of these groupings. That is, there is some background knowledge that members of our culture possess that makes it easy to see the connections between groups of terms such as *School children*, *Cafeterias*, *Nutrition*, *School meals*, *Children eating & drinking*, and *Queues*. By identifying the sort of knowledge that accounts for this understanding of interrelationships between terms, we can design clusters of terms that are cognitively based.

One approach is to turn to cognitive science theories of knowledge organization to provide a basis for determining how terms should be clustered within a particular thesaurus. The resulting clusters would reflect our best understanding of how commonsense knowledge is organized and how this organization accounts for expectations about the interrelationships between terms. In this research, clusters developed using a specific cognitive theory of knowledge organization are referred to as *Expectation Packages*. This designation reflects the two most prominent characteristics

of these clusters. First, they *package* together related terms from a thesaurus into interrelated clusters. Second, they codify the knowledge organization that accounts for the *expectations* that people have about the interrelationships between thesaurus terms.

Expectation Packages need not be complicated structures. At the very least, an Expectation Package consists of a list of member terms. For display and identification purposes, Expectation Packages are given some textual title that distinguishes them from each other. The organizational theory used in the development of Expectation Packages may require some additional structural components as well, such as special ordering or grouping of member terms. The Déjà vu system supports Expectation Package structure consisting of an unordered list of member terms that can be subdivided into a fixed number of *slots*. These slots support the representation of role-filler pairs which are often employed in knowledge representation tasks.

4.2.2 Scripts: An organizational theory for the LCTGM

As an example of how an organizational theory can be applied to a thesaurus, consider how a cognitive theory can be applied to the LCTGM. To develop Expectation Packages for a thesaurus, it is necessary to locate or construct an organizational theory which can account for the expectations that people have concerning the interrelationships between terms. To be an appropriate organizational theory, it must be one that has

something to say about the concepts that the thesaurus terms reference. The LCTGM is a thesaurus of index terms for graphical materials, and consists of indeterminate terms for people, places, things, activities, and some abstract concepts. Accordingly, an appropriate organizational theory will be about the expectations that people have regarding these entities.

Fortunately, the issue of understanding our expectations about people, places, things, and activities has been a central focus of a large body of cognitive science research over the last 20 years. The most thorough treatment of this topic has been developed for the purpose of computer programs for natural language understanding. Schank and Abelson (Schank and Abelson 1977) introduced the theory of *scripts*, which encode for computers our culturally shared knowledge about the common and ritualized activities of our daily lives. With scripts, common activities like going to a restaurant for a meal or riding the subway are encoded in computer-readable syntax. These activities are described with regard to the places that they occur, the roles that people play in the activity, the physical objects which play some part, and the series of actions that people expect to happen. Initially designed to help control the process of inference, scripts were applied in computer applications for understanding stories (Cullingford 1978; DeJong 1977; Lehnert 1978), and later served a starting point for the development of a model of memory organization (Schank 1982).

Scripts constitute a cognitive theory of how concepts are interrelated in memory. Expectation Packages, on the other hand, serve to represent these interrelationships with regard to thesaurus terms. Figure 4.4 illustrates this distinction by depicting two separate levels of interest. At the cognitive level, we have a theory of scripts and how they organize concepts in memory. Expectation Packages exist on the representational level, and attempt to mirror this organization with regard to thesaurus terms. There is, however, an imperfect correspondence between concepts at the cognitive level and thesaurus terms. As cognitive scientists, we must believe that concepts are richly represented entities constructed from a generative vocabulary. Thesaurus terms, however, consists of unitary lexical tokens, and refer to only a small subset of the concepts that scripts can operate upon.

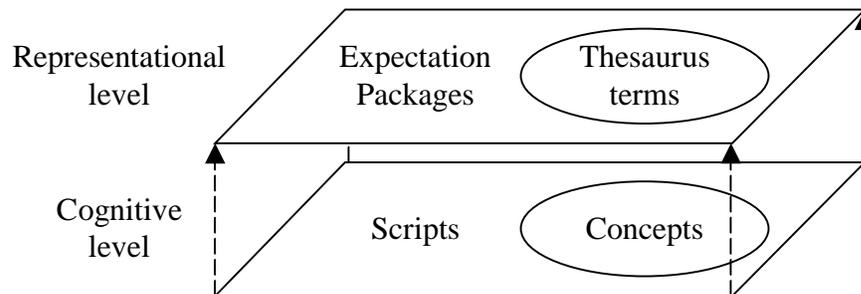


Figure 4.4. The relationship between cognitive theory and Expectation Packages

In order to use the cognitive theory of scripts as an organizational theory for Expectation Packages in the LCTGM, it is necessary to extract from the theory principles that govern

the interrelationship between concepts, and map these principles to the representational domain. As an organizational theory, scripts give us a number of important constraints for specifying the contents of clusters of thesaurus terms. These are:

1. Each script is defined around a commonly understood, ritualized activity.
Accordingly, when clustering terms into Expectation Packages, a central activity should be identified.
2. Each script can be divided into scenes, which constitute sub-activities of the larger activity. Terms that refer to these sub-activities, as well as those that refer to the larger activity itself, should be included in the Expectation Package.
3. Each script has a set of roles that are played out by the people who engage in the activity. Terms that refer to these roles should be included in the Expectation Package.
4. Each script has a setting that constitutes the places in which the activity happens. Terms that refer to these places should be included in the Expectation Package.
5. Each script has a set of props that are the physical objects that that are used in the activity. Terms that refer to these things should be included in the Expectation Package.

Schank and Abelson (1977) discuss in detail one particular script, that for the activity of going to a restaurant for a meal. In their representations, scripts are composed of a *header* and a *body*. For the purpose of natural language processing, the headers of scripts are designed to provide triggers which cause the parser to consider the application of the script to a current understanding problem. Headers trigger the application of a script by encoding preconditions for engaging in a script, the instrumental outcomes that a script achieves, the typical locations that a script takes place, and the props or roles that are the things or people that participate in the script. Figure 4.5 shows the header of the restaurant script.

Script: RESTAURANT	Entry Conditions:
Track: Coffee Shop	S is hungry.
Props: Tables	S has money.
Menu	Results:
F-Food	S has less money
Check	O has more money
Money	S is not hungry.
Roles: S-Customer	S is pleased (optional)
W-Waiter	
C-Cook	
M-Cashier	
O-Owner	

Figure 4.5. Header from the restaurant script (Schank and Abelson 1977)

For the purpose of designing Expectation Packages that are based on scripts, the header of this script is very useful. Many of the concepts described in the header directly correspond to terms in the LCTGM. For example, the name of the script itself argues

for the inclusion of the term *Restaurants* in the Expectation Package inspired by this script. This script represents a particular track, or specialization, of one's expectations about restaurants, namely that of a Coffee Shop, which may correlate to the terms *Coffeeshouses* or *Cafes*. The roles of waiter and cook suggest the inclusion of the terms *Waiters* and *Cooks*. The props of tables, menu, food, and money correspond to terms *Dining tables*, *Menus*, *Food*, and *Money*. The concepts in the entry conditions and results of the script are a bit more abstract than in the rest of the header, but they may be associated with LCTGM terms as well. For example, The term *Starvation* could arguably be included to capture the idea that the customer is hungry. There are some roles and props, such as cashier and check, which have no corresponding LCTGM term and cannot be represented in the Expectation Packages. However, given the role of Expectation Packages to richly connect terms that are in the thesaurus, the absence of these concepts from the Expectation Package does not pose a serious problem. The issue that is more of concern is the existence of thesaurus terms that probably should have corresponding concepts that appear in the restaurant script header. These terms include *Cash registers*, *Condiments*, *Silverware*, *Table settings & decorations*, and *Tableware*, *Waitresses*, and *Restaurant workers*. Although the concepts associated with these terms are not identified in the script, it must be assumed that if the restaurant script were to be fully represented, it would include conceptual corollaries for these terms as well. Accordingly, these terms will also be included in the Expectation Package.

The body of the restaurant script contain a description of the events that are expected to occur when eating a restaurant, such as receiving the menu from a waiter, ordering food, serving and eating the ordered food, and paying a bill. Schank and Abelson describe each of these events in a representational vocabulary known as Conceptual Dependency (Schank 1972). Conceptual Dependency was designed to provide a set of canonical conceptual primitives for use in natural language processing computer systems.

Conceptual Dependency is a useful representational tool for decomposing complex events and actions into a sequence of simple and unambiguous units. In the LCTGM, however, complex events and actions are referred to using single terms. For example, in the restaurant script, the action of paying the bill is represented as a series of eight Conceptual Dependency forms. For the corresponding Expectation Packages, the single term *Paying bills* is preferred. Of all of the events that make up the restaurant script, there appears to be only two terms in the LCTGM, *Eating & drinking* and *Paying bills*, that can represent these events in the Expectation Package. These terms should be included in the Expectation Package. Again, it is of little concern that the LCTGM does not contain the terms *Ordering* or *Serving*, as the purpose of Expectation Packages is not to accurately represent scripts, but rather to interconnect existing terms in a thesaurus.

Given this analysis of the restaurant script, a straightforward Expectation Package structure for the LCTGM can be devised. Déjà vu allows for Expectation Packages that consist of a textual title, and an unordered set of thesaurus terms which can be divided into a fixed set of slots. The terms that correspond to elements in the restaurant script fall into five basic categories, each of which will constitute a slot for terms in the Expectation packages for the LCTGM. Figure 4.6 summarizes the slots used for LCTGM Expectation Packages.

Slot	Corresponding Script Elements
Events	Terms corresponding to the events represented in the body of the script.
Places	The location of the script, encoded in the script title or track.
People	The roles of the script.
Things	The props of the script.
Misc	The abstract ideas that are encoded in the entry conditions or results of a script.

Figure 4.6. Slots used in LCTGM Expectation Packages

While slots provide a slight bit of added organization to an otherwise unorganized list of Expectation Package member terms, their primary purpose is assist in the development of Expectation Packages. While there are no requirements that each slot be filled with some positive number of terms, their existence reminds Expectation Package designers to consider each of these conceptual elements when searching for terms to include in each Expectation Package.

Figure 4.7 shows an Expectation Package that directly corresponds to the restaurant script. Although the representation of the script as a set of thesaurus terms eliminates much of the conceptual complexity that scripts encode, many of the constituent concepts have direct correlates in LCTGM terms. While this Expectation Package would fare poorly as a representation for use in computer reasoning systems, it serves as an excellent structure for browsing through subject terms.

Going to a restaurant for a meal	
Events	<i>Eating & drinking, Paying bills</i>
Places	<i>Cafes, Coffeehouses, Restaurants</i>
People	<i>Cooks, Restaurant workers, Waiters, Waitresses</i>
Things	<i>Cash registers, Condiments, Dining tables, Menus, Money, Silverware, Table settings & decorations, Tableware</i>
Misc	<i>Starvation</i>

Figure 4.7. An Expectation Package based on the restaurant script

4.3 Creating Expectation Packages

The previous section introduced Expectation Packages, a new knowledge structure for representing clusters of thesaurus terms by applying a cognitive theory. Remaining to be addressed is the issue of how a set of Expectation Packages can be generated for a particular thesaurus. This section offers a methodology for creating a full set of Expectation Packages, describes how this methodology was applied to the LCTGM, and

lists a set of heuristics that were learned through the application of this methodology to this thesaurus.

4.3.1 A methodology for creating Expectation Packages for a thesaurus

When creating a set of Expectation Packages for a thesaurus, there are no shortcuts. The person assigned the task of generating a set of Expectation Packages (referred to as the *author* in this section) must carefully consider every single authorized term in the thesaurus. For each term, the author must create each of the Expectation Packages for which the term is a member. While there is simply no way of avoiding this work, DeJa Vu was designed to support a particular generation methodology that minimizes redundant effort. The basic process involves consideration of each authorized term in the thesaurus in a sequential order (any ordering is appropriate, e.g. alphabetical). Beginning with the first term and proceeding sequentially to the last term, the author must complete several tasks.

First, the author must create all of the new Expectation Packages for which the current term is a member. Largely an introspective process, this involves a self-evaluation of the background knowledge that the structure of the Expectation Packages have been designed to capture. It is helpful to first determine what slot or slots the current term would likely fill in the Expectation Package structure used for the given thesaurus, and

then to consider the most obvious Expectation Packages that could be built with the term in the given slot. Each Expectation Package should be created in full, i.e. each of the slots in the new Expectation Packages should be filled out in their entirety. Some omissions and mistakes will undoubtedly be made, but are often corrected as the sequential consideration of terms progresses.

Second, the author must add the current term to any Expectation Packages previous created in the process that should have included the term, but were incompletely specified by the author. Explicating a full set of Expectation Packages is easiest when authors are very familiar with the contents of the thesaurus. Even in the best cases, however, there will exist some terms that the author was unaware of when creating new Expectation Packages. When these terms are encountered through sequential consideration of terms, they must be added to each of the Expectation Packages that already exist that should contain them as members. In some cases, especially when a single author explicates an entire set of Expectation Packages, they will recall the appropriate Expectation Packages to which the current term should have been added upon its consideration. More likely, however, the author may not be able to recall all of the Expectation Packages previously created which should contain the current term. In these cases, it is best to create new Expectation Packages for the current term as if no previous Expectation Packages exist. However, during the process of finding terms for

the new Expectation Packages, the knowledge engineer should inspect the ones that have already been created for the new member terms to see if they are doing redundant work. Even if created at different times or by different authors, redundant Expectation Packages will often share many (if not most) of the same terms, so noticing the overlap is not difficult. When Expectation Packages are found to be identical, the author simply deletes the partially completed Expectation Package that they were creating, and supplements the old Expectation Package with any missing terms.

Third, the author must verify that the current term should indeed be a member of each of the Expectation Packages that were previously created containing the term. Even the most careful author may have not fully understood the context and use of the current term when they added it to Expectation Packages created when considering earlier terms in the sequential progression. In some cases, using a Broader or Narrower Term may have been more appropriate. In other cases, closely reading the Catalogers, History, and Public Notes associated with the current term may reveal that the concept indexed by the term is not the one that the author originally had in mind. Completing this task ensures that every Expectation Package member is given consideration at two different times in the creation process: once when the Expectation Package is originally created, and again when the member terms are considered while sequentially traversing through the terms.

While these tasks are laborious, there are a couple of features of this methodology that makes it tractable even for thesauri of significant size. First, since Expectation Packages are created in full as member terms are considered in sequential order, the majority of new Expectation Packages are created at the beginning of this process. By the time that the author considers terms that are later in the sequence, the majority of Expectation Packages for those terms will already exist. The third task in the consideration of terms, verifying appropriate Expectation Package membership, is much less time consuming than the creation and modification tasks. Accordingly, the author will find that the latter majority of terms can be quickly considered during the sequential progression.

The second advantage of this methodology is that work done early in the process serves as scaffolding for work to be done later in the process. In using the authoring functionality provided by *Déjà vu*, each new Expectation Package that is created improves the browsing space of the current thesaurus, making it easier to locate terms that should be included in Expectation Packages created later. As authors progress through the sequential ordering of thesaurus terms, they will change the way they locate members of Expectation Packages. In the beginning, authors must rely on their own familiarity with the thesaurus, the standard links provided with the thesaurus, and the text-based thesaurus search tools to locate terms for inclusion in new Expectation Packages. As the process continues, authors can begin to rely more heavily on the

Expectation Packages that they have already created to browse the thesaurus terms to locate the ones they need.

4.3.2 Example: Expectation Packages for the LCTGM

As a demonstration of this methodology and for the purpose of user testing the Déjà vu system, a complete set of Expectation Packages were created for the LCTGM. This work was done by me alone, and took approximately four months of half time work (approximately two person-months of work). This work was done using the authoring functionality provided in the Déjà vu system and following the methodology described above. The organizational theory used was scripts with an Expectation Package structure consisting of slots for Activities, Places, People, Things, and Miscellaneous terms, as described in the previous section. When completed, statistics regarding the set of Expectation Packages were calculated, and are displayed in Figure 4.8. The full set of 770 Expectation Packages for the LCTGM are given in the appendix to this dissertation.

A. Authorized Terms	5,760 Terms
B. Expectation Packages created	770 Expectation Packages
C. Total Expectation Package members	9,417 Terms
D. Average Expectation Packages per term ($C \div A$)	1.63 Expectation Packages per term
E. Average Expectation Package size ($C \div B$)	12.23 Terms per Expectation Package
F. Unique unidirectional links generated	100,894 Links
G. Redundant unidirectional links generated	13,416 Links
H. Average unique links generated per term ($F \div A$)	17.52 Links per term

Figure 4.8. Statistics for the Expectation Packages created for the LCTGM

Of special interest in Figure 4.8 is the number of unique and redundant unidirectional links that were created by the set of Expectation Packages. To calculate these numbers, every authorized term in the thesaurus was examined to see how many terms were directly linked to it via an Expectation Package. Since Expectation Packages sometimes overlap slightly, some redundant links are created. For example, the LCTGM term *Money* is linked to the term *Banks* both through the Expectation Packages that capture the activity of going to a bank to make a transaction and that of a bank robbery. In the first Expectation Package, *Money* refers to the thing that a customer at a bank deposits or withdraws, while in the second Expectation Package, *Money* refers to the thing that a bank robber will be stealing. Therefore *Money* is linked to *Banks* twice through these Expectation Packages, which is counted as one unique link and one redundant link.

Figure 4.9 is a graph of the number of unidirectional links generated by different subsets of the Expectation Packages created for the LCTGM. The graph indicates that additional Expectation Packages improved connectivity throughout the process, but with an additive amounts of redundancy.

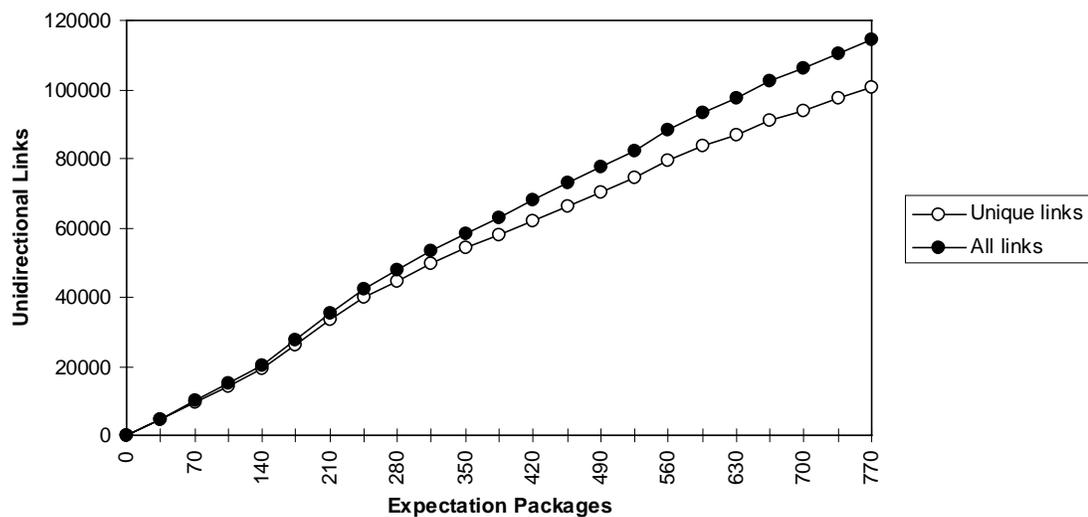


Figure 4.9. Unidirectional links generated for the LCTGM

It is interesting to compare the amount of connectivity generated by the work that went into creating 770 Expectation Packages to what would have been generated if this work had gone into traditional one-to-one Related Term linking. If we make the assumption that the work required to create a Related Term link is roughly equivalent to the work required to add a single term to an Expectation Package, we can calculate the advantage of clustering over traditional methods. If the 9,417 terms that make up the 770

Expectation Packages were equated with 9,417 Related Term links, this would generate 18,834 unidirectional links, or 2.27 links per authorized term. In contrast, the 770 Expectation Packages generated 100,894 unique unidirectional links, accounting for 17.52 links per authorized term. Considering the small number of standard links that existed in the LCTGM without Expectation Packages (an average of 3.58 links per term), this approach offers an efficient way to provide a rich browsing space of thesaurus terms.

4.3.3 Heuristics for Expectation Packages development

The task of explicating a full set of Expectation Packages for a thesaurus is not well defined. The desired outputs of the process are not well specified, and difficult to evaluate. Throughout the process of creating Expectation Packages, it is challenging to determine when each piece of work is complete and when it is time to move on. While no evaluative tools are offered here to assist in the development of Expectation Packages, there are a number of heuristics that were formulated while creating the Expectation Packages for the LCTGM which may be valuable to people working on other thesauri.

Heuristic 1: Skip terms that you have no expectations about

The task that the person is engaged in while explicating a set of Expectation Packages is to introspect upon and encode their own background knowledge with regard to the concepts captured in the terms of a thesaurus. Accordingly, when faced with terms that they simply have no expectations about, no Expectation Packages should be created. For example, in the course of sequentially considering terms in the LCTGM, no Expectation Packages were generated that include the terms *Aluminum industry*, *Cave churches*, *Mongoose*, *Paisley*, or *Vice presidential seal*, among many others. While each of these terms may refer to concepts that are part of someone else's background knowledge and expectations, none of them play a role in the knowledge that I can introspect over through self-analysis.

Heuristic 2: Do not include Expectation Packages with only a few of members

In the course of considering every term in a thesaurus, there will be Expectation Packages that you will want to create that cannot be well represented with the vocabulary offered in the thesaurus. Of course, it is not possible to include terms in an Expectation Package that do not exist, so it is often necessary to develop Expectation Packages that lack many of the critical components that the organizational theory would recommend. In some cases, the vocabulary may be so impoverished that it is of little value to construct an

Expectation Package at all, as it would consist of terms referring to merely a couple of the key concepts involved. For example, the LCTGM term *Calculators* brings to my mind the script of using a calculator, which involves pushing buttons corresponding to mathematical operations and numbers appearing on a liquid crystal display, stashing the calculator in a shirt pocket or a briefcase, and applying equations to scientific data. As it turns out, the LCTGM contains only a couple of terms with any relationship to this script: *Calculators* and *Mathematics*. Creating an Expectation Package consisting of only these two terms would have some value, as there is no direction connection between these terms in the LCTGM. However, the resulting Expectation Package would poorly represent the intended background knowledge, which may be misleading to a user who is viewing the Expectation Package during the browsing process. It is important to remember that the purpose of creating Expectation Packages is not to completely represent our background knowledge, but rather to support the browsing process in a given set of thesaurus terms.

Heuristic 3: Avoid hierarchies of Expectation Packages

In the world of knowledge representation, everybody loves a hierarchy. Hierarchies organize representations of domain knowledge, and help researchers determine where representational gaps exist. However, for the task of developing a set of Expectation Packages to support browsing, hierarchies are particularly problematic. The main

problem is that hierarchies of Expectation Packages encourage redundancy between levels of abstraction. In hierarchical organizations of items, children nodes resemble parent nodes in almost every respect except for the few features which make it a specialized case. Recognizing this redundancy is especially useful in many representational tasks; the successor to script theory exploited this insight to account for cross-contextual reminding (Schank 1982). However, redundancy of representation is harmful to the goal of creating a useful browsing space of thesaurus terms. Consider the problems that would be caused by generating a series of increasingly specific Expectation Packages to represent knowledge about being a passenger on an airplane. At the most specific level, we could imagine creating an Expectation Package to represent flying in first-class seating on a commercial airline, which would be slightly more specific than our general expectations about plane travel, which would be more specific than our expectations about traveling on all sorts of mass-transit vehicles. Each of these Expectation Packages could be represented as displayed in Figure 4.10.

<p>Flying in First Class Events <i>Aerial views, Air travel</i> Places <i>Airplanes, Runways (Aeronautics)</i> People <i>Air pilots, Businessmen, Flight crews, Passengers, Stewards</i> Things <i>Beverages, Cities & towns, Intercommunication systems, Luggage, Periodicals, Windows</i> Misc <i>Wealth</i></p>
<p>Flying on an Airplane Events <i>Aerial views, Air travel</i> Places <i>Airplanes, Runways (Aeronautics)</i> People <i>Air pilots, Flight crews, Passengers, Stewards</i> Things <i>Beverages, Cities & towns, Intercommunication systems, Luggage, Periodicals, Windows</i></p>
<p>Traveling as a Passenger Events <i>Travel</i> Places <i>Vehicles</i> People <i>Passengers</i> Things <i>Cities & towns, Luggage</i></p>

Figure 4.10. Expectation Packages at three levels of abstraction

Notice that the three Expectation Packages shown in Figure 4.10 overlap significantly. The most specific Expectation Package, *Flying in First Class*, contains all of the terms in the more general Expectation Package, *Flying on an Airplane*, which in turn contains most of the terms of the most general Expectation Package, *Traveling as a Passenger*. Of the 442 unidirectional links created by these three packages, 191 of those links are redundant (43%). Only one of these Expectation Packages is necessary. When writing Expectation Packages for the LCTGM, only the middle Expectation Packages was created. The more specific Expectation Package would have been unnecessarily constrained, leading the user to believe that perhaps there existed other Expectation

Packages for traveling in coach or business class on an airplane. The more general Expectation Package captured very few connections, and was possibly too abstract to be easily understood by browsing users.

Heuristic 4: Don't include very common terms in all appropriate Expectation Packages

Some terms refer to concepts that are very prolific throughout our expectations. For example, the term *Money* could reasonably be included in an enormous number of the Expectation Packages created for the LCTGM, as we live in a society where much of the activities we engage in involve money in some way. Following the organizational theory of scripts would argue for including this term in all of these Expectation Packages, as in the example Expectation Package for the restaurant script shown in Figure 3. However, the result of this would be problematic for people interested in browsing for terms related to *Money* in some way. Rather than presenting the user with thousands of terms from hundreds of Expectation Packages that contain the term *Money*, it is preferable to limit the list to only those where *Money* is particularly salient. Accordingly, the term *Money* was included only in those Expectation Packages where it is an thing of particular interest, such as those that represent our expectations about bank transactions, robberies, gambling, fundraising, and financial planning.

Heuristic 5: Do not include Expectation Packages that are not culturally shared

Part of the challenge that a person has in explicating a set of Expectation Packages for a thesaurus is sorting out which of their background knowledge is culturally shared, and which is idiosyncratic and unique to themselves and their experiences. Only those Expectation Packages that are easily recognizable and understandable by the majority of the intended users of the system should be created. In my own experience, I found that I had to curb my desire to encode all of the expectations that I had concerning computer science research and technology, as this area of my background knowledge is not commonly shared by the general public. Still, some level of cultural specificity must be identified. Indeed, within the set of 770 Expectation Packages created for the LCTGM, there are many that are specific to the culture of the United States, including knowledge about American holidays, history, and government. A contributing factor to the creation of culturally-specific Expectation Packages was the coverage of the vocabulary itself. Having been designed by the United States' Library of Congress, the vocabulary of the LCTGM favors concepts unique to life in America over other cultures. The bottom line is that it is important to consider the diversity of users who may be relying on an understandable browsing space when creating Expectation Packages.

4.4 Summary

In this chapter, I have argued that the set of links provided by standard thesauri are too sparse, and that an effective way of improving the connectivity of terms is to cluster them into Expectation Packages. A methodology for developing a set of Expectation Packages for a particular thesaurus was described, along with the lessons learned by applying this methodology to the LCTGM. No evaluative tools were offered to assess the quality of the knowledge engineering work that goes into creating a set of Expectation Packages for a thesaurus, which brings up the question: How is this research to be evaluated. In the next chapter, the value of the Deja Vu system and the Expectation Packages for the LCTGM is assessed through an analysis of Deja Vu's use at institutions with large online media collections.

CHAPTER 5: USE AND EVALUATION OF THE DÉJÀ VU SYSTEM

For the purpose of evaluation, Déjà vu was installed at two institutions that had large collections of digital images. The first installation was at the North Dakota Institute for Regional Studies (NDIRS) at North Dakota State University. Here Déjà vu was introduced as an interface to over 11,000 images captured on a video laserdisc. The second installation is at the Library of Congress Prints and Photographs Division in Washington, DC. Here Déjà vu was evaluated as an interface to a collection of over 25,000 digital images accessible online as part of the National Digital Library project.

Both of these institutions use the Library of Congress Thesaurus for Graphic Materials (LCTGM) as their primary source of indexes used in cataloging collection materials.. Because a full set of Expectation Packages had been developed for the LCTGM as part of this research, Déjà vu could be easily installed and evaluated at these sites without additional cataloging work.

The purpose of installing Déjà vu at these sites was to assess Déjà vu's value as a retrieval tool for existing collections of library materials. In particular, these evaluations sought to answer the following questions:

1. Does Déjà vu improve access to library collections?
2. Would library professionals want to use Déjà vu as a part of their set of retrieval tools?
3. What functionality was missing in Déjà vu that would be necessary in future browsing-based retrieval systems?

This chapter first examines the retrieval practices of the two institutions before and during their evaluation of the Déjà vu system. Then, the evaluative comments of the staff members at these institutions are summarized and analyzed. Following this, ten examples of the application of Déjà vu to real user requests are presented and analyzed. Finally, the results of this evaluation are summarized.

5.1 Using Déjà vu at the North Dakota Institute for Regional Studies

As part of the evaluation of Déjà vu, it was used as a retrieval tool at the North Dakota Institute for Regional Studies, a historical archive associated with the libraries of North Dakota State University in Fargo, North Dakota. Although the institute itself is small and is staffed by a modest number of employees (around five full and part-time staff members), their photograph collection made it an ideal test-bed for the Déjà vu system. In 1988, the institute completed the production of a laser videodisc containing more than 15,000 of the 50,000 historical photographs in the institute's collection, each captured as

an individual video frame and accessible by serial frame numbers. After completing the videodisc, the institute began the process of indexing each of the images on the videodisc. The primary source for index terms used to catalog the images was the LCTGM. When Déjà vu was first being used at the institute in March of 1997, more than 11,000 of the images had been indexed.

The North Dakota Institute for Regional Studies was founded in 1950 for the purpose of preserving the history and culture that is unique to the upper Midwest region of the United States. The institute's photographic archive consist primarily of images that capture aspects of the daily lives of ordinary people that lived in North Dakota over the last century. Images in the archive were acquired in collections obtained from various historical societies, libraries, photographers, and private citizens. The general public uses the archive primarily for the purposes of historical research, commercial advertising, and book publishing.

5.1.1 Retrieval Practices at NDIRS

Before Déjà vu was introduced at the Institute for Regional Studies in March of 1997, their existing retrieval practices were already well developed. Receiving an estimated 200 requests for photographic materials a year, the institute utilized a number of

electronic and printed aids to satisfy the requests of the users of their photographic collection.

When collection users first come to the institute, a staff reference librarian would conduct a *reference interview* with the user. During the reference interview, the staff member would ask the user a series of questions about their retrieval needs to better understand what they were looking for. The purpose of these questions is twofold. First, library users and staff member would agree on the common terminology for the content of the desired images. Second, the staff member would attempt to broaden or narrow the nature of the users' requests to a scope that the collection could likely satisfy. Often, the staff member would be able to judge right away if there is likely to be images in the collection that will satisfy the users needs.

In some cases, the information obtained in the reference interview would prompt the staff member to search for a specific collection or photograph in the physical stacks of the institute's photographic collection. Typically, however, the archive user and the staff member would have to search the archives to see if there is some set of images that will meet the user's needs. For these users, the staff member would employ one of two means of finding photographic materials.

First, the staff member might decide to have the user browse through some subset of the 15,000 images that are captured on the laser videodisc produced by the institute in 1988. Using a remote control device for the laser videodisc player, users could enter in the frame number of any image on the videodisc, causing the image to appear on a small video monitor attached to the videodisc player. The staff member would provide the user with a small thirty-page booklet listing the videodisc frame numbers for specific images and sets of images from the same original collection. This booklet contains a short description of each collection on the videodisc (approximately 120 entries) which describes its content, as well as a separate listing of peoples' portraits and geographic locations that can be found on the videodisc. The staff member would typically help the user get to the start of a collection that they believe will be most fruitful for the user. However, users would almost always search on other parts of the videodisc, often by scanning through the 15,000 images without regard to their organization.

Second, the archivist might decide to have the user look through printouts of the archive's electronic records, organized into a set of loose-leaf binders. These binders contain listings of videodisc frame numbers and photograph call numbers that correspond to images cataloged under specific people, corporate names, geographic locations, photograph dates, and the subject headings that have been assigned to these images by institute archivists. The listings in these binders were generated directly from the

Machine Readable Cataloging (MARC) records in the archives electronic database.

When using these binders, users would first select the set that list images according to the fields they are interested in (e.g. by geographic location). Then they would browse the lists to find videodisc frame numbers or photograph call numbers of the images that they wanted to examine. Finally, with the staff member's help, they would use the videodisc player or pull photographs from the physical stacks as necessary.

5.1.2 Evaluating Déjà vu at the Institute for Regional Studies

After learning about the retrieval practices in place at NDIRS, it was decided that the Déjà vu system could benefit this institution. Although the search process previously employed by reference librarians and archive users was often cumbersome, staff members report that users typically left with some set of images that would suit their needs. In this context, the Déjà vu system was not expected to improve the rate of successful searches, which was already quite high. Instead, the purpose of installing the Déjà vu system was to improve the appropriateness of the retrieved set of materials and to provide a retrieval tool that users and reference librarians would find easier to use.

To install Déjà vu at NDIRS, three steps were necessary. First, the software itself was loaded onto a Windows-based PC located in a section of the NDIRS reading room that was easily accessible to its users. Second, the individual cataloging records of the

materials available at NDIRS were converted into a database format that could be used by the Déjà vu system. This was accomplished using a functionality built into Déjà vu to parse the MARC record format, a format which could be generated by the Minaret cataloging software used at NDIRS. Third, Déjà vu was setup to use a special controller for a video laserdisc player to display retrieved materials to users. This software controller was custom-built by me to control the operation of a Pioneer-brand video laserdisc player connected to a PC via a serial cable.



Figure 5.1. The Déjà vu system at the North Dakota Institute for Regional Studies

After installing the Déjà vu system, several hours were spent familiarizing the NDIRS staff with its use and maintenance requirements. Of particular interest to the NDIRS staff was the process of updating the Déjà vu databases to reflect their most recent cataloging work. This process is easily facilitated by Déjà vu, requiring an

administrative user to select options to clear the current Déjà vu database records and load in an updated set of records encoded in the MARC record format.

Evaluation of Déjà vu system was nearly entirely directed by the NDIRS staff after I had left North Dakota. The staff at the institute believed that the Déjà vu system could be immediately valuable to them in servicing the needs of their users. Initially, the expectation was that the system would be used both by reference librarians and by the population of people that came to the institute to conduct their research. It was believed that the system could be used to assist reference librarians in answering written or telephone requests and in servicing the requests of institute visitors that were not technologically savvy. It was expected that more frequent users would choose to learn to use the system with the assistance of institute staff, and would conduct searches on their own. Each of the expectations were realized as Déjà vu was utilized and integrated into the daily retrieval practices of NDIRS staff members and visitors.

Soon after it was installed at NDIRS, Déjà vu was adopted as a search tool for of the users of the institute. Over one year after its installation at NDIRS, Déjà vu continues today to be used by staff members and institute visitors as the primary means of accessing the images stored on the institute's laser videodisc. Staff members have taken on the full responsibility of maintaining the system, which primarily involves updating

Déjà vu's databases when a significant amount of new MARC records have been added or updated using the institute's cataloging tools.

Six months after Déjà vu's introduction at NDIRS, the institute's main archivist, John Bye, sent a detailed letter analyzing their use of the Déjà vu system. Section 5.3 addresses the comments and criticisms that John Bye's raised in this letter, as well as those of the staff at the Library of Congress Prints and Photographs Division. Also included in this letter were ten examples of searches conducted at NDIRS, which are described in detail in section 5.4.

5.2 Déjà vu at the Library of Congress Prints and Photographs Division

One of the reasons for using the Library of Congress Thesaurus for Graphic Materials in Déjà vu was the hope that the Library of Congress Prints and Photographs Division would be an evaluator of the Déjà vu system. In June of 1997, I visited the Library of Congress to install the Déjà vu software at their site to and to explore whether the software would be an appropriate search tool for their collections.

The Prints and Photographs Division maintains the United State's preeminent collection of photographs, prints, drawings, posters, and architectural records of historical interest. There are an estimated 13.6 million individual items in the division's holdings, but an

active curative staff ensures that this number is constantly increasing. The Prints and Photographs Division services a wide range of users, including historical researchers, publishers, advertisers, and the general public.

The division's staff of archivists are engaged in the constant and unending task of processing, cataloging, and digitizing the materials in their collections. The size of the collections prohibits cataloging of each individual item in the majority of cases. Some item-level cataloging does exist, however, particularly for those collections that have been digitized for electronic distribution, as well as items that are in high-demand by library users. As a retrieval tool, *Déjà vu* is most appropriate when records and indexing terms exist for each individual item in a collection - especially when those items are electronically accessible. At the time that *Déjà vu* was introduced to the Prints and Photographs Division in June of 1997, there were an estimated 100,000 online images with individual cataloging records organized into various collections, and an additional 50,000 individual records without online images. A subset of 25,000 of the 100,000 online images was used for the evaluation of the *Déjà vu* system.

5.2.1 Retrieval Practices at the Library of Congress

Through an effective network of resources, the Prints and Photographs Division services over 2,000 people using the collections each month. The Prints and Photographs

Department accommodates researchers both in the department's reading room at the Library of Congress and via mail requests. Mail requests are handled by a team of reference librarians, with a turn-around time of roughly four weeks. Visitors to the division's reading room will typically conduct their searches with some degree of assistance from one of two on-duty reference librarians. A small portion of the libraries collections are housed in the department's reading room, which allows users to browse through file cabinets of individual prints grouped by collection and organized topically or by proper names. To provide access to the rest of the collections, the library provides several traditional and automated finding aids.

When a person comes to the library, a reference librarian's first task is to determine if the person is likely to find appropriate materials in the libraries collections, and to direct that person to the most appropriate collections or finding aids. While a variety of search tools exist at the library, the collections associated with each tool overlap very little. As a result, the choice of which search tool to use is determined not by what is most convenient or user-friendly, but rather by which collection is mostly likely to contain materials that are relevant to the researcher's needs.

In order to reduce damage to prints and photographs due to handling, the library has invested heavily in video laserdisc and digital imaging technologies. Using traditional

online-card catalog search tools, users can retrieve and view image electronically, both as video frames in video laserdisc collections and as image files from the library's assortment of digitized collections. In addition, the Prints and Photographs Division has been actively involved in the Library of Congress's American Memory project, allowing users to access portions of the division's digitized collections over the Internet. Accordingly, several computers set up with Internet browsers are available for public use in the reading room.

5.2.2 Evaluating Déjà vu at the Library of Congress

In June of 1997, Déjà vu was installed at the library of congress prints and photographs division for the purpose of evaluation. Unlike NDIRS, where Déjà vu was made available to visitors of the institute for search purposes, the evaluation of the system at the Library of Congress was to be undertaken solely by members of the Prints and Photographs Division staff, including reference specialists, cataloging specialists, and those involved in the design of the LCTGM.

To assist in the evaluation of this system, the division provided me with the MARC records for one of the libraries largest digitized collections, that of the Detroit Publishing Company. The Detroit Publishing Company was one of America's largest publishers of postcards and photographic views from the 1880s to the 1920s. The Library of

Congress obtained a portion of the Detroit Publishing Company's collection from the Colorado Historical Society, which contains approximately 20,000 vintage photographs, over 25,000 glass negatives and transparencies, and about 300 Photochrom prints. In June of 1997, when the division's MARC records were loaded into the Déjà vu system, over 25,000 of the materials in this collection had been cataloged, digitized and made available as part of the American Memory project. The primary source of thesaurus terms used in the cataloging records was the LCTGM. The images in this collection cover a enormous breadth of aspects of everyday life during this time period. Accordingly, the indexing of these materials utilizes the vast majority of the LCTGM terms.

To install the Déjà vu system at the Library of Congress, three steps were necessary. First, the software itself was loaded onto a windows-based PC that was easily accessible by the library staff. This PC was located in a portion of the Prints and Photographs Division adjacent to the reading room, in an area where the cataloging staff processes collection materials. Second, the MARC records for the Detroit Publishing Company collection were loaded into Déjà vu's databases. Over 25,000 records were loaded into the Déjà vu system, each of which had a corresponding digital image which was accessible by the American Memory web site. Third, the Déjà vu system was configured to use a web browser as a helper-application for viewing the digital images. When users

of the Déjà vu system choose to view the materials associated with retrieved records, the web address of the items are extracted from their MARC records and passed to the web browser, which displays the images to the user.

The Déjà vu system was evaluated in a self-directed manner by five members of the Prints and Photographs Division staff after I had left Washington, DC. These five staff members consisted of two reference specialists (Maja Keech and Barbara Natanson, editor of the LCTGM from 1989-1994), and three catalogers (Glenn Gardner, Brett Carnell, and Arden Alexander, editor of the LCTGM since 1993). Each of these evaluators examined the system and wrote evaluative comments during a period of three months after Déjà vu was installed. These evaluative comments, along with those of the NDIRS, are noted and addressed in section 5.3.

In contrast to NDIRS, Déjà vu was not used as a retrieval tool by the Library of Congress after the evaluation period. The primary reason for this difference appears to be the lack of a need for additional retrieval tools. Unlike NDIRS, the Prints and Photographs Division is very well staffed with expert reference specialists who are well-equipped with a broad range of traditional and automated retrieval aids. While the evaluators at the Library of Congress agreed that ideas presented by Déjà vu could improve access to collection materials, it was not considered appropriate to integrate this

research project into their daily retrieval practices. It should be noted that each of the retrieval tools utilized at the Library of Congress are heavily supported either by internal library staff or by commercial software vendors.

5.3 Analysis of evaluative comments

The primary source of information regarding the utility of the Déjà vu system comes from the evaluative comments provided by the staff at the Library of Congress Prints and Photographs Division and the North Dakota Institute for Regional Studies. Each group of evaluators consisted of library science professionals who were very familiar with current practices in computer-based retrieval systems and the use of thesauri in cataloging. Accordingly, the comments provided by these evaluators reflected a deep understanding of the design decisions made in Déjà vu and the concerns that may arise in the context of its use.

Below is a summary the major comments that were made by this group of evaluators. Eight of these comments are listed, each of which is followed by a brief analysis of the point that is made. The source of each comment is noted in parenthesis as *NDIRS* for North Dakota Institute for Regional Studies, *LOC* for the Library of Congress Prints and Photographs Division, and *Both* when both institutions made the same observation.

Comment 1: *The most beneficial functionality provided by Déjà vu is ability to move seamlessly between cataloging data and the visual items. (Both)*

Both institutions agreed that Déjà vu offered a level of automation that is a great improvement over the tools that they are currently using. While both institutions have electronic card catalog systems and means of accessing digital images, neither has had the capability of accessing the digital media directly from the record retrieval tools. Déjà vu provides this functionality by utilizing helper applications that control video laserdisc players or access online materials using external web browsers. This allows Déjà vu users to immediately see the result of their searches, and fosters a style of searching that is more exploratory and immediate. This functionality was very easy to provide to Déjà vu users, but is often not available in the tools that institutions like the Prints and Photographs Division and NDIRS currently use. Building a video laserdisc controller was a simple task, but was very customized work - work that was much too specialized to be included as functionality in off-the-shelf commercial retrieval tools. Utilizing web browser technology was an even easier task, but required the use of operating-system routines and web browser functionality that has only recently been available.

Although this functionality provided by Déjà vu was viewed as a great improvement over current retrieval tools, it has little to do with the claims made in this research, or the

ideas put forth in the design of the Déjà vu interface. It is easy to imagine that tight integration of retrieval tools and digital media will be much more commonplace in commercial software in the near future. However, the important point made by this comment is that automation of cataloging records and media may be significantly more important than the design of the retrieval interface itself.

Comment 2: *Another very beneficial functionality provided by Déjà vu is the ability to see the availability of materials at the time that users are browsing the thesaurus.*

(Both)

While browsing through a thesaurus in Déjà vu, users are constantly made aware of the availability of materials by the display of an asterisk next to thesaurus terms. This asterisk informs the user that the term is currently being used to index some materials in the collection, and can be selected by the user to retrieve those items. Furthermore, when some thesaurus terms have already been selected by the user, the asterisks inform them of which additional terms can be selected to further reduce the set of retrieved materials. Evaluators at both institutions noted that the importance of this functionality was not immediately evident, but was later realized as a great improvement over traditional retrieval tools. In the absence of this functionality, Déjà vu users would still enjoy the benefits of browsing through the space of thesaurus terms in order to find ones

that were most suitable for their retrieval needs. But with the addition of this type of immediate feedback with regard to the availability of materials, a more explorative style of search was facilitated. After using Déjà vu for some time, these evaluators felt that this functionality was an important difference between the system and the tools that were previously available.

Providing immediate availability information to users was not an easy task. It is impossible to pre-calculate whether a thesaurus term should be displayed with an asterisk, because this information is dependant upon which terms have already been selected by the user at run-time. Déjà vu utilizes specialized databases which are optimized specifically for calculating availability information. These specialized databases are created when the MARC records of a collection are first loaded into the Déjà vu system. The design of these databases allows Déjà vu to determine if a specific thesaurus term should be displayed with an asterisk in a very short amount of time, a process which occurs at the time that the each term is displayed on the screen. The speed of this process allows the availability information for a full screen of thesaurus terms to be calculated at run-time, causing a negligible amount of delay in the display of each screen during user-browsing.

While this functionality is seen as a valuable new direction for the design of future commercial retrieval tools, the trends in digital library standards seem to be operating against this possibility. Providing immediate availability feedback of the sort found in *Déjà vu* requires tight integration and communication between the interface and the collection databases. However, the trend is much more in the direction of separating the databases and the retrieval tools to facilitate distributed and remote access to large collections. New standards for online client/server access to library databases such as ANSI/NISO Z39.50 (American National Standards Institute 1995) effectively hide the implementation details of the library databases from the retrieval tools that access them. While this type of procedural abstraction is good computer science practice, it may prohibit commercial vendors from providing *Déjà vu*'s functionality in retrieval software that operates in a distributed environment and complies with library standards.

Comment 3: *Déjà vu* lacks the essential functionality of searching for materials based on criteria other than subject indexes. (NDIRS)

Déjà vu was designed to allow users to retrieve materials by browsing through the thesaurus terms that were used to index collection materials. However, no functionality was provided for searching for materials based on other information that could be found in the catalog records of the collection. There was no capability for searching for

materials from a specific time period or particular location, of a particular type of medium, from a named photographer or illustrator, etc. All of this information was available in the records that Déjà vu had loaded, but the system provided no means of retrieving materials based on this information.

Déjà vu design was motivated by an interest in exploring a new type of retrieval interface - one based on browsing rather than a traditional query-based approach. However, it is the traditional query-based approach that most effectively services searches based on non-topical criteria. The commercial software that was available at both of these institutions could already effectively support searches of this sort. The hope was that Déjà vu could be used as a complimentary retrieval tool at these sites. This comment, however, suggests that the most effective retrieval tools might integrate browsing functionality with traditional query-based approaches into a single system.

Other than maintaining the purity of the research, there was very little reason not to include the desired functionality for query-based searching in the Déjà vu system. Accordingly, soon after this omission was noted by NDIRS in their evaluation, a new version of Déjà vu was developed that included this functionality. Although this added functionality was significantly less powerful than that of the query-based tools that NDIRS already had, the new Déjà vu version had some attractive features that NDIRS

found useful. Using the added query-based functionality, users could first select all of the photographs from a particular place or time period. For example, users interested in photographs from before 1900 or taken in Fargo, ND could first select this criteria - which would, in these examples, retrieve hundreds available materials. Then users could employ the thesaurus-browsing features of *Déjà vu* to locate photographs that met some topical criteria. This combination of query-based and browsing based searching was not well explored in this research, and constitutes a rich area for future investigation.

Comment 4: *Déjà vu lacks the essential functionality of incorporating multiple thesauri and thesaurus terms that are local to an institution. (NDIRS)*

NDIRS and the Library of Congress were ideal candidates for evaluators of *Déjà vu* because they both used the Library of Congress Thesaurus for Graphic Materials as their primary source for indexing terms. However, both institutions also included terms from other thesauri as well in their catalog records. In addition, NDIRS utilized a set of 46 local thesaurus terms, that is, they were invented by the NDIRS staff solely for the purpose of indexing materials in their collection. There was no functionality provided in the *Déjà vu* system for handling local terms or multiple thesauri. Only the terms from the LCTGM were included in *Déjà vu*'s browsing space, and only those items indexed using

those terms could be retrieved using the system. As a result, a number of indexed materials at NDIRS were inaccessible to Déjà vu users.

While this is indeed a significant problem with the Déjà vu system, it is unclear what the best approach would be to overcome it. The major problem with incorporating local thesaurus terms or multiple thesauri is effectively managing the organization of the browsing space - especially the Expectation Packages. In the life-cycle of a particular Déjà vu system, it is imagined that an institution would be given a version of the software with a complete browsing space already constructed for a particular thesaurus. The only task left to the institution is to load their MARC records into the empty Déjà vu databases. But if it is essential that the browsing space also include local thesaurus terms and terms from other thesauri, then it would be necessary to customize the browsing space to accommodate the new terms. While the Déjà vu system does provide the tools for modifying the set of Expectation Packages that are provided to the user, this work was not intended to be performed by individuals unfamiliar with the process of knowledge representation, e.g. the staff managing an institution's archives.

For a small set of terms that are local to an institution, a potentially satisfactory solution would be to include the additional terms in the standard Broader, Narrower, and Related Term organization (as determined by archivists at the local institution) but leave the

Expectation Packages untouched. Typically, terms that are local to an institution consist of a set of Narrower Terms that further discriminate some concept that already exists in the given thesaurus. With the expectation that the existing Broader Term is well-connected in the browsing space, then it is conceivable that the local Narrower Terms could be found by the user with only a small amount of additional browsing. The problem with this solution is that some of the local terms fit perfectly in some of the system's Expectation Packages. Users who find the appropriate Expectation Package would be misled into believing that the missing local term does not exist.

The problem is even more troubling when multiple thesauri are necessary. While it is hoped that sets of Expectation Packages could be constructed for many different existing thesauri, it is unclear how these organizations can be merged into a single, coherent browsing space. Keeping the two browsing spaces completely separate requires the least amount of work, but effectively eliminates the possibility of users finding terms from separate thesauri during the same browsing session. The alternative, to merge the browsing spaces together, would require the identification and unification of synonym terms and overlapping Expectation Packages between the multiple thesauri.

Unfortunately, the amount of effort that it would take to manage this merger could potentially be more work than creating the multiple browsing spaces in the first place.

This is certainly an important and difficult problem, and constitutes an interesting direction for future research.

Comment 5: *The set of Expectation Packages, which were viewed as an expanded set of Related Terms, were very effective and heavily utilized by Déjà vu users. (Both)*

Evaluators at both institutions agreed that the Expectation Packages provided in Déjà vu were very helpful in browsing through the space of thesaurus terms. Throughout Déjà vu's use at NDIRS, Expectation Packages were reportedly heavily used by the visitors of the institute who used the system. Evaluators and users had little difficulty understanding the purpose of the Expectation Packages or how to use them, with a tendency of viewing them as an expanded set of Related Terms. This view is not unreasonable, as there is very few constraints on what constitutes a Related Term in the construction of standard thesauri.

Evaluators at NDIRS made several observations concerning the use of Expectation Packages with regard to their presentation on the Déjà vu screen. The size of the Expectation Package display is much larger than that of any of the other standard thesaurus relationships, and it was believed that this caused users to favor using Exception Packages over other types of relationships. Also, the size of the Expectation

Package display (19 lines) allows for only one complete, average-sized Expectation Package (13.23 lines including title) to be displayed without scrolling. As a result, users tended to choose browsing links contained in the Expectation Package that was displayed first in the list over the ones that followed. Currently, the Expectation Packages are displayed in the order that they were created. However, this observation suggests that it may be fruitful to consider manipulating this order to improve the effectiveness of the browsing space in some way.

Comment 6: *One potentially confusing aspect of Déjà vu is that users may expect that the materials retrieved using Expectation Package terms are related to the Expectation package itself. (LOC)*

The primary purpose of the Expectation Packages for a thesaurus is to provide a rich browsing space to the user. That is, the Expectation Packages' primary role is navigational - to help users locate the most appropriate thesaurus terms for their particular retrieval needs. One potentially confusing condition can arise, however, when a user selects a term that is a member of an Expectation Package to retrieve some set of materials. At this point, a user may believe that they are retrieving materials indexed by the term whose content is related to the Expectation Package itself. For example, a user who selects the LCTGM term *Luggage* from the Expectation Package entitled *Flying on*

a passenger airplane may be surprised to find that some or all of the retrieved materials have nothing at all to do with airplanes or air travel. While all of the retrieved materials will have the term *Luggage* assigned to them as an index term, this is the only retrieval criteria that has been specified by the user. Users must understand that index terms are separate from the context of the Expectation Packages of which they are members.

While this point can be easily explained to new users, it would be preferable if there was a means of conveying this point in the design of the Déjà vu interface itself. One possibility would be to restrict the way users are able to select terms to retrieve materials. Currently, users can choose any term on the Déjà vu screen that is displayed with an asterisk to retrieve materials from the collection. If instead users could only select the term that was currently in focus, then the term would be physically separated from any associated Expectation Packages. That is, if a user wanted to select a term that was a member of an Expectation Package, they would have to first choose it as the current focus term, effectively removing it from the context of the Expectation Package from which it came. One could easily imagine that this restriction would only be put in place for novice Déjà vu users to assist them in understanding the operation of the system, then later removed when they better understood the role of Expectation Packages.

Comment 7: *The Expectation Packages are too subjective and too contemporary for historical collections.* (Both)

All of the 770 Expectation Packages for the Library of Congress Thesaurus of Graphic Materials were generated by me, and are largely based on my own set of expectations about the world. As a result, there are many idiosyncrasies and peculiarities in these Expectation Packages that reflect my own subjective thoughts. Several evaluators commented on the subjective nature of these Expectation Packages, noting that some of them did not reflect their own understanding of the world, and may not be shared by people of different nationalities, age groups, or socioeconomic class. In addition, it was noted that the Expectation Packages tended to portray a very contemporary view of life, which was in stark contrast to the historical nature of both of the evaluation collections. The preference seems to be for a set of Expectation Packages that is more closely aligned with the world-view captured by the content of a collection as a whole.

This comment brings up a number of separate issues concerning who should be designing sets of Expectation Packages and for which collections they might be appropriate. First, graduate students pursuing research are *not* the most appropriate people to design Expectation Packages for a thesaurus. While this work does require some degree of expertise in knowledge representation, there are other professionals in the library science

field who are better suited to take on this responsibility. Specifically, those individuals who are engaged in the design and maintenance of the thesauri themselves are the ideal people to develop and maintain Expectation Packages as well. The advantage would be that these people would be best suited to modify the set of Expectation Packages for a thesaurus when new terms or added, terms are deleted, or the organization of terms is changed. While sometimes it is a single person that is in charge of maintaining a particular thesaurus, it is preferable to have a diverse group of library scientists and domain experts working in conjunction on a set of Expectation Packages. This helps to insure that the resulting set is not overly subjective or idiosyncratic. Such a group could benefit from a set of collaborative tools to assist in the development of Expectation Packages, which is an interesting direction for future Déjà vu development.

The second issue raised by this comment concerns the mismatch between the contemporary nature of the Expectation Packages and the historical nature of the collections. While it is true that the Expectation Packages reflect a contemporary perspective, this is because the intended audience for this browsing space are people that live in a contemporary world. The point here is that the purpose of the set of Expectation Packages is to capture the commonsense knowledge of the target users of a collection - and not the knowledge that is contained *within* the collection. While it is conceivable that a target population could consist solely of historical researchers with

lots of common knowledge of everyday life in a particular time period, this was *not* the case in two collections that were used in this evaluation. Instead, the intended user population represented a broad cross-section of society with varying degrees of expertise concerning the materials for which they were searching. Accordingly, the Expectation Packages developed for the Library of Congress Thesaurus for Graphic Materials were designed with the non-expert in mind. In short, expectation Packages should be designed for a particular thesaurus and a particular group of intended users, but not for a particular collection.

Comment 8: *Déjà vu improves the search process by increasing users' understanding of the relationship between the thesaurus and the collection. (NDIRS)*

Although thesauri have become increasingly popular in the library science community, the majority of library users remain oblivious to their existence. While some modern online card catalog systems make heavy use of thesaurus terms when servicing user requests, most of these systems have user interfaces that work to hide the details of how records are indexed and cataloged. In contrast, *Déjà vu* brings the thesaurus to the forefront of the search process, and requires that users understand the relationship between thesaurus terms and the materials that they index. At NDIRS, the evaluators report that by making this relationship obvious to users, *Déjà vu* has greatly improved

the quality of user-directed searches. By understanding how materials are cataloged and stored in the collection, users are better able to select the best terms to retrieve materials that meet their needs.

It was not an original design goal to build a system that taught users about library cataloging practice. However, this comment suggests that one way to improve retrieval performance is to increase the level of understanding of library users. *Déjà vu* achieves this goal by providing an interface that makes it obvious to users that terms are assigned to collection items, and that selecting terms will retrieve the set of items indexed by those terms. To the user, there is no great mystery involved in understanding why the system has retrieved a certain set of materials in response to a set of selected terms - there is a direct connection between terms and retrieved materials. Compare this to the complex intelligent rules used in query-based search engines that use standard thesauri (for example, Kim and Kim 1990). In these systems, the relationship between what the user has given to the system as a query and the set of retrieved materials is so complex that users cannot predict how changing their search behavior would effect the quality of the end results. That is, without understanding the process, users cannot improve their own search behavior.

5.4 The applicability of Déjà vu in ten example requests

Six months after Déjà vu's introduction at NDIRS, the institute's main archivist, John Bye, sent a detailed letter analyzing their use of the Déjà vu system. Included in that letter were ten examples of requests that the institute had received since Déjà vu was installed. For some of these requests, Déjà vu was used - resulting in both successful and unsuccessful searches. For other requests, it was determined that Déjà vu was not an appropriate search tool. Below is a list of each of the ten examples as given in John Bye's evaluation letter. Each is followed by a short analysis of Déjà vu's ability or inability to service the request.

Example 1: *Recently a woman wished to look at all of our photographs of Broadway in Fargo, meaning the downtown area. Here Déjà vu would not work and I had her view our images directly on the videodisc, using the printed finding aid. Déjà vu would have needed to have been able to access the 691 field in which we place address information (the format is: 691 Fargo, N.D.—Streets—Broadway—North (followed by number if desired)).*

As noted in Comment 3 in the previous section, Déjà vu originally lacked the ability to search for records based on criteria other than the thesaurus terms which served as their indexes. As this example illustrates, there are many times when the subject terms are the

least important criteria for a request. Here, the critical information is encoded in a special location in the institute's MARC records (field 691), and not in the thesaurus terms assigned to the items. After this evaluation was complete, a new version of Déjà vu was given to NDIRS which included the functionality of searching in specific MARC fields, e.g. field 691, for specific textual strings, e.g. "Broadway" or "Fargo, N.D."

Example 2: *A researcher working on his Ph.D. thesis regarding migrant farm workers in the late 19th and early 20th centuries in North Dakota visited the Institute, using several manuscript collections. He also wanted to view our visual images. He used Déjà vu for quite some time looking at various visual images on the videodisc. We began with the term of "Agricultural laborers" which produced a large number of items. We saw on the primary screen that the "NT Migrant agricultural laborers" was the term in which he was most interested. That term did not have an asterisk and thus not a term which we have used to-date in our indexing of photographs. That term would only be used if textual information on or with a photograph explicitly stated the person in the image were migrant laborers. He then searched through the more general category of agricultural laborers images and chose to have copies of a number of them made. Through the cataloging data he was able to determine the date for some of the images.*

This example illustrates the utility of the asterisks that Déjà vu displays next to thesaurus terms to indicate that they are being used to index materials in the current collection. In this case, the most appropriate term for this researcher, *Migrant agricultural laborers*, was not being used as an index term. By providing availability information for all of the thesaurus terms in the conceptual neighborhood of the desired term, Déjà vu directed this researcher to a term that still met their retrieval criteria and was being used to index collection materials.

Example 3: *A local person, moving to Colorado and opening a restaurant, wanted to have copies of various Fargo scenes to be used in that restaurant. Time period was not a factor, but did want some images to have the name Fargo appear in the image. Since the main criteria was geographic, we had him go directly to the videodisc to browse the images we had on Fargo. He also looked at photocopies of images which are not on the disc. He did place quite a large order of images. Déjà vu would needed to access the 651 field.*

In the NDIRS MARC records, the 651 field contains information about where a photograph was taken. If Déjà vu would have been able to access the 651 field at the time of this search (a functionality that was added in a later version of Déjà vu), this person would have been presented with 2496 photographs of the Fargo, N.D. area.

Given the enormous size of this retrieved set, the user could have then benefited from Déjà vu's browsing space to find subject terms that referred to interesting things and which were being used as index terms in the set of 2496 images of Fargo. By browsing in their area of interest for terms displaying an asterisk, the user would be able to find pictures from Fargo, N.D., that contained subject matter that best met their retrieval needs. For example, in searching for images which contained the name "Fargo" in the image, this user could have further reduced the set of retrieved images by selecting a relevant subject term such as *Signs* (retrieving 97 photographs containing signs in Fargo, N.D.).

Example 4: *A number of Fargo home owners have visited or telephoned the Institute to inquiry if we have a photograph of their home. Most are aware that we have a 5,000-plus item photo collection of Fargo houses donated by a local realty company. For this type of request we tend to go directly to the collection which is organized by address. Only a limited number of records for this collection are in Minaret and thus a search of it would not be comprehensive. Again, the 691 field would need to be accessible for Déjà vu to be useable.*

In this example, even if the Déjà vu software was able to access the 691 field in the institute's MARC records, the incompleteness of the cataloging data would frustrate

many users. Here, the best solution is to take advantage of the existing, special-purpose organization that the institute provides for pictures of houses in Fargo, N.D. Organizing pictures of houses by their address perfectly services a set of the requests that NDIRS receives. The process of searching for materials of this type is not likely to be improved by the subject-browsing capabilities that Déjà vu provides.

Example 5: *A local person wished to know what images we had of the various Norwegian American related statues and monuments in Fargo. We used Déjà vu for this search and found nothing under Sculpture, but then went to Monuments & memorials where we did find an item. I knew there were additional items and found that they had not yet been cataloged at the item level. Although we use the LCSH for ethnic groups, Déjà vu does not support those terms and thus cannot search by ethnic group. My knowledge of the collection lead me to the images that were needed.*

This is an example of how the browsing space provided by Déjà vu can be useful when the term that is considered most appropriate retrieves no suitable materials. In the NDIRS collection, the term *Sculpture* retrieves 48 items. Evidently none of the these items satisfied the needs of this user. It is at this point that the browsing space provided by Déjà vu can point the user toward alternative terms which may index satisfactory material. With the term *Sculpture* as the current focus term, three other terms are

displayed on the screen with asterisks, indicating that they are being used to index materials in the collection. These are the Broader Term *Art*, the Related Term *Monuments & memorials*, and the term *Ladders*, which is a member of the Expectation Package entitled *An artist making a sculpture in their studio*. Of these, the term *Monuments & memorials* is most promising to the user, and leads them find a single useful item among the 27 items indexed by this term.

As noted in Comment 4 in the previous section, Déjà vu does not support multiple thesauri. Therefore it was impossible for this user to select a term for Norwegian Americans from the Library of Congress Subject Headings (LCSH), which is used by NDIRS to indicate ethnic groups. In the end, however, it was the individual knowledge that this evaluator had of the NDIRS collection that led to the best images for this user's needs.

Example 6: *A local advertising firm wanted to know what images we had of the former Great Northern Railroad Depot in Fargo, as well as images of people eating in a restaurant circa 1890s. This was for advertising being developed for the Great Northern Restaurant. I did use Déjà vu to look under "Railroad stations" but then we had to look through the various entries to find the Fargo depots. Titles do not always indicate that it is Fargo, and only looking at the full catalog record could we determine*

that it was Fargo. To be effective in this situation, Déjà vu needs to be able to link the term with the geographic entity. Another strategy would be to search under the corporate heading: Great Northern Railway Company which would be broader than needed, but would hopefully lead to the Fargo entries. For the second portion regarding restaurants we used Déjà vu, but the RT, NT and EP did not help us. I had to do three separate searches under: Interiors, Restaurants, and People which reduced the results to three images. I added Eating & Drinking facilities and it was narrowed to two, but none of the images fit the needs of the researcher. To have been effective, we would have to be able to access the decade sub-field we assign to all topical headings. Before even starting this search, I was quite sure we would not have anything they needed. I even checked with the SHSND [State Historical Society of North Dakota] and they could not come up with any images that fit exactly the searcher's demands. I think this is a case of a researcher wanting something so specific that it becomes almost impossible to find what they want.

This evaluator offers two possible means of finding images of the Great Northern Railroad Depot in Fargo, N.D. The first approach, the one attempted by this user, was to first retrieve all of the images of railroad stations and then search through the set to identify which ones were in Fargo, N.D. (effectively narrowing the search down to a single location). As the evaluator notes, the ability to select only photographs from

Fargo, N.D. (by searching the 651 field in the NDIRS MARC records) would have been useful in this search. This functionality would have also been useful in the second approach that this evaluator suggests: searching the MARC records for the name of the corporate entity that owned the building in question. As noted in Comment 3 in the previous section, this functionality was added to a version of Déjà vu that was given to NDIRS after this evaluation took place.

While Déjà vu was an appropriate tool for servicing the second part of this request, i.e. people eating in a restaurant around the 1890's, there were no materials in the NDIRS collection that satisfied the users needs. This evaluator is right to note that this version of Déjà vu lacked the ability to restrict the search to photographs from the 1890's, but using such a constraint to reduce the size of the retrieved set of materials would not have been desirable in this case. In fact, it is somewhat peculiar that, after selecting three terms which narrowed the retrieved set to three items, this evaluator selected yet another term that reduced the set to two items. It should be noted that this is not the way that Déjà vu was intended to be used. Instead, the intention was that users would select the minimum number of thesaurus terms necessary to reduce the size of the retrieved set down to a manageable number. Then, the user would examine each of the retrieved items to determine if it was appropriate. In this users case, the set of three items retrieved by the first three index terms was certainly small enough to begin the process of

evaluating each individual item. As users add more and more terms to narrow the set of retrieved items, they increase the requirement that the collection is thoroughly indexed. As the number of selected terms becomes greater than the average number of terms assigned to collection materials, the likelihood that suitable materials will not be retrieved is increases greatly.

Example 7: *Two local magazine publishers were interested in images from the 1957 tornado that hit Fargo. Using the term Tornadoes we had a number of hits and with the brief cataloging information we were easily able to find Fargo and that they were from 1957. Ideally, a search on the terms "Tornadoes" "Fargo" and perhaps 1957 or the decade, would have gotten us directly to the desired images.*

The thesaurus term *Tornadoes* retrieves 66 photographs from the NDIRS collection, which is more than most users would want to examine individually. Accordingly, the functionality of restricting the set to the year 1957 or to the city of Fargo, N.D. would have been helpful in this situation.

Example 8: *A patron wanted photos of Lindbergh's "Spirit of St. Louis" when it was in Fargo. By putting in the term "Airplanes" a short list of images was generated and scrolled down until we found the desired image. If we could have limited this with the*

term Fargo it would have helped. Of course, a quicker method would have been to enter the name of the airplane (610 field) or Lindbergh's name (600 field).

The fastest method for finding these photos, by searching for the name Lindbergh or the name of the airplane, is indeed the most appropriate way for conducting this search.

While it is encouraging to know that Déjà vu was useful in this case, this user knew all of the information necessary (the proper names of a person and a plane) to effectively conduct this search with a traditional query-based search engine.

Example 9: *A user wanted images on Native Americans. Such a broad search worked very well on Déjà vu and the user was able to browse a large number of images, using the term "Indians of North America."*

This type of search is very appropriate for Déjà vu for a number of reasons. First, with this subject matter, the user is immediately faced with the challenge of locating the thesaurus term the best describes the subject they are seeking. Using the various zooming functions that Déjà vu provides, the user can easily move from reasonable phrases such as "American Indians" or "Native Americans" to the more obscure phrase that is used in the corresponding LCTGM term, *Indians of North America*.

Second, Déjà vu is particularly effective after the user has selected this term and wishes to narrow down the number of items that are retrieved. In the NDIRS collection, *Indians of North America* is assigned as an index to 116 photographs. While every one of these photographs may be valuable to this user, they could then use the Déjà vu browsing space to locate other terms which would retrieve a subset of these photographs in some particular area of interest. By providing immediate availability information by displaying asterisks next to selectable terms, the user is presented with many options and opportunities for identifying interesting items in amongst these 116 photographs.

Third, Déjà vu provides a rich browsing space of terms around *Indians of North America* that quickly point the user to material that may be related to their research interest in some reasonable way. Although there are no Broader, Narrower, or Related Term links for *Indians of North America* provided in the LCTGM, seven Expectation Packages are directly associated with this term. These seven Expectation Packages contain 29 thesaurus terms that are displayed with an asterisk, indicating that they are being used as indexes in the NDIRS collection, including *Frontier & pioneer life*, *Indian reservations*, *Pioneers*, and *Trading posts*. This user may take advantage of these opportunities, or select one of the other Expectation Package terms that are not being used as indexes. Although terms such as *Indian encampments*, *Westward movement*, or *Tribal chiefs* are

not being used as indexes in the NDIRS collection, the user may find that they are linked to terms that offer other relevant retrieval options.

Example 10: *Just recently a person working with developing an exhibit in the new federal building being constructed in Fargo wanted an image representing North Dakota to be used as a large backdrop for quotes regarding N.D. Based on her initial ideas we used Déjà vu and searched all the images with the words "Wheat" or "Croplands" or "Windmills." She was impressed with the images in our collection and the ease of viewing them immediately. Such a search request would be almost impossible under a manual system, or take an extreme amount of time, both by the user and the Institute staff. Although no single image chosen at this time, it did help her focus on what would be the most appropriate type of image. The request evolved into almost a graphic or stylistic decision on the type of image that would work best with text.*

The interesting thing to note about this example is that, while no photographs were retrieved by this user, this can be considered a very successful use of the Déjà vu system. This user seemed to have the goal of searching for visual ideas that could assist her in developing a creative work. The conceptual browsing space offered by Déjà vu, along with quick access to the visual media, allow this person to effectively brainstorm a

number of possibilities in a short amount of time. The result of this use of Déjà vu was not a set of retrieved materials, but rather a new conception of the retrieval goal. This case is a good example of what Bates (1989) referred to as an *evolving search*, where the retrieval goals of the user are continually shifting during the search process.

The idea that a retrieval system like Déjà vu may serve a purpose other than actually retrieving a set of materials seriously challenges the traditional understanding of the information retrieval task. Rather than bridging the gap between a given query and a set of materials, information retrieval systems of the future may work to assist users in developing their retrieval needs through creative brainstorming. Although Déjà vu was not originally designed to be a tool for supporting the creative brainstorming process, it is worth considering if and how the functionality of the system should be changed if this was made an explicit design goal. While the intuition is that the current design of the Déjà vu interface is well suited for this task, this is largely a question to be answered by future research.

5.5 Conclusions of the evaluation of Déjà vu

The evaluation of the Déjà vu system was a success on several different levels. First, the evaluation offered answers to the three research questions posed at the beginning of this chapter, which are discussed below. Second, this evaluation represented a successful

migration of a research prototype out of the laboratory and into the hands of real-world practitioners. By installing the Déjà vu system in working environments, this evaluation could be based on the experiences of library practitioners and library visitors using Déjà vu in service of actual needs. Third, as Déjà vu has now been in use at NDIRS for over a year, this evaluation has led to an actual improvement in the ability of this institution to service the needs of its patrons. Considering the difficulty that researchers often face in the transfer of technology from research labs to practitioners, the Déjà vu evaluation can be viewed as unqualified success.

For the purpose of summarizing the results of this evaluation, it is useful to consider each of the three questions posed at the beginning of this chapter. Collectively, they address the current functionality of the Déjà vu system, its appropriateness and utility in real retrieval environments, and the directions for future development work in browsing-based retrieval systems.

1. Does Déjà vu improve access to library collections?

Déjà vu improved access to the evaluation collections in several ways. First, Déjà vu provided a level of automation that greatly improved the ability of users to move seamlessly between cataloging data and the media itself. When using the retrieval tools that were in place before the introduction of Déjà vu, library staff and visitors did not

have a means of quickly accessing the visual materials from the same system that they were using as a search tool. By integrating the retrieval interface and the means of accessing the visual materials, *Déjà vu* facilitated searches that were more explorative, comprehensive, and creative.

Second, *Déjà vu* improves the ability of library users to find materials based solely on their subject content. Given a rich browsing space of thesaurus terms and the ability to instantly see the availability of collection materials, *Déjà vu* is well suited to users who don't know exactly what they are looking for and don't know what is available in the collection. Traditional query-based tools are still preferable when users know some proper names or specific characteristics of the materials they desire.

Third, *Déjà vu* improved the quality of user searches by bringing the thesaurus to the forefront of the search process. Library visitors are typically unaware of how archivists catalog materials in a collection and of the existence of thesauri. By requiring that users understand the relationship between thesaurus terms and collection materials, *Déjà vu* improved users' understanding of library cataloging practice, resulting in more knowledgeable and successful search behavior. *Déjà vu* improves access to library collections by revealing the internal organization of a collection, and offering a means of traversing this organization in an intuitive manner.

2. Would library professionals want to use Déjà vu as a part of their set of retrieval tools?

Each set of evaluators agreed that Déjà vu provided functionality that would improve retrieval at their institutions. However, only NDIRS continued to use the Déjà vu system after the evaluation period. The reasons for the difference seen at each of these institutions can be attributed to judgements of costs and benefits. At NDIRS, Déjà vu was seen as significant improvement over the search tools they currently had available for accessing their video laserdisc collection. Accordingly, they were willing to take on the added responsibility of training staff and library visitors how to use the software, and of maintaining the Déjà vu databases by periodically loading up-to-date versions of the institute's MARC records. At the Library of Congress Prints and Photographs Division, Déjà vu was viewed solely as a research prototype, lacking the support or the reliability to be integrated into their retrieval practices. Given that the Prints and Photographs Division services an estimated 120 times as many requests for photographic materials per year as NDIRS, these concerns seem perfectly justified.

3. What functionality was missing in Déjà vu that would be necessary in future browsing-based retrieval systems?

The evaluators offered several recommendations for improvements to the Déjà vu system or future browsing-based retrieval systems based on the Déjà vu design. First, browsing-based retrieval systems must support multiple thesauri and local thesaurus terms in a single browsing space. Both evaluation collections utilized thesaurus terms found outside of the LCTGM. NDIRS also used local thesaurus terms that were created at the institute solely for the purpose of indexing materials in their collection. The current version of Déjà vu has no facility for handling terms outside of a single thesaurus. As a result, items indexed solely by external terms are completely inaccessible to Déjà vu users. Future browsing-based retrieval systems should provide some mechanisms for managing the complexities involved in incorporating external thesaurus terms into a single browsing space. A challenging research problem would be to develop methods for merging multiple thesauri, each with their own set of Expectation Packages, into a single, comprehensible network that can be traversed by users.

Second, the best retrieval systems will integrate a browsing-based interface with traditional query-based retrieval functionality. Déjà vu does an excellent job of servicing the requests of users who don't know exactly what they are looking for or what is available in a collection. Traditional query-based retrieval systems do an excellent job of

finding materials based on proper names or specific characteristics that are known by the user. However, as seen in several of the examples presented in Section 4 of this chapter, the most useful retrieval systems would be those that combine both of these methods into a single interface. That is, there are times when a user's interests are can be partially specified by proper names or specific characteristics, such as the name of a city or a period in history. By using this information to constrain the retrieval possibilities, users could then benefit from a rich browsing space to locate the opportunities and alternatives that are available in a collection. Some of this functionality was developed in a new version of Déjà vu that was given to NDIRS after the evaluation period. However, a truly integrated retrieval system would require much more design consideration than was possible in the software that was provided.

Third, to reduce the subjectivity of the Expectation Packages, they should be developed by multiple people who are familiar both with the thesaurus terms and with the common knowledge of the population of users. Because the Expectation Packages for the LCTGM were developed by solely by me, a number of them reflect the idiosyncrasies and peculiarities of my own knowledge and experiences in the world. It would be much preferable if Expectation Packages were developed in larger groups to ensure that the represented knowledge was less individualized. Ideally, Expectation Packages would be developed by people who were very familiar with the content and structure of the

particular thesaurus, perhaps the thesaurus developers themselves. In addition, this group of people should be familiar with the knowledge that is common amongst the intended users of the resulting browsing space. The users of the two evaluation collections represented a broad slice of the general public whose common knowledge was truly commonsense - that which could be represented by people who were unfamiliar with any particular domain of knowledge. For more technical collections and specialized thesauri, the group of Expectation Package designers should include members of the intended user community.

CHAPTER 6: RESEARCH SUMMARY

This research began in an attempt to improve the tools that were available for accessing digital library materials. This work started with a simple idea: How could we design a retrieval system that let users browse for what they wanted? In the course of exploring this possibility, a number of ideas which started as design options developed into the central research claims that this dissertation supports. Four of the central research claims of this research are presented again in this chapter, providing a framework for summarizing the whole of this dissertation.

6.1 Browsing-based retrieval systems avoid the pitfalls of query-based techniques

The focus of this dissertation has been on the design of effective retrieval interfaces that support user-directed browsing of collection materials. The purpose of any retrieval system is to mediate between the retrieval needs of the user and the materials that are available in a collection. Browsing-based retrieval systems effectively support this mediation process by eliminating two problematic steps present in more traditional query-based techniques.

First, in browsing-based retrieval systems users are not forced to specify their retrieval needs in the form of a text-based query. Instead, users can traverse a browsing space in

some direction of increasing importance which is never made explicit. In some cases, users may be completely unable to introspect on their own retrieval needs, and may explore a browsing space simply to find something interesting. By eliminating the task of specifying a text-based query, browsing-based systems avoid a host of problems associated with the language and vocabulary employed by users and archivists. Those users who are unfamiliar with the indexing vocabulary of an archive are not forced to guess which terms are likely to be recognized by the retrieval system. In turn, the retrieval system avoids the difficult tasks of matching synonymous terms or phrases, and of disambiguating the meaning of terms in the users query.

Second, information concerning the availability of collection materials is presented directly to the user. In systems that employ text-based queries, information about the availability of materials is known only to the retrieval system itself, which attempts to bridge the gap between the query and the available materials in the most intelligent way possible. The user is faced with the difficult task of guessing which query is likely to yield the an appropriate retrieved set - one that is relevant and contains neither too many materials nor is completely empty. By showing the user what materials are available throughout the browsing process, browsing-based retrieval systems eliminate this guesswork. In addition to directing users toward available retrieval options that directly meet their needs, browsing-based systems can highlight retrieval opportunities related to

users interests that they may not have initially considered, and offer retrieval alternatives when specific needs are not met by available materials.

6.2 Browsing spaces should be constructed from thesaurus terms

One of the key design choices made for the *Déjà vu* system was that users would browse through the indexes used to catalog a collection. That is, the browsing space presented to the user consisted solely of index terms, and not the collection materials themselves. This choice opened up the possibility of capitalizing on work that had already been done in various library science communities. The use of controlled index vocabularies, called thesauri, has steadily increased over the years in large and small libraries alike. As a result, there exists many thesauri developed for various special purpose collections that are already being used in existing libraries. Rather than using any hand-made, special-purpose indexing vocabulary or cataloging techniques, *Déjà vu* was designed to be used with existing collections that are indexed using existing thesauri. In *Déjà vu*, users browse through the terms in a thesaurus directly to locate collection materials. The browsing process takes place in a browsing space consisting of thesaurus terms and conceptual links between those terms.

The advantages of this design choice are twofold. First, by separating the browsing space from the collection materials, a single, well-crafted browsing space of the

thesaurus terms can be applicable to any number of collections that use that thesaurus as a primary indexing tool. For example, a browsing space that contains terms from the Library of Congress Thesaurus for Graphic Materials can be used by Déjà vu to provide access to any library collection that uses this thesaurus for cataloging purposes. This approach puts an upper-bound on the amount of work that needs to be done to create browsing-based retrieval systems for a particular thesaurus, regardless of the number of institutions that will use it.

Second, separating the browsing space from the collection materials allows browsing-based retrieval systems to scale well to very large and dynamic collections. The work required to generate a browsing-based retrieval system for a collection is determined by the size of the thesaurus in use, and not by the size of the collection. By focusing our efforts on the browsing space of thesaurus terms, which seldom top more than tens of thousands of terms, we can provide retrieval solutions to collections that are an order of magnitude greater in size. In this dissertation, a modest-size thesaurus (under 6,000 terms) served as a browsing space for two different collections of considerable size (over 11,000 and 25,000 indexed materials, respectively).

Déjà vu's limitations with regard to its use of index terms does present directions for future investigation. Déjà vu was designed to support only a single thesaurus at a time,

but most institutions use multiple thesauri in their cataloging efforts. If *Déjà vu* is to be applicable in these environments, some questions regarding multiple browsing-spaces must be answered. This dissertation has offered an approach for creating browsing spaces for individual thesauri. It is an open research question whether there are methods for integrating multiple browsing spaces together in a manner that is comprehensible to users.

6.3 Thesaurus terms should be clustered into Expectation Packages

The ability of users to browse through a thesaurus to find relevant materials depends primarily on the quality of the links that are provided between terms. In general, thesauri have been designed by library scientists primarily for the purpose of assisting archivists in cataloging materials in a collection, and not for the purpose of end-user browsing. While thesaurus designers often try to specify reasonable taxonomic and associative links between terms, the average number of links per term is typically very small. The reason for this is twofold. First, it takes an enormous amount of effort to specify a full set of reasonable links, even for modestly-sized thesauri. Second, thesaurus designers do not have a suitable methodology to guide them in the linking process. This dissertation has proposed that these problem could be addressed by changing the way that thesaurus designers create links between terms.

Currently, thesaurus links are made directly from one term to another. That is, thesaurus designers attempt to identify establish links between two terms that share some conceptual relationship, typically taxonomic or associative. In the standard practice of thesaurus construction, links between terms are always reflexive. Accordingly, every time that the thesaurus designer identifies two terms that should be paired together, two new links are created. In this dissertation, it was argued that it would be greatly advantageous if thesaurus designers could devote their energies to the creation of clusters of terms - groups of terms in which all of the members of the group were fully linked to all of the other members. Adding a new thesaurus term to a group would create a pair of reflexive links between the term and all of the current members. Identifying these groups would greatly reduce the amount of work it takes for thesaurus designers to create a richly interconnected space for end-user browsing.

The efficiency benefits of clustering thesaurus terms can only be realized if thesaurus designers have some reasonable criteria for determining which clusters should be created. In this dissertation, I have argued that Expectation Packages provide the necessary framework for determining which clusters should be created in order to best provide a rich end-user browsing space. The argument for using Expectation Packages is based on the idea that concepts referred to by thesaurus terms exist as parts of larger cognitive structures in people's minds. Cognitive science researches have developed theories to

represent these larger cognitive structures, often for the purpose of supporting reasoning in computer models. By removing much of the representational complexity and by substituting conceptual components with thesaurus terms, these cognitive science representations can be used to cluster groups of terms into Expectation Packages. As part of this dissertation research, 770 Expectation Packages were created for the Library of Congress Thesaurus for Graphic Materials through the application of theory of episodic memory organization.

The application of Expectation Packages to the development of a rich end-user browsing space demonstrate how cognitive science theories and Artificial Intelligence knowledge representations can be useful in solving large-scale, real-world problems. Research in knowledge representation has certainly furthered our understanding of human cognitive processes, but the engineering value of this research is often in dubious, leading to systems that are brittle and capable of operating on small, tightly constrained problems. This dissertation describes how the engineering value of cognitive theories can be exploited in a robust and large-scale manner by reducing the role of automated reasoning. While *Déjà vu* is decidedly knowledge-rich, none of its knowledge representations are used to support automated reasoning or problem-solving tasks. The sole purpose of its representations is to organize a browsing space that end-users find useful and intuitive.

There are many issues concerning the use of Expectation Packages that remain as directions for future research. First, it would be useful to investigate strategies for collaborative generation of Expectation Packages in order to reduce the subjectivity of the collection. The 770 Expectation Packages that were developed as part of this research were developed solely by myself, and therefore reflect my own personal understanding of the domains that they represent. In the ideal case, Expectation Packages for a thesaurus should be developed by thesaurus designers themselves in collaboration with representatives from the target user population. Designing collaborative authoring tools was not a focus of this research, but they would be necessary in the ideal case. A second direction for future research is to investigate the possibility of automatic or semi-automatic generation of Expectation Packages. While the 770 Expectation Packages generated for this research required a rather modest amount of effort, authoring Expectation Packages for much larger thesauri may be less feasible without computational assistance. It is an open question whether existing data-mining and knowledge-extraction techniques could be adapted for this purpose.

6.4 Retrieval researchers should use library standards to facilitate evaluation

The design of the Déjà vu system made it easy to evaluate its effectiveness as an access tool for large, existing collections. The critical design choice was to support the

thesaurus and database standards that are employed throughout the library science community. It is common for researchers in computer science and information retrieval to employ special-purpose, hand-crafted indexing vocabularies and database standards, which limits either the scale of their evaluations or the types of approaches they can take. The use of existing standards allowed Déjà vu to be evaluated in the context of existing, large-scale retrieval environments with no additional content work on the part of collection archivists and catalogers.

In this dissertation, the development and evaluation efforts centered on one widely-used thesaurus, the Library of Congress Thesaurus for Graphic Materials. Accordingly, Déjà vu could be evaluated at any site that used this thesaurus as its primary source of indexing terms. Two evaluation sites were chosen: the North Dakota Institute for Regional Studies and the Library of Congress Prints and Photographs Division. Each of these institutions provided the Machine Readable Cataloging records for a particular digital image collection (of over 11,000 and 25,000 images, respectively). After reading these records into the Déjà vu system, the software was installed at these sites for evaluation by library staff and users.

After an evaluation period, the staff at these institutions provided an in-depth written evaluation of the Déjà vu software as well as a review of how it was applicable to the

requests presented by library users. These evaluative comments included both praise and criticism of the system. Three areas of positive feedback were provided. First, *Déjà vu* improved access to these collections by servicing users looking for materials based solely on their subject content. Second, *Déjà vu* improved the search abilities of users by bringing the thesaurus to the front of the search process, forcing users to understand the relationship between thesaurus terms and library materials. Third, *Déjà vu* made accessing materials easier by greatly improving the level of automation by making the digital materials immediately viewable from the search tool itself.

In addition, three areas of criticism were offered by the evaluators, which offered directions for future research. First, future systems must facilitate multiple thesauri, allowing users to browse through the entire space of index terms rather than those from a single thesaurus. Second, browsing-based systems must also include the functionality that is found in traditional query-based systems as well. That is, the best retrieval systems will incorporate both browsing and query-based search to provide a tool that is more useful than either approach on its own. Third, the Expectation Packages used to provide a rich browsing space for end-users should be developed in a way that minimizes their subjectivity, making them less susceptible to the particular knowledge of any one person.

While the evaluation of Déjà vu at these two sites answered an important set of research questions, further evaluations of browsing-based systems are necessary. One important area of future research is the design of new evaluation methodologies that are appropriate for this retrieval approach. Of special interest would be methods for evaluating the comparative quality of different particular browsing spaces, particularly with regard to their level of intuitiveness, comprehensibility, and ultimately their utility to service the retrieval task. Importantly, these evaluative methods must recognize that the retrieval task itself is broad and multi-faceted. The process of mediating between users' needs and collection materials must continually be viewed as an exploration through an enormous space of options, opportunities, and alternatives.

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APPENDIX: EXPECTATION PACKAGES FOR THE LCTGM

The 770 Expectation Packages created for the Library of Congress Thesaurus for Graphic Materials are listed below in the order that they were generated.

1. A jousting competition

Events Horseback riding, Jousting, Tournaments
Places Castles & palaces
People Knights, Lancers, Nobility
Things Armor, Coats of arms, Horses, Shields
Misc Chivalry

2. Performing an abortion in a clinic

Events Abortions, Teenage pregnancy
Places Clinics
People Physicians, Pregnant women, Single women
Things Surgical instruments

3. Performing a back-alley abortion

Events Abortions
Places Alleys
People Pregnant women, Single women
Misc Hygiene

4. Parents physically abusing their children

Events Beating, Children crying, Children misbehaving, Temper tantrums
People Abused children, Fathers & children, Mothers & children
Things Belts (Clothing), Wounds & injuries
Misc Child discipline, Children's rights, Family violence

5. Men physically abusing their women partners

Events Beating, Swearing, Threats
People Abused women, Men
Things Wounds & injuries
Misc Family violence

6. Women going to abused women's shelters

Events Examinations
Places Women's shelters
People Abused women, Social workers
Things Wounds & injuries
Misc Family violence

7. Going polka dancing in a dance hall

Events Folk dancing
Places Dance halls, Ethnic neighborhoods
People Couples, Ethnic groups
Things Accordions, Bands, Beer, Sausages

8. Going to church for a Christian religious service

Events Benedictions, Communion, Prayer, Preaching, Religious services, Sabbaths
Places Chancels, Churches
People Acolytes, Choirboys, Preachers
Things Bibles, Chalices, Choirs (Music), Church vestments, Crosses, Pews, Pulpits
Misc Christianity

9. A circus performance at a show tent

Events Acrobatics, Circuses & shows, Juggling, Sword swallowing, Trick riding
Places Show tents
People Acrobats, Aerialists, Circus performers, Clowns, Daredevils, Human curiosities, Magicians, Strong men
Things Circus posters, Trained animals, Unicycles

10. A gymnastic competition

Events Acrobatics, Coaching (Athletics),
Falling, Gymnastics, Jumping
Places Gymnasiums
People Athletes, Sports spectators
Things Scoreboards

11. A cheerleading squad performing a routine

Events Acrobatics, Cheering,
Cheerleading, Jumping, Shouting
Places Athletic fields, Gymnasiums,
Stadiums
People Athletes, Sports spectators

12. An audition for a theatrical production

Events Auditions
Places Stages (Platforms), Theaters
People Actors, Actresses, Theatrical
producers & directors
Things Queues
Misc Anxiety

13. Going to a theatrical production

Events Bowing, Hand clapping,
Theatrical productions,
Whispering
Places Lobbies, Stages (Platforms),
Theaters, Ticket offices
People Actors, Actresses, Children
performing in theatrical
productions, Theater audiences,
Theatrical producers & directors
Things Costumes, Playbills, Stage
lighting, Stage props, Theater
programs, Theatrical posters,
Tickets

14. An entertainment industry awards ceremony

Events Hand clapping, Rites &
ceremonies
Places Theaters
People Actors, Actresses, Celebrities,
Musicians, Photographers,

Socialites, Theatrical producers & directors
Things Awards, Envelopes, Flash photographs,
Limousines, Podiums, Tuxedos
Misc Fame

15. A film or video production shoot

Events Cinematography, Sound recording,
Television broadcasting
Places Photographic studios, Television studios
People Actors, Actresses, Daredevils, Theatrical
producers & directors
Things Film negatives, Lighting, Motion picture
cameras, Motion pictures, Set design
drawings, Studio props
Misc Motion picture industry

16. Performing acupuncture treatment

Events Acupuncture, Acupuncture anesthesia,
Healing
Places Clinics, Medical offices
People Sick persons
Things Pins & needles
Misc Pain

17. Advertising by distributing pamphlets on the street

Events Advertising
Places Business districts, Commercial streets
Things Advertisements, Fliers (Printed matter),
Pamphlets, Refuse, Sandwich boards
Misc Publicity

18. Delivering the daily mail

Events Postal service
Places Dwellings
People Letter carriers
Things Advertising mail, Bags, Correspondence,
Envelopes, Mail trucks, Mailboxes,
Periodicals

19. An aerial bombing attack

Events Aerial bombings, Air operations, Bridge
failures, Building failures, Explosions,
Fires, Shouting, War
Places Air raid shelters
People Military air pilots

Things Barrage balloons, Bombers,
Bombs, War damage, Warnings

20. Going to a county fair

Events Agricultural exhibits, Animal shows, Art exhibitions, Circuses & shows, Fairs, Flower shows, Fortune telling, Livestock judging
Places Exhibition buildings, Midways, Portable buildings
People Food vendors
Things Amateur works, Amusement rides, Balloons, Livestock, Vending stands

21. Harvesting a crop at the end of a farming season

Events Farming, Harvesting
Places Croplands, Food storage buildings
People Agricultural laborers, Farmers
Things Farm produce, Harvesting machinery, Haystacks, Pitchforks, Plants, Scythes, Tractors
Misc Agricultural productivity, Autumn

22. A military air show over an air base

Events Military air shows, Stunt flying
Places Air bases, Runways (Aeronautics)
People Audiences, Military air pilots, Military officers
Things Fighter planes

23. Pumping gas into an automobile at a gas station

Events Parking, Vehicle maintenance & repair, Window cleaning
Places Automobile service stations
People Mechanics (Persons)
Things Air compressors, Automobiles, Gasoline, Gasoline pumps
Misc Gasoline prices, Gasoline taxes, Petroleum industry

24. Using an air conditioner

Places Apartments, Automobiles, Houses, Office buildings

Things Air conditioners, Thermometers, Windows
Misc Air conditioning industry, Cold, Heat, Temperature

25. Transporting mail by airplane

Events Air mail service
Places Airports
People Air pilots, Postal service employees
Things Advertising mail, Bags, Correspondence, Mail trucks, Periodicals, Transport planes
Misc Postal service rates

26. Flying on a passenger airplane

Events Aerial views, Air travel
Places Airplanes, Runways (Aeronautics)
People Air pilots, Flight crews, Passengers, Stewards
Things Beverages, Cities & towns, Intercommunication systems, Luggage, Periodicals, Windows

27. Operations in an air traffic control tower

Events Air traffic control, Navigation
Places Airports
People Air pilots
Things Airplanes, Binoculars, Radar, Radiophones, Radios
Misc Noise pollution, Safety

28. Commuting on a crowded expressway

Events Automobile driving, Automobile travel, Radio broadcasting, Traffic congestion
Places Express highways, Toll roads
People Commuters
Things Automobiles, Helicopters, Horns (Communication devices)
Misc Air pollution

29. Fixing a flat tire on an automobile

Places Roads, Streets
Things Air pumps, Automobile equipment & supplies, Automobiles, Bolts & nuts, Flat tires, Hoisting machinery, Tires
Misc Tire industry

30. An air raid drill during wartime

Events Air raid drills, Evacuations, War blackouts

Places Air raid shelters
 Things Horns (Communication devices),
 Queues
 Misc Aerial bombings, Bombardment,
 War

31. In-flight refueling of aircraft

Events Air refueling, Flights around the
 world
 People Military air pilots
 Things Airtankers, Bombers, Fuel

32. An air show of stunt flying

Events Air shows, Parachuting, Stunt
 flying
 People Air pilots, Daredevils,
 Parachutists
 Things Biplanes, Fighter planes

33. Going to the airport to catch a flight

Events Air travel, Arrivals & departures,
 Circulation (Architecture),
 Customs inspections, Farewells
 Places Airports, Concourses, Ticket
 offices
 People Guards, Passengers
 Things Luggage, Schedules (Time plans),
 Security systems, Taxicabs,
 Tickets

34. An in-flight battle between military aircraft

Events Air warfare, Campaigns & battles,
 Explosions
 Places Clouds
 People Fighter pilots
 Things Ammunition, Bullet holes, Fighter
 planes, Machine guns, Radar,
 Rockets

35. An airplane crash and rescue

Events Aircraft accidents, Death,
 Explosions, Fire fighting, Fires,
 Investigation, Rescue work
 Places Runways (Aeronautics)
 People Dead persons, Disaster victims,
 Fire fighters

Things Airplanes, Ambulances, Fire engines &
 equipment, Wounds & injuries

36. Aircraft taking off and landing from an aircraft carrier

Events Air traffic control, Air warfare
 Places Aircraft carriers, Decks (Ships), Seas
 People Fighter pilots
 Things Fighter planes, Signal flags

37. Waking up in the morning

Events Hangovers, Sleeping, Sunrises & sunsets,
 Waking
 Places Bedrooms
 Things Alarm clocks, Beds, Sleepwear
 Misc Fatigue

38. Cooking a meal at home in a kitchen

Events Cookery, Dishwashing
 Places Kitchens, Pantries
 People Cooks
 Things Alarm clocks, Cooking utensils,
 Dishwashing machines, Food, Herbs,
 Ovens, Refrigerators, Stoves
 Misc Domestic life, Hygiene, Temperature

39. Playing music on a stereo system

Places Discotheques
 People Disc jockeys
 Things Album covers, High-fidelity sound
 systems, Phonographs, Sound recordings
 Misc Acoustical engineering

40. Working in an alchemist's laboratory

Events Alchemy, Chemistry, Magic
 Places Laboratories
 People Wizards
 Things Fire, Gold, Kettles, Magical devices,
 Skulls, Smoke, Vats

41. Having a drink in a bar

Events Eating & drinking, Intoxication, Smoking
 Places Barrooms, Bars
 People Waiters, Waitresses
 Things Alcoholic beverages, Bars (Furniture),
 Jukeboxes, Smoke
 Misc Alcoholism, Temperance

42. Going to a college fraternity party

Events Eating & drinking, Intoxication, Nausea, Parties, Rock & roll dancing, Smoking
 Places Fraternities & sororities, Universities & colleges
 People Students
 Things Alcoholic beverages, Music, Smoke
 Misc Alcoholism, Social life

43. Tending to a bar

Events Dishwashing, Measuring, Shaking
 Places Barrooms, Bars
 People Waiters, Waitresses
 Things Alcoholic beverages, Bars (Furniture), Bottles, Carbonated beverages, Cherries, Drinking vessels, Glassware, Ice, Lemons, Limes, Olives, Refrigerators

44. Driving an automobile while intoxicated

Events Automobile driving, Drunk driving, Intoxication
 Places Roads, Streets
 People Traffic police
 Things Alcoholic beverages, Automobiles, Narcotics
 Misc Safety

45. Going to a liquor store

Places Liquor stores, Wine cellars
 Things Alcoholic beverages, Licenses, Refrigerators, Tobacco products
 Misc Brewing industry, Distilling industries, Wine industry

46. Going to an alcoholics support group meeting

Events Conversation, Discussion, Hangovers, Meetings
 Places Conference rooms
 People Social workers
 Misc Alcoholism, Temperance

47. Getting sick from drinking too much alcohol

Events Dizziness, Intoxication, Loss of consciousness, Nausea
 Places Bathrooms
 People Sick persons, Young adults
 Things Alcoholic beverages, Toilets
 Misc Alcoholism, Temperance

48. Having an allergy attack

Events Allergies, Sneezing
 Things Flowers, Handkerchiefs, Noses, Pets, Plants

49. Being assaulted in an dark alley

Events Rapes, Robberies, Self-defense, Threats, Violence
 Places Alleys
 People Criminals, Victims
 Things Handbags, Handguns, Purses, Shadows, Wounds & injuries

50. Municiple garbage collection

Events Civil service, Garbage collecting, Recycling
 Places Alleys, Residential streets
 Things Aluminum, Bottles, Newspapers, Refuse, Trucks

51. Hunting for alligators in a swamp

Events Alligator hunting, Poaching, Shooting
 Places Wetlands
 Things Alligators, Amphibious vehicles, Rifles

52. A wedding at a church

Events Crying, Kissing, Marriage, Weddings
 Places Altars, Chapels, Churches
 People Brides, Families, Grooms (Weddings), Photographers, Priests
 Things Bouquets, Certificates, Invitations, Limousines, Marriage certificates, Marriage licenses, Rice, Rings, Veils, Wedding costume

53. A school reunion anniversary party

Events Anniversaries, Parties, Reminiscing, Reunions

Places Schools, Universities & colleges
 People Alumni & alumnae, Students
 Things Photograph albums, Photographs,
 Time capsules
 Misc Baldness, Obesity, Occupations,
 Then & now comparisons

54. Going to a college football game

Events Cheering, Cheerleading, Football
 Places Stadiums, Universities & colleges
 People Alumni & alumnae, Football
 players, Marching bands,
 Mascots, Referees, Sports
 spectators, Students
 Things Balls (Sporting goods),
 Scoreboards

55. A peace conference between warring countries

Events Armistices, D tente, Military
 demobilizations, Peace
 conferences, Peace negotiations,
 Surrenders
 People Ambassadors, Generals, Heads of
 state, War allies
 Things Peace treaties
 Misc International relations, Military
 occupations, Peace, Reparations,
 War, War claims

56. A meeting of an international congress

Events Debates, International agricultural
 assistance, International
 communication, International
 competition, International
 economic assistance, International
 relations, Peace negotiations,
 Voting
 People Ambassadors
 Things International organizations
 Misc Free trade & protection,
 International economic
 integration, International
 organization, Parliamentary
 practice, Peace

57. A government confirmation hearing

Events Confirmations, Governmental
 investigations, Presidential appointments,
 Questioning
 Places Capitols
 People Ambassadors, Cabinet officers, Legislators,
 Supreme Court justices
 Misc Financial disclosure, Presidents & the
 Congress

58. An automobile wreck and emergency effort

Events Automobile driving, Death, Emergency
 medical services, Explosions, Fire fighting,
 Fires, Traffic accidents, Traffic congestion
 Places Roads, Streets
 People Dead persons, Fire fighters, Traffic police
 Things Ambulances, Automobiles, Broken glass,
 Fire engines & equipment, Litters, Wounds
 & injuries

59. Having a heart attack

Events Artificial respiration, Death, Emergency
 medical services, Loss of consciousness
 Places Emergency rooms, Hospitals
 People Dead persons, Sick persons
 Things Ambulances, Cardiovascular system,
 Hearts, Litters
 Misc Obesity, Pain, Physical fitness

60. An army ambushing an enemy in the field of battle

Events Ambushes, Campaigns & battles, Hiding,
 Silence, War
 Places Battlefields
 People Casualties, Soldiers
 Things Armies, Camouflage (Military science)
 Misc Courage, Cowardice, Surprise

61. Sightseeing at a famous place

Events Travel
 Places Historic buildings, Historic sites, Souvenir
 shops
 People Americans in foreign countries, Guides &
 scouts, Sightseers, Tourists
 Things Cameras, Historical markers, Monuments
 & memorials, Postcards
 Misc Tourist trade

62. Going through customs when entering a foreign country

- Events Bribery, Customs inspections, Questioning, Searching, Smuggling, Travel
- Places Boundaries, Customhouses, Guardhouses
- People Americans in foreign countries, Guards, Police
- Things Identification photographs, Luggage
- Misc Tariffs

63. Going frog hunting in a shallow lake or pond

- Events Country life, Hunting, Wading
- Places Lakes & ponds
- Things Amphibians, Fishing nets, Frogs, Lilies, Moonlight, Pitchforks
- Misc Night

64. Begging for money on a city street

- Events Pleading (Begging)
- Places Business districts, Commercial streets
- People Amputees, Beggars, Blind persons, Homeless persons, Mentally ill persons
- Things Coins, Tin cups
- Misc Charity

65. Moving around in a wheelchair

- Events Circulation (Architecture), Human locomotion
- Places Elevators, Sidewalks
- People Aged persons, Amputees, Paraplegics
- Things Wheelchairs

66. A surgery in an operating room

- Events Anesthesia, Blood transfusions, Surgery
- Places Hospitals, Operating rooms
- People Amputees, Health care personnel, Nurses, Physicians, Sick persons

- Things Blood, Human body, Hypodermic needles, Splints (Surgery), Surgical instruments, Wounds & injuries
- Misc Hygiene

67. Going to an amusement park

- Places Amusement parks, Midways
- People Food vendors, Mascots
- Things Amusement rides, Balloons, Karts (Midget cars), Monorail railroads, Queues, Vending stands
- Misc Summer

68. Going to an amusement pier

- Events Roller skating
- Places Amusement piers, Beaches, Boardwalks, Piers & wharves, Seas
- People Food vendors, Skaters
- Things Amusement rides, Gulls, Vending stands
- Misc Summer

69. Medical students dissecting a human cadaver

- Events Anatomy, Dissections, Examinations, Medical education, Nausea
- Places Laboratories
- People Dead persons, Physicians, Students
- Things Human body, Medical illustrations, Skeletons, Surgical instruments

70. Putting down an anchor while in a boat

- Events Mooring, Ocean travel, Parking
- Places Bodies of water
- People Fishermen, Sailors
- Things Anchors, Chains, Hoisting machinery, Mud, Rocks, Ropes, Shackles, Ship equipment & rigging, Vessels, Weeds

71. Making a fire in a fireplace during the winter

- Places Dens, Living rooms
- Things Andirons, Blankets, Chimneypieces, Chimneys, Fire, Fire screens, Fireplaces, Mantels, Matches, Newspapers, Smoke

72. Being escorted by angels through the gates of heaven

- Events Death
- Places Clouds, Heaven

People Angels, Dead persons, Ghosts,
Gods, Saints
Things Gates, Harps
Misc Christianity, Religion

73. Wild cats hunting for prey on the savanna

Events Animal attacks, Animal locomotion, Chasing, Hiding, Hunting, Running
Places Plains, Prairies
Things Cheetahs, Dead animals, Gazelles, Leopards, Lions, Panthers, Rifles, Tigers, Vultures

74. A police officer using a police dog to pursue a criminal

Events Animal attacks, Bites & stings, Chasing, Law enforcement, Running, Surrenders
People Criminals, Police
Things Working dogs

75. Going to an animal auction

Events Animal auctions, Animal grooming, Selling
Places Corrals, Stockyards
People Farmers
Things Horses, Livestock, Sheep, Swine
Misc Meat industry

76. Experimenting on animals in a science laboratory

Events Animal experimentation, Animal treatment, Electric shocks, Experiments, Surgery
Places Laboratories
People Scientists
Things Cages, Communicable diseases, Hypodermic needles, Incubators, Medicines, Mice, Monkeys, Rats
Misc Ethics

77. Feeding a pet a meal in the kitchen

Events Animal feeding, Eating & drinking
Places Kitchens

Things Bowls (Tableware), Cats, Dogs, Meat, Pet supplies, Water
Misc Domestic life

78. Feeding the livestock on a farm or ranch

Events Animal feeding, Farming
Places Barns, Farms, Poultry houses, Ranches, Stables
People Farmers
Things Boots, Grains, Horses, Livestock, Poultry, Sheep, Swine, Watering troughs
Misc Farm life, Meat industry

79. Going to a horse show

Events Animal grooming, Animal training, Horse shows, Horseback riding, Show jumping
Places Exhibition buildings
People Upper class
Things Fences, Saddles, Show horses, Teeth, Trained animals, Whips

80. Birds migrating because of seasonal change

Events Animal locomotion
Places Clouds
Things Birds, Winds
Misc Seasons

81. Fishing for salmon during a salmon run

Events Animal locomotion, Fishing, Jumping, Swimming, Wading
People Fishermen
Things Fishing nets, Fishing & hunting gear, Rocks, Salmon, Streams

82. Picking out a pet at a shelter, kennel, or shop

Events Adoption
Places Animal shelters, Animal welfare organizations, Kennels, Pet shops
Things Cages, Cats, Collars, Dog licenses, Dogs, Pets

83. Hunting for deer in the woods

Events Deer hunting, Population control, Searching, Silence
Places Forests, Game preserves, National parks & reserves

Things Animal tracks, Bullets, Dead animals, Deer, Rifles

84. Fox hunting on horseback with hunting dogs

Events Chasing, Fox hunting, Horseback riding, Jumping (Horsemanship), Searching

Places Forests

People Upper class

Things Animal tracks, Foxes, Horses, Hunting dogs

85. Taking a dog to dog obedience school

Events Animal training, Beating, Walking

Places Kennels

Things Chains, Collars, Dogs, Feces, Pets, Trained animals

86. An artist making an animated cartoon

Events Drawing, Painting

People Cartoonists

Things Animation cels, Artists' materials, Colors, Desks, Paints & varnishes, Pens

87. A couple celebrating a wedding anniversary

Events Anniversaries, Celebrations, Marriage, Toasting

People Aged persons, Families, Spouses

Things Rings

88. Going to an antique store

Events Searching, Shopping

Places Antique stores

Things Antiquities, Furniture, Memorabilia

Misc History

89. Going to an art or history museum

Events Art exhibitions

Places Galleries & museums

People Guards, Guides & scouts,

Sightseers, Tourists

Things Antiquities, Art, Art objects, Dinosaurs, Drawings, Paintings, Showcases

90. Having a picnic in a park

Events Eating & drinking, Outdoor cookery, Picnics

Places Parks, Picnic grounds

People Couples

Things Ants, Blankets, Flies, Food, Silverware, Wine

91. Taking an important test in school

Events Examinations, Perspiration, Thinking

Places Classrooms, Schools, Universities & colleges

People Students

Things Clocks & watches, Pencils

Misc Anxiety, Education, Stress

92. Apartment neighbors complaining about noise

Events Knocking, Parties, Shouting

Places Apartment houses, Apartments

People Neighbors

Things Doors & doorways, High-fidelity sound systems, Music

Misc Acoustical engineering, Anger, Noise pollution

93. Bobbing for apples

Events Bobbing for apples, Children's parties

Things Apples, Barrels, Basins, Teeth, Wash tubs

94. A craftsman teaching their trade to an apprentice

Events Handicraft, Vocational education

Places Workshops

People Apprentices

Things Arts & crafts, Equipment

Misc Education, Guilds, Teaching methods

95. Going to an aquarium

Events Animal feeding, Swimming

Places Aquariums

People Guides & scouts, Sightseers, Tourists

Things Aquatic animals, Water, Water tanks

Misc Oceanography

96. An offshore oil spill and cleanup effort

Events Cleaning, Oil spills, Shipwrecks
 Places Beaches, Seas, Waterfronts
 Things Aquatic animals, Dead animals, Tankers
 Misc Petroleum industry, Water pollution

97. Excavation at an archaeological site

Events Archaeology, Digging, Excavation, Measuring, Paleontology, Sweeping & dusting
 Places Archaeological sites, Cliff dwellings, Pyramids, Ruins
 People Scientists
 Things Antiquities, Brooms & brushes, Fossils, Measured drawings, Pottery, Shovels
 Misc Extinct animals

98. Architects working on the schematics of a new building

Events Architecture, Building construction
 Places Architects' offices
 People Architects
 Things Architectural drawings, Architectural models, Architectural photographs, Blueprints, Computer graphics, Computers, Computer-aided designs, Design drawings, Floor plans, Plans

99. A swordfight between two knights on a battlefield

Events Action & adventure dramas, Dueling, Fighting
 Places Battlefields
 People Gladiators, Knights
 Things Armor, Coats of arms, Daggers & swords, Wounds & injuries
 Misc Chivalry

100. A royal procession at a castle or palace

Events Bowing, Curtsying, Parades & processions
 Places Castles & palaces
 People Guards, Nobility, Rulers
 Things Armor, Coats of arms, Crowns, Flags, Uniforms

101. Forging horseshoes or weaponry in a forge shop

Events Blacksmithing, Fire, Forging, Heat
 Places Forge shops
 People Armorers, Blacksmiths
 Things Armor, Daggers & swords, Hammers, Horseshoes, Ironwork, Kilns, Steel

102. Firing a nuclear warhead at an enemy country

Events Explosions, Fires, Heat, War
 People Generals, Nuclear weapons victims, Presidents
 Things Mushroom clouds, Nuclear weapons, Rockets
 Misc Arms control, Arms race, Moral aspects of war, Radioactivity

103. Going to an Army-Navy store

Events Secondhand sales, Shopping
 Places Army-Navy stores
 People Veterans
 Things Camouflage (Military science), Gas masks, Military uniforms, Surplus government property, Tents

104. A battle between American Indians and U.S. Military

Events Archery, Bareback riding, Campaigns & battles, Frontier & pioneer life, Scalping
 Places Battlefields, Forts & fortifications
 People Casualties, Indians of North America, Pioneers, Soldiers
 Things Arrows, Bows (Archery), Bugles, Cavalry, Horses, Rifles, Tomahawks
 Misc Westerns, Westward movement

105. Going to an art auction

Events Art auctions
 Places Commercial art galleries

People Art collectors, Art dealers, Upper class
 Things Art objects, Auction catalogs
 Misc Extravagance, Wealth

106. Going to a opening at a commercial art gallery

Events Art exhibitions, Flattery
 Places Commercial art galleries
 People Art collectors, Art dealers, Artists, Bohemians, Critics
 Things Art objects, Artists' signatures, Champagne (Wine), Paintings

107. Figure painting or drawing in an art class

Events Art education, Drawing, Painting
 Places Artists' studios
 People Artists, Artists' models, Nudes, Students
 Things Amateur works, Artists' materials, Drawings, Female figure drawings, Figure drawings, Human body, Paintings

108. Going to an outdoor arts and crafts festival

Events Art festivals
 Places Markets, Midways, Parks
 People Art dealers, Food vendors
 Things Art objects, Arts & crafts, Jewelry, Vending stands

109. Stealing a valuable art object from a museum

Events Art thefts
 Places Galleries & museums
 People Criminals, Guards, Watchmen
 Things Art objects, Fingerprints, Gems, Security systems, Showcases
 Misc Insurance

110. A lifeguard saving a drowning victim at a beach

Events Artificial respiration, Drowning, Floating, Lifesaving, Loss of consciousness, Swimming

Places Beaches, Bodies of water, Lifesaving stations
 People Children playing in water, Drowning victims, Lifeguards, Swimmers
 Things Life preservers

111. Stargazing on a clear night with a telescope

Events Auroras, Stargazing
 Places Hills, Meadows, Plains, Prairies
 Things Artificial satellites, Celestial bodies, Moonlight, Telescopes
 Misc Astronomy, Night, Unidentified flying objects

112. A launch of a rocket for space flight

Events Fire, Space flight
 Places Air bases
 People Astronauts, Scientists
 Things Artificial satellites, Rockets, Smoke
 Misc Excitement

113. An artist working in an artist studio

Events Art
 Places Artists' studios
 People Artists, Artists' models
 Things Art objects, Artists' materials, Drawings, Paintings, Paints & varnishes, Palettes

114. Assassination of a public figure at a public appearance

Events Assassinations, Covert operations, Political parades & rallies, Public appearances, Shooting
 People Anarchists, Criminals, Crowds, Diplomats, Government officials, Guards, Heads of state, Politicians, Rulers
 Things Firearms
 Misc Anarchism, Secret service

115. Assassinating someone using a car bomb

Events Assassinations, Bombings, Explosions, Terrorism
 Places Parking garages, Parking lots
 People Activists, Criminals, Government officials, Heads of state, Politicians, Rulers, Statesmen
 Things Automobiles, Bombs, Gasoline engines

Misc Organized crime

116. Working on an assembly line in a factory

Events Assembly-line methods, Industry, Product inspection, Welding

Places Factories

People Laborers, Working class

Things Conveying systems, Gloves, Goggles, Helmets, Machinery, Products, Robots

Misc Boredom, Employee rights, Labor unions

117. Going to a fortune teller or astrologist

Events Astrology, Divination, Fortune telling, Witchcraft

People Witches, Wizards

Things Amulets, Candles, Crystal balls, Fortune telling cards, Incense, Ouija boards, Talismans, Tarot cards

Misc Prophecy, Warnings, Zodiac

118. Making a moon landing

Events Experiments, Radio broadcasting, Space flight

Places Craters, Moon

People Astronauts

Things Artificial satellites, Flags, Footprints

119. Astronauts travelling in a space ship

Events Experiments, Floating, Radio broadcasting, Space flight, Sunrises & sunsets, Voyages around the world

People Astronauts, Scientists

Things Celestial bodies, Earth, Scientific equipment

120. Working in an astronomical observatory

Events Astronomy, Measuring, Stargazing

Places Astronomical observatories

People Scientists

Things Celestial bodies, Galaxies, Moonlight, Night photographs, Stars, Telescopes

Misc Night

121. Going to a planetarium

Events Astronomy

Places Circular buildings, Circular rooms, Planetaria

People Audiences

Things Celestial bodies, Domes, Motion picture devices, Motion pictures, Stars

Misc History, Night

122. An awards ceremony at an olympic competition

Events Boycotts, International competition, National songs, Sports, Victories

Places Athletic fields, Gymnasiums, Stadiums

People Americans in foreign countries, Athletes

Things Medals, Olympic flame, Podiums

Misc Patriotism

123. Working out at an athletic club

Events Calisthenics, Perspiration, Physical fitness, Weight lifting, Weight loss

Places Athletic clubs, Locker rooms

People Strong men

Things Bicycles & tricycles, Towels, Treadmills, Weights & measures

Misc Health, Obesity

124. Going to a locker room in an athletic club

Events Bathing, Grooming

Places Athletic clubs, Bathrooms, Locker rooms

Things Bathtubs & showers, Cosmetics & soap, Dressing & grooming equipment, Scales, Towels

125. Going to a book signing in a bookstore

Events Autographing, Book talks, Bookselling, Celebrity touring

Places Bookstores

People Authors

Things Autographs, Book covers, Book jackets, Book & magazine posters, Books, Pens, Queues
 Misc Publishing industry

126. Catching a fly ball while watching a baseball game

Events Autographing, Baseball, Raising hands
 Places Stadiums
 People Baseball players, Sports spectators
 Things Autographs, Balls (Sporting goods), Hands

127. Asking a celebrity for an autograph

Events Autographing
 People Celebrities
 Things Autographs, Writing materials
 Misc Adoration, Fame, Gratitude, Snobbishness

128. Test driving and buying a car from an dealership

Events Automobile driving, Deals, Document signings, Kicking
 Places Automobile dealerships, Parking lots, Showrooms
 People Consumers, Sales personnel
 Things Automobiles, Contracts, Keys (Hardware), Tires

129. Getting an automobile inspection, repair, or tune-up

Events Automobile inspections, Vehicle maintenance & repair
 Places Automobile service stations
 People Mechanics (Persons)
 Things Automobile equipment & supplies, Automobiles, Hoisting machinery, License plates, Licenses, Stickers

130. Going to a automobile racing track

Events Automobile racing, Drag racing, Parachuting
 Places Grandstands, Racetracks

People Automobile racing drivers, Mechanics (Persons), Sports spectators
 Things Flags, Gasoline, Gasoline engines, Gasoline pumps, Hot rods, Racing automobiles, Signal lights

131. Going on a family road trip

Events Automobile driving, Automobile travel, Children fighting, Sleeping
 Places Automobile service stations, Express highways, Rest stops
 People Families
 Things Automobiles, Billboards, Maps, Radios

132. Going trick-or-treating on Halloween

Events Children walking, Holidays, Knocking
 Places Porches, Sidewalks
 People Children
 Things Candy, Costumes, Doors & doorways, Jack-o-lanterns, Masks
 Misc Autumn, Children & safety

133. Raking up fallen leaves in Autumn

Events Children jumping, Children playing outdoors, Raking (Sweeping)
 Things Gardening equipment & supplies, Leaves, Plastic bags, Trees
 Misc Autumn

134. Being caught in an snow avalanche

Events Avalanches, Mountaineering, Search & rescue operations, Snowshoeing
 Places Mountains
 Things Axes, Ice, Snow, Sound waves
 Misc Cold, Despair

135. Chopping wood by a log cabin in the woods

Events Fuelwood gathering, Woodcutting
 Places Forests, Log cabins
 People Woodcutters
 Things Axes, Crosscut saws, Fuelwood, Logs, Trees

136. Firefighters fighting a fire and rescuing trapped people

Events Bucket brigades, Fire fighting, Fires, Lifesaving at fires

Places Buildings, Fire escapes
 People Disaster victims, Fire fighters
 Things Axes, Burns & scalds, Fire
 alarms, Fire engines &
 equipment, Fire extinguishers,
 Fire hydrants, Floor plans, Hoses,
 Smoke, Water
 Misc Courage, Danger, Fire prevention,
 Fire-resistive construction, Heat

**137. Children working on a 4-H Club
 project on a farm**

Events 4-H clubs, Farming, Gardening
 Places Farms
 People Children, Farmers
 Things Livestock, Poultry, Swine,
 Tractors
 Misc Farm life

**138. Homeless people finding a place to
 sleep**

Events Sleeping
 Places Abandoned buildings, Alleys,
 Parks, Shelters
 People Churches, Homeless persons,
 Police
 Things Boxes, Newspapers, Refuse

139. Demolishing an abandoned building

Events Building failures, Demolition,
 Explosions
 Places Abandoned buildings, Ruins
 People Architects, Construction workers,
 Spectators
 Things Barricades, Bulldozers, Dump
 trucks, Dynamite, Helmets

**140. Children living at an orphanage
 seeking adoption**

Events Adoption, Child rearing, Public
 service
 Places Orphanages
 People Abandoned children, Abused
 children, Children & adults,
 Orphans, Sick children
 Misc Custody of children, Foster home
 care

141. Living in a Monastery or a Convent

Events Meditation, Prayer, Religious services
 Places Abbeys, Convents, Monasteries, Scriptoria
 People Monks, Nuns, Religious orders
 Things Religious articles, Religious books, Scrolls
 Misc Christianity, Religion

142. The coronation of a new monarch

Events Abdication, Coronations, Parades &
 processions
 Places Castles & palaces
 People Clergy, Flags, Guards, Kings, Nobility,
 Rulers, Uniforms
 Things Crowns, Thrones
 Misc Monarchy, Red carpet

**143. An ablution ritual as part of a religious
 ceremony**

Events Bathing, Cleaning, Rites & ceremonies
 Places Churches
 People Clergy
 Things Ablution fountains, Hands, Heads
 (Anatomy), Water

144. Going to a slave auction

Events Auctions, Slave trade, Slavery
 Places Plantations, Slave ships
 People Afro-Americans, Agricultural laborers,
 Plantation owners, Slaves
 Things Chains, Shackles
 Misc Abolition movement, Civil rights

**145. Abolitionists helping slaves move through
 northern states**

Events Assistance, Hiding
 Places Boundaries, Caches
 People Abolitionists, Activists, Afro-Americans,
 Fugitive slaves, Slaves
 Misc Abolition movement, Underground
 railroad system

146. Staying home in bed due to illness

Events Communicable diseases, Coughing,
 Sleeping, Sneezing
 Places Bedrooms
 People Sick persons

Things Bacteria, Beds, Medicines,
Thermometers

Misc Absenteeism (Labor),
Temperature

147. Musicians recording in a recording studio

Events Acoustical engineering, Music,
Rehearsals, Sound recording

Places Music rooms, Studios

People Engineers, Musicians

Things High-fidelity sound systems,
Music stands, Musical
instruments, Rock groups, Sheet
music covers, Sound recordings

Misc Musicians' unions, Sound
recording industry

148. A criminal trial in a courtroom

Events Actions & defenses, Judicial
proceedings, Legal aid

Places Courthouses, Courtrooms

People Bailiffs, Criminals, Informers,
Judges, Juries, Lawyers, Police,
Prisoners, Victims

Things Courtroom sketches, Gavels

Misc Crimes, Criminal investigations,
Ethics, Justice, Laws, Quotations

149. Staging a demonstration for some political issue

Events Civil disobedience,
Demonstrations, Political parades
& rallies, Protest movements,
Public speaking

Places Capitols, City & town halls,
Student unions, Universities &
colleges

People Activists, Dissenters, Police,
Students

Things Banners

Misc Civil rights, Freedom of speech,
Opposition (Political science),
Student movements

150. Working in a government administrative office

Events Civil service, Government regulation

Places Administrative agencies, Office buildings,
Offices

People Government employees, Office workers

Things Documents, Forms, Office equipment &
supplies, Office furniture, Paperwork

Misc Civil service reform, Red tape

151. Planning military action in a war room

Events Campaigns & battles, Military maneuvers,
Military mobilizations, Troop movements,
War

Places Military camps, Military headquarters

People Admirals, Generals, Heads of state

Things Aerial photographs, Maps

Misc Military intelligence, Military leadership,
Military policy

152. Building an adobe structure

Events Bricklaying, Building construction

Places Mesas, Pueblos

People Indians of Central America, Indians of
North America, Indians of South America

Things Adobe buildings, Brickwork, Hay, Mud,
Walls

Misc Building deterioration, Heat

153. Living in a religious community as part of a cult

Events Adoration, Deception, Meditation, Prayer,
Preaching, Prophecy

Places Collective settlements

People Evangelists, Healers, Hippies, Prophets,
Spiritual leaders

Misc Cults, End of the world, Freedom of
religion

154. Going to a business seminar

Events Adult education, Business education,
Public speaking

Places Auditoriums, Lecture halls

People Businessmen

Things Business cards, Podiums, Writing
materials

155. Pregnant women and spouses going to a natural birth class

Events Adult education, Discussion,
Pregnancy
Places Clinics, Maternity hospitals
People Midwives, Physicians, Pregnant
women, Spouses

**156. Going to a hotel or brothel for
prostitution**

Events Adultery, Massage, Prostitution,
Sex
Places Brothels, Hotels
People Masseurs
Things Beds, Birth control
Misc Lust, Sexually transmitted
diseases

**157. Making a sales pitch to a corporate
interest**

Events Deals, Selling
Places Advertising agencies, Architects'
offices, Conference rooms
People Businessmen, Sales personnel
Things Presentation albums, Presentation
drawings
Misc Customer relations, Slogans

**158. A weatherman making a weather
forecast**

Events Broadcasting, Disasters,
Forecasting, Warnings, Weather
Places Newsrooms, Television studios
People Disaster victims, Reporters
Things Aerial photographs, Barometers,
Maps, Radar, Thermometers,
Weather vanes
Misc Emergency housing

**159. Going to the observation floor of a
skyscraper**

Events Aerial views, Cityscapes,
Panoramic views
Places Clouds, Elevators, Roofs,
Skyscrapers
People Sightseers, Tourists
Things Cameras, Telescopes, Windows

160. Navigating at sea using stars or landmarks

Events Measuring, Navigation, Sounding
Places Bodies of water, Decks (Ships), Vessels
Things Alidades, Beacons, Buoys, Compasses,
Lighthouses, Lightships, Map cases, Maps,
Sextants, Stars

**161. Becoming a citizen during a citizenship
ceremony**

Events Emigration & immigration, Flag salutes,
Naturalization, Pledges of allegiance
Places Social & civic facilities, Stadiums
People Aliens, Judges
Misc Allegiance, Citizenship, Patriotism

**162. Getting a soft drink or snack out of a
vending machine**

Places Automobile service stations, Cafeterias
Things Aluminum, Candy, Cans, Carbonated
beverages, Chewing gum, Coins, Vending
machines
Misc Beverage industry

163. Pushing around an infant in a baby carriage

Events Child rearing, Walking
Places Walkways
People Fathers & children, Infants, Mothers &
children, Pedestrians
Things Baby carriages, Rattles, Toys

164. Babysitting for young children in their home

Events Babysitting, Children misbehaving,
Children sleeping, Day care, Practical
jokes, Temper tantrums
Places Dwellings
People Children, Governesses, Teenagers, Young
adults
Things Telephones, Televisions
Misc Children & safety

165. Single people going to a bar to meet people

Events Conversation, Courtship, Leering, Lust,
Rock & roll dancing, Winking
Places Barrooms, Bars
People Bachelors, Single women
Things Music
Misc Relations between the sexes

166. Getting a massage from a professional masseurs

Events Massage, Physical therapy
 Places Clinics
 People Athletes, Masseurs, Nudes
 Things Back (Anatomy), Hands
 Misc Pain

167. Having a backyard barbecue

Events Barbecues, Cookery, Eating & drinking, Fire
 Places Backyards, Neighborhoods, Patios
 People Families, Neighbors
 Things Barbecue grilles, Charcoal, Condiments, Cooking utensils, Matches, Meat, Natural gas, Outdoor furniture, Smoke
 Misc Heat, Suburban life, Summer

168. Mowing the lawn and lawn care at a house

Events Domestic life, Gardening, Housework, Mowing, Perspiration, Pruning
 Places Backyards, Meadows
 People Teenagers
 Things Gardening equipment & supplies, Hedges (Plants), Hoses, Mowing machines, Plastic bags, Shrubs, Yard ornaments

169. Shopping in a grocery store

Events Shopping
 Places Grocery stores
 People Sales personnel
 Things Bags, Baskets, Cash registers, Food, Price lists, Queues, Shelving
 Misc Food industry, Food prices

170. Going to get a haircut in a barbershop or beauty shop

Events Conversation, Grooming, Hair preparations, Hairdressing, Sweeping & dusting
 Places Barbershops, Beauty shops

People Barbershop quartets
 Things Brooms & brushes, Dressing & grooming equipment, Heads (Anatomy), Scalps, Scissors & shears, Wigs
 Misc Baldness, Fads, Hairstyles, Individuality

171. Going to a ball at a private club or dancehall

Events Ballroom dancing, Balls (Parties), Curtsyng
 Places Ballrooms, Country clubs, Dance halls
 People Couples, Debutantes
 Things Ball dresses, Beverages, Big bands, Dance floors
 Misc Ballads, Jazz, Romances

172. Going to the ballet

Events Ballet, Choreography, Hand clapping, Whispering
 Places Lobbies, Stages (Platforms), Theaters, Ticket offices
 People Audiences, Ballerinas, Socialites, Upper class
 Things Binoculars, Costumes, Dance posters, Hand lenses, Orchestras, Stage lighting, Stage props, Tickets, Tuxedos

173. A child's birthday party

Events Birthday parties, Birthdays, Children playing, Children's parties, Games, Wishing
 Places Dwellings
 People Children, Clowns, Families
 Things Balloons, Birthday cards, Boxes, Cakes, Candles, Festive decorations, Gifts, Ice cream & ices, Invitations, Packaging, Toys
 Misc Human life cycle, Popularity

174. Riding in a hot air balloon

Events Aerial views, Air travel, Balloon racing
 Places Clouds, Meadows
 People Balloonists, Passengers
 Things Balloons (Aircraft), Baskets, Electric lines, Fire, Radiophones, Ropes, Weights & measures, Winds

175. Voting in a voting booth for a candidate or issue

Events Political elections, Referendums, Vote counting, Voting
 Places Social & civic facilities
 People Electoral college, Politicians
 Things Ballots, Political posters, Punched card systems, Registers
 Misc Democracy, Gerrymandering, Political issues, Political platforms, Public opinion, Suffrage, Voter apathy, Voter registration

176. Going to a music club to see a live band

Events Concerts, Hand clapping, Music, Rock & roll dancing, Singing
 Places Concert halls, Music halls, Nightclubs, Ticket offices
 People Audiences, Musicians, Rock groups, Singers
 Things Bands, Concert posters, Ears, Musical instruments, Rubber stamps, Smoke, Tickets
 Misc Deafness

177. Going into a bank to make a transaction

Events Banking, Document signings, Saving & investment
 Places Banks
 People Bankers, Guards
 Things Cash registers, Coin counting machines, Coins, Identification photographs, Money, Security systems, Wages
 Misc Paydays, Wealth

178. A bank robbery

Events Escapes, Robberies, Threats
 Places Banks
 People Bankers, Criminals, Guards, Police
 Things Bags, Cash registers, Handguns, Money, Safes, Security systems, Vaults (Strong rooms)

Misc Insurance

179. Going to a political rally for a candidate

Events Political elections, Political parades & rallies, Public appearances, Public speaking, Shaking hands, Whistle-stop campaigning
 Places Plazas, Social & civic facilities
 People Activists, Dissenters, Politicians
 Things Banners, Bumper stickers, Campaign insignia, Podiums, Political posters, Railroad cabooses
 Misc Political issues, Political parties, Political platforms

180. Going to a fundraising banquet

Events Banquets, Eating & drinking, Fund raising, Pleading (Begging), Public speaking
 Places Banquet halls
 People, Celebrities, Socialites
 Things Banquet camera photographs, Dining tables, Gifts, Ice sculpture, Public address systems
 Misc Charitable organizations, Political campaign funds, Political organizations

181. A christian baptism ceremony

Events Baptisms, Outdoor religious services
 Places Churches, Streams
 People Infants, Priests
 Things Baptismal certificates, Baptisteries, Church vestments, Fonts, Water

182. Escaping from a prison

Events Chasing, Digging, Prison escapes, Running
 Places Guardhouses, Prisons, Tunnels
 People Guards, Prisoners
 Things Ball & chain, Barbed wire, Fences, Keys (Hardware), Locks (Hardware), Prison uniforms, Searchlights, Security systems, Shackles, Working dogs

183. A parent giving their child a haircut

Events, Barbering, Grooming, Hair preparations, Hairdressing

People Fathers & children, Mothers & children
 Things Bowls (Tableware), Combs, Heads (Anatomy), Scalps, Scissors & shears
 Misc Hairstyles

184. Making wine at a vineyard

Places Bottling industry, Wine cellars, Wine industry
 People Coopers
 Things Bacteria, Barrels, Bottles, Cork, Drinking vessels, Grapes, Grapevines, Harvesting machinery, Labels, Microorganisms, Presses, Vats, Wine

185. Rescue and protection efforts at a flooded river

Events Bridge failures, Drowning, Evacuations, Flood control, Floods, Rain, Search & rescue operations
 Places Basements, Fords (Stream crossings), Levees, Roofs, Streams, Waterfronts, Wetlands
 People Disaster victims
 Things Bags, Barricades, Boats, Water

186. Going to a baseball game

Events Baseball, Coaching (Athletics), National songs
 Places Stadiums
 People Baseball managers, Baseball players, Baseball scouts, Food vendors, Referees, Sports spectators
 Things Balls (Sporting goods), Beer, Candy, Frankfurters, Hats, Peanuts, Popcorn, Scoreboards, Vending stands

187. Doing the laundry at home

Events Cleaning, Domestic life, Housework, Laundry

Places Basements, Closets, Laundries (Rooms & spaces)
 People Housewives, Servants
 Things Basins, Clothes chests, Clotheslines, Clothespins, Clothing & dress, Household soap, Irons (Pressing), Wash tubs, Washboards, Washing machines

188. Going to a basketball game

Events Basketball, Cheering, Cheerleading, Coaching (Athletics), National songs
 Places Gymnasiums, Stadiums
 People Basketball players, Celebrities, Food vendors, Referees, Sports spectators
 Things Balls (Sporting goods), Baskets, Scoreboards, Vending stands

189. Going sunbathing at the beach

Events Sleeping, Sunbathing, Sunburns, Swimming, Tanning
 Places Bathhouses, Beaches, Bodies of water
 People Bathing beauties, Children playing in sand, Children playing in water, Lifeguards
 Things Balls (Sporting goods), Bathing suits, Footprints, Freckles, Gulls, Radios, Sand sculpture, Shells, Sun, Towels, Umbrellas, Watch towers
 Misc Summer

190. Taking a bath in a bathtub

Events Bathing, Shaving
 Places Bathrooms
 People Nudes
 Things Bathtubs & showers, Bubbles, Cosmetics & soap, Shaving equipment, Towels, Water
 Misc Hygiene

191. Going to a beauty contest

Events Beauty contests, Performances, Questioning, Singing, Victories, Walking
 Places Stages (Platforms), Theaters
 People Bathing beauties, Beauty contestants
 Things Bathing suits, Crowns, Envelopes, Evening gowns

192. Swimming in a swimming pool

Events Diving, Swimming
 Places Bathhouses, Swimming pools
 People Children playing in water,
 Lifeguards, Swimmers
 Things Bathing suits, Towels

193. Using a restroom

Events Sewerage
 Places Bathrooms, Privies, Public
 comfort stations, Rest rooms,
 Sewers
 Things Cosmetics & soap, Feces,
 Plumbing fixtures, Plumbing
 systems, Toilets
 Misc Hygiene, Sanitation

194. A holiday parade on a city street

Events Baton twirling, Celebrations,
 Drum majoring, Holidays,
 Parades & processions
 Places Commercial streets, Reviewing
 stands
 People Drum majorettes, Drum majors,
 Fraternal organizations, Labor
 unions, Mounted police
 Things Balloons, Convertible
 automobiles, Drill teams, Festive
 decorations, Floats (Parades),
 Marching bands, Motorcades

195. Exploring a cave

Events Crawling & creeping, Discovery
 & exploration, Erosion
 Places Cave dwellings, Caves,
 Passageways
 People Explorers
 Things Bats, Cave drawings, Helmets,
 Lanterns, Rock formations,
 Shadows, Stalactites &
 stalagmites
 Misc Air quality, Cold

196. Making a seige on a castle or fort

Events Action & adventure dramas,
 Archery, Bombardment,
 Campaigns & battles, War

Places Castles & palaces, Forts & fortifications,
 Gatehouses, Moats
 People Armies, Casualties
 Things Arrows, Barricades, Battering rams,
 Battlements, Bows (Archery), Crossbows,
 Daggers & swords, Drawbridges, Gates,
 Spears

197. Men shaving a beard or mustache

Events Reflections, Shaving
 Places Bathrooms
 People Men
 Things Beards, Blood, Cosmetics & soap, Mirrors,
 Mustaches, Razor blades, Shaving
 equipment, Wounds & injuries

198. Going to bed at night

Events Dreaming, Sleeping, Somnambulism,
 Sunrises & sunsets, Yawning
 Places Bedrooms
 People Children praying
 Things Alarm clocks, Bedbugs, Beds, Sleepwear,
 Teddy bears
 Misc Fatigue, Night

199. Having sex with a spouse or lover

Events Kissing, Pregnancy, Sex
 Places Bedrooms
 People Couples, Nudes, Spouses
 Things Beds, Birth control, Lingerie, Spermatozoa
 Misc Free love, Love, Lust

200. Going to a beer hall for a beer drinking festival

Events Festivals, Folk dancing, Folk music,
 Singing
 Places Beer halls
 People Waiters, Waitresses
 Things Bands, Beer, Drinking vessels,
 Lederhosen, Sausages

201. Ringing the bells in a bell tower

Events Pulling, Signals & signaling
 Places Bell towers, Clock towers
 Things Bells, Clocks & watches, Metals, Ropes
 Misc Grief, Time, Warnings

202. Staying in a hotel on a trip

Events Sleeping, Travel, Waking
 Places Hotels, Suites, Swimming pools
 People Hotel employees
 Things Art reproductions, Beds, Bibles,
 Cosmetics & soap, Ice, Ice
 buckets, Keys (Hardware),
 Televisions, Towels
 Misc Night

203. Going to a bicycle race

Events Accidents, Bicycle racing, Cycling
 Places Roads, Streets
 People Athletes
 Things Air pumps, Banners, Barricades,
 Bicycles & tricycles, Emblems,
 Helmets, Logos, Winds, Wounds
 & injuries

204. Going for a bicycle ride in a neighborhood

Events Cycling
 Places Neighborhoods, Residential
 streets
 People Children riding bicycles &
 tricycles
 Things Air pumps, Bells, Bicycles &
 tricycles, Helmets

205. Lobbying an elected official by special interests groups

Events Bribery, Deals, Fund raising,
 Lobbying, Political representation
 Places Capitols
 People Legislators, Organizations
 Things Defense contracts, Gifts,
 Legislation, Political campaign
 funds
 Misc Big business, Corruption, Special
 interests

206. Going fishing in a fishing boat or on the shoreline

Events Children fishing, Fishing,
 Measuring, Silence

Places Bodies of water, National parks & reserves,
 Piers & wharves, Waterfronts
 People Fishermen
 Things Boat engines, Fish, Fishing boats, Fishing
 lures, Fishing & hunting gear, Gasoline,
 Ice buckets, Worms
 Misc Retirements

207. Going big game hunting on a safari

Events Animal attacks, Big game hunting,
 Chasing, Poaching, Safaris
 Places Game preserves, Plains, Prairies
 People Guides & scouts
 Things Animal tracks, Bullets, Dead animals,
 Extinct animals, Jeep automobiles, Rifles

208. Playing billiards in a billiard parlor

Events Billiards, Smoking, Wagers
 Places Billiard parlors, Billiard rooms
 Things Cigars, Gin, Whiskey
 Misc Billiard table industry, Geometry,
 Organized crime

209. Birdwatching in a nature reserve

Events Bird watching, Silence
 Places National parks & reserves, State parks &
 reserves
 People Biologists
 Things Binoculars, Birds, Birds' eggs & nests,
 Cameras, Camouflage (Biology)
 Misc Wildlife conservation

210. Using a microscope to look at microorganisms

Events Biology, Winking
 Places Laboratories, Medical offices
 People Biologists, Physicians
 Things Bacteria, Cells (Biology), Eyes,
 Microorganisms, Microscopes

211. Working as a miner in an underground mine

Events Digging, Mining
 Places Caves
 People Miners

Things Axes, Birdcages, Birds, Candles,
Lanterns, Mine railroads,
Minerals, Mining equipment,
Natural gas, Rocks, Shovels
Misc Black lung, Mine accidents,
Miners' unions, Ore industry

212. Birds feeding insects to thier young

Events Animal feeding
Places Birdhouses, Trees
Things Birds, Birds' eggs & nests, Insects

213. Skydiving out of an airplane

Events Aerial views, Bird's-eye views,
Falling, Jumping, Parachuting,
Shouting
Places Clouds
People Parachutists
Things Airplanes, Goggles, Helmets
Misc Anxiety, Courage, Cowardice,
Excitement, Fear, Parachute
industry

214. A woman giving birth

Events Births, Children crying,
Pregnancy, Shouting
Places Birthplaces, Maternity hospitals
People Health care personnel, Infants,
Midwives, Mothers, Nurses,
Physicians, Pregnant women,
Quadruplets, Quintuplets,
Spouses, Triplets, Twins
Things Birth certificates, Blood
Misc Birth defects, Happiness, Human
life cycle, Illegitimacy, Names,
Pain

215. Gathering honey from a beehive

Events Bee culture, Bites & stings,
Foraging
Places Trees
Things Bears, Beehives, Bees, Honey,
Honeycombs

216. A race riot between African Americans and police

Events Beating, Race riots, Riot control, Violence
Places Afro-Americans, Slums
People Police
Things Hoses, Nightsticks, Shields, Tear gas
Misc Black power, Race discrimination, Race
relations, Racism

217. Giving a class lesson in a school classroom

Events Children reading & writing, Discussion,
Education, Examinations, Questioning,
Raising hands, Thinking
Places Classrooms, Schools
People School children, Students, Teachers
Things Blackboards, Desks, Writing materials
Misc Teaching methods

218. Children having a fistfight on a school playground

Events Blaming, Children fighting, Children
misbehaving, Fighting, Kicking, School
recesses, Temper tantrums
Places Playgrounds
People School children, Teachers
Things Fists, Wounds & injuries
Misc School discipline

219. Blind people walking with a seeing-eye dog

Events Navigation, Walking
Places Crosswalks, Streets, Walkways
People Blind persons, Pedestrians
Things Braille, Traffic signs & signals, Working
dogs
Misc Blindness

220. An execution by firing squad

Events Executions, Shooting, Smoking
Places Rifle ranges
People Dead persons, Firing squads, Political
prisoners, Prisoners of war, Soldiers
Things Blindfolds, Cigarettes, Handcuffs, Rifles

221. Driving on a road during a blizzard

Events Blizzards, Sliding, Snow removal, Street
cleaning, Traffic accidents
Places Roads, Streets
Things Automobiles, Shovels, Snow, Trucks
Misc Danger, Salt industry

222. Donating blood at a blood drive

Events Blood donations, Loss of consciousness, Questioning
 Places Schools, Social & civic facilities, Universities & colleges
 People Nurses
 Things Beverages, Blood, Cardiovascular system, Confections, Forms, Hypodermic needles, Plastic bags

223. Working at a construction site of a new building

Events Architecture, Bricklaying, Building construction, Welding
 People Architects, Construction workers
 Things Barricades, Blueprints, Brickwork, Building materials, Design drawings, Foundations, Girders, Helmets, Hoisting machinery, Plans, Progress photographs, Steel, Structural frames, Trusses, Wheelbarrows

224. Going to a coffeehouse or a cafe

Events Eating & drinking, Folk music
 Places Cafes, Coffeehouses
 People Bohemians, Poets, Restaurant workers, Waiters, Waitresses
 Things Board games, Cakes, Cigarettes, Coffee, Coffeepots, Outdoor furniture, Periodicals, Pies, Smoking

225. The dedication of a new boat or ship

Events Dedications, Launchings, Naval parades & ceremonies, Ship trials
 Places Boat & ship companies, Harbors, Naval yards & naval stations
 People Ship captains
 Things Broken glass, Champagne (Wine), Inclined planes, Ship figureheads, Tugboats, Vessels
 Misc Boat & ship industry

226. Going to an olympic winter games competition

Events Ice hockey, Ice skating, International competition, Ski jumping, Skiing, Speed skating
 Places Ice skating rinks, Mountains
 People Americans in foreign countries, Athletes, Skaters
 Things Bobsleds, Olympic flame, Snow
 Misc Winter, World records

227. Competing in a triathlon

Events Bicycle racing, Body marking, Contests, Running, Running races, Swimming
 People Runners (Sports), Swimmers
 Things Bathing suits, Bicycles & tricycles, Clocks & watches
 Misc Time

228. Running a boiler

Places Power plants, Public utility companies, Ships, Steamboats
 Things Boilers, Coal, Fire, Fuel, Heat, Shovels, Steam engines, Water pumps
 Misc Boiler industry, Ore industry

229. Building something in a carpenter's workshop

Events Cabinetmaking, Carpentry, Drilling, Joinery, Painting, Wood carving
 Places Carpenter shops
 People Carpenters
 Things Bolts & nuts, Chisels & mallets, Drills (Equipment), Furniture, Glue, Hammers, Lathes, Paints & varnishes, Saws, Wood carvings, Woodwork
 Misc Furniture industry

230. A terrorist bombing attack at a crowded public space

Events Bombings, Explosions, Terrorism
 Places Bombproof construction, Shopping centers, Subway stations, Subways
 People Crowds, Dead persons, Disaster victims, Police
 Things Bombs, Wounds & injuries

231. A dog burying a bone in the ground

Events Digging
 Places Backyards, Holes
 Things Bones, Dogs, Mud, Pets

232. Treating a broken bone by putting it in a cast

Events Autographing, Emergency medical services, Fractures, Radiography, Wounds & injuries
 Places Emergency rooms
 People Physicians, Radiologists
 Things Autographs, Bones, Orthopedic braces, Radiographs, Splints (Surgery)

233. A book burning rally prompted by religious activism

Events Book burning, Fires
 Places Churches, Libraries, Plazas
 People Evangelists, Religious groups, Spiritual leaders
 Things Book covers, Book jackets, Books, Censored works
 Misc Church & education, Conservatism, Freedom of speech

234. Finding and checking out a book from a library

Events Reading, Searching, Whispering
 Places Libraries, Reading rooms
 People Librarians
 Things Book ends, Bookcases, Books, Bookstacks, Card catalogs, Identification photographs
 Misc Alphabets (Writing systems)

235. A bookmobile van going to a rural town

Events Automobile driving, Country life
 Places Libraries, Roads, Rural schools, Villages
 People Librarians
 Things Bookmobiles, Books, Trucks

236. Working in a botanical garden

Events Botany, Digging, Gardening

Places Botanical gardens, Greenhouses
 People Biologists
 Things Botanical illustrations, Gardening equipment & supplies, Hoses, Plant containers, Plants, Seeds, Shovels, Spades

237. Feeding milk to an infant child

Events Bottle feeding, Breast feeding, Children crying
 People Infants, Mothers, Mothers & children
 Things Bottles, Breasts, Milk
 Misc Nutrition

238. Rock climbing on a mountain or a boulder

Events Mountaineering
 Places Boulders, Cliffs, Mountains
 Things Belts (Clothing), Rock formations, Rocks, Ropes, Shoes
 Misc Danger

239. Bowling in a bowling alley

Events Bowling, Pinsetting
 Places Bowling alleys
 People Bowlers, Pin boys
 Things Balls (Sporting goods), Gloves, Scoreboards, Shoes

240. Going to a soup kitchen for a meal

Events Bread & soup lines, Charity, Community service, Eating & drinking
 Places Churches, Welfare facilities
 People Charitable organizations, Homeless persons, Poor persons
 Things Bowls (Tableware), Bread, Dining tables, Kettles
 Misc Poverty

241. A boxing match at a boxing arena

Events Boxing, Cheering, Coaching (Athletics), Falling, Fighting, Raising hands
 Places Gymnasiums, Stadiums
 People Boxers (Sports), Referees, Sports spectators
 Things Bells, Blood, Fists, Gloves, Wounds & injuries

242. Moving to a new house or apartment

Events Internal migration, Lifting & carrying, Packaging, Shipping
 Places Dwellings, Lease & rental services
 Things Boxes, Dollies (Moving equipment), Furniture, Keys (Hardware), Trucks
 Misc Moving & storage trade

243. Children playing pin-the-tail-on-the-donkey

Events Blindness, Children playing, Children's parties, Dizziness, Laughter, Pin-the-tail-on-the-donkey, Spinning
 People Children
 Things Blindfolds, Donkeys, Pins & needles

244. Playing in a marching band

Events Baton twirling, Drum majoring, Marching, Music, Parades & processions
 People Drum majorettes, Drum majors, Marching bands
 Things Band uniforms, Brass instruments, Drums, Marching percussion, Musical notation, Sheet music covers

245. Having a morning breakfast at home

Events Domestic life, Eating & drinking
 Places Breakfast rooms, Kitchens
 Things Coffee, Coffeepots, Dining tables, Eggs, Fruit, Grapefruit, Milk, Newspapers, Pancakes & waffles, Prepared cereals, Preserves, Tableware, Toasters

246. Bribing the police to avoid being arrested

Events Bribery, Capture & imprisonment, Crimes, Law enforcement
 People Criminals, Police
 Things Money, Narcotics
 Misc Corruption

247. A wedding reception and party

Events Ballroom dancing, Banquets, Dance parties, Intoxication, Kissing, Receiving lines, Receptions, Rock & roll dancing, Toasting, Weddings
 Places Banquet halls
 People Brides, Families, Grooms (Weddings), Music ensembles, Photographers
 Things Banquet camera photographs, Invitations, Limousines, Wedding costume

248. An earthquake in an urban area

Events Bridge failures, Building failures, Earthquakes, Fires, Floods, Landslides, Rescue work, Rescues, Shaking, Tidal waves
 Places Bridges, Buildings, Doors & doorways, Elevated highways
 People Disaster victims
 Misc Danger, Fear

250. Committing suicide by jumping off a bridge

Events Death, Drowning, Falling, Jumping, Lifesaving, Suicides
 Places Bridges, Streams
 People Drowning victims, Mentally ill persons
 Things Correspondence, Railings
 Misc Depression (Mental state)

251. Activating the emergency broadcasting system

Events Announcements, Broadcasting, Civil defense
 Places Newsrooms
 People Reporters
 Things Horns (Communication devices), Radios, Sound waves, Televisions
 Misc Danger

252. Cleaning a house

Events Domestic life, Housework, Sweeping & dusting, Window cleaning
 Places Dwellings
 People Housewives, Servants

Things Brooms & brushes, Cobwebs,
Floor coverings, Gloves,
Household soap, Pails,
Upholstery, Vacuum cleaners

253. Chewing a piece of chewing gum

Events Grinding
Things Bubbles, Chairs, Chewing gum,
Mouths, Packaging
Misc Chewing gum industry

254. Children blowing soap bubbles

Events Children blowing bubbles,
Children playing outdoors
People Children
Things Bubbles, Household soap,
Rainbows, Trays, Winds

255. Playing with a miniature train set

Events Children playing with toys, Model
vehicles, Modeling (Sculpture)
Things Building models, Electric
railroads, Model railroads

256. A drive-by shooting as part of gang warfare

Events Automobile driving, Homicides,
Shooting
Places Housing, Slums, Streets
People Gangs, Juvenile delinquents,
Pedestrians
Things Automobiles, Bullet holes,
Bullets, Firearms, Symbols

257. Shooting a firearm at a shooting range

Events Sharpshooting
Places Rifle ranges, Shooting galleries
People Police, Soldiers
Things Bullet holes, Bullets, Ears,
Firearms, Goggles, Licenses,
Targets (Sports)

258. Going to a bullfight

Events Bullfighting, Chasing, Cheering
Places Corrals, Stadiums
People Bullfighters

Things Bulls, Capes (Outerwear), Daggers &
swords, Spears

259. Executing a witch by burning them at the stake

Events Burning at the stake, Shouting, Witchcraft,
Witchcraft trials
Places Plazas
People Spectators, Witches
Things Fires, Fuelwood

260. Tending to a crying infant

Events Burping, Children crying, Children
sleeping, Hugging, Lifting & carrying,
Singing
Places Cradles, Nurseries
People Infants, Mothers, Mothers & children
Things Intercommunication systems, Rattles
Misc Nursery rhymes

261. Waiting for the bus at a bus stop

Events Chasing, Mass transit
Places Bus stops, Bus terminals, Streets
People Commuters, Passengers
Things Benches, Buses, Clocks & watches,
Newspapers, Queues, Schedules (Time
plans), Tickets

262. Taking a bus trip between cities

Events Sleeping, Travel
Places Bus terminals, Buses, Cities & towns, Rest
rooms, Rest stops, Ticket offices
People Passengers
Things Luggage, Schedules (Time plans), Tickets

263. School children taking a school bus

Events Busing (School integration), Children
misbehaving
Places Bus stops, Driveways, Neighborhoods,
Residential streets, Schools
People Passengers, School children
Things Buses, Signal lights, Traffic signs &
signals
Misc Traffic regulations

264. Making a call on the telephone

Events Conversation, Salutations

Places Telephone booths
 People Children using telephones,
 Telephone operators
 Things Bells, Business cards, Telephone
 directories, Telephone lines,
 Telephone switchboards,
 Telephones
 Misc Telephone companies, Telephone
 industry

265. Going to a business meeting

Events Discussion, Meetings, Salutations,
 Shaking hands
 Places Business enterprises, Conference
 rooms, Office buildings
 People Businessmen
 Things Charts, Documents, Tables,
 Writing materials

266. Applying and interviewing for a job

Events Employment, Employment
 interviewing, Questioning,
 Shaking hands, Stereotyping
 Places Commercial facilities, Offices
 People Businessmen, Employees,
 Unemployed
 Things Documents, Forms, Neckties,
 Portfolios
 Misc Employment agencies,
 Occupations, Race discrimination,
 Sexism

267. Going to the butcher shop

Events Food adulteration & inspection,
 Meat cutting, Packaging
 Places Butcher shops
 Things Bacteria, Fat, Freezers, Knives,
 Meat, Scales
 Misc Meat industry

268. Using a churn to make butter

Events Butter making, Dairying
 Places Farms
 People Farmers
 Things Butter, Churns, Fat, Milk
 Misc Farm life

269. Collecting and cataloging butterflies

Events Zoology
 Places Meadows, Plains, Prairies
 Things Butterflies, Butterfly nets, Cans, Dead
 animals, Labels, Pins & needles

270. A parent giving a child a spanking

Events Child discipline, Children crying, Children
 misbehaving, Spanking, Temper tantrums
 People Fathers & children, Mothers & children
 Things Buttocks, Hands
 Misc Child rearing

271. Sewing to create or repair clothing & dress

Events Children sewing, Domestic life,
 Housework, Sewing, Tailoring
 People Housewives, Seamstresses
 Things Buttons, Clothing & dress, Pins & needles,
 Sewing equipment & supplies, Sewing
 machines, Thread

272. A presidential cabinet meeting

Events Discussion, Meetings
 Places Capitols, Official residences
 People Cabinet officers, Presidents, Vice
 presidents
 Things Legislation
 Misc Administrative agencies, Political issues,
 Presidential appointments

273. Vacationing at a cabin in the woods

Events Fishing, Leisure, Sunbathing, Swimming,
 Vacations, Water skiing
 Places Boathouses, Cabins, Forests, Lakes &
 ponds, Private camps, Summer houses
 Things Fireplaces, Fishing & hunting gear,
 Motorboats

274. Playing a game of golf on a golf course

Events Golf
 Places Clubhouses, Country clubs, Meadows
 People Caddies, Golfers
 Things Balls (Sporting goods), Electric
 automobiles, Flags, Gloves, Holes

275. Eating in a cafeteria at a school

Events Children eating & drinking, School meals

Places Cafeterias, Schools
 People School children, Students, Teachers
 Things Dining tables, Food, Milk, Queues, Silverware, Tableware, Trays
 Misc Nutrition

276. Eating in a public or business cafeteria

Events Eating & drinking
 Places Cafeterias, Employee eating facilities
 People Employees
 Things Cash registers, Dining tables, Food, Price lists, Queues, Silverware, Tableware, Trays

277. Going to the zoo

Events Animal feeding, Animal treatment, School excursions, Zoology
 Places Aviaries, Rookeries, Zoos
 People Biologists, Children & animals, Sightseers, Tourists
 Things Cages, Cameras, Zoo animals
 Misc Evolution

278. Going to a physical education class in school

Events Bathing, Calisthenics, Children exercising, Children playing, Coaching (Athletics), Perspiration, Physical education, Sports
 Places Gymnasiums, Locker rooms, Playgrounds, Schools
 People School children
 Things Bathtubs & showers, Sporting goods, Towels
 Misc Health

279. Going on a caravan across the desert

Events Caravans, Mirages, Sunburns
 Places Caravansaries, Deserts, Dunes, Oases, Water holes

People Guides & scouts, Merchants
 Things Camels, Pack animals, Packtrains, Sun, Turbans, Water
 Misc Water supply

280. Going gambling in a casino

Events Card games, Gambling, Victories, Wagers
 Places Casinos, Flatboats
 People Losers
 Things Coins, Crossed fingers, Electric signs, Playing cards, Slot machines
 Misc Organized crime, Wealth

281. Going to a magic show

Events Card tricks, Circuses & shows, Escapes, Hypnotism, Levitation, Magic, Optical illusions, Telepathy
 Places Theaters
 People Audiences, Magicians
 Things Capes (Outerwear), Mirrors, Pigeons, Playing cards, Rabbits, Smoke, Top hats, Trapdoors

282. Being a stowaway on a ship

Events Hiding, Ocean travel
 Places Cargo holds, Loading docks, Piers & wharves, Seas, Ships
 People Longshoremen, Passengers, Stowaways
 Things Crates

283. Transporting goods by cargo ships

Events Lifting & carrying, Shipping
 Places Cargo holds, Cargo ships, Loading docks, Locks (Hydraulic engineering), Piers & wharves, Seas, Warehouses
 People Longshoremen, Sailors, Ship captains
 Things Crates, Dollies (Moving equipment), Hoisting machinery, Pilot boats, Trucks
 Misc Longshoremen's unions

284. Children caroling at Christmas time

Events Caroling, Children singing, Holidays
 Places Neighborhoods, Plazas
 People Children
 Things Christmas decorations, Christmas trees, Snow, Songs
 Misc Winter

285. Building a residential home

Events Bricklaying, Building construction, Carpentry, Drilling
 Places Houses
 People Architects, Carpenters, Construction workers
 Things Brickwork, Building materials, Drills (Equipment), Hammers, Ladders, Sawhorses, Saws, Shovels, Structural systems, Woodwork, Wrenches

286. An artist making a cartoon or comic book

Events Drawing, Painting
 People Cartoonists
 Things Artists' materials, Caricatures, Cartoons (Commentary), Colors, Comic books, Comics, Desks, Paints & varnishes, Pens
 Misc Fictitious characters

287. A photo shoot of a fashion model in a photo studio

Events Grooming, Hair preparations, Lighting, Photography, Posing, Smiling
 Places Photographic studios
 People Fashion models, Photographers
 Things Cameras, Clothing & dress, Cosmetics & soap, Dressing & grooming equipment, Negatives, Photographic apparatus & supplies, Studio props
 Misc Magazine covers, Photography industry

288. A fashion show with models and photographers

Events Fashion shows, Photography, Posing, Walking
 Places Stages (Platforms)
 People Designers, Fashion models, Photographers
 Things Cameras, Clothing & dress, Cosmetics & soap, Dressing &

grooming equipment, Fashion design drawings, Fashion photographs

Misc Fads

289. Going on a backpacking trip through a nature reserve

Events Camping, Fuelwood gathering, Hiking, Outdoor cookery
 Places Forest reserves, Forests, Mountains, National parks & reserves, State parks & reserves
 Things Bags, Boots, Campfires, Compasses, Fuelwood, Tents, Topographic maps
 Misc Nature

290. Going camping at a campground

Events Camping, Fuelwood gathering, Outdoor cookery
 Places Camps, Forests, National parks & reserves, Picnic grounds, Public comfort stations, State parks & reserves
 People Rangers
 Things Campfires, Fuelwood, Mobile homes, Observation towers, Tents

291. Going to the hospital for cancer treatment

Events Cancer, Healing, Radioactivity, Therapy
 Places Hospitals
 People Radiologists, Sick persons
 Misc Baldness

292. A power blackout at night

Events Power shortages
 Places Dwellings, Transformer rooms
 Things Candles, Clocks & watches, Electric batteries, Electric generators, Electric lighting, Electric lines, Lanterns
 Misc Electricity, Fear, Night, Power plants

293. Carving a pumpkin into a Jack-o-lantern on Halloween

Events Carving, Holidays, Shadows
 Things Candles, Fire, Jack-o-lanterns, Knives, Newspapers, Pies, Pumpkins, Seeds

294. Being captured by cannibals on an island

Events Cannibalism, Capture & imprisonment, Dismemberment, Outdoor cookery
 Places Islands
 People Captives, Castaways, Indigenous peoples
 Things Campfires, Drums, Kettles, Meat, Shrunken heads, Skulls, Spears

295. An American civil war battle reenactment

Events Campaigns & battles, Civil wars, Historical reenactments
 Places Battlefields
 People Actors, Soldiers, Spectators
 Things Bayonets, Cannon balls, Cannons, Drums, Rifles
 Misc History

296. A pirate attack on another tall sailing ship

Events Action & adventure dramas, Campaigns & battles, Fighting, Naval warfare, Shipwrecks
 Places Sailing ships, Seas
 People Pirates
 Things Cannon balls, Cannons, Daggers & swords, Eye patches, Peg legs, Treasure-trove
 Misc Death's head, Navies

297. Going on a canoe trip down a stream

Events Floating, Portages, Shooting rapids
 Places Dams, Rapids, Rivers, Streams, Waterfalls
 People Canoeists
 Things Canoes, Life preservers, Rocks, Snakes

298. A salesman selling things door-to-door

Events Canvassing, Knocking, Salutations
 Places Doors & doorways
 People Housewives, Peddlers

Things Business cards, Vacuum cleaners
 Misc Obstinacy

299. Legislative debate in congress

Events Debates, Filibustering, Legislation, Parliamentary practice, Political representation, Public speaking, Vote counting, Voting
 Places Capitols
 People Capitol pages, Legislators
 Things Laws, Legislative bodies, Podiums, Resolutions
 Misc Coalition (Social sciences), Democracy, Government policy, Political issues, Political parties

300. Presidential state of the union address

Events Hand clapping, Public speaking, Speechwriting, Television broadcasting
 Places Capitols
 People Cabinet officers, Cabinet officers' spouses, Legislators, Legislators' spouses, Presidents' spouses, Supreme Court justices
 Misc Constitutions

301. A captured criminal being processed at a police station

Events Capture & imprisonment, Law enforcement, Recording & registration
 Places Jails, Police stations
 People Bailiffs, Captives, Criminals, Police
 Things Fingerprints, Handcuffs, Identification photographs, Paperwork

302. A police office arresting a captured criminal on scene

Events Capture & imprisonment, Chasing, Frisking, Law enforcement, Surrenders, Suspicion
 People Captives, Criminals, Police
 Things Handcuffs, Handguns, Nightsticks
 Misc Civil liberties, Laws

303. Going to a car wash facility

Events Cleaning, Sweeping & dusting, Window cleaning, Winds
 Places Automobile service stations, Car washes

Things Automobiles, Brooms & brushes,
Conveying systems, Hoses,
Towels, Upholstery, Vacuum
cleaners, Windows

304. An artists making a sculpture in their studio

Events Carving, Marble
Places Artists' studios
People Artists, Artists' models
Things Chisels & mallets, Knives,
Ladders, Pedestals, Sculpture
Misc Human body

305. Going shopping in a retail clothing store

Events Shopping
Places Clothing stores, Department
stores, Shopping centers
People Sales personnel
Things Cash registers, Clothing & dress,
Mannequins, Mirrors, Money
Misc Clothing industry

306. Being a castaway on a deserted island

Events Hallucinations & illusions,
Marooned, Search & rescue
operations, Shipwrecks,
Starvation
Places Islands, Seas, Tropical forests
People Castaways
Things Beards, Bottles, Coconuts,
Correspondence

307. Firemen rescuing a kitten stuck up a tree

Events Rescues
Places Residential streets
People Fire fighters
Things Cats, Fire engines & equipment,
Ladders, Trees

308. Cats chasing mice around the house

Events Chasing, Ratcatching
Places Dwellings, Holes
Things Cats, Mice, Mousetraps, Rats

Misc Rodent control

309. Branding cattle for identification

Events Cattle branding
Places Cattle ranches
People Cowboys
Things Cattle, Fire, Hides & skins, Logos,
Ownership marks
Misc Heat

310. Cattle herding and cattle drives

Events Cattle herding, Horseback riding, Westerns
Places Cattle ranches, Meadows
People Cowboys
Things Cattle, Horses, Working dogs
Misc Meat industry

311. A cattle raid on a cattle ranch

Events Cattle raids, Roping
Places Cattle ranches, Corrals
People Cowboys, Criminals
Things Cattle, Logos, Ownership marks, Rifles,
Ropes

312. Going to a rodeo

Events Rodeos, Roping, Trick riding, Wild west
shows
Places Corrals
People Clowns, Cowboys, Cowgirls
Things Barrels, Broncos, Cattle, Horses, Ropes

313. Cave people living in a cave community

Places Cave dwellings, Caves, Cliff dwellings,
Cliffs
People Cave dwellers
Things Campfires, Extinct animals, Fur garments,
Hides & skins
Misc Civilization

314. Pirates burying their treasure

Events Digging
Places Caves, Islands
People Pirates
Things Chests, Eye patches, Maps, Parrots, Peg
legs, Shovels, Treasure-trove

315. Painting the interior rooms of a building

Events Painting
 Things Brooms & brushes, Ceilings,
 Ladders, Newspapers, Paints &
 varnishes, Plastics, Trays,
 Wallpaper, Walls
 Misc Buildings, Color in architecture,
 Colors, Paint industry

316. A New Year's Eve Party

Events Celebrations, Holidays,
 Intoxication, Kissing, New Year
 resolutions, Parties, Rock & roll
 dancing
 Places Bars, Dance halls, Discotheques,
 Nightclubs
 Things Champagne (Wine), Clocks &
 watches, Kazoos, New Year cards
 Misc Time

317. A celebrity interview on a talk show

Events Celebrity touring, Interviews,
 Laughter, Television broadcasting
 Places Television studios
 People Audiences, Celebrities
 Things Chairs, Desks, Motion picture
 cameras

318. A funeral at a cemetery

Events Crying, Funeral processions,
 Funeral rites & ceremonies,
 Gravedigging, Grief, Lifting &
 carrying, Prayer, Undertaking
 Places Cemeteries
 People Dead persons, Families,
 Preachers, Widowers, Widows
 Things Coffins, Crosses, Flowers, Graves,
 Hearses, Mourning clothes,
 Shovels, Tombs & sepulchral
 monuments, Veils
 Misc Human life cycle

319. A native American Indian religious ceremony

Events Dance
 Places Indian encampments, Indian
 reservations, Tipis

People Ceremonial dancers, Indians of North
 America, Shamans, Tribal chiefs
 Things Calumets, Campfires, Drums, Totem poles
 Misc Religion

320. A graduation ceremony for a high school or college

Events Graduation ceremonies, Public speaking,
 Shaking hands
 Places Auditoriums, Universities & colleges
 People Alumni & alumnae, Celebrities, Students
 Things Diplomas
 Misc Pride

321. Laboring as part of a prison chain gang

Events Garbage collecting, Quarrying
 Places Express highways
 People Chain gangs, Guards
 Things Chains, Hammers, Prison uniforms,
 Refuse, Shackles, Shovels

322. Going to a psychiatrist or psychotherapist for therapy

Events Hypnotism, Psychiatry, Psychotherapy,
 Questioning
 Places Medical offices
 People Mentally ill persons, Physicians, Social
 workers
 Things Chairs, Couches, Diplomas, Writing
 materials
 Misc Mental health, Mental states

323. Children playing with chalk outside on a sidewalk

Events Children drawing & painting, Children
 playing outdoors, Hopscotch
 Places Residential streets, Sidewalks
 People Children
 Things Chalk drawings, Children's art, Colors,
 Graffiti

324. Going to a Roman chariot race

Events Chariot racing, Whipping
 Places Racetracks (Horse racing), Stadiums
 People Emperors, Empresses, Freedmen, Slaves
 Things Armor, Chariots, Helmets, Race horses,
 Whips

325. A military parade

- Events Flag salutes, Goose stepping, Marching, Military parades & ceremonies
- People Dictators, Flag bearers, Military officers, Soldiers
- Things Artillery (Weaponry), Flags, Military bands, Military standards, Military vehicles
- Misc Chauvinism & jingoism, Nationalism, Parades & processions, Patriotism

326. Working in a chemist's laboratory

- Events Chemistry, Experiments, Explosions
- Places Laboratories
- People Scientists
- Things Chemicals, Fire, Glassware, Goggles, Natural gas

327. Collecting eggs from a henhouse on a farm

- Events Farming
- Places Farms, Poultry houses
- People Farmers
- Things Baskets, Chickens, Eggs, Roosters
- Misc Chicken industry, Farm life

328. Shopping in a toy store

- Events Children playing with toys, Shopping
- People Children & money
- Things Toys
- Misc Toy industry

329. Flying a kite in a park or meadow

- Events Children flying kites, Running
- Places Meadows, Parks
- Things Electric lines, Kites, Winds
- Misc Lightning

330. Going to a miniature golf course

- Events Children golfing, Golf, Miniature golf

Things Balls (Sporting goods), Holes, Windmills

331. A children's slumber party

- Events Children jumping, Children pillow fighting, Children sleeping, Children's parties
- Places Bedrooms, Playrooms
- Things Sleepwear

332. Building a snowman

- Events Children playing in snow
- Places Parks
- Things Carrots, Coal, Gloves, Snow, Snowballs, Snowmen
- Misc Winter

333. Snow sledding down a hill in the winter

- Events Children playing in snow
- Places Hills, Parks
- Things Sleds & sleighs, Snow
- Misc Winter

334. Having a snowball fight

- Events Children fighting, Children playing in snow, Children playing soldiers
- Things Gloves, Snow, Snowballs
- Misc Winter

335. Practicing a musical instrument in a music room

- Events Children playing musical instruments, Music, Music education, Rehearsals
- Places Music rooms
- People Musicians
- Things Music stands, Musical instrument cases, Musical instruments, Musical notation
- Misc Preparedness

336. Playing in a school youth orchestra or band

- Events Children playing musical instruments, Music, Noise pollution, Rehearsals
- Places Music rooms
- People Conductors, School children, Youth bands, Youth orchestras
- Things Music stands, Musical instrument cases, Musical instruments, Musical notation

337. A parent reading a bedtime story to a child

Events Children reading & writing, Reading, Storytelling, Sunrises & sunsets

Places Bedrooms

People Fathers & children, Mothers & children

Things Beds, Books, Fables, Fairy tales, Myths, Sleepwear, Stuffed animals (Toys)

Misc Fatigue, Night

338. School students smoking in the school restroom

Events Children misbehaving, Children smoking, Hiding

Places Rest rooms, Schools

People School children

Things Cigarettes, Smoke, Toilets

339. Shoplifting items from a store in a shopping center

Events Children stealing, Robberies, Shopping

Places Clothing stores, Department stores, Shopping centers

People Criminals, Private police, Sales personnel

Things Handbags, Purses, Security systems

340. Children taking swimming lessons at a pool

Events Children swimming, Floating, Kicking, Physical education

Places Swimming pools

People Lifeguards, Teachers

Things Bathing suits, Goggles

Misc Air, Teaching methods

341. Children playing on a school playground during recess

Events Children playing outdoors, Children swinging, Hopscotch, Ring-around-a-rosy, Rope skipping, School recesses, Softball

Places Playgrounds, Schools

People School children, Softball players, Teachers

Things Balls (Sporting goods), Ropes, Seesaws, Sliding boards, Swings

342. Cracking open a child's piggy bank with a hammer

Events Saving & investment

Things Children's allowances, Coin banks, Hammers, Money

Misc Children & money

343. Having a garage sale

Events Barter, Secondhand sales, Shopping

Places Driveways, Garages, Neighborhoods

People Neighbors

Things Advertisements, Children's clothing & dress, Clothing & dress, Furniture, Memorabilia

344. A divorce settlement hearing

Events Divorce, Judicial proceedings, Marriage

Places Courthouses, Courtrooms

People Divorced women, Families, Judges, Lawyers

Misc Children's rights, Cost & standard of living, Custody of children, Right of property

345. A chimney sweep sweeping a chimney

Events Ash disposal, Chimney sweeping

Places Roofs

People Chimney sweeps

Things Andirons, Brooms & brushes, Chimneypieces, Chimneys, Fire screens, Fireplaces, Mantels

Misc Smoke

346. Working at a refugee camp in a famine stricken country

Events Droughts, Famines, Food relief, Preventive medicine, Starvation, Vaccinations

Places Refugee camps

People Refugees

Things Charitable organizations, Food, International organizations, Medicines

Misc Cholera, Population control

347. Opening presents around a Christmas tree

- Events Holidays
- Places Dwellings
- People Families
- Things Boxes, Christmas cards, Christmas decorations, Christmas stockings, Christmas trees, Gifts, Letters to Santa Claus, Mistletoe, Neckties, Packaging, Snow, Toys
- Misc Christianity, Winter

348. Going out to the woods to chop down a Christmas tree

- Events Woodcutting
- Places Forests
- People Fathers & children
- Things Axes, Christmas trees, Firs, Pines, Ropes, Snow, Tree limbs, Tree stumps
- Misc Winter

349. Going to a Christian Sunday school

- Events Children praying, Religious education
- Places Churches, Sunday schools
- People Clergy, Nuns, School children, Teachers
- Things Bibles
- Misc Christianity, Church & education

350. Going to a religious elementary or secondary school

- Events Children praying, Religious education, School discipline
- Places Church schools, Classrooms
- People Nuns, School children, Students, Teachers
- Things Uniforms
- Misc Christianity, Church & education, Conformity

351. Lighting up and smoking a cigarette, cigar, or pipe

- Events Coughing, Smoking

- Places Railroad smoking cars, Smoking rooms
- Things Cigarette papers, Cigarettes, Cigars, Fire, Matches, Smoke, Tobacco, Tobacco pipes
- Misc Match industry, Tobacco habit, Tobacco industry

352. Going to a circus parade

- Events Acrobatics, Circus parades, Juggling
- Places Commercial streets
- People Acrobats, Circus performers, Clowns, Human curiosities
- Things Elephants, Unicycles

353. Going to a city council meeting

- Events Debates, Voting
- Places City & town halls
- People City council members, Mayors
- Things Legislation
- Misc City planning, Municipal services, Refuse disposal, Taxes, Urban beautification, Urban growth, Urban renewal

354. Going to a town meeting

- Events Debates, Discussion, Public speaking, Town meetings, Voting
- Places City & town halls
- People Municipal officials
- Things Podiums

355. An American civil rights demonstration

- Events Civil disobedience, Demonstrations, Political parades & rallies, Protest movements, Public speaking
- Places Capitols
- People Activists, Afro-Americans, Civil rights leaders, Dissenters
- Things Banners
- Misc Civil rights, Opposition (Political science)

356. Taking a driving test at the department of motor vehicles

- Events Automobile driving, Children driving, Examinations, Eye examinations, Parking
- Places Streets
- People Teenagers
- Things Automobiles, Identification photographs, Licenses, Paperwork

Misc Civil service, Driver education

357. Brushing your teeth

Events Cleaning, Dental hygiene

Places Bathrooms

Things Brooms & brushes, Cosmetics & soap, Dental equipment & supplies, Mirrors, Teeth

358. Cleaning the leaves out of the gutters on a roof

Events Cleaning, Domestic life, Housework, Raking (Sweeping)

Places Houses, Roofs

Things Downspouts, Gutters (Roofs), Ladders, Leaves

Misc Autumn, Sewerage

359. Taking your clothes to the cleaners

Events Laundry

Places Cleaning establishments

Things Chemicals, Clothing & dress, Household soap, Irons (Pressing), Plastics, Tickets, Washing machines

Misc Laundry workers' strikes

360. Working as a lumberjack in the lumber industry

Events Clearing of land, Woodcutting

Places Cutover lands, Forests, Mills, Rivers, Wooding stations

People Woodcutters

Things Axes, Crosscut saws, Logs, Lumber, Tree stumps, Trees, Trucks

Misc Conservation of natural resources, Forest reserves, Lumber industry

361. Children playing in a tree house

Events Children playing outdoors, Climbing, Falling

Places Clubhouses, Tree houses, Trees

Things Ladders, Ropes, Tree limbs

362. A lineman climbing up and working on a utility pole

Events Climbing, Maintenance & repair

People Linemen

Things Electric lines, Ladders, Telecommunication cables, Telecommunication lines, Utility poles, Wire

Misc Electric shocks, Electricity

363. Getting a health examination

Events Examinations, Preventive medicine, Vaccinations

Places Clinics, Medical offices

People Health care personnel, Nurses, Physicians

Things Blood, Cardiovascular system, Diplomas, Hammers, Hearts, Tongues, Underwear

Misc Health

364. Going through personal memorabilia

Events Reminiscing

Places Attics, Basements

Things Albums, Boxes, Clippings, Love letters, Memorabilia, Photograph albums, Photographs, Scrapbooks, Viewbooks

365. Getting dressed in the morning

Events Children dressing

Places Bedrooms, Boudoirs, Closets

Things Clothes chests, Clothing & dress, Dressing tables, Dressing & grooming equipment, Mirrors, Perfumes

Misc Individuality

366. Getting caught in a rainstorm

Events Rain, Rainbows, Sewerage, Storms

Places Shelters

Things Clouds, Coats, Convertible automobiles, Hail, Lightning, Umbrellas

367. Teaching an infant how to walk

Events Child rearing, Crawling & creeping, Falling, Holding hands, Human locomotion, Walking

People Fathers & children, Infants, Mothers & children

Things Floor coverings, Shoes

Misc Clumsiness

368. Sightseeing in a horse-drawn carriage in the city

Events Whipping
 Places Streets
 People Coach drivers, Passengers, Sightseers
 Things Carriages & coaches, Horns (Communication devices), Horses, Traffic congestion, Whips

369. A coach giving a locker room pep talk

Events Blaming, Shouting
 Places Locker rooms
 People Athletes, Coaching (Athletics)
 Things Blackboards, Chalk drawings
 Misc Anger, Optimism

370. A soap box derby race

Events Automobile racing, Children driving
 Places Hills, Streets
 People Children
 Things Coaster cars, Karts (Midget cars), Wheels

371. Putting on all of your winter outerwear

Events Children dressing, Shaking
 Places Closets
 Things Boots, Capes (Outerwear), Coats, Fur garments, Gloves, Hats
 Misc Cold, Winter

372. Going to a haunted house

Events Horror dramas, Shaking
 Places Haunted houses
 Things Cobwebs, Garlic, Ghosts, Spiders, Spirit photographs, Torches
 Misc Cowardice, Fear, Night

373. Going to a cockfighting match

Events Cockfighting, Gambling, Wagers
 Places Basements
 People Criminals, Peasants
 Things Birdcages, Blood, Chickens, Feathers

374. Having a tea party

Events Conversation, Tea parties
 Places Living rooms
 People Guests, Housewives, Socialites
 Things Coffee tables, Sofas, Tea, Teapots
 Misc Rumor

375. Going to a funeral parlor for a viewing

Events Crying, Funeral processions, Grief, Lifting & carrying, Lying in state, Prayer, Undertaking
 Places Morgues & mortuaries
 People Dead persons, Families, Preachers
 Things Coffins, Flowers, Hearses, Mourning clothes, Veils
 Misc Human life cycle

376. Making a wish at a wishing well

Events Wishing
 Places Wishing wells
 Things Coins, Pails, Ropes
 Misc Magic

377. Taking a dog for a walk

Events Walking
 Places Parks, Walkways
 People Pedestrians
 Things Chains, Collars, Dogs, Feces, Fire hydrants, Pets, Plastic bags, Trees

378. Registering for classes at a college or university

Events Queues, Recording & registration
 Places Universities & colleges
 People College administrators, Students
 Things Computers, Forms
 Misc Anxiety, Student aspirations

379. Interviewing to be a student at a college or university

Events Interviews
 Places Offices, Universities & colleges, Waiting rooms
 People Alumni & alumnae, College administrators, Fathers & children, Mothers & children, Students

Things Documents, Forms
 Misc Anxiety, Student aspirations

380. An interior decorator planning a room

Events Interior decoration
 Places Interiors
 People Designers
 Things Colors, Decorations, Floor coverings, Furniture, Interior design drawings, Light, Lighting, Upholstery, Wallpaper
 Misc Circulation (Architecture), Interior decoration firms

381. Going to see a comedian in a comedy club

Events Hand clapping, Imitation, Joking, Laughter, Musical revues & comedies, Stereotyping, Storytelling
 Places Nightclubs
 People Comedians
 Things Public address systems

382. Advertising using an airship or blimp

Events Advertising, Aerial views, Air travel
 Places Clouds
 People Air pilots
 Things Advertisements, Airships, Mooring masts
 Misc Publicity, Slogans

383. Clipping coupons out of magazines and newspapers

People Housewives
 Things Advertisements, Clippings, Periodicals, Premiums, Scissors & shears
 Misc Coupon stores, Food industry, Home economics

384. A retirement party at work

Events Resignations, Retirements, Shaking hands

Places Commercial facilities
 People Aged persons, Employees, Unemployed
 Things Clocks & watches, Pensions
 Misc Age & employment, Employment, Social security

385. Living in a nursing home

Events Community service, Gerontology, Institutional care, Nursing, Visiting
 Places Nursing homes, Rest homes
 People Aged persons, Grandparents, Health care personnel, Nurses, Shut-ins
 Things Medicines, Wheelchairs
 Misc Human life cycle, Longevity, Medicaid, Medicare

386. A child working on a newspaper route

Events Child labor, Sunrises & sunsets
 Places Neighborhoods, Residential streets
 People Delivery boys, Newspaper carriers
 Things Bicycles & tricycles, Newspapers
 Misc Age & employment

387. Reading the newspaper

Events Reading
 People Journalists
 Things Advertisements, Announcements, Comics, Crossword puzzles, Editorial cartoons, Newspapers, Political cartoons
 Misc Freedom of the press, Journalism, Newspaper industry

388. A government investigation hearing

Events Governmental investigations, Questioning
 Places Capitols, Conference rooms
 People Legislators, Press, Scapegoats
 Things Committees, Legislation, Legislative bodies
 Misc Corruption, Impeachments, McCarthyism, Political issues, Public opinion, Resignation from office

389. Actions at a commodity exchange

Events Auctions, Forecasting, Raising hands
 Places Commodity exchanges
 People Stockbrokers
 Things Bells, Coats, Contracts, Prices, Ticker tape

Misc Gold, Grains, Treasuries

390. Taking the commuter train to work

Events Daydreaming, Mass transit, Reading
 Places Subway stations, Ticket offices, Tunnels
 People Commuters, Newspaper vendors, Passengers
 Things Clocks & watches, Schedules (Time plans), Subways, Tickets
 Misc Subway accidents

391. Hiking on a nature trail

Events Foraging, Hiking, Walking
 Places Forests, Mountains, Parks, Scenic overlooks, Trails & paths
 Things Berries, Boots, Mushrooms, Staffs (Sticks), Wildflowers
 Misc Nature

392. Being a part of the crew on a sailboat in a sailboat race

Events Sailboat racing, Yacht racing
 Places Bodies of water, Yacht clubs
 People Sailors
 Things Buoys, Clocks & watches, Compasses, Life preservers, Ropes, Sailboats, Ship equipment & rigging, Steering wheels, Winds, Yachts

393. A composer writing a piece on a piano

Events Creation, Writing
 Places Music rooms
 People Composers, Pianists
 Things Musical notation, Pianos, Writing materials
 Misc Music publishing industry

394. Children playing with home video games

Events Children playing, Games
 Places Playrooms

Things Computer graphics, Computers, Electronic music, Sounds, Televisions

Misc Laziness

395. An engineer working with a computer design program

Events Creation, Engineering
 Places Factories, Offices
 People Engineers
 Things Computers, Computer-aided designs, Design drawings, Mechanical drawings, Specifications, Weights & measures
 Misc Industry

396. Using a computer for word processing

Events Printing, Typewriting, Writing
 Places Offices
 People Authors, Office workers
 Things Computers, Desks, Documents, Fingers

397. Being imprisoned in a concentration camp

Events Body marking, Forced labor, Starvation, War
 Places Concentration camps
 People Ethnic groups, Guards
 Misc Military policy, Racism

398. Going to an orchestra concert at a concert hall

Events Concerts, Hand clapping, Music, Whispering
 Places Concert halls, Ticket offices
 People Audiences, Conductors, Musicians, Socialites, Upper class
 Things Music stands, Musical instruments, Musical notation, Orchestras, Tickets, Tuxedos

399. Going to the railroad station to catch a train

Events Arrivals & departures, Circulation (Architecture), Customs inspections, Farewells
 Places Concourses, Railroad passenger cars, Railroad stations, Ticket offices
 People Passengers, Railroad employees, Railroad porters

Things Luggage, Railroads, Schedules
(Time plans), Taxicabs, Tickets
Misc Railroad companies

400. Working at a road construction site

Events Road construction, Traffic
congestion
Places Roads, Streets
People Construction workers
Things Barricades, Concrete, Graders
(Earthmoving machinery),
Helmets, Retaining walls, Road
rollers, Ruts, Signal flags, Traffic
signs & signals
Misc Construction industry

401. Buying a hot dog from a street vendor

Events Eating & drinking
Places Commercial streets
People Businessmen, Food vendors
Things Beverages, Condiments,
Frankfurters, Vending stands

402. Going to a restaurant for a meal

Events Eating & drinking, Paying bills
Places Railroad dining cars, Restaurants
People Cooks, Restaurant workers,
Waiters, Waitresses
Things Cash registers, Condiments,
Dining tables, Menus, Silverware,
Table settings & decorations,
Tableware

403. An open house at a house or a condominium

Events Deals, House buying
Places Condominiums, Houses, Housing
developments
People Guests, Sales personnel
Things Business cards, Cameras,
Mortgages
Misc Cost & standard of living, Real
estate business

404. Giving a confession to a priest in a church

Events Confession, Grief
Places Churches, Confessionals
People Priests
Things Bibles
Misc Children misbehaving, Christianity,
Deadly sins, Ethics

405. A police raid on a person's dwelling

Events Capture & imprisonment, Confiscations,
Frisking, Law enforcement, Police raids,
Searching, Surrenders, Suspicion
Places Dwellings
People Criminals, Police
Things Firearms, Handcuffs
Misc Civil rights, Drug abuse, Gambling, Illegal
arms transfers

406. Getting pulled over by the highway patrol

Events Capture & imprisonment, Chasing,
Confiscations, Police surveillance, Racing
automobiles, Ticketing
Places Express highways
People Traffic police
Things Automobiles, Documents, Insurance
certificates, License plates, Licenses,
Radar, Trucks

407. A military officer inspecting enlisted troops in attention

Events Marching, Military inspections, Military
life, Saluting
Places Drill halls, Military camps
People Military officers, Soldiers
Things Boots, Military decorations, Military
uniforms, Rifles
Misc Conformity

408. Teenagers quarreling with their parents

Events Child rearing, Confrontations, Family
violence, Intergenerational relations,
Quarreling
People Fathers & children, Mothers & children,
Teenagers
Misc Children's rights

409. An employee having a confrontation with their boss

Events Confrontations, Dismissal of employees, Quarreling, Resignations

Places, Commercial facilities

People Businessmen, Employee rights, Employees

Misc Stress, Wages, Work ethic

410. A peaceful protest of government military aggression

Events Demonstrations, Protest movements

Places Capitols, Universities & colleges

People Conscientious objectors, Draft resisters, Hippies, Pacifists

Things Peace signs, Protest posters

Misc Defense budgets, Moral aspects of war, Pacifism, Peace

411. Restoring an antique automobile in a home workshop

Events Conservation & restoration, Metalworking, Vehicle maintenance & repair, Welding

Places Driveways, Garages, Workshops

People Hobbyists, Mechanics (Persons)

Things Automobiles

Misc Nostalgia

412. Restoring a landmark or historic building

Events Conservation & restoration, Maintenance & repair, Painting, Remodeling

Places Historic buildings

People Architects, Construction workers, Historical societies

Things Architectural photographs, Building materials, Paints & varnishes

Misc Building deterioration, History

413. Irrigation of farmland in dry regions

Events Irrigation

Places Croplands, Deserts

People Agricultural laborers

Things Aqueducts, Canals, Hoses, Water pumps

Misc Conservation of natural resources

414. A political debate between candidates for office

Events Debates, Political elections, Public affairs television programs, Public appearances, Public speaking

People Audiences, Politicians

Things Podiums

Misc Conservatism, Liberalism, Negative campaigning, Political issues, Political platforms, Public opinion

415. Putting on and removing contact lenses

Events Cleaning, Reflections

Places Bathrooms, Mirrors

Things Contact lenses, Eyeglasses, Eyes, Fingers

Misc Hygiene, Vision disorders

416. Going to the optometrists for an eye exam

Events Eye examinations, Reading

Places Medical offices, Opticians' shops

People Physicians

Things Alphabets (Writing systems), Contact lenses, Eyeglasses, Eyes, Optical devices

Misc Optical industry, Vision disorders

417. Losing and searching for a contact lens

Events Crawling & creeping, Searching

Places Floors

Things Contact lenses, Eyes

Misc Blindness, Despair

418. Working as a chef in a restaurant

Events Cookery

Places Kitchens, Restaurants

People Cooks, Restaurant workers, Waiters, Waitresses

Things Cooking utensils, Food, Herbs, Knives, Menus, Ovens, Refrigerators, Stoves

Misc Dietary laws, Hygiene

419. A convenience store/gas station robbery

Events Escapes, Robberies, Shooting, Threats

Places Automobile service stations, Convenience stores

People Criminals, Sales personnel
 Things Bags, Cash registers, Handguns,
 Masks, Money, Safes, Security
 systems

420. Having dinner with your family at home

Events Conversation, Eating & drinking
 Places Dining rooms, Kitchens
 People Families
 Things Dining tables, Food, Silverware,
 Table settings & decorations,
 Tableware
 Misc Domestic life, Nutrition

421. Making copies at an office copy machine

Events Recycling
 Places Office buildings
 People Office workers
 Things Books, Copying machines,
 Documents, Paperwork,
 Photocopies, Reproductions,
 Stationery
 Misc Copyright

422. Going to a winetasting event

Events Eating & drinking
 Places Crates, Liquor stores, Wine
 cellars
 People Sales personnel
 Things Bottles, Cheese, Cork, Crackers,
 Drinking vessels, Labels, Price
 lists, Wine
 Misc Wine industry

423. Having a Thanksgiving dinner celebration at home

Events Carving, Holidays, Prayer,
 Visiting
 Places Dining rooms
 People Families
 Things Cranberries, Dining tables,
 Knives, Pies, Turkeys
 Misc Autumn, Cornucopias, Gratitude

424. Staying in a hospital bed for recovery or illness

Events Coughing, Examinations, Healing, Health
 care, Nursing, Pain, Visiting
 Places Hospital wards, Hospitals
 People Health care personnel, Nurses, Physicians,
 Sick persons
 Things Beds, Flowers, Medicines, Televisions
 Misc Boredom, Diseases, Health

425. Giving someone a marriage proposal

Events Courtship, Marriage proposals, Romances
 Places Lovers' lanes
 People Couples, Young adults
 Things Diamonds, Hands, Rings
 Misc Happiness, Love, Marriage

426. Getting married in a courthouse by a justice of the peace

Events Marriage, Weddings
 Places Courthouses
 People Brides, Grooms (Weddings), Judges
 Things Marriage certificates, Marriage licenses
 Misc Secularism

427. A military court martial for offenses against military law

Events Courts martial & courts of inquiry,
 Military discharges
 Places Courtrooms, Military headquarters
 People Criminals, Judges, Military deserters,
 Military personnel, Military police
 Misc Cowardice, Ethics, Justice, Laws, Military
 policy

428. Sending flowers to a boyfriend or girlfriend

Events Courtship, Romances
 Places Doors & doorways, Florist shops
 People Couples, Delivery boys
 Things Bouquets, Flowers, Vases
 Misc Love, Surprise

429. Pioneers on a westbound wagon train

Events Transcontinental journeys, Wagon trains,
 Westward movement
 Places Trails & paths

People Guides & scouts, Indians of North America, Pioneers
 Things Covered wagons, Horses
 Misc Frontier & pioneer life

430. A spy planting bugs and taking spy photos

Events Covert operations, Deception, Electronic surveillance, Spying
 Places Government facilities
 People Government officials
 Things Cameras, Documents, Gadgets
 Misc Danger, Military intelligence, National security, Secret service

431. Milking cows at a dairy farm

Events Dairy farming, Dairying, Milking
 Places Barns, Farms
 People Farmers
 Things Cows, Hoses, Milk, Pails, Stools
 Misc Dairy products industry, Farm life

432. Sitting down to pay the monthly bills

Events Paying bills
 Things Credit cards, Envelopes, Money, Postage stamps, Wages
 Misc Credit, Debt, Insurance companies, Months, Public utility companies, Telephone companies

433. Cremation of a dead body in a crematorium

Events Ash disposal, Cremation, Fire, Funeral rites & ceremonies, Undertaking
 Places Crematoriums, Morgues & mortuaries
 Things Dead persons, Furnaces, Incinerators, Urns
 Misc Heat, Human life cycle

434. Serving a prison sentence

Events Prison education, Reading, Weight lifting
 Places Prisons
 People Criminals, Guards, Prisoners

Things Barbed wire, Locks (Hardware), Prison uniforms
 Misc Boredom, Crimes, Parole, Solitude, Time

435. An investigator analyzing the scene of a crime

Events Criminal investigations
 Places Sites
 People Detectives, Police, Victims
 Things Cameras, Fingerprints, Footprints, Forensic photographs, Hand lenses
 Misc Crimes

436. Police using a bug to collect evidence from a suspect

Events Criminal investigations, Deception, Discussion, Electronic surveillance, Police surveillance, Sound recording
 People Criminals, Detectives, Police
 Things Sound recordings
 Misc Crimes, Frisking

437. Police investigators on a stakeout of a suspect

Events Criminal investigations, Eavesdropping, Electronic surveillance, Hiding, Police surveillance, Sound recording, Spying
 Places Dwellings
 People Criminals, Detectives, Police
 Things Binoculars, Sound recordings
 Misc Crimes

438. A police interrogation of suspects or witnesses to a crime

Events Confession, Criminal investigations, Questioning, Smoking
 Places Police stations
 People Criminals, Detectives, Informers, Police
 Things Cigarettes, Smoke
 Misc Civil rights, Constitutional amendments, Crimes, Legal aid, Tall tales

439. Working with evidence in a police laboratory

Events Criminal investigations, Testing
 Places Laboratories, Police stations
 People Detectives, Police

Things Blood, Fingerprints, Microscopes,
Plastic bags
Misc Crimes

440. Going to a movie theater to see a film

Events Motion picture premieres
Places Motion picture theaters, Ticket offices
People Actors, Actresses, Critics, Motion picture audiences
Things Candy, Carbonated beverages, Marquees, Motion picture devices, Motion picture posters, Motion pictures, Popcorn, Tickets
Misc Motion picture industry

441. A small plane crop dusting a rural farm

Events Crop dusting, Water pollution
Places Croplands, Runways (Aeronautics)
People Air pilots
Things Biplanes, Insects, Plant parasites, Plants, Poisons

442. Planting a crop at the beginning of the farming season

Events Crop rotation, Farming, Plowing
Places Croplands
People Agricultural laborers, Farmers
Things Peat, Plants, Plows, Scarecrows, Seeds, Spades, Tractors
Misc Agricultural productivity, Spring

443. Buying a lottery ticket at a convenience store

Events Lotteries
Places Convenience stores
Things Crossed fingers, Lottery tickets
Misc Anniversaries, Birthdays, Optimism, Wealth

444. White supremacists burning a cross at a home

Events Fires

People Afro-Americans, Crowds, Minorities
Things Costumes, Crosses, Fire, Masks
Misc Conservatism, Fear, Race discrimination, Racism

445. Crossing guard assisting children at a crosswalk

Events Children walking, Community service, School safety patrols
Places Crosswalks, Streets
People Pedestrians, School children, Traffic police
Things Signal lights, Traffic signs & signals
Misc Traffic accidents, Traffic regulations

446. Capital punishment via crucifixion

Events Crucifixions, Lifting & carrying, Whipping
People Criminals, Dead persons
Things Crosses, Feet, Hammers, Hands
Misc Christianity, Crown of thorns

447. Putting up a dam to create a reservoir

Events Dam construction
Places Reservoirs, Spillways, Streams
People Engineers
Things Dams, Engineering drawings, Hydroelectric generators, Water
Misc Conservation of natural resources, Flood control, Floods, Hydroelectric power, Water supply

448. Going dancing at a discotheque or dance club

Events Electronic music, Music, Perspiration, Rock & roll dancing
Places Dance halls, Discotheques, Nightclubs
People Disc jockeys, Young adults
Things Dance floors, High-fidelity sound systems, Sound recordings

449. Having a party at a house or apartment

Events Conversation, Dance parties, Music, Rock & roll dancing
Places Dwellings
People Guests
Things Beverages, High-fidelity sound systems, Sound recordings

Misc Friendship, Popularity, Social life

450. Going to a modern dance performance

Events Choreography, Modern dancing
 Places Stages (Platforms), Theaters
 People Audiences, Dancers
 Things Dance posters, High-fidelity sound systems, Sound recordings, Stage lighting

451. Looking after children in a day care center

Events Babysitting, Children drawing & painting, Children playing, Children sleeping, Day care
 People Children, Working mothers
 Things Crayon drawings, Games
 Misc Child rearing, Children & safety

452. Going to a lecture or academic talk

Events Daydreaming, Public speaking, Questioning
 Places Classrooms, Lecture halls
 People Scholars, Students, Teachers
 Things Podiums, Transparencies
 Misc Boredom

453. Adjusting the time on a clock or watch

Events Standardization
 Places Airplanes, Boundaries
 Things Clock towers, Clocks & watches, Longcase clocks
 Misc Autumn, Daylight savings, Spring, Time

454. Hitting an animal while driving outside of a city

Events Dead animals, Traffic accidents
 Places Roads
 Things Armadillos, Automobiles, Birds, Blood, Deer, Pets, Squirrels, Trucks
 Misc Grief, Surprise

455. Communication with deaf persons using sign language

Events Conversation, Sign language, Silence
 People Deaf persons
 Things Eyes, Hands, Hearing aids
 Misc Deafness

456. Lifesaving efforts in the emergency room of a hospital

Events Artificial respiration, Death, Emergency medical services
 Places Emergency rooms, Hospitals, Operating rooms
 People Health care personnel, Nurses, Physicians
 Things Death certificates, Deathbeds, Hearts, Hypodermic needles, Medical equipment & supplies, Medicines, Physical restraints

457. Applying for a loan at a bank

Events Banking, Pleading (Begging), Usury
 Places Banks
 People Bankers
 Things Forms, Neckties
 Misc Credit, Debt, Employment, Paying bills, Saving & investment

458. Capital punishment via decapitation using a guillotine

Events Decapitations
 Places Plazas
 People Criminals, Crowds, Dead persons, Executioners
 Things Guillotines, Heads (Anatomy), Ropes
 Misc Revolutions

459. Working as a disc jockey in a radio station

Events Advertisements, Announcements, Dedications, Music, Radio broadcasting
 Places Radio stations
 People Disc jockeys
 Things Album covers, High-fidelity sound systems, Phonographs, Radios, Sound recordings
 Misc Radio industry

460. Congression budget debates

Events Debates, Legislation, Tax reform, Vetoes

Places Capitols
 People Legislators, Presidents
 Misc Defense budgets, Deficit financing, Economic policy, Government spending policy, Government spending reductions, Political patronage, Presidents & the Congress, Social security, Special interests, Taxes

461. Activities at a political party's national convention

Events Political conventions, Political elections, Presidential elections, Public affairs television programs, Public speaking
 People Celebrities, Delegations, Presidents, Presidents' spouses, Vice presidents
 Things Political platforms
 Misc Political parties

462. Being tortured in hell in the afterlife

Events Death, Punishment & torture
 Places Hell
 People Criminals, Dead persons, Devil
 Things Demons, Fire
 Misc Christianity, Deadly sins, Heat, Religion

463. Going to the dentist's office for an appointment

Events Anesthesia, Dental hygiene, Dentistry, Grinding, Pain, Radiography, Toothaches
 Places Dental offices
 Things Chairs, Dental equipment & supplies, Hypodermic needles, Medicines, Mouths, Radiographs, Teeth
 Misc Anxiety, Cowardice, Dental education, Deterioration

464. Border patrol police trying to catch illegal aliens

Events Deportations, Hiding, Police surveillance, Running, Searching
 Places Boundaries
 People Guards, Illegal aliens, Refugees
 Things Barbed wire, Searchlights, Walls

465. Playing basketball in a driveway or a park court

Events Basketball
 Places Driveways, Playgrounds
 People Neighbors
 Things Balls (Sporting goods), Baskets, Garages
 Misc Friendship

466. A private detective following a person

Events Hiding, Spying, Surveillance, Vigils
 Places Shadows
 People Detectives, Spouses
 Things Cameras, Detective camera photographs
 Misc Suspicion, Walking

467. Selling your soul to the devil

Events Document signings
 Places Crossroads
 People Devil, Musicians
 Things Contracts
 Misc Blues music, Despair, Fame, Power (Social sciences), Wealth

468. Working as a secretary for a corporate executive

Events Typewriting
 Places Office buildings, Offices, Reception rooms
 People Businessmen, Office workers
 Things Coffee, Coffeepots, Dictating machines, Documents, Facsimile transmissions, Intercommunication systems, Letterheads, Paperwork, Schedules (Time plans), Stationery, Telephones

469. Going to a late-night truck stop

Events Parking, Sleeping
 Places Automobile service stations, Diners (Restaurants), Parking lots
 People Waitresses
 Things Coffee, Trucks
 Misc Night

470. Dissecting a frog in biology class in high school

Events Anatomy, Biology, Dissections, Examinations, Nausea
 Places Classrooms
 People Students, Teachers
 Things Dead animals, Frogs, Pins & needles, Surgical instruments

471. Scuba diving from a boat

Events Discovery & exploration, Diving, Skin diving, Spear fishing, Swimming, Underwater photography
 Places Boats, Reefs, Seas
 Things Air, Aquatic animals, Counterbalances, Diving suits, Oxygen masks, Spears, Underwater photographs

472. Going to a dog show

Events Animal grooming, Animal training, Dog shows
 Places Exhibition buildings
 Things Combs, Dogs, Family trees, Trained animals

473. Dogsledding through the snow

Events Dogsledding, Travel
 Places Trails & paths
 Things Dog teams, Ice, Sleds & sleighs, Snow, Working dogs
 Misc Winter

474. Dogcatchers picking up abandoned dogs

Events Chasing, Dogcatching, Running
 Places Animal shelters, Animal welfare organizations
 Things Cages, Collars, Dog licenses, Dogs, Pets
 Misc Rabies

475. Children playing with dolls

Events Children playing adults, Children playing with dolls, Ventriloquism

Places Playrooms
 Things Dollhouses, Dolls, Stuffed animals (Toys)
 Misc Fantasy

476. Sitting around watching television at home

Events Advertisements, Leisure, Television broadcasting, Television programs for children
 Places Dens
 Things Sofas, Televisions, Videodiscs
 Misc Domestic life, Laziness, Television industry

477. A burglar breaking into someone's house

Events Robberies, Sounds, Tiptoeing
 Places Dwellings
 People Criminals
 Things Crowbars, Dogs, Door knobs, Doors & doorways, Fire escapes, Keyholes, Locks (Hardware), Security systems, Windows
 Misc Night

478. Living in a college dormitory

Events Noise pollution, Parties, Reading, Writing
 Places Bedrooms, Dormitories, Universities & colleges
 People Students
 Things Beds, Desks, High-fidelity sound systems, Posters
 Misc Friendship

479. Amateur drag racing at a traffic light on a city street

Events Drag racing
 Places Streets
 People Teenagers
 Things Hot rods, Smoke, Tires, Traffic signs & signals
 Misc Competition (Psychology), Traffic regulations

480. Going to a drive-in restaurant

Events Eating & drinking, Roller skating
 Places Drive-in restaurants
 People Skaters, Waiters, Waitresses
 Things Automobiles, Condiments, Food, Intercommunication systems, Trays

481. Going to a drive-in theater

Events Horror dramas
 Places Drive-in theaters
 People Couples
 Things Automobiles, Candy, Motion picture devices, Motion pictures, Popcorn
 Misc Night

482. People smoking marijuana for recreation

Events Children smoking, Drug abuse, Floating, Hallucinations & illusions, Smoking
 Places Universities & colleges
 People Hippies, Juvenile delinquents, Students, Young adults
 Things Marijuana, Smoke, Tobacco pipes, Water pipes (Smoking)
 Misc Surrealism

483. Going to the pharmacist to fill a prescription

Events Health care
 Places Drugstores
 People Pharmacists, Sick persons
 Things Bottles, Cotton, Medicines, Pills
 Misc Drug abuse, Pharmaceutical industry

484. Duck hunting near a pond

Events Country life, Duck shooting
 Places Lakes & ponds
 Things Decoys (Hunting), Ducks, Hunting dogs, Kazoos, Rifles

485. A fencing competition

Events Action & adventure dramas, Dueling, Fencing, Fighting, Jumping
 Places Gymnasiums
 People Fencers, Referees
 Things Clocks & watches, Daggers & swords, Masks, Signal lights, Wire
 Misc Competition (Psychology)

486. A pistol duel between two aristocratic men

Events Dueling, Gunfights, Homicides, Shooting, Walking
 Places Dueling grounds
 People Upper class
 Things Handguns
 Misc Competition (Psychology)

487. A gunfighting duel in western town

Events Dueling, Homicides, Shooting, Westerns
 Places Dueling grounds, Plazas
 People Cowboys, Criminals, Sheriffs
 Things Handguns
 Misc Cowardice, Gunfights

488. Being imprisoned in the dungeon of a castle

Events Punishment & torture, Starvation
 Places Castles & palaces, Dungeons
 People Prisoners
 Things Chains, Cobwebs, Punishment devices, Rats, Shackles, Skeletons

489. Making, hiding, and searching for Easter eggs

Events Dyeing, Hiding, Holidays, Searching
 People Children
 Things Baskets, Colors, Crayon drawings, Easter cards, Easter eggs, Eggs
 Misc Christianity

490. Having your ears pierced in order to wear earrings

Events Pain
 Places Jewelry stores
 People Girls
 Things Blood, Earrings, Ears, Pins & needles, Wounds & injuries

491. Health and safety inspectors checking an establishment

Events Food adulteration & inspection, Investigation, Measuring
 Places Eating & drinking facilities
 People Government employees
 Things Food

Misc Consumer protection,
Government regulation, Health,
Hygiene

492. Watching a solar eclipse

Events Eclipses, Light
Things Clouds, Eyes, Moon, Pinhole
camera photographs, Pins &
needles, Shadows, Sun
Misc Astronomy, End of the world

493. Calling a tow truck because of car trouble

Events Towing
People Mechanics (Persons)
Things Automobile equipment &
supplies, Automobiles, Chains,
Electric batteries, Flat tires,
Gasoline engines, Wreckers
(Vehicles)

494. Building a electronic device on a circuit board

Events Electric shocks, Handicraft
Places Workshops
People Hobbyists
Things Electric batteries, Electrical
systems drawings, Electronic
apparatus & appliances, Light
bulbs, Transistors, Wire
Misc Electricity, Electronic industry

495. An execution by electrocution in the electric chair

Events Electric shocks, Electrocutions,
Executions, Last rites
Places Prisons
People Audiences, Criminals, Dead
persons, Executioners, Priests,
Prisoners
Things Chairs, Physical restraints

496. Young people getting married by eloping

Events Elopements, Marriage, Weddings
People Brides, Grooms (Weddings),
Young adults

Things Marriage certificates, Marriage licenses
Misc Surprise

497. Elves making toys in Santa's workshop

Events Carpentry, Singing
Places Workshops
People Elves
Things Christmas decorations, Christmas
stockings, Christmas trees, Gifts, Letters to
Santa Claus, Snow, Toys
Misc Toy industry, Winter

498. Immigrants coming to a new country

Events Deportations, Emigration & immigration,
Interviews, Recording & registration
Places Boundaries, Immigration stations
People, Aliens, Exiles, Immigrants, Refugees
Things Identification photographs, Paperwork,
Registers
Misc Employment, Family, Names, Nationalism

499. Planting trees in an open space

Events Digging, Forestry, Gardening, Tree
planting ceremonies
Places Forests, Meadows, Plains, Prairies
Things Gardening equipment & supplies, Holes,
Shovels, Trees
Misc Ecology, Erosion, Erosion protection works

500. A hurricane attacking a coastal town

Events Disasters, Evacuations, Hurricanes, Pier &
wharf failures, Rain, Typhoons, Winds
Places Abandoned buildings, Capes (Coasts),
Cities & towns, Oceans, Piers & wharves,
Waterfronts
People Law enforcement officers
Misc Civil defense, Safety

501. Media reporters covering an event

Events Broadcasting, Events, Interviews,
Photojournalism, Sound recording, Writing
Places Sites
People Photojournalists, Reporters
Things Cameras, Writing materials
Misc Lighting

502. Getting evicted from an apartment by the landlord

Events Evictions, Lease & rental services
 Places Apartment houses, Apartments
 People Landlord & tenant
 Things Contracts, Locks (Hardware)
 Misc Housing

503. Performing an exorcism of a possessed person

Events Exorcism
 People Priests, Sick persons
 Things Bibles, Crosses, Demons
 Misc Christianity

504. Going on a mountain climbing expedition

Events Expeditions & surveys, Mountaineering, Panoramic views
 Places Mountains, Passes (Landforms)
 People Explorers, Guides & scouts
 Things Axes, Boots, Expedition photographs, Ice, Mountain goats, Oxygen masks, Ropes, Snow
 Misc Cold, Danger

505. Working at a particle accelerator laboratory

Events Experiments, Physics
 Places Circular buildings, Particle accelerators, Tunnels
 People Physicists
 Things Magnets, Scientific equipment

506. Being abducted by space aliens

Events Experiments, Interplanetary voyages, Kidnappings, Surgery
 Places Forests, Unidentified flying objects
 Things Electronic apparatus & appliances, Extraterrestrial life
 Misc Night, Tall tales

507. Going to the plastic surgeon for elective cosmetic surgery

Events Anesthesia, Face lifts, Surgery
 Places Clinics, Operating rooms

People Actresses, Beauty contestants
 Things Breasts, Faces, Fat, Human body, Noses
 Misc Contentment, Obesity

508. Researching a family history for genealogical study

Places Archives, Historical societies
 People Grandparents
 Things Birth certificates, Death certificates, Family trees, Marriage certificates, Newspapers
 Misc History, Recording & registration

509. Going to a farmer's market

Events Farmers' markets
 Places Parking lots, Plazas
 People Farmers, Food vendors, Peasants, Vending stands
 Things Farm produce, Flowers, Fruit, Preserves, Spices, Vegetables

510. Going to a hoedown on a farm

Events Folk music, Hayrides, Hoedowns (Parties), Square dancing
 Places Barns, Farmhouses, Farms
 People Farmers
 Things Banjos, Hay, Violins, Washboards

511. Going to a fast food restaurant

Events Eating & drinking, Queues
 Places Fast food restaurants
 People Restaurant workers
 Things Bags, Carbonated beverages, Cash registers, Intercommunication systems, Packaging, Sandwiches, Trays
 Misc Health, Standardization

512. Going on a hunger strike for some political issue

Events Fasts, Publicity, Reducing, Starvation
 Places Prisons
 People Activists, Political prisoners
 Things Food, Water
 Misc Passive resistance, Peace, Political issues

513. Getting a polishing from a shoe shiner

Events Cleaning, Shoe shining

Places Airports, Bus terminals, Business districts, Railroad stations
 People Businessmen, Shoe shiners
 Things Chairs, Feet, Newspapers, Shoes, Stools, Towels

514. Trying on new shoes at a shoe store

Events Measuring, Pain, Shoemaking, Walking
 Places Shoe stores
 People Shoemakers
 Things Boots, Feet, Footwear, Hosiery, Shoes
 Misc Shoe industry, Shoestring industry

515. Running in a marathon

Events Cheering, Marathon running, Perspiration, Running, Running races
 Places Streets
 People Runners (Sports), Sports spectators
 Things Clocks & watches, Feet, Legs, Shoes
 Misc Fatigue, Health, Time

516. Taking a ferry across between two land masses

Events Ocean travel
 Places Islands, Marine terminals, Piers & wharves, Seas
 People Commuters, Passengers, Ship captains
 Things Automobiles, Ferries, Schedules (Time plans)

518. A photographer working in a darkroom

Events Photography
 Places Bathrooms, Photographic studios, Portable darkrooms
 People Photographers
 Things Chemicals, Negatives, Photographs
 Misc Light

519. Working as a ranger at a national park

Events Fire prevention, Forestry, Search & rescue operations
 Places Fire lookout stations, National parks & reserves
 People Rangers
 Things Binoculars, Campfires, Jeep automobiles, Radiophones

520. Firemen waiting for emergency calls at a fire station

Events Leisure
 Places Fire stations
 People Fire fighters
 Things Fire alarms, Fire engines & equipment, Fireboats, Working dogs
 Misc Boredom, Preparedness

521. Buying firearms from a gun dealer

Events Recording & registration, Shooting
 Places Pawnshops
 People Collectors, Criminals, Ex-convicts, Hobbyists
 Things Bullets, Firearms, Identification photographs, Licenses
 Misc Firearms control, Firearms industry, Gunsmithing, Safety

522. Fighting a forest fire

Events Conservation of natural resources, Fire prevention, Forest fires, Heat, Winds
 Places Firebreaks, Forests, National parks & reserves
 People Fire fighters, Rangers
 Things Fire engines & equipment, Helicopters
 Misc Temperature

523. Watching a Independence day fireworks celebration

Events Celebrations, Concerts, Explosions, Holidays, Sounds
 Places Parks
 People Families
 Things Blankets, Firecrackers, Fireworks, Orchestras
 Misc Autonomy, Night

524. Setting up and caring for a home aquarium

Events Animal feeding
 Places Dens, Living rooms, Pet shops
 Things Air pumps, Animal housing, Aquariums, Fish, Pets, Rocks, Water, Water pumps, Water tanks

525. Working on a commercial fishing vessel

Events Fishing industry, Shellfish industry
 Places Decks (Ships), Seas
 People Fishermen
 Things Fish, Fishing boats, Fishing nets, Fishing weirs, Freezers, Hoisting machinery, Ice
 Misc Conservation of natural resources

526. Raising and lowering a flag on a flagpole

Events Flag salutes
 Places Educational facilities, Government facilities
 Things Flagpoles, Flags, Ropes
 Misc Patriotism, Pledges of allegiance

527. Going to a speakeasy during prohibition

Events Charleston (Dance), Jazz, Smuggling
 Places Basements, Speakeasies
 People Big bands, Criminals, Flappers, Gangs, Jazz singers
 Things Alcoholic beverages, Speakeasy cards
 Misc Organized crime, Prohibition

528. Going to a flea market

Events Barter, Bazaars, Flea markets, Secondhand sales, Shopping
 Places Parking lots, Plazas
 People Crowds, Peddlers
 Things Merchandise displays, Vending stands

529. Pilots training in a flight simulator

Events Flight testing, Flight training, Rehearsals
 People Air pilots, Students
 Things Computer graphics, Computers, Dashboards, Steering wheels
 Misc Aeronautics, Preparedness, Teaching methods

530. Working in a home garden

Events Gardening, Leisure, Recreation
 Places Backyards, Garden rooms, Gardens
 People Aged persons, Hobbyists
 Things Flower pots, Flowers, Gardening equipment & supplies, Gloves, Herbs, Plant containers, Plants, Seeds, Straw hats, Topiary work, Weeds, Wheelbarrows
 Misc Horticulture, Retirements

531. Going on a diet to lose weight

Events Calisthenics, Fasts, Physical fitness, Reducing, Starvation, Weight loss
 People Fashion models
 Things Fat, Food, Scales
 Misc Gluttony, Nutrition, Obesity

532. Being an entertainer in a king's court

Events Juggling, Storytelling, Sword swallowing
 Places Castles & palaces, Reception rooms
 People Bards, Fools & jesters, Kings, Knights, Minstrels, Queens, Troubadours
 Things Daggers & swords, Fools' caps, Thrones
 Misc Tall tales

533. Watching a big football game on television

Events Cheering, Football, Leisure, Television broadcasting
 Places Dens
 People Football players, Men, Sports spectators
 Things Beer, Popcorn, Pretzels, Televisions
 Misc Friendship

534. Waiting in the reception area of a medical office

Places Dental offices, Medical offices, Reception rooms
 People Health care personnel, Nurses, Office workers, Sick persons
 Things Forms, Periodicals

Misc Anxiety, Boredom, Time

535. Warfare on the front line of a military battle

Events Campaigns & battles, Explosions, Military retreats, Shooting, Trench warfare, Troop movements, War
 Places Battlefields, Foxholes
 People Casualties, Soldiers, War correspondents
 Things Armies, Camouflage (Military science), Chevaux-de-frise, Gun turrets, Mines (Warfare), Mortars (Ordnance), Obstacles (Military science), Rockets
 Misc Courage, Cowardice

536. Peddling tonics in a travelling medicine show

Events Deception, Fraud, Healing, Medicine shows, Selling
 Places Markets, Plazas
 People Actors, Actresses, Peddlers, Quacks, Sick persons, Spectators
 Things Patent medicines

537. A press conference with some government official

Events Broadcasting, Muckraking, Press conferences, Questioning, Raising hands, Sound recording, Writing
 Places Conference rooms
 People Government officials, Press, Reporters
 Things Cameras, Lighting, Podiums, Writing materials
 Misc Freedom of information

538. Freighthopping to and from a train

Events Freighthopping, Hiding, Jumping
 Places Loading docks, Railroad freight cars, Railroad stations
 People Railroad employees, Runaway children, Stowaways, Tramps
 Things Crates, Mouth organs, Railroads

539. Fundraising by canvassing door-to-door for donations

Events Canvassing, Fund raising, Knocking, Salutations
 Places Doors & doorways
 People Philanthropists
 Things Gifts, Money
 Misc Charitable organizations, Charity, Philanthropy

540. Telemarketers and fundraisers making phone calls

Events Fund raising, Salutations, Selling
 People Peddlers
 Things Telephone directories, Telephones
 Misc Charitable organizations, Newspaper industry, Obstinacy, Telephone companies

541. Playing a game of chess

Events Chess, Contests, Thinking
 Places Dens, Living rooms, Parks
 Things Clocks & watches, Game boards, Game pieces

542. Committing suicide by jumping off the ledge of a building

Events Death, Falling, Jumping, Suicides
 Places Office buildings
 People Businessmen, Fire fighters, Mentally ill persons, Spectators
 Things Gargoyles, Megaphones, Windows
 Misc Depression (Mental state)

543. Flying a hang-glider off a cliff

Events Aerial views, Air travel, Running
 Places Cliffs, Mountains
 Things Gliders, Goggles, Helmets, Winds

544. Working as a jeweler making jewelry

Events Jewelry making, Lapidary work, Metalworking
 Places Jewelry stores
 Things Diamonds, Gems, Gold, Goldwork, Hand lenses, Inscriptions, Jewelry, Monocles, Showcases, Silver

545. Panning for gold in a river

Events Frontier & pioneer life, Gold rushes, Prospecting, Wading
 Places Streams
 People, Pioneers
 Things Gold, Mules, Pack animals, Prospecting equipment & supplies
 Misc Westerns, Westward movement

546. Riding in a gondola in a city's canals

Places Canals, Landing floats, Piers & wharves
 People Couples, Gondoliers, Passengers, Sightseers
 Things Gondolas, Pedestrian bridges
 Misc Romances

547. Going to an African-American Christian religious service

Events Dance, Gospel music, Hand clapping, Religious services
 Places Churches
 People Afro-Americans, Evangelists, Gospel singers
 Things Bands, Bibles, Choirs (Music), Organs
 Misc Christianity

548. A tutor giving personal attention to a student

Events Children reading & writing, Education, Reading, Writing
 Places Classrooms, Libraries (Rooms), Studies (Rooms)
 People Governesses, Scholars, Students, Teachers
 Things Books, Desks, Writing materials
 Misc Preparedness, Teaching methods

549. A graffiti vandal painting in the night

Events Autographing, Hiding, Painting, Vandalism
 Places Alleys, Subway stations, Subways
 People Artists, Gangs, Juvenile delinquents, Police

Things Billboards, Graffiti, Paints & varnishes, Symbols, Walls
 Misc Night

550. Mass executions as part of a genocide or war

Events Executions, Genocide, Gravedigging
 Places Concentration camps, Holes
 People Executioners, Firing squads, Prisoners of war
 Things Graves
 Misc War crimes

551. A bachelor party for before a wedding

Places Hotels, Nightclubs
 People Bachelors, Dancers, Grooms (Weddings), Nudes
 Things Alcoholic beverages, Erotic films
 Misc Friendship, Weddings

552. Playing rock and roll music with friends

Events Singing
 Places Basements, Garages
 People Musicians, Teenagers, Young adults
 Things Drums, Guitars, Musical instruments, Public address systems, Rock groups

553. Assembling warships off the coast of another country

Events Military mobilizations, Naval operations, Naval warfare, Threats
 Places Capes (Coasts), Territorial waters, Waterfronts
 People Marines, Navies
 Things Gun turrets, Mines (Warfare), Warships
 Misc International security, Preparedness

554. Women going to the powder room

Events Conversation, Grooming
 Places Rest rooms, Restaurants
 People Women
 Things Cosmetics & soap, Handbags, Mirrors, Purses, Queues
 Misc Rumor

555. Airplane mechanics inspecting and maintaining airplanes

Events Vehicle maintenance & repair

Places Hangars
 People Mechanics (Persons)
 Things Airplane engines, Airplane equipment, Airplanes, Fuel, Hoisting machinery
 Misc Airline industry strikes, Safety

556. An execution by hanging from a rope

Events Hangings, Last rites, Strangling, Westerns
 People Cowboys, Criminals, Dead persons, Executioners, Priests, Prisoners, Sheriffs, Spectators
 Things Heads (Anatomy), Nooses, Pails, Ropes, Trees

557. Navigating a private boat in and out of a harbor

Events Launchings, Mooring, Navigation, Rowing
 Places Harbors, Marine terminals, Piers & wharves, Waterfronts
 People Fishermen, Sailors
 Things Anchors, Boat clubs, Motorboats, Rowboats, Sailboats, Trucks

558. Retrieving and moving organs from an organ donor

Events Accidents, Emergency medical services, Surgery
 Places Hospitals, Operating rooms
 People Dead persons, Physicians
 Things Ambulances, Hearts, Helicopters, Human body, Ice, Licenses, Surgical instruments

559. Coast guard search & rescue operations

Events Drowning, Lifesaving, Marine accidents, Search & rescue operations, Searching
 Places Seas
 People Lifeguards
 Things Helicopters, Life preservers, Lifeboats, Motorboats, Searchlights

560. Working as a shepherd of a flock of sheep

Events Herding, Sheep shearing
 Places Hills, Meadows
 People Shepherdesses, Shepherds
 Things Scissors & shears, Sheep, Staffs (Sticks), Wool, Working dogs
 Misc Wool industry

561. Working as a shepherd of a flock of goats

Events Dairy farming, Dairying, Milking
 Places Hills, Meadows, Mountains
 People Goatherds
 Things Goats, Herding, Staffs (Sticks), Working dogs

562. Bears hibernating for the winter

Events Hibernation, Sleeping
 Places Caves
 Things Bears
 Misc Temperature, Winter

563. Burial in an egyptian pyramid

Events Funeral rites & ceremonies
 Places Deserts, Pyramids
 People Kings, Servants, Slaves
 Things Hieroglyphics, Jewelry, Mummies, Sarcophagi, Sphinxes, Treasure-trove
 Misc Cursing

564. A city celebrating Founder' Day commemorations

Events Anniversaries, Founders' Day commemorations, Historical pageants, Historical reenactments, Parades & processions
 Places Cities & towns, Commercial streets, Plazas
 Things Banners
 Misc Historical societies, History

565. Hitchhiking on a road between towns

Events Automobile travel, Hitchhiking, Transcontinental journeys, Transportation, Walking
 Places Cities & towns, Roads
 People Runaway children, Young adults
 Things Automobiles, Fingers, Trucks

566. Playing a game of ice hockey

Events Cheering, Fighting, Ice hockey,
Ice skating
Places Ice skating rinks, Lakes & ponds,
Stadiums
People Athletes, Referees, Sports
spectators
Things Hockey masks, Ice
Misc Winter

567. Exchanging gifts and cards for St. Valentine's Day

Events Courtship, Holidays
People Couples
Things Candy, Flowers, Gifts, Love
letters, Valentines
Misc Love

568. Canning and preserving fruit and vegetables

Events Country life, Home economics,
Home food processing
Places Kitchens
People Housewives
Things Cans, Fruit, Kettles, Preserves,
Vegetables

569. Murdering someone by poisoning their drink

Events Eating & drinking, Homicides
Things Beverages, Drinking vessels,
Poisons
Misc Deception, Distress, Revenge,
Suspicion

570. Swearing to tell the truth in a courtroom

Events Oaths, Raising hands
Places Courthouses, Courtrooms
People Bailiffs
Things Bibles, Hands
Misc Gods, Honesty, Truth

571. Taking a vacation on a cruise ship

Events Ballroom dancing, Eating &
drinking, Honeymoons, Leisure,

Motion sickness, Ocean travel, Recreation,
Vacations

Places Decks (Ships), Islands, Ocean liners,
Oceans
People Couples, Passengers, Porters, Ship
captains, Tourists
Things Lifeboats, Shuffleboard

572. Sea navigation through a thick fog

Events Blindness, Fog, Navigation, Ship accidents
Places Bodies of water, Vessels
People Ship captains
Things Bells, Compasses, Horns (Communication
devices)
Misc Danger

573. Going to the race track to bet on horse races

Events Cheering, Gambling, Horse racing,
Horseback riding, Wagers
Places Racetracks (Horse racing), Stables
People Jockeys, Sports spectators
Things Binoculars, Gates, Race horses

574. Signing in and out of work with a punch clock

Places Commercial facilities, Industrial facilities
People Employees, Working class
Things Cards, Clocks & watches, Punched card
systems
Misc Hours of labor, Wages

575. A tornado striking a residential area

Events Civil defense, Disasters, Forecasting,
Radio broadcasting, Tornadoes, Warnings,
Winds
Places Basements, Shelters
People Reporters
Things Houses, Maps, Mobile homes, Radios,
Shutters

576. Vacationing on a tropical island

Events Honeymoons, Hula dancing, Leisure,
Luaus, Recreation, Vacations
Places Beaches, Cabanas, Resorts
People Couples, Tourists
Things Alcoholic beverages, Fruit, Leis, Sun

577. Going to a competitive track meet

Events Running, Track athletics
 Places Athletic fields, Stadiums
 People Athletes, Runners (Sports), Sports spectators
 Things Clocks & watches, Handguns, Medals, Shoes
 Misc Time, World records

578. Buying drugs from a drug dealer

Events Deals, Drug abuse, Selling, Smuggling
 Places Slums
 People Criminals, Gangs
 Things Hypodermic needles, Narcotics, Plastic bags
 Misc Black market, Organized crime, Police surveillance

579. An athlete tending to an sprain or minor injury

Events Accidents, Wounds & injuries
 Places Locker rooms, Sports & recreation facilities
 People Athletes
 Things Arms (Anatomy), Back (Anatomy), Feet, Hands, Ice, Legs, Plastic bags, Splints (Surgery)
 Misc Pain

580. Ice fishing in on a frozen lake

Events Ice crossings, Ice fishing
 Places, Glaciers, Ice floes, Icebergs, Igloos, Lakes & ponds
 People Fishermen, Indians of North America
 Things Fish, Fishing lures, Fishing & hunting gear, Holes, Ice
 Misc Cold

581. Ice skating outside in the winter

Events Children playing in snow, Ice skating
 Places Ice skating rinks, Lakes & ponds
 People Skaters
 Things Ice, Shoes

Misc Winter

582. Nautical navigating in arctic waters

Events Navigation, Ocean travel, Ship accidents
 Places Seas
 People Ship captains
 Things Aerial photographs, Glaciers, Ice floes, Icebergs, Iceboats, Ice-breaking vessels, Maps
 Misc Danger

583. Building and living in an igloo

Events Building construction, Carving
 Places Glaciers, Ice floes, Icebergs, Igloos
 People Indians of North America
 Things Campfires, Ice, Ice sculpture, Knives, Snow
 Misc Cold

584. Working as a revolutionary in a third world country

Events Counterrevolutions, Covert operations, Illegal arms transfers, National liberation movements, Rebellions, Revolutions, Sabotage, Underground movements
 Places Capitols, Military camps
 People Counterrevolutionaries, Dictators, Guerrillas, Military regimes, Rebels, Revolutionaries
 Things Arms & armament
 Misc Rearmament

585. Filing an income tax return

Events Paying bills
 Places Law offices, Post offices
 People Lawyers
 Things Envelopes, Forms, Income taxes, Wages
 Misc Laziness, Tax exemptions, Tax reform

586. Making a will to allocate in inheritance

Events Document signings, Inheritance & succession
 Places Law offices
 People Aged persons, Families, Lawyers
 Things Wealth, Wills
 Misc Death, Inheritance & transfer taxes

587. Going to a fraternity for a meeting

Events Discussion, Initiation rites,
Meetings, Pledges of allegiance
Places Fraternities & sororities,
Universities & colleges
People Students

588. Putting on a military officer's uniform

Events Military life, Military parades &
ceremonies
Places Officers' quarters
People Military officers
Things Daggers & swords, Hats, Insignia,
Medals, Military decorations,
Military uniforms, National
emblems

589. Living in an insane asylum

Events Escapes, Institutional care,
Psychiatry
Places Mental institutions
People Mentally ill persons, Physicians
Things Medicines, Physical restraints
Misc Mental health, Mental states

590. Two automobiles getting in a fender-bender accident

Events Automobile driving, Blaming,
Quarreling, Traffic accidents
Places Streets
People Traffic police
Things Automobiles, Broken glass,
Insurance, Insurance certificates,
Traffic signs & signals, Wreckers
(Vehicles)
Misc Anger, Traffic regulations

591. United Nations peace keeping forces patrolling a city

Events Arms control, Civil wars,
Intervention (International law),
Law enforcement, Military
assistance, Military occupations
Places Cities & towns
People International police
Things Arms & armament

Misc Foreign participation in war, International
security, Military regimes, Peace, Treaty
violations

592. Working in an inventor's workshop

Events Creation, Handicraft
Places Workshops
People Hobbyists, Inventors
Things Design drawings, Gadgets, Inventions,
Scientific equipment, Transistors, Wire
Misc Patents

593. Poaching elephants as part of the ivory trade

Events Big game hunting, Elephant hunting,
Poaching, Shooting
Places Plains, Prairies
Things Dead animals, Elephants, Rifles, Saws,
Tusks
Misc Ivory

594. Playing in a jazz band at a club

Events Creation, Jazz
Places Nightclubs
People Composers, Jazz singers, Musicians,
Pianists
Things Bands, Brass instruments, Musical
instruments, Pianos, Songs

595. Putting together a jigsaw puzzle

Events Searching
Places Dens, Living rooms
Things Boxes, Colors, Eyes, Jigsaw puzzles,
Pictures, Tables
Misc Recreation

596. Getting three wishes from a genie in a lamp

Events Cleaning, Wishing
People Jinns
Things Fables, Fairy tales, Lamps, Smoke
Misc Fame, Love, Magic, Power (Social
sciences), Prosperity, Wealth

597. Going to a junkyard to drop off junk or search for something

Events Recycling, Refuse disposal, Searching
Places Junkyards

Things Automobile equipment & supplies, Bulldozers, Dump trucks, Hoisting machinery, Refuse, Salvage

598. Touching a pregnant woman to feel kicking

Events Human locomotion, Kicking, Pregnancy
 People Pregnant women, Spouses
 Things Hands, Human body
 Misc Nausea

599. Kidnapping a child from a public place

Events Children crying, Kidnappings, Shouting
 Places Parks, Playgrounds
 People Children, Criminals
 Things Candy

600. Making pottery and clay artifacts

Events Modeling (Sculpture), Painting, Spinning
 Places Artists' studios, Potteries
 People Hobbyists
 Things Kilns, Paints & varnishes, Pottery, Urns, Vases
 Misc Pottery industry

601. Going to a kindergarten class

Events Children drawing & painting, Children playing, Children sleeping, Storytelling
 Places Classrooms, Kindergartens
 People Children, Teachers
 Things Crayon drawings, Games

602. A king knighting a subject

Events Knighting, Pledges of allegiance
 Places Castles & palaces
 People Kings, Knights
 Things Armor, Coats of arms, Daggers & swords
 Misc Chivalry

603. Going to a seance to contact to spirits

Events Holding hands, Knocking, Levitation, Seances, Witchcraft
 Places Dining rooms
 People Dead persons, Ghosts, Quacks, Witches, Wizards
 Things Crystal balls, Dining tables, Memorabilia, Ouija boards, Tarot cards

604. Sending a package through the mail

Events Postal service, Shipping
 Places Post offices
 People Postal service employees
 Things Boxes, Labels, Mailboxes, Packaging, Postage stamps, Wanted posters
 Misc Postal service rates

605. Workers picketing during a strike outside a business

Events Sabotage, Shouting, Strikes
 People Employees, Labor leaders, Labor unions, Pickets
 Things Signs
 Misc Anger, Employee rights, Industrial arbitration, Wages

606. Working as a building window washer

Events Window cleaning
 Places Skyscrapers
 Things Hoisting machinery, Ladders, Pails, Pulleys, Ropes, Windows
 Misc Danger, Safety

607. Surveying a piece of land for records or construction

Events Measuring, Real estate development, Surveying
 Places Land
 People Surveyors
 Things Measured drawings, Site plans, Surveying equipment
 Misc Civil engineering, Construction industry, Real estate business

608. Waiting at the deathbed of a dying elderly person

Events Crying, Death, Last rites

Places Bedrooms, Deathbeds
 People Aged persons, Dead persons,
 Families, Priests
 Misc Longevity, Sadness

609. Taking your dirty clothes to the laundromat

Events Cleaning, Laundry
 Places Apartments, Laundries (Rooms & spaces)
 Things Baskets, Clothing & dress, Coin operated machines, Coins, Household soap, Washing machines

610. Reading a book for leisure at home

Events Leisure, Reading
 Places Dens, Libraries (Rooms), Studies (Rooms)
 Things Books, Chairs, Eyeglasses, Lamps
 Misc Literacy, Literature

611. Working as a lighthouse keeper

Places Capes (Coasts), Lighthouses, Waterfronts
 People Lighthouse keepers
 Things Beacons, Signal lights, Stairways
 Misc Navigation

612. Working at a military medical camp

Events Military discharges, Military medicine, Surgery
 Places Military hospitals, Operating rooms
 People Amputees, Nurses, Physicians, Soldiers, Unknown soldiers, War casualties
 Things Blood, Helicopters, Litters, Surgical instruments
 Misc Medical aspects of war

613. Going skiing in the mountains

Events Falling, Ski jumping, Skiing
 Places Mountains, Ski lodges

Things Boots, Flags, Gloves, Goggles, Hoisting machinery, Ice, Ropes, Snow
 Misc Winter

614. City employees working in the sewer

Events Civil service, Maintenance & repair
 Places Manholes, Sewers, Streets
 Things Lanterns, Manhole covers, Pipelines, Pipes, Septic tanks
 Misc Public utility companies, Sanitation, Sewerage, Waterworks

615. Getting a manicure at a beauty salon

Events Manicuring, Painting
 Places Beauty shops
 People Women
 Things Brooms & brushes, Fingers, Paints & varnishes, Scissors & shears

616. Shopping through a mail-order catalog

Events Postal service
 Places Mail-order businesses, Warehouses
 People Sales personnel
 Things Credit cards, Manufacturers' catalogs, Packaging, Products, Sales catalogs, Telephones
 Misc Postal service rates

617. Practicing martial arts with a group

Events Dueling, Martial arts, Meditation, Oriental hand-to-hand fighting
 Places Gymnasiums
 People Apprentices
 Things Belts (Clothing)
 Misc Philosophy, Preparedness, Self-defense

618. A wrestling or martial arts competition

Events Dueling, Fighting, Martial arts, Oriental hand-to-hand fighting, Wrestling
 Places Gymnasiums
 People Referees, Wrestlers
 Things Belts (Clothing), Clocks & watches
 Misc Competition (Psychology)

619. Going to a masquerade or a Halloween party

Events Holidays, Masquerades, Parties

Places Ballrooms
 Things Costumes, Masks
 Misc Impersonation

620. Getting fitted for a suit or a dress

Events Measuring, Sewing, Tailoring
 Places Tailor shops
 People Seamstresses, Tailors
 Things Ball dresses, Coats, Evening gowns, Pins & needles, Sewing equipment & supplies, Sewing machines, Textiles, Trousers, Tuxedos, Wedding costume
 Misc Clothing industry

621. Medical students going on hospital rounds with a doctor

Events Examinations, Health care, Medical education, Questioning
 Places Hospital wards, Hospitals
 People Apprentices, Physicians, Sick persons, Students
 Things Documents, Medicines

622. A police standoff or gunfight with a surrounded criminal

Events Deals, Escapes, Gunfights, Police shootings, Prisoner exchanges, Sharpshooting, Surrenders
 People Criminals, Police, Prisoners
 Things Firearms, Megaphones

623. A military officer enlisting or registering men for service

Events Draft, Recruiting & enlistment, War rallies
 Places Schools
 People Conscientious objectors, Draft resisters, Men, Military officers, Soldiers
 Misc Military organizations, Military service, Patriotism

624. Working as a bicycle messenger in a big city

Events Cycling, Traffic congestion
 Places Office buildings, Streets

People Delivery boys, Letter carriers, Messengers
 Things Bicycles & tricycles, Boxes, Correspondence, Helmets
 Misc Traffic accidents, Traffic regulations

625. Doing research in a library

Events Reading, Searching, Whispering
 Places Archives, Libraries, Reading rooms
 People Librarians, Scholars, Students, Teachers
 Things Books, Encyclopedias & dictionaries, Microfiches, Microfilms, Periodicals

626. Using a microwave oven

Events Cookery, Ionizing radiation
 Places Kitchens
 People Bachelors, Working mothers
 Things Coffee, Food, Microwave ovens, Plastics, Porcelain
 Misc Metals

627. Writing a person's memoirs in their old age

Events Confession, Reminiscing, Writing
 People Aged persons, Celebrities
 Things Writing materials
 Misc Events, History, Human life cycle, Middle age, Wisdom, Youth

628. Eating in a military mess hall

Events Bread & soup lines, Military cookery
 Places Mess halls, Military camps
 People Military personnel
 Things Potatoes, Tableware, Tin cups, Trays, Vats
 Misc Standardization

629. A strategic air strike of military targets

Events Aerial bombings, Air operations, Explosions, War
 Places Armories, Magazines (Military buildings), Military depots, Military facilities, Runways (Aeronautics)
 People Military air pilots
 Things Aerial photographs, Bombers, Bombs, Rockets, War damage
 Misc Military intelligence

630. Going to a military school for a military education

Events Military education, Military training, School discipline
 People Cadets, Military personnel
 Things Military uniforms
 Misc Military art & science, Military tactics, Teaching methods

631. Military reconnaissance of an enemy territories

Events Military reconnaissance, Searching, Spying, War
 Places Boundaries
 People Military air pilots, Military scouts
 Things Aerial photographs, Artificial satellites, Fighter planes, Radar
 Misc Military intelligence

632. Test firing conventional or nuclear weapons

Events Explosions, Nuclear weapons testing, Ordnance testing
 Places Caves, Deserts, Military reservations
 People Military personnel, Scientists
 Things Bombs, Mushroom clouds, Nuclear weapons, Rockets
 Misc Ordnance industry

633. Military boot camp training of new recruits

Events Calisthenics, Marching, Military maneuvers, Military training, Perspiration, Running, War games
 Places Drill halls, Military camps
 People Cadets
 Things Rifles
 Misc Hairstyles, Physical fitness, Standardization

634. Being a war prisoner in enemy territory

Events Punishment & torture, Questioning, Starvation, War
 Places Dungeons, Military camps
 People Missing in action, Prisoners of war, Soldiers

Things Punishment devices
 Misc War prisoners' organizations

635. A violent protest or riot by civilians

Events Demonstrations, Protest movements, Riot control, Riots, Shouting, Vandalism
 Places Business districts, Capitols
 People Dissenters, Police, Revolutionaries
 Things Molotov cocktails, Nightsticks, Rocks, Tear gas
 Misc Opposition (Political science)

636. Travelling through a jungle

Events Hiking
 Places Trails & paths, Tropical forests, Wetlands
 People Explorers, Guides & scouts, Indigenous peoples, Missionaries
 Things Boots, Mosquitos, Snakes, Vines
 Misc Malaria, Nature

637. Renting a movie to watch at home

Events Leisure, Televisions
 Places Lease & rental services
 Things Boxes, Membership cards, Motion picture posters, Motion pictures
 Misc Motion picture industry

638. A government motorcade going through city streets

Events Motorcades, Traffic congestion
 Places Government facilities, Streets
 People Government officials, Secret service, Traffic police
 Things Barricades, Limousines

639. Riding in a motorcycle gang

Events Noise pollution
 Places Leather goods stores, Roads
 People Gangs
 Things Beards, Boots, Motorcycles, Whiskey
 Misc Leather industry

640. Taking a private music lesson from a music teacher

Events Children playing musical instruments, Music, Music education
 Places Music rooms

People Apprentices, Musicians, Students, Teachers
 Things Music stands, Musical instruments, Musical notation
 Misc Teaching methods

641. Going to a musical instrument store

Events Children playing musical instruments, Noise pollution
 Places Music stores
 People Musicians
 Things High-fidelity sound systems, Music, Musical instrument cases, Musical instruments, Musical notation, Public address systems
 Misc Music publishing industry, Musical instrument industry

642. Going to an outdoor music festival

Events Concerts, Music festivals, Outdoor cookery, Picnics
 Places Bandstands, Open-air theaters, Parks, Pedestrian malls
 People Crowds, Food vendors, Music ensembles
 Things Blankets, Outdoor furniture, Refuse, Vending stands

643. Exploring for new lands on a sailing ship

Events Discovery & exploration, Map making, Navigation, Ocean travel, Starvation, Voyages around the world
 Places Islands, Sailing ships, Seas, Waterfronts
 People Explorers, Sailors, Shellbacks, Ship captains
 Things Limes, Maps
 Misc Mutinies

644. A presidential inauguration

Events Hand clapping, National songs, Oaths, Presidential inaugurations, Public speaking
 Places Capitols

People Legislators, Legislators' spouses, Presidents, Presidents' spouses, Supreme Court justices, Vice presidents
 Things Music ensembles
 Misc Presidential elections, Presidential terms of office

645. Disaster relief and assistance efforts

Events Clothing relief, Disaster relief, Disasters, Emergency medical services, Food relief, Natural disasters
 Places Emergency housing, Relief ships, Ruins
 People Disaster victims, Governors, Reporters
 Things Insurance
 Misc Insurance companies

646. A naval battle between two warring countries

Events Aerial bombings, Air warfare, Campaigns & battles, Explosions, Naval warfare, Scuttling of warships, Submarine warfare
 Places Naval yards & naval stations, Seas
 People Fighter pilots, Navies
 Things Fighter planes, Gun turrets, Lifeboats, Submarines, Torpedoes, Warships

647. Newspaper trucks making morning deliveries

Events Sunrises & sunsets
 Places Bookstores, Business districts, Commercial streets, Kiosks, Neighborhoods, Newspaper carriers, Residential streets
 People Newspaper vendors
 Things Newspapers, Trucks, Vending machines
 Misc Newspaper industry

648. Managing a nuclear power plant

Events Nuclear power, Radioactivity
 Places Nuclear power plants, Nuclear submarines
 People Engineers, Physicists
 Things Boilers, Radioactive wastes, Steam engines, Water pumps
 Misc Heat

649. Conducting an underwater scientific investigation

Events Experiments, Oceanography, Underwater photography

Places Boats, Seas
 People Scientists
 Things Aquatic animals, Diving suits,
 Oxygen masks, Underwater
 photographs
 Misc Natural phenomena

650. Working as a businessman in an office for a corporation

Places Business enterprises, Office buildings, Offices
 People Businessmen, Office workers
 Things Documents, Neckties, Office equipment & supplies, Office furniture, Paperwork, Telephones, Writing materials

651. Drilling for oil at an oil field

Events Boring
 Places Deserts, Plains, Prairies
 Things Barrels, Drilling & boring machinery, Oil wells, Storage tanks
 Misc Petroleum industry, Petroleum leases

652. Going to an olympic summer games competition

Events Gymnastics, International competition, Track athletics
 Places Athletic fields, Gymnasiums, Stadiums
 People Americans in foreign countries, Athletes
 Things Olympic flame
 Misc Summer, World records

653. Going to an open-air theatrical production

Events Bowing, Open-air theatrical productions, Pageants
 Places Open-air theaters
 People Actors, Actresses, Children performing in theatrical productions, Theater audiences, Theatrical producers & directors

Things Costumes, Electric generators, Public address systems, Stage lighting, Tickets

654. Going to an opera performance

Events Hand clapping, Operas & operettas, Singing, Whispering
 Places Lobbies, Opera houses, Stages (Platforms), Ticket offices
 People Audiences, Opera singers, Socialites, Upper class
 Things Binoculars, Costumes, Hand lenses, Orchestras, Stage lighting, Stage props, Tickets, Tuxedos
 Misc Obesity

655. Hand-picking fruit in an orchard by consumers

Events Foraging, Harvesting
 Places Farms, Orchards
 People Consumers
 Things Baskets, Fruit, Ladders, Trees
 Misc Fruit industry

656. Working as a street musician

Events Performances, Songs
 Places Commercial streets, Subway stations
 People Organ grinders, Street musicians
 Things Coins, Monkeys, Musical instrument cases, Musical instruments, Tin cups

657. Diving for shellfish at the seashore

Events Foraging, Oystering, Pearl fishing, Skin diving
 Places Seas, Waterfronts
 Things Aquatic animals, Bags, Knives, Shellfish

658. Waiting in a hospital waiting room during a surgery

Events Crying, Pacing, Prayer
 Places Hospitals, Waiting rooms
 People Families
 Misc Anxiety, Surgery, Worry

659. An actor performing a pantomime

Events Mumming, Pantomimes, Silence
 Places Commercial streets
 People Actors, Actresses

Things Cosmetics & soap, Tin cups

660. Putting your car in a commercial parking garage

Events Automobile driving, Parking
 Places One-way streets, Parking garages, Parking lots
 Things Automobiles, Gates, Inclined planes

661. A car thief stealing a parked vehicle

Events Robberies
 Places Parking garages, Parking lots
 People Criminals, Victims
 Things Automobiles, Keyholes, Locks (Hardware), Security systems, Wire

662. Going to a pawnshop to hock some valuable items

Events Secondhand sales, Usury
 Places Pawnshops
 People Poor persons
 Things Clocks & watches, High-fidelity sound systems, Jewelry, Musical instruments
 Misc Debt, Poverty

663. Children making a meal in the kitchen

Events Children cooking, Children playing adults
 Places Kitchens
 Things Bread, Ladders, Peanut butter, Preserves, Sandwiches
 Misc Fires, Working mothers

664. Peasants rebelling against the aristocracy

Events Fires, Peasant rebellions, Shouting, Starvation
 People Crowds, Peasants, Poor persons, Rebels, Revolutionaries, Rulers, Upper class
 Things Pitchforks, Torches

665. Trains making connections in railroad yards

Events Railroad switching, Shipping
 Places Railroad roundhouses, Railroad shops & yards
 People Railroad employees
 Things Loading docks, Pedestrian bridges, Railroad freight cars, Railroad locomotives, Railroad signal towers, Railroad signals, Railroad tracks, Railroads

666. Going on an arctic expedition

Events Blizzards, Dogsledding, Expeditions & surveys
 Places Glaciers, Icebergs
 People Explorers, Guides & scouts
 Things Dog teams, Expedition photographs, Flags, Fur coats, Ice-breaking vessels, Penguins, Polar bears, Seals (Animals), Sleds & sleighs
 Misc Cold

667. Signing an important contract for goods or services

Events Autographing, Deals, Document signings
 Places Law offices
 People Businessmen, Lawyers
 Things Contracts, Initials, Pens

668. The life-cycle of a person

Events Births, Death, Education, Marriage, Occupations
 Places Birthplaces, Dwellings
 People Families, People
 Misc Human life cycle

669. Working on a submarine

Events Navigation, Radar
 Places Seas, Submarines
 People Ship captains
 Things Mines (Warfare), Paravanes, Periscopes, Torpedo boats, Torpedoes
 Misc Submarine warfare

670. Working as an exterminator

Events Crawling & creeping, Pest control, Ratcatching

Places Kitchens
 People Ratcatchers
 Things Cans, Flypaper, Insects, Lanterns,
 Mousetraps, Poisons, Rodents

671. Canvassing a neighborhood to collect petition signatures

Events Canvassing, Document signings,
 Knocking
 Places Doors & doorways,
 Neighborhoods
 People Activists, Neighbors
 Things Pens, Petitions
 Misc Ballots, Political issues, Public
 opinion, Solidarity

672. Drilling for oil at an offshore oil rig

Events Underwater drilling
 Places Seas
 Things Barrels, Beacons, Buoys, Drilling
 & boring machinery, Oil wells,
 Pipelines, Storage tanks, Tankers
 Misc Petroleum industry, Water
 pollution

673. Having your film developed at a photography store

Places Photography stores
 People Photographers, Sightseers,
 Tourists
 Things Chemicals, Negatives,
 Photographic apparatus &
 supplies, Photographic prints,
 Photographs, Portable darkrooms
 Misc Photography industry

674. A witness describing a suspect to a police sketch artist

Events Criminal investigations, Drawing
 Places Police stations
 People Artists, Victims
 Things Drawings, Sketchbooks, Sketches
 Misc Faces, Physical characteristics

675. Going to a physical therapy session at a clinic

Events Human locomotion, Massage, Pain,
 Physical therapy
 Places Clinics
 People Health care personnel
 Things Human body, Orthopedic braces,
 Wheelchairs

676. A pickpocket stealing from someone on a city street

Events Robberies
 Places Business districts, Commercial streets,
 Pedestrian malls, Sidewalks
 People Crowds, Pedestrians, Pickpockets
 Things Clocks & watches, Credit cards, Purses
 Misc Surprise

677. Playing games in a penny arcade or video arcade

Events Children playing, Games
 Places Penny arcades
 Things Coin operated machines, Coins, Computer
 graphics, Electronic music, Pinball
 machines, Sounds

678. Children working a lemonade stand

Events Child labor
 Places Neighborhoods, Residential streets
 People Child laborers
 Things Beverages, Drinking vessels, Lemons,
 Pitchers, Sugar, Vending stands
 Misc Age & employment, Children & money

679. Working as a pizza delivery person

Events Automobile driving, Knocking
 Places Doors & doorways, Neighborhoods,
 Residential streets, Restaurants
 People Delivery boys, Restaurant workers
 Things Maps, Pizza

680. A space probe examining a planet

Events Experiments, Interplanetary voyages,
 Investigation, Space flight
 Places Planets
 Things Artificial satellites, Computers, Robots,
 Rockets, Rocks, Space photographs

681. Having a card game with friends at home

Events Card games, Gambling, Smoking
 Places Recreation rooms
 Things Beverages, Cigars, Money,
 Playing cards, Tables
 Misc Credit, Friendship

682. Working as a plumber to fix pipes

Events Maintenance & repair
 Places Basements, Bathrooms, Plumbing
 stores
 Things Metalwork, Pipes, Plumbing
 fixtures, Plumbing systems,
 Wrenches
 Misc Plumbing industry

683. Getting drive-through service at a bank

Events Banking
 Places Banks
 People Bankers
 Things Automobiles, Intercommunication
 systems, Money, Pneumatic tubes

684. Writing a poem

Events Creation, Plays on words, Poetry,
 Writing
 People Poets
 Things Encyclopedias & dictionaries,
 Writing materials
 Misc Grammar, Mental states, Nursery
 rhymes

685. Playing in a polo match

Events Horseback riding, Polo
 Places Athletic fields
 People Athletes
 Things Balls (Sporting goods), Boots,
 Chisels & mallets, Horses,
 Saddles

686. Transporting mail via the pony express

Events Frontier & pioneer life, Pony
 express
 Places Post offices
 People Postal service employees

Things Correspondence, Horses, Stagecoaches
 Misc Telegraph

687. Sitting on a rocking chair on a porch smoking a pipe

Events Frontier & pioneer life, Leisure,
 Retirements, Smoking
 Places Porches
 People Aged persons, Pioneers
 Things Rocking chairs, Tobacco pipes

688. Roasting a pig over a fire pit

Events Barbecues, Celebrations, Outdoor cookery
 Places Farms
 Things Apples, Charcoal, Fire, Pork, Smoke,
 Swine

689. Going to a photo studio for a portrait photograph

Events Lighting, Photography, Posing, Smiling
 Places Photographic studios
 People Photographers
 Things Cameras, Photographic apparatus &
 supplies, Portrait photographs, Portrait
 prints, Portraits, Studio props
 Misc Photography industry

690. Working with a stamp collection

Events Recreation
 People Collectors, Hobbyists
 Things Albums, Envelopes, Hand lenses, Postage
 stamps
 Misc History, Postal service rates

691. Stockbrokers trading at a stock exchange

Events Auctions, Forecasting, Gambling, Raising
 hands, Shouting
 Places Stock exchanges, Stock market
 People Stockbrokers
 Things Bells, Computers, Price lists, Prices,
 Refuse, Stock certificates, Telephones,
 Ticker tape
 Misc Business enterprises, Saving & investment

692. Working as a printer

Events Printing, Typesetting
 People Printers

Things Alphabets (Writing systems),
Books, Letterpress works,
Periodicals, Printing blocks,
Printing plates, Printing presses
Misc Printers' unions, Printing industry

693. An artist making artistic prints

Events Printmaking
Places Artists' studios
People Artists
Things Colors, Printmaking equipment,
Prints, Woodcuts

694. Working in prison as a prison laborer

Events Assembly-line methods, Forced labor
Places Prisons
People Prison laborers
Things License plates, Products
Misc Free trade & protection, Prison reform, Wage-price policy

695. A riot in a prison

Events Prison riots, Riot control, Violence
Places Prisons
People Guards, Prisoners
Misc Civil rights, Prison reform

696. Writing a personal letter to a friend or family member

Events Writing
Things Correspondence, Envelopes, Greeting cards, Mailboxes, Postage stamps, Postcards, Proofs before letters, Seals, Writing materials
Misc Interpersonal relations

697. Visiting a wise man on mountaintop

Events Meditation, Philosophy, Pilgrimages, Questioning, Thinking
Places Mountains, Shrines
People Philosophers, Spiritual leaders
Misc Proverbs, Wisdom

698. A couple going to see a marriage counselor

Events Blaming, Confrontations, Quarreling, Therapy
Places Conference rooms
People Social workers, Spouses
Things Pointing fingers
Misc Anger, Interpersonal relations, Marriage

699. Producing a talk-radio program

Events Advertisements, Discussion, Public affairs radio programs, Radio broadcasting
Places Radio stations
People Guests, Pundits
Things Radios, Telephone switchboards
Misc Radio industry

700. Playing a game of tug of war

Events Falling, Pulling, Tug of war
People Strong men
Things Mud, Ropes
Misc Competition (Psychology), Cooperation

701. Going to a puppet show

Events Laughter, Puppet shows, Ventriloquism
Places Theaters
People Actors, Actresses, Children
Things Puppets
Misc Fantasy

702. Working as a ventriloquist

Events Joking, Laughter, Musical revues & comedies, Ventriloquism
Places Nightclubs
People Comedians
Things Drinking vessels, Hands, Puppets

703. An outbreak of the plague in a city

Events Mass burials, Plague, Preventive medicine, Quarantines
People Sick persons
Things Fire, Masks, Rats
Misc Population control

704. Sewing and quilting as a hobby

Events Leisure, Quilting, Quilting bees, Sewing
People Hobbyists, Housewives

Things Pattern books, Pins & needles,
Quilts, Sewing equipment &
supplies, Sewing machines,
Thread

**705. A jewish religious ceremony in a
synagogue**

Events Prayer, Religious services,
Sabbaths
Places Synagogues, Tabernacles
People Rabbis, Talmudists
Things Bibles, Pews
Misc Religion, Religious calendars,
Zionism

706. Going to a rowing regatta

Events Rowing, Rowing races, Shouting,
Team rowing
Places Lakes & ponds, Rivers
People Rowers
Things Boathouses, Racing shells

707. Going on a whitewater rafting trip

Events Floating, Portages, Rafting
(Sports), Shooting rapids
Places Rapids, Streams, Valleys,
Waterfalls
People Guides & scouts
Things Helmets, Life preservers, Rafts,
Rocks

708. A railroad collision or derailment

Events Railroad accidents, Railroad
switching, Traffic accidents
Places Railroad crossings, Railroad
signal towers
People Pedestrians
Things Automobiles, Livestock, Railroad
signals, Railroad tracks, Railroads
Misc Railroad construction &
maintenance

**709. Santa Claus coming down the
chimney to deliver gifts**

Places Chimneys, Roofs
People Fictitious characters

Things Christmas stockings, Christmas trees,
Gifts, Reindeer, Sleds & sleighs, Toys
Misc Holidays, Letters to Santa Claus, Night

710. Remodeling the interior of a building

Events Interior decoration, Remodeling
Places Interiors
People Architects, Construction workers,
Designers
Things Blueprints, Design drawings, Floor
coverings, Light fixtures, Plumbing
fixtures
Misc Then & now comparisons

711. Riding in a rickshaw in an oriental city

Events Pulling, Running, Transportation
Places Commercial streets
People Americans in foreign countries, Coach
drivers, Crowds, Passengers
Things Rickshaws

712. Working in a high technology research lab

Events Engineering, Science
Places Research facilities
People, Engineers, Scholars, Scientists
Things Computers, Electrical systems drawings,
Gadgets, Robots, Scientific equipment
Misc Technocracy

713. Riding on a roller coaster

Events Queues, Raising hands, Shouting
Places Amusement parks
People Passengers, Teenagers, Young adults
Things Karts (Midget cars), Roller coasters
Misc Cowardice, Fear

714. Running for exercise or recreation

Events Perspiration, Running
Places Parks, Sidewalks, Trails & paths
People Pedestrians, Runners (Sports)
Things Radios, Shoes
Misc Physical fitness

715. Sacrificing a person or an animal to the gods

Events Rites & ceremonies, Sacrifices
Places Temples, Volcanoes

People Captives, Ceremonial dancers,
Girls, Indigenous peoples,
Spiritual leaders, Tribal chiefs
Things Blood, Cattle, Knives, Sheep
Misc Gods

716. Caring for horses in a stable

Events Animal grooming, Saddlery
Places Horse farms, Horse herding,
Stables
People Upper class
Things Brooms & brushes, Horses,
Horseshoes, Pitchforks, Saddles

717. Putting valuables in a safe-deposit box

Places Banks
People Bankers, Guards
Things Bonds (Financial records),
Certificates, Documents, Jewelry,
Keyholes, Keys (Hardware),
Locks (Hardware), Safe-deposit
boxes, Wills
Misc Fire-resistive construction

718. A salvage operation for a sunken ship

Events Marine accidents, Salvage,
Shipwrecks, Vehicle maintenance
& repair
Places Seas
People Sailors
Things Hoisting machinery, Pumps,
Ropes, Ship equipment & rigging,
Vessels

719. Checking into a sanatorium to treat an illness

Events Health care
Places Hospital wards, Sanatoriums
People Health care personnel, Sick
persons
Misc Alcoholism, Despair, Diseases,
Drug abuse, Tuberculosis

720. Going to the fishmarket

Events Food adulteration & inspection, Packaging
Places Seafood stores
People Fishermen
Things Aquariums, Fish, Freezers, Ice, Knives,
Scales, Shellfish, Shells, Showcases

721. Working as a domestic servant

Events Automobile driving, Cleaning, Cookery,
Home economics, Housework, Laundry
Places Servants' quarters
People Chauffeurs, Cooks, Servants, Upper class,
Women domestics

722. Sexual harassment in the workplace

Events Leering, Lust, Sexism, Sexual harassment,
Swearing, Winking
Places Commercial facilities
People Employees, Women
Things Buttocks, Hands
Misc Relations between the sexes

723. Going surfing in the ocean

Events Surfing, Swimming
Places Beaches, Oceans
People Swimmers
Things Diving suits, Jellyfishes, Rocks, Sharks
Misc Tidal waves

724. A shotgun wedding ceremony

Events Marriage, Shotgun weddings, Threats
Places Courthouses
People Brides, Fathers & children, Grooms
(Weddings), Judges, Pregnant women
Things Rifles

725. Working in a slaughter house

Events Meat cutting, Slaughtering
Places Stockyards
People Laborers
Things Blood, Dead animals, Freezers, Hides &
skins, Livestock, Meat
Misc Kosher food industry, Meat industry

726. Working as a slave on a southern plantation

Events Blues music, Slavery, Whipping
Places Plantations, Slave quarters
People Afro-Americans, Plantation owners, Slaves

Things Whips
Misc Abolition movement, Slave trade

727. A snake charmer playing a flute

Events Dance, Snake charming
Places Commercial streets
People Street entertainers
Things Baskets, Flutes, Snake venom, Snakes

728. Being bitten by a poisonous snake

Events Animal attacks, Dizziness
Places Deserts, Forests, Tropical forests
People Sick persons
Things Bites & stings, Legs, Medicines, Snake venom, Snakes, Teeth
Misc Fear

729. Shoveling snow in the winter

Events Lifting & carrying, Snow removal
Places Driveways, Sidewalks
Things Back (Anatomy), Shovels, Snow
Misc Winter

730. Going to a soccer game

Events Cheering, Hugging, Kicking, Riots, Running, Soccer, Violence
Places Athletic fields, Stadiums
People Referees
Things Balls (Sporting goods), Flags, Nets
Misc Riot control

731. Asking someone out on a date

Events Conversation, Courtship, Romances
People Couples
Things Schedules (Time plans), Telephones
Misc Anxiety, Friendship, Love, Relations between the sexes, Social life

732. Working with a speech therapist

Events Sounds, Speech therapy
Places Clinics

People Mentally ill persons, Social workers
Things Mouths, Tongues
Misc Birth defects, Communication, Voice disorders

733. Making yarn or string with a spinning wheel

Events Spinning
People Laborers
Things Fibers, Spinning apparatus, Spinning machinery, Wheels, Yarn
Misc Clothing industry, Knitting, Textile industry

734. Working as a referee at a sporting event

Events Coaching (Athletics), Raising hands, Signals & signaling, Sports, Sports officiating, Surveillance, Whistling
Places Sports & recreation facilities
People Athletes, Referees, Sports spectators
Things Eyes

735. Travelling in a stagecoach between cities

Events Travel
Places Cities & towns, Roads
People Coach drivers, Passengers
Things Horse teams, Horses, Luggage, Stagecoaches

736. Crossing a river or stream along a trail

Events Sliding, Wading
Places Fords (Stream crossings), Streams, Trails & paths
Things Shoes, Stepping stones
Misc Clumsiness

737. Making alcohol using a still

Things Alcoholic beverages, Fire, Gin, Pipes, Stills (Distilleries), Sugar, Vats, Whiskey
Misc Distilling industries, Prohibition

738. Talking to a financial planner

Events Forecasting
People Capitalists & financiers, Stockbrokers
Things Pensions, Social security, Wages
Misc Money, Retirements, Saving & investment, Wealth

739. Operations at a water pumping and purifying station

- Events Civil engineering, Civil service
- Places Pumping stations, Reservoirs, Sewers, Waste disposal facilities, Waterworks
- Things Bacteria, Chemicals, Microorganisms, Pumps, Storage tanks, Streams, Water tanks, Water towers
- Misc Sanitation, Water pollution

740. Window shopping in a shopping district

- Events Shopping
- Places Business districts, Sidewalks, Storefronts, Stores & shops
- People Sales personnel
- Things Mannequins, Show windows, Window displays

741. A sumo wrestling competition

- Events Martial arts, Sumo
- Places Gymnasiums
- People Referees, Sumo wrestlers
- Misc Obesity

742. Going to a tanning salon

- Events Sunbathing, Sunburns, Tanning
- Places Beauty shops, Sunspaces
- People Nudes
- Things Eye patches, Lamps, Stickers
- Misc Heat, Winter

743. Getting a tattoo in a tattoo parlor

- Places Tattoo parlors
- People Artists, Gangs
- Things Arms (Anatomy), Colors, Hearts, Names, Symbols, Tattoos

744. Having a dinner party with friends

- Events Celebrations, Conversation, Eating & drinking, Parties, Toasting
- Places Dining rooms
- People Guests

- Things Dining tables, Food, Table settings & decorations, Tableware, Wine
- Misc Friendship

745. Competing or practicing for an archery competition

- Events Archery, Pulling, Thinking, Tournaments, Winds
- Things Arrows, Bows (Archery), Targets (Sports)

746. Having a romantic stay at a bed & breakfast

- Events Country life, Honeymoons, Romances, Vacations
- Places Breakfast rooms, Lodging houses, Suites, Taverns (Inns)
- People Couples, Hotel employees
- Things Fireplaces

747. Taking a city taxicab

- Events Eavesdropping, Raising hands, Whistling
- Places Airports, Hotels, Streets
- People Aliens, Passengers, Taxicab drivers
- Things Luggage, Radiophones, Taxicabs

748. Working as a taxidermist

- Events Modeling (Sculpture), Plasterwork, Sewing, Taxidermy
- Places Hunting & fishing clubs
- Things Airbrush works, Dead animals, Deer, Fish, Hides & skins, Hunting trophies, Pins & needles, Thread
- Misc Fishing, Hunting

749. A japanese tea ceremony

- Events Entertaining, Tea ceremonies
- Places Alcoves, Teahouses
- Things Fireplaces, Flowers, Kettles, Scrolls, Tea, Teapots
- Misc Buddhism

750. Using a computer for Internet access

- Events Conversation, Discussion, International communication
- Things Computer graphics, Computers, Correspondence, Telephone lines
- Misc Technocracy, Telecommunications industry

751. Communicating via telegraph devices

Events Electricity
 Places Telegraph offices
 People Reporters
 Things Telecommunication cables, Telegrams, Telegraph, Telegraph lines, Teletypewriters, Ticker tape, Utility poles
 Misc Newspaper industry, Telegraph industry

752. Working as a superhero

Events Disasters, Levitation, Power (Social sciences), Rescue work
 Places Telephone booths
 People Criminals, Strong men, Superheroes, Victims, Villains
 Things Costumes, Gadgets, Masks

753. Playing a game of tennis

Events Chasing, Children playing tennis, Running, Silence, Tennis
 Places Parks, Tennis courts
 People Referees, Sports spectators, Tennis players
 Things Balls (Sporting goods), Nets

754. Going to a spa for therapeutic baths

Events Bathing, Massage, Physical therapy, Wading
 Places Health resorts, Therapeutic baths
 People Aged persons, Masseurs
 Things Mineral waters, Springs, Towels
 Misc Heat

755. Pioneers going to a trading post

Events Barter, Frontier & pioneer life, Fur trade, Selling
 Places Trading posts
 People Indians of North America, Pioneers
 Things Equipment, Hides & skins

756. Going to see a travel agent

Events Travel

Places Ticket offices, Visitors' centers
 People Tourists
 Things Maps, Schedules (Time plans), Tickets, Travel posters
 Misc Tourist trade, Transportation

757. Living as a vampire

Events Reflections
 Places Castles & palaces
 People Vampires, Victims
 Things Bats, Blood, Capes (Outerwear), Coffins, Crosses, Garlic, Mirrors, Wolves
 Misc Longevity, Night

758. A vaudeville show

Events Vaudeville shows
 Places Beer halls, Theaters
 People Acrobats, Comedians, Dancers, Magicians, Pantomimes, Singers, Theater audiences
 Things Stages (Platforms), Trained animals

759. Working in a veterans hospital

Events Health care
 Places Military hospitals
 People Disabled veterans, Medical personnel, Veterans
 Misc Medical aspects of war, Veterans' benefits, Veterans' organizations, Veterans' rights

760. Working as a veterinarian

Events Animal treatment, Veterinary medicine
 Places Veterinary hospitals
 People Physicians
 Things Animal attacks, Animals, Dead animals, Pets, Veterinary drugs

761. A volcanic eruption

Events Ash disposal, Fires, Sounds, Volcanic eruptions
 Places Mountains, Volcanoes
 Things Smoke, Volcanic rock
 Misc Heat

762. Pirates executing someone by making them walk the plank

Events Falling, Mutinies, Walking the plank
 Places Oceans, Sailing ships

People Pirates, Ship captains
 Things Lumber, Physical restraints,
 Ropes, Sharks

763. War crime trials after the end of a war

Events War crime trials, War crimes
 People Informers, Judges, Military officers, Victims
 Things Forensic photographs
 Misc Atrocities, Executions, Grief

764. An army invading a city in an enemy country

Events Civil defense, Fires, Marching, Military occupations, Surrenders, War, War destruction & pillage
 Places Banks, Government facilities, Treasuries
 People Prisoners of war, Soldiers
 Things Art objects
 Misc War damage

765. Working as a night watchman in a building

Events Sleeping, Sounds, Surveillance, Vigils
 Places Commercial facilities
 People Guards, Watchmen
 Things Keys (Hardware), Lanterns, Security systems, Televisions
 Misc Boredom

766. Going water skiing on a lake

Events Falling, Pulling, Signals & signaling, Swimming, Water skiing

Places Lakes & ponds
 People Children playing in water
 Things Boat engines, Life preservers, Motorboats, Ropes

767. Going to a water slide

Events Floating, Sliding
 Places Hills, Stairways, Swimming pools, Water slides
 People Children playing in water
 Things Bathing suits, Water pumps

768. Getting water from a well or a pump

Events Lifting & carrying, Pulling
 Places Wells
 People Water carriers
 Things Hoisting machinery, Pails, Ropes, Water, Water pumps, Yokes
 Misc Water pollution, Water supply

769. Hunting whales on a whaling ship

Events Shooting, Whaling
 Places Fishing boats, Oceans, Territorial waters
 Things Blood, Extinct animals, Hoisting machinery, Nets, Ropes, Spears, Whales
 Misc Fishing industry, Freedom of the seas, Wildlife conservation

770. Being caught in a ocean storm

Events Hurricanes, Lightning, Motion sickness, Rain, Ship accidents, Shipwrecks, Storms, Typhoons, Waterspouts, Whirlpools
 Places Oceans
 People Sailors
 Things Ship equipment & rigging, Ships