Go! buttons and arrow icons:
How metaphors motivate conventions in web design

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Introduction

The World Wide Web is a young medium, yet in the few years of its existence, distinct conventions in web page design have emerged. This fact does not reflect a technical imperative, for although there are standards for the interpretation of HTML, there are only informal guidelines (most often, codifications of the opinions of a specific design "guru") to direct web site layout, terminology, and the specific appearance of navigation features. Only a few very basic conventions, such as underlining and color-coding hyperlinks, have anything like the status of rules, and even those rules can be and are overridden.

Nevertheless, many web pages use similar page layout and navigation features. Common design features appear to spread by a process of imitation, in which successful innovations are noticed and re-used, eventually becoming conventions. There is an obvious benefit to the web designer in following conventions, which allow the site to be easily understood and used. Noting this imitative process and its motivation, however, does nothing to explain why specific design features are successful to begin with.

The purpose of this paper is to explore how emergent conventions in web design are motivated by metaphor and metonymy. This includes consideration of paper document design conventions, which provide frames by which newer document forms are understood. The background context of this work includes both conceptual metaphor theory and the blended spaces model.

Background

It seems to be conventional wisdom in user interface (UI) design circles that user interfaces rely on metaphor, and that good UI design requires the selection of "the right metaphor" [Nielson 1992]. Despite being frequently stated as a guideline, there are remarkably few concrete and detailed examples given in the literature. The desktop metaphor (particularly as exemplified by the Macintosh) is repeatedly referenced as if by rote.[1]

Furthermore, discussion of the role of metaphor is often limited to overarching metaphoric themes. For instance, one study purportedly investigating the effectiveness of metaphor in web browser design contrasted a specialized browser that used an overall "library" theme with a standard web browser, which was described as the "non-metaphor" condition [Smilowitz 1996]. This depiction of the role of metaphor might well lead many UI designers to conclude that metaphor is irrelevant to their work. For instance, designers who create applications that conform to the standards of a particular windowing system might think that "the metaphors" are already established. Similarly, web site designers, who normally work within constraints imposed by existing browsers, HTML, and web scripting languages, might see metaphor as applying only to special, artistic sites rather than ordinary web site design.

In contrast, the body of work on metaphor in cognitive linguistics provides the basis for a far more subtle and far-reaching interpretation of the role of metaphor in user interfaces. A fundamental tenet of conceptual metaphor theory is that metaphors (and related figurative forms such as metonymy) are pervasive in not only language but also cognition. The definition of metaphor is not limited to novel, poetic forms, but includes ordinary expressions and ways of thinking. While a consistent metaphoric theme may provide a sense of depth and coherency in a piece of writing or speech, individual statements and phrases are understood metaphorically whether or not an overarching (or consistent) context is explicitly provided.

[1] An exception to the general dearth of examples is the amusing and informative set of **bad** UI design metaphors to be found at the UI Hall of Shame web site (http://www.iarchitect.com/metaphor.htm). I have not, however, come across any corresponding pool of good examples.

Throughout this paper, I will be using the term basic metaphor to refer to instances of metaphor that are commonplace in everyday language and thought. Generally, such metaphors have a clear experiential basis, meaning that the correlation between source and target domain can be seen to derive from common early life experiences or universals such as human sensory perception. For members of a given culture, a basic metaphor from this shared set requires no conscious interpretation, and will seem so natural that it may even be difficult to understand as metaphorical rather than literal language.

Examples of basic metaphors

A pertinent example is the conception of communication as object exchange, often referred to as the Conduit metaphor, although it may be more accurately described as a related set of metaphors [Reddy 1979, Lakoff and Johnson 1980, Sweetser 1992]. Phrases such as "he got his ideas across to them" or "I can't seem to put the idea into words" are so natural that it may be difficult to recognize them as metaphoric. Yet, in fact, they describe an abstract domain (communication of ideas) in terms of concrete domains (physical objects, containers, and movement).

Following the standard established by Lakoff and Johnson [1980], a metaphor is described in terms of a target domain (the domain that is actually being discussed) and a source domain (the domain that provides the means of describing and understanding). Characteristics and inferences are mapped from the source domain to the target. Thus, the components of the Conduit metaphor can be expressed as:

IDEAS ARE OBJECTS
LINGUISTIC EXPRESSIONS ARE CONTAINERS (for those idea/objects)
COMMUNICATION IS SENDING (the expression/container, from which the recipient can then extract the idea/object)

This everyday metaphor has a wide range of entailments. It usefully expresses the experience of successful verbal communication, where ideas do seem to originate in one person's mind and end up in another's. In addition, it captures some types of unsuccessful communication, such as the idea that words can be "empty". Other entailments are somewhat more problematic, such as the implication that meaning exists in words independently of context (as in "the meaning is right there in the words"). Despite the fact that this metaphor highlights some aspects of communication and masks others, it is extremely pervasive (by Reddy's estimate, over 70% of expressions used in English to describe language use this metaphor).

It is also worth mentioning another frequent metaphor for communication:

COMMUNICATION IS A SHARED JOURNEY

This appears in common utterances such as "are you with me?" and "I can't quite follow you". This metaphor provides a counterpoint to the conceptualization of ideas as objects that move from person to person; instead, people move along a path to reach the ideas' location. This type of figure-ground reversal is often seen in basic metaphors.

Other figurative forms

Two other terms need to be defined: metonymy and iconicity.

Metonymy refers to the use of one element in a domain to invoke another element or the whole domain. Commonplace examples include statements such as "The White House announced today...", where the building (White House) is standing in for the organization (executive branch of the U.S. government), which in turn stands in for the individual who actually made the announcement (authorized person). Of particular interest is the way in which a reference to one element in a domain can evoke a complex frame of references. For instance, referring to a "headline" might bring up a range of associations with newspapers.

Iconicity refers to a direct mapping between form and meaning. In spoken language, this can take the form of onomatopoeia (a word which sounds like its meaning, such as "ding" for the sound of a bell) or more subtle forms, such as mapping of word order to assumed temporal order of events (in the sentence "she jumped in the water and took off her shoes", we understand that her shoes got wet because of iconic structure). A similar mapping process is even more evident in signed languages, gesture, and images. Obviously, this use of the term iconicity is not unrelated to the common use of the term "icon" to refer to a small graphic image from which a computer program or function may be invoked. However, I will be examining various graphical elements of web pages, most of which would not be called icons in the usual sense.

Metaphor and metonymy often co-occur and interact in both everyday and poetic language [cf. Lakoff and Johnson 1980, Lakoff and Turner 1989]. Similarly, usages which are simultaneously iconic and metaphoric are common in both signed languages and gesture [cf. Taub 2001 and Sweetser 1998]. The material to be examined in this paper will also be shown to include complex combinations of metaphor, metonymy, and iconicity.

Blended spaces

In the past few years, the interpretation of metaphor as mapping from source to target domain has been reinterpreted and extended in the context of blended spaces [Turner and Fauconnier 1995, Grady, Oakley, and Coulson 1999]. Blending theory incorporates metaphor as a mechanism for connecting two domains, but provides a richer explanation for cases where inferences seems to emerge from the combination of domains, rather than strictly being mapped from a source to a target. In addition, it provides a broader structure in which non-metaphoric elements may also be incorporated.

In the blended spaces model, in addition to two input spaces (corresponding to source and target domains), there is also a generic space comprising the shared structure of the two inputs, which acts to constrain what mappings are valid. The resulting blended space contains the mapped elements, but may also draw in cultural background and metonymic references from either input space.

As an example, Figure 1 shows an interpretation of the phrase "put ideas into words" as a blended spaces diagram (note that for readability, most correlations between the input spaces and the generic and blended spaces have not been explicitly drawn). Both of the input spaces contain two agents and a purposive action performed by the first agent; the generic space dictates that the agent who puts objects into containers must be mapped onto the agent who communicates, and the act of placing objects into containers must be mapped onto the act of verbalizing. Any other mapping (for instance, mapping the first agent in input space 1 to the second agent in input space 2) would violate the constraints imposed by the generic space.

In Figure 1, the mappings between the spaces are quite symmetrical. The added power of blending is more evident in complex examples, where the contents of the blended space may be drawn from either input space, rather than only reflecting items that can be mapped between them. For instance, imagine extending the conventional phrase "put ideas into words" into a novel phrase such as "he really knows how to put ideas into sound bites". Since sound bites are understood to be comprised of words, the mappings in the conventional metaphor still apply. Some aspects of our understanding of "sound bites" could contribute to the mapping structure; for instance, we might surmise that the selected containers were very small. However, other connotations of the phrase "sound bites" could enter into the blend without having a correlate in the object-manipulation space. For instance, the blended space could contain elements related to public speaking and politics (e.g., assumptions about the speaker's sincerity).

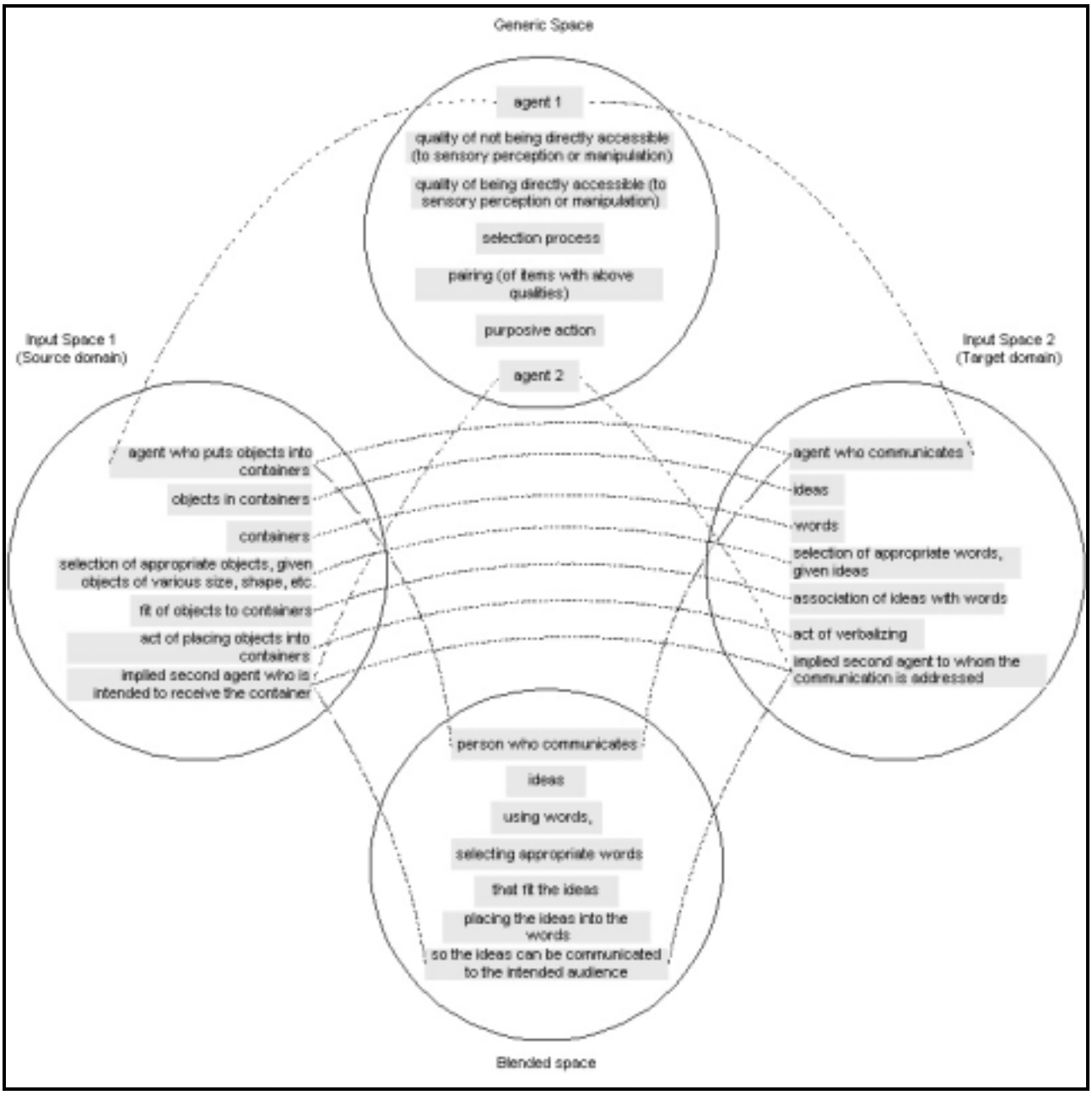

Figure 1. Example of blended spaces diagram: "Putting ideas into words"

Applications of cognitive metaphor theory to the Internet

Previous work has applied cognitive metaphor theory and blended spaces to understanding people's conceptualization of the Internet. For instance, Rohrer has explored the popular characterization of the Internet as "Information Superhighway". This simultaneously presents the Internet as a road system on which information travels, and also as a path into the future. This blend operates by combining the basic metaphor of information as moving objects with another basic metaphor where time is understood in terms of space.

More closely related to my concerns here, experimental work by Maglio and Matlock [1999] explored people's conceptualization of Internet as "information space". In this study, they examined the terminology used by novice and experienced Internet users to describe their experience of Internet use. Metaphoric expressions of two types were frequently used: those referring to movement (of the user along a path to the information, or of the information to the user) and those referring to containers.[2]

My goals in this paper are both narrower and broader than these previous studies. On the one hand, I would like to apply the conceptual structure provided by cognitive metaphor and blended spaces to a closer examination of web design, filling in some of the detail usually left out of examinations of metaphor in user interfaces. However, I also find it of interest to consider the metaphoric understanding of the Internet in a broader context: the general understanding of documents through metaphor and established conceptual frames.

In particular, the concept of "information space", although the phrase is often used synonymously with the Internet, can be seen to apply to paper documents as well. It is commonplace to say "go to chapter 5 in the book; you'll find the information you need in there". Such phrases mirror the movement and container metaphors found by Maglio and Matlock in descriptions of web use. For this reason, I see paper document conventions as having a profound influence on emergent web design conventions on two levels: first, that paper document designs may be explicitly mirrored by web sites, and that the type of paper document that a web site resembles provides important context for understanding the site's purpose and use; and second, that both paper documents and web sites may be understood via the same underlying set of conceptual metaphors.

Approach

Although it was inevitable to have pre-conceptions, I did not want to start by assuming that I already knew exactly what comprises the set of web design conventions. Instead, I closely examined a small set of web sites, looking for common elements and approaches. Observations were made over a period of about a month (27 October through 28 November 2001). Most of the selected sites have content that changes frequently, and in one case (National Geographic) the site's appearance changed noticeably during the period of this research.

[2] These metaphors were referred to by Maglio and Matlock as TRAJECTORY and CONTAINER schemas, respectively.

Selected sites

Although sites with a range of purposes and styles were examined, I focused on information-oriented sites, and specifically excluded sites which were primarily artistic in purpose (since, by definition, such sites would not be "conventional".) The examined sites (listed below) were arbitrarily selected from the 2001 Webby Award winners. The Webby Awards were used as a basis in order to provide a set of sites that may be assumed to be reasonably representative of successful, well-designed sites:

- Craigslist (http://www.craigslist.org/)
- National Geographic (http://www.nationalgeographic.com/)
- PBS (http://www.pbs.org/)
- Google (http://www.google.com/)
- Expedia (http://www.expedia.com/)
- BBC World Service (http://www.bbc.co.uk/worldservice/index.shtml)
- Open Secrets (http://www.opensecrets.org/)
- Fact Monster (http://www.factmonster.com/)

A representative full-page illustration of each of these sites is provided in Appendix A. A typical "entry" page is shown for all sites except Google, for which a sample search results page is shown.

Conventional features to be discussed

Examination of these web sites identified a number of features that were common across several of the sites. These fall into two broad categories: page layout and navigation controls. Table 1 lists the features to be discussed and shows the number of sites (out of the sample of eight) on which they were observed in some form.[3]

In the following sections, these features will be examined in terms of:

- Basic-level metaphors
- Iconic representations
- Metaphors of information space
- Frames provided by paper document conventions
- Blends of computer, document, and information space frames

[3] Note that I make no claim that this is an exhaustive list of web conventions, merely that it is a common set which can be illustrated using the selected pages, and which can be seen to have metaphoric and/or metonymic motivation. As a counter-example, 7 of the 8 pages used underlined text to represent hyperlinks. While clearly representing a common element of web design, and not impossible to interpret figuratively, this seems mainly rule-based, rather than being a convention which can be construed to have emerged from successful practice.

Table 1. Conventional Features of Examined Web Sites

Category	Feature	Number of sites
Page Layout	Header (containing logo and basic navigation, and sometimes advertisements)	8
	Footer (minimally containing copyright information; typically containing secondary navigation controls)	7
	3-column layout, with left-most column providing a navigable list of topics	8
	Outlined or clearly demarcated areas (usually rectangular) enclosing related material or defining a navigation feature; similar to a paper document "side bar"	7
Navigation	Navigation via buttons or small clickable areas labeled "Go"	6
	Navigation elements incorporating an iconic arrow or pointer	7
	Navigation between sections presented as "tabs" (varying widely in degree of realism)	7

Note on terminology

Throughout this paper, the terms "navigation" and "navigation control" are used to describe features of the web page that allow a different web page to be selected for display. Because it is standard terminology, it would be awkward to describe such features without using the word "navigation", although it clearly invokes a specific metaphoric frame. The same is true of the term "site", which itself implies a location in space. While navigation controls often are understood in terms of directed movement through space (from "site" to "site"), it should not be assumed that this is the only metaphor involved when the term "navigation" is used.

It may similarly be noted that the term "page" and related terms such as "page layout" are not strictly literal when applied to a computer-based display of information, but rather draw on paper document frames. However, as with "navigation" and "site", it would be almost impossible to maintain coherency while avoiding the word "page". And how can one refer to the "main" or "first" or "top-level" or "entry" page of a site without using one of those terms, with their various entailments of importance, sequence, verticality, or movement?

Indeed, almost all of the common terminology for describing web sites implies some particular metaphorical interpretation; it is simply a given that our ways of talking and thinking about electronic information (as with many other topics) are intrinsically metaphorical. A detailed discussion of web terminology and its implications could be the topic of a paper by itself. For this reason, I will simply use these common terms without special emphasis.

Page Layout Conventions: Paper and Web

Several page layout conventions appear quite consistently across the set of web pages. To begin, I will consider various ways in which these conventions derive from and extend paper document conventions, and then proceed to examine the underlying basic metaphors.

All of the sites use the top of the page as some form of header; most use the bottom of the page as a footer. The convention of having a header above and footer below the main body of the text is clearly inherited from paper documents, but has evolved considerably in the web context. For instance, consider the following illustrations of headers from BBC World Service, Open Secrets, and PBS (Figures 2 through 4).

Figure 2. BBC World Service Header (Lower-level Page)

Figure 3. Open Secrets Header (Lower-level Page)

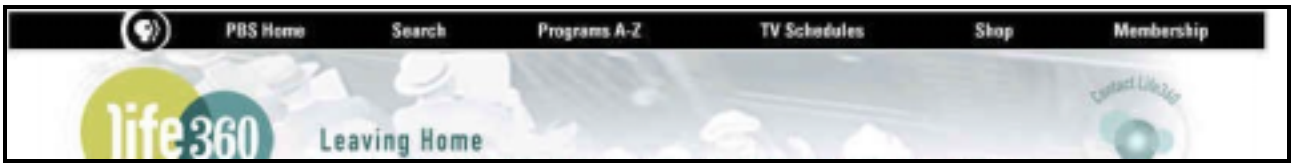

Figure 4. PBS Header (Lower-level Page)

A paper document's header and footer will typically contain information identifying the page location within the document (section number or name, page number); in some cases, the header or footer will identify the document itself (title, author name), especially for paper documents that contain subdocuments, such as a compilation of articles by different authors. In a paper document, the header and footer area may be delineated by a horizontal line or shading, or may simply be implied by the (horizontally aligned) space above and below the main block of text.

In comparison, the header of these web pages always identifies the site (name and/or logo), and often provides clues about the location within the site. The fact that the site itself must always be identified implies that, effectively, the web site is treated as a sub-document within the overall WWW. Generally, the location information is in a form much less specific than a page number, more closely resembling a section title. (The extent to which the pages within a site are considered as a sequence, and the mechanisms for presenting this, are discussed later).

The web site page headers also consistently include "basic navigation", by which I mean navigation to a selected small set of main content areas, which is carried forward from page to page within the site. (Typically, this takes the form of "tabs", a navigation device that will be discussed in depth later.)

The footer also frequently contains navigation controls, most often what I would call "secondary navigation". This may duplicate the navigation controls provided in the header or other area of the page, or may provide navigation to less important or less frequently visited areas of the site. While the header is usually graphically distinctive, the footer usually consists of relatively small text links (see Figure 5 and Figure 6, which show footers from the BBC World Service and PBS sites, which are typical). In its most minimal form, the footer contains only a copyright notice.

Figure 5. BBC World Service Footer

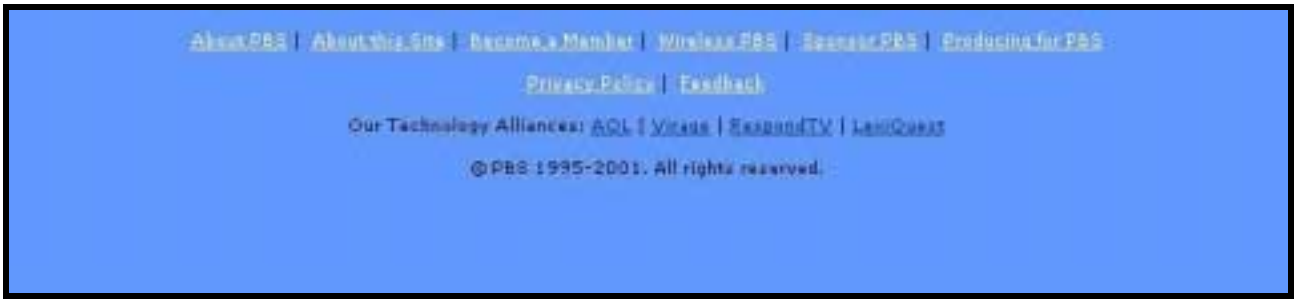

Figure 6. PBS Footer

In most cases, the header and footer areas are clearly demarcated, but not always, especially on the top-level page, where the line between header and body may be deliberately blurred. For instance, consider the headers of the top-level pages for Open Secrets and PBS (Figures 7 and 8). On Open Secrets, the fingerprint graphic extends from the header into the body of the page, linking the site name in the header to the following subheading ("Your guide to the money in American elections"). The PBS top-level page also breaks the expectation of horizontal alignment, using irregular shapes.

This seems to reflect the special status of the top-level page. In effect, it serves as a title page (or the cover of the book) as well as an ordinary page of content. There is considerably more freedom in the layout of the title page than an ordinary page in a book, and this carries through to web documents.[4]

[4] Note that some sites do provide an "entrance" page that simply identifies the site and precedes any substantial page content. However, there are no examples of this in the set of sites I am considering; the closest would be Google, which provides minimal content until a search is entered. I suspect that a pure "entrance" page is more frequently seen in artistically oriented rather than information-oriented sites.

Figure 7. Open Secrets Header (Top-level Page)

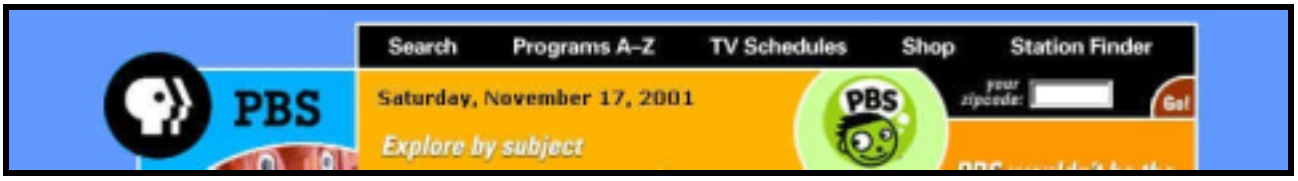

Figure 8. PBS Header (Top-level Page)

Another feature that was remarkably consistent across the set of sites was use of a three-column layout, where the left-hand column contains a navigable list of items. Often, this list resembles a table of contents for the site, listing major content areas in more detail than the header's basic navigation. The BBC World Service page shown in Figure 9 provides a clear example of this layout; other examples can be found in Appendix A.[5]

This style of layout is reminiscent of popular magazines, which often have narrow columns of advertisements to the left and/or right of a wider column of story text. It also evokes a sidebar, as used in a magazine or textbook to contain related information that is distinct from the main text. (On the example page in Figure 9, a graphic of a paper clip is used to suggest the separate piece of content in the right-hand column is only loosely attached to the page!) Within all three columns, specific content areas are delineated by shading or outlining, most often rectangular.

On many sites, the "table of contents" navigable list in the left-hand column is maintained across all pages, just as the header is. Just as the top-level web page seemed to blend elements of a book cover or title page with a page of content, so every web page can incorporate the table of contents, which would be a separate page in a book. Indeed, some top-level pages contain all three elements, serving as title page, table of contents, and content page simultaneously.

The role of the right-hand column is more variable, but often consists of additional fixed navigation elements, although it may also contain advertisements (as in all but the top-level page of Fact Monster) or illustrations (as in some of the lower-level pages of Open Secrets).

[5] I counted all of the sites as using this convention to some degree on at least one page. For Google, the site's primary pages did not use a multi-column layout, but specific lower-level pages such as the Jobs page (http://www.google.com/jobs/index.html) did. For Craigslist, the front page uses five columns, but the left and right-most columns are distinct. All other sites use a clear version of the three-column layout on their top-level page, while following pages may use a variation (such as a two-column layout in which the role of the left-hand column is unchanged).

Figure 9. Typical three-column layout (BBC World Service, Science story, top)

Another point worth noting is that the central "content" column will often extend further than the side columns. Web designers use the phrase "above the fold" to describe the part of the page expected to be visible in a browser window without scrolling. This phrase is inherited from newspapers, where the initially visible content is literally that which can be seen before the newspaper is unfolded. It appears to be conventional to keep (especially) the left-hand column's contents above the fold, while the central column may extend farther.

Underlying basic metaphors

These page layout features can be interpreted in terms of underlying basic metaphors. Given the frequent use of headers, footers, and narrower left- and right-hand columns (usually containing navigation features), the main content is often framed in the center of the page. The basic metaphor IMPORTANT IS CENTRAL (expressed by phrases such as "the core idea") makes this seem natural.

The source domain of verticality is prevalent in basic metaphors. These metaphors have several potentially pertinent uses in interpreting web page layout. Most clearly, the basic metaphor IMPORTANT IS UP (as in "high status") pertains to the placement of the page logo and basic navigation in the header, and also to placement of the main page content and navigation "above the fold", with "lead" stories further up.

There is a certain tension between IMPORTANT IS UP and IMPORTANT IS CENTRAL, but both seem to come into play. From one perspective, the "main story", located in the center (and near the top) of the page, is the most important feature. From another perspective, the identity of the web site and the ability to easily navigate to main topics are essential. The conventional use of a header containing the site logo/title and basic navigation, immediately followed by the (centered) main content, uses both metaphors effectively.

The contrast between the header and footer also highlights IMPORTANT IS UP. In contrast to a printed document page, where the header and footer are almost interchangeable, the web page header is a dominant element of the page, while the footer generally appears deliberately low-key.

The frequent placement of ads at the top of the page is also pertinent. On a practical level, placing the ad at the very top of the screen ensures that it will be visible, at least when the page is first displayed. It may also serve to subtly imply that the ads are important and worthy of attention. However, since Internet users have come to expect advertisements at the top of the page, the actual effect may have been to reinforce the importance of the center, with the top being viewed more like the margin in a paper document.[6]

In addition, consider the basic metaphors CONTROL IS UP and GENERAL IS UP. The basic metaphor CONTROL IS UP is expressed in phrases such as "I'm on top of the situation". The basic metaphor GENERAL IS UP (and its converse, SPECIFIC IS DOWN) can be seen in phrases such as "high-level summary" or "get down to the details".

CONTROL IS UP is consistent with the convention of providing basic navigation controls at the top of the page. Just as IMPORTANT IS UP interacts with IMPORTANT IS CENTRAL, CONTROL IS UP can be seen to interact with GENERAL IS UP. On these web pages, the navigation control provided at the top of the page is general in nature, providing access to main topics. One or more areas further down on the page provide more detailed and specific navigation choices (most frequently, as a list in the left-most column).

There are practical constraints that lead to this pattern, in that there is a limit to the number of options that can be clearly presented in a single horizontal row, while a larger number can be presented in a list extending vertically. However, noting the practical constraints on navigation options in the header does not explain why this convention has persisted, and is so frequently used in conjunction with more detailed navigation controls in another part of the page. The application of these basic metaphors makes the emergence of these conventions more comprehensible.

[6] Although infrequently seen in this set of sites, several of which are non-commercial, it has become more common to place ads in the center of the page. This is consistent with other web advertisement strategies that blur the line between ads and page content or navigation [cf. Rohrer 1998].

Iconicity in page layout

Documents and sections of documents are frequently conceptualized as nested containers. For instance, a book contains chapters, each chapter contains paragraphs, each paragraph contains sentences, and each sentence contains words; depending on context, the sentences and/or words may be seen as containers for ideas. As noted before, paper documents may use the convention of a sidebar, where tangential text is segregated from the main text, often by enclosure in a rectangle. In this context, the rectangle can be interpreted as an iconic "box": a separate container for the text.

The web makes substantial use of enclosing shapes as iconic containers for information content. The area labeled "Ceasefire for polio" in Figure 9 is typical; this example is quite similar to a side bar in a paper document, such as a newspaper. In other cases, the use of iconic containers is more extensive than would be typical in any paper document, as illustrated by the National Geographic page in Figure 10 (also see Appendix A, especially Figures A-3 and A-7).

Figure 10. Iconic "boxes" enclosing topic areas on National Geographic page

While it is quite unusual to see shapes other than rectangles used as iconic containers in paper documents, web pages often extend this usage to other shapes. For example, the PBS web page uses overlapping circles containing both text and images, as shown in Figure 11. The use of non-rectilinear shapes (also prominent on Fact Monster) seems to evoke a mood of playfulness, perhaps in part by deliberate dissimilarity to a conventional paper document frame.

Non-rectilinear shapes are used more often to contain images than text, and seem to be mainly used when the content represents a navigation control. The interaction of container and movement metaphors in navigation is discussed below.

Figure 11. Circles as content containers on PBS page

Navigation

The example web sites used the full range of navigation controls available, including text links, buttons, and clickable areas (containing text or images). Despite the wide range of controls in use, distinct themes emerged. These correlate with the categories described by Maglio and Matlock, particularly the movement and container metaphors.

Web navigation as movement

By far the most common label for a button was the single word "Go" (sometimes accompanied by an exclamation point). Four of the examined sites used a button labeled "Go" on their top-level page, and two others used a similar small clickable area (see Figure 12). In contrast, two sites used buttons labeled "Search" (in the case of Google, actually "Google Search"); no other button label (or clickable area text) appeared on multiple sites or pages.

Figure 12. Go buttons from Craigslist, National Geographic, PBS, BBC World Service, Open Secrets, and Fact Monster

This clearly relates to the prevalent understanding of web site use as movement by the user, as described by Maglio and Matlock: the action taken in displaying a new page is conceptualized as going to a new spatial location. (This conceptualization is also embedded in the common terminology "navigating" to a "site".)

Interestingly, iconic arrows or pointers (referred to hereafter as pointer icons) also seem to have the characteristic of implying movement. A striking example appears on Craigslist, as shown in Figure 13. In this case, two very similar navigation elements occur on the same page, consisting of a pull-down menu to the left of a button. The pointer label ">" seems interchangeable with the word "Go".

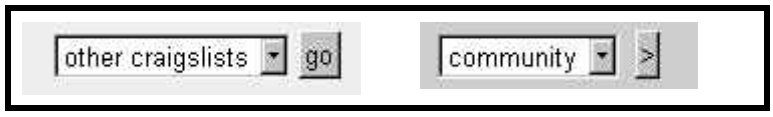

Figure 13. Parallel "go" and pointer labels on Craigslist top-level page

The example in Figure 13 illustrates another interesting characteristic of pointer icons: In some cases, they point at a specific item (usually an image); in others, they simply point towards the right (consistent with Western reading order). There appears to be a distinction between a pointer icon that generically means "go" or "go forward", and one that more specifically means "go there, to the location pointed at". Figure 14 and Figure 15 illustrate pointers of each type. Note that specific pages may use pointers in more than one way, as the examples from National Geographic show.

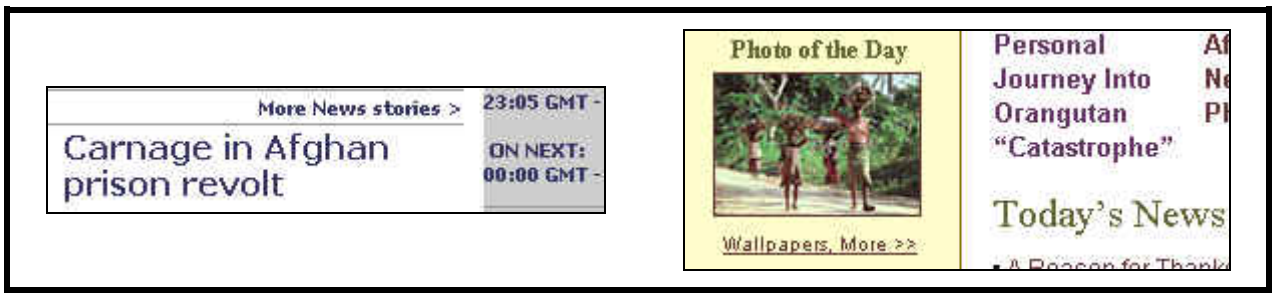

Figure 14. Pointers using reading order to represent "Go" (from BBC World Service and National Geographic

Figure 15. Pointers directed at images to represent "Go there" (from PBS and National Geographic)

Reading order is also invoked in the use of pointer icons representing movement between pages in a sequence. In most information-oriented web sites, of course, the order in which pages are read is arbitrary and variable. Nevertheless, a sequential order may be implied for specific sets of pages.

For instance, contrast the images from Google and Fact Monster shown in Figure 16. The pages of a Google search result are genuinely ordered, albeit by criteria that are not necessarily exposed to the user, and are presented as an explicitly numbered sequence. The words "Previous" and "Next" are used along with the iconic pointers (both words and icons are clickable). In contrast, the illustrated section of Fact Monster contains a set of separate articles related by theme, which can be read in any order. Nevertheless, the user is provided a mechanism to "page through" the "sequence". Interestingly, in addition to the left-pointing (back) and right-pointing (forward) icons, there is also an upward-pointing icon that leads to the "higher-level" page listing all the articles on the topic: a clear example of GENERAL IS UP.

Figure 16. Navigation through page sequences on Google and Fact Monster

Note that such arrows are also used on the Forward and Back buttons of both Netscape and Internet Explorer browsers. This particular browser affordance is notorious for not working well with complex web pages (older browser versions could not handle frames; current browsers have difficulty with redirects), but is still commonly used and even relied on by web designers, who may actually direct the user to use the browser Back button rather than providing an internal navigation control. Difficulties aside, when the Forward and Back buttons work effectively, they are relying on the user's understanding of the sequence of pages just viewed as establishing a path that can then be traversed in two directions.

These are not the only uses of pointer icons; other examples will be discussed later.

Web navigation as object manipulation

The movement metaphor described above is pervasive, but there is also evidence for a metaphor of web navigation as object manipulation. One clear example of this is in the convention of tabs: the presentation of topic areas in a horizontal row, each topic text appearing on a shape resembling a file folder tab. In this metaphor, the pages are seen as a stack of folders or tabbed sheets of paper, any one of which may be moved to the top of the stack. The item "on top" is completely visible, while for the items "below" only the tab can be seen (but the full content is imagined to be present, although occluded from vision).

Interestingly, the use of tabs in web pages and other computer user interfaces is quite easy to understand, despite lacking a precise correspondence to the way that paper documents are used. The most common use of tabbed paper would be for file folders, and when using file folders, the content is not immediately visible when the folder itself is moved to the top of a stack. In other uses, such as paper card catalogs or binders with tabbed sections, the content is immediately visible; however, without the stack metaphor, you lose the affordance that all tabs are always visible. Thus, there is a blend of multiple paper-document models built in.

It should be noted that the general convention of placing basic navigation options in the header can be seen as using the tab metaphor, even when the resemblance to paper file folder tabs is less distinct. For instance, consider the series of headers in Figure 17. Only the top two examples (Open Secrets and Expedia) have close literal resemblance to file folder tabs; the middle example (Craigslist) is quite stylized, but still presents each "tab" as a separate bounded form; on the last two pages (BBC World Service and PBS), the navigation controls consist of a horizontal list of text items with minimal demarcation of boundaries between items. Nevertheless, the same function is being performed, and can be conceptualized in the same way.

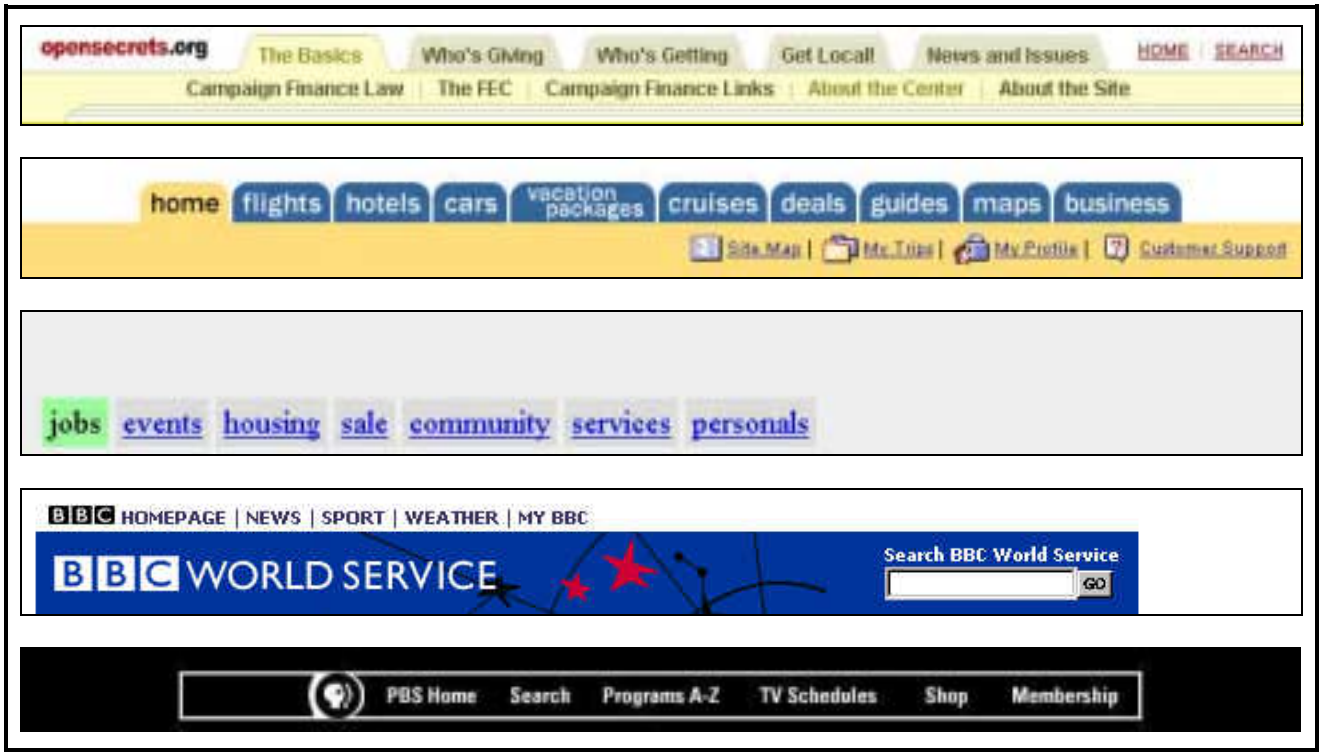

Figure 17. Representational and stylized tabs (from Open Secrets, Expedia, Craigslist (search page), BBC World Service, and PBS)

The object and movement metaphors interact seamlessly. For instance, selecting a navigation control in the form of a tab can still be conceptualized as "going to" that tab, while maintaining the affordance of having other main pages readily available in the visible "stack".

A similar interaction occurs between movement and container metaphors. As noted before, marked areas can be seen as containers for content; often, such marked areas have a dual role as navigation control (either the entire marked area is clickable, or the most prominent content of the marked area is a navigation control). For web pages as for paper documents, containers can be nested. While traversing a paper document would usually be described simply as "going to", selecting a navigation control within a "box" on a web page can be described as "going into" the box. (Although to my knowledge, web pages are rarely if ever explicitly described as rooms, I think it is clear that they can be conceptualized as containers big enough for the agent to move into.)

This usage combines the movement and container metaphors with the basic metaphor GENERAL IS UP (SPECIFIC IS DOWN): selection of the navigation control within a marked area displays a page with more detail on the topic. This combination of metaphors entails that the full content of the container cannot be seen from outside; the agent goes down into the box to obtained a closer, more detailed view.

Web navigation as computer use

The third main category examined by Maglio and Matlock are instances of literal, computer-oriented language. These web sites had surprisingly few instances of such language, most of which were in advertisements (arguably, outside the design control of the site). One Expedia page contained instructions to "type" information into an entry field; however, this was an exception, as most other Expedia pages with entry fields simply labeled them with the required information, with no explicit direction regarding the expected user action.

A particularly charming example was observed on a PBS page, where a link to a transcribed interview used the text "Click here to eavesdrop". In this case, the computer term "click" may have been deliberately chosen for humorous effect, as it seems to heighten the incongruity of equating reading a transcribed interview with eavesdropping on a conversation. Whether or not this specific instance was intended to be humorous, it was definitely exceptional. Except for advertisements, this was the only instance of the text "click here" that I observed.

It is clear that these sites rely almost solely on metaphorical rather than literal language for navigation controls. The fact that the metaphors have become so completely conventional demonstrates their effectiveness.

Instances of Blending

In this section I will begin by revisiting and extending some previous examples, considering them as instances of blending. I will then present additional examples that particularly exemplify the application of blended spaces theory to analysis of web design.

Recall that the web site front pages frequently contain elements that are interpretable as a "table of contents" for the site, as well as elements that resemble the title page or cover of a book. The conventional web site top-level page can be seen as blending various parts of a canonical paper document, as illustrated in Figure 18.

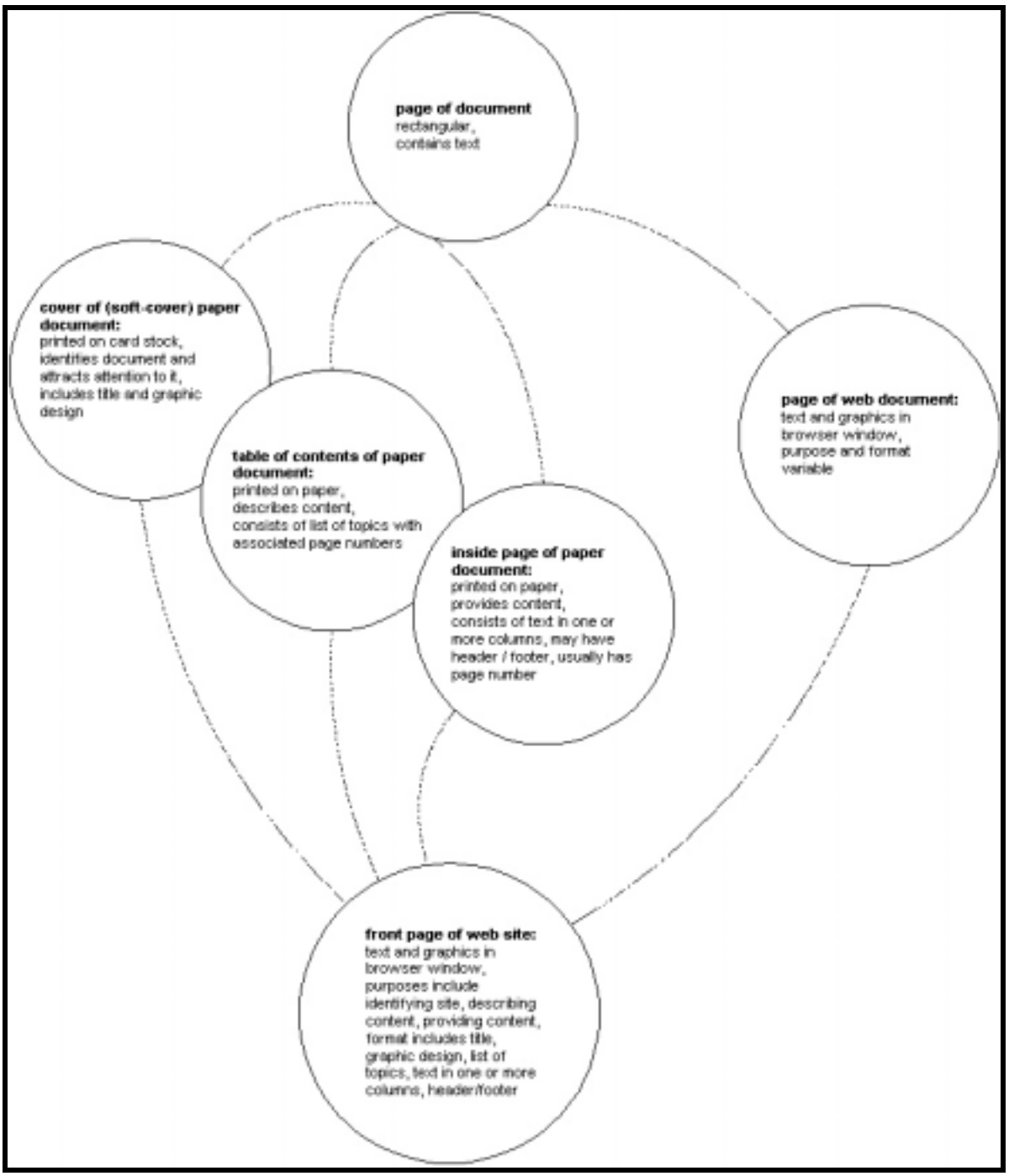

Figure 18. Blend of paper document page elements in conventional web site front page

The way in which multiple metaphors combine can also be construed as blending. For instance, as noted previously, the movement and container metaphors interact, such that web navigation can often be conceptualized as movement into a series of nested containers. The combination of movement and nested container metaphors has an experiential basis in human interactions with buildings and rooms. For web sites, it also combines with the basic-level metaphor GENERAL IS UP, such that movement towards detail is down and into a container; movement toward generality is primarily construed as up.

As another example, consider the conventional three-column layout seen on most of the sample web sites. As noted before, this can be interpreted in terms of basic-level metaphor, or in terms of conventions inherited from paper documents. Blending theory provides a way to integrate these ways of looking at the web page, with both basic metaphor and metonymic frames drawn into the blend.[7]

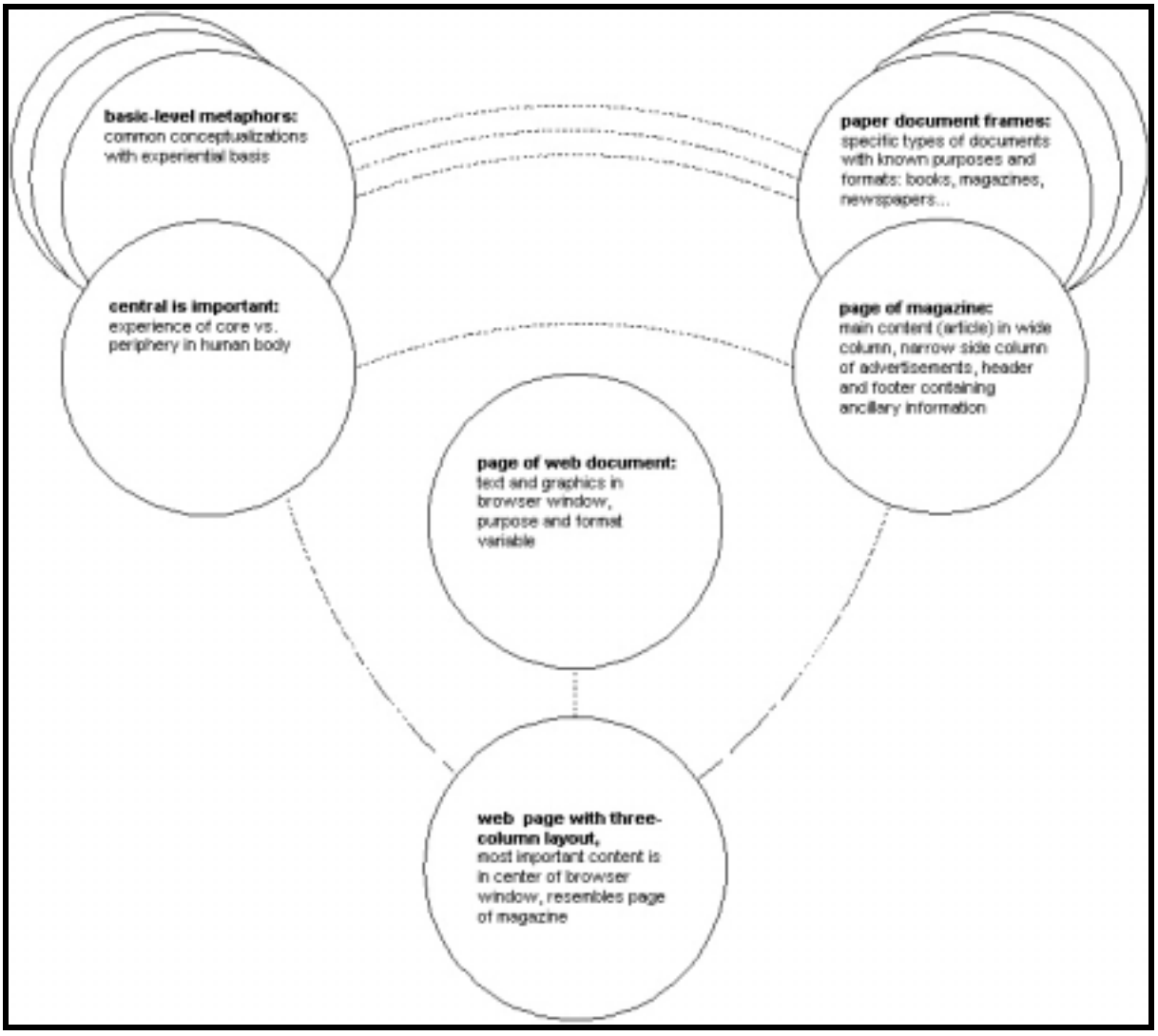

Figure 19. Blended elements in three-column web page layout

A factor that I have not focused on is the way that web navigation elements are inherited from other computer user interfaces. Web design is pervaded by blends of computer elements (buttons and tabs, mouse clicks) with textual information. This can be seen as a multi-level blend: an immediately accessible combination of metonymic frames from common computer applications and paper documents, with each of those domains in turn reflecting a rich medley of basic level metaphors. The effectiveness of the blend derives from the sense of naturalness that the basic-level metaphors impart.

[7] Note that Figure 19 does not attempt to represent the various generic spaces that would structure the mappings between the multiple input spaces.

In the following section, I will present several examples of blends incorporating pointer icons. These include instances of blending with computer interface frame elements as well as paper document frame elements.

Blending the pointer icon

As discussed previously, pointer icons are used both to indicate movement forward and to specify movement in a particular direction. The pointer icon can also be combined with text in several interesting ways. For instance, consider the advertisement shown in Figure 20. The text is a description of literal computer usage; however, the use of the iconic pointer brings in the understanding of web navigation as movement.

Figure 20. Combination of text "click here" with pointer icon (ad from National Geographic)

Note that Maglio and Matlock also attest to this type of blend; for instance, they describe the phrase "clicking into" being used to describe web navigation. Given that "into" can be read as referring to movement by the agent, the verbal form "clicking into" seems to be a coherent description of the effect of a navigation control consisting of an iconic container labeled "click here >".

Another blend featuring the iconic pointer is shown in Figure 21. In this example, a set of navigation elements are presented as a bulleted list, where the bullet character is a pointer icon "►" instead of the more typical circle or square. Thus, the use of a bulleted list as "outline of major topics" combines with the "go there" usage of the pointer icon. (Note that this format is used extensively on BBC World Service, but was also observed on at least two other sites, National Geographic and PBS.)

Figure 21. Bulleted list with pointer icons (from BBC World Service)

Pointer icons are frequently used in another way, as elements within what web designers refer to as "breadcrumbs". This term refers to a sequence of text that shows the sequence of previously visited pages, or sometimes the topics that "precede" the current page in the site hierarchy.[8] Breadcrumbs are usually placed in or near the page header, and typically use a pointer icon ">" between elements, as shown in Figure 22.

Figure 22. Breadcrumbs using pointer icon (from BBC World Service)

In the case of breadcrumbs, the list of terms joined by pointer icons has a dual role. First, it is understood as a map illustrating the path previously followed, with the direction of previous movement presented as left to right ("page/topic A > page/topic B > page/topic C" indicating you have followed a path from A to B to C). Secondly, each item serves as a navigation element to select ("move back to") the previously visited topic or page ("> B" meaning "go to B").

In the adaptation of paper document forms to the web, a major change is the shift from fixed sequences of pages to freely navigated links that do not intrinsically define a consistent sequential order. Despite this, web conventions such as breadcrumbs and the previously described forward/back sequences seem to operate by imposing such an order. The naturalness of these conventions derives from the familiarity of the metonymic paper document frames as well as the underlying common basic-level metaphors.

The above examples do not constitute an exhaustive description of the ways in which pointer icons were used on the sample webs sites. Other cases include use of an up arrow to indicate opening ("launching") a new window (on BBC World Service), a down arrow to select a detailed view (on Expedia, a full page calendar selected from an icon consisting of a small calendar and a down arrow), and various combinations of pointers with text elements, such as links marked "go >>" and "<< return" (on National Geographic and Google, respectively). Each of these can be seen as utilizing the same basic-level metaphors described previously.

Conclusions

Given that the Internet is not the first "information space", it is unsurprising that web design builds on a rich context of paper document design. Despite this, it is more common to focus on the differences and unique aspects of web documents. This research has shown that web design can be usefully analyzed as extending paper document design, and as blending paper document conventions with other frames and basic metaphors.

[8] This is a classic example of metaphoric usage that is almost impossible to describe without using metaphoric language. The basic understanding of temporal sequences as spatial paths is extraordinarily pervasive; in the context of a paper document frame, the mapping of the physical ordering of pages to the (expected) sequence in which the pages are read reinforces the time sequence as path metaphor.

The web design conventions discovered in the examined sites are consistent with the findings of Maglio and Matlock. Web navigation design conventions, like the language used by Internet users to describe web navigation, rely heavily on metaphors of movement through space and containers. Presumably, users' conceptualizations and the design conventions reinforce each other. For instance, the convention of labeling control buttons with the word "Go" may have arisen from the common use of phrases such as "go to that site". On the other hand, the common terminology (and the underlying conceptualization) must surely be reinforced by the pervasiveness of the "Go" button.

It would be extremely interesting to examine the parallel historical development of web design conventions and conceptualization of the Internet. It might be possible to examine resources such as archives of usenet discussions about the early Internet, along with archives of web images. My speculation is that the movement and container metaphors probably occurred almost immediately in discussions of the web, by extension from paper documents. The design conventions consistent with those conceptual metaphors, on the other hand, may have emerged over time.

Basic-level metaphors pervade web design and help to make the experience of Internet use comprehensible and coherent. Because metaphors such as IMPORTANT IS CENTRAL and GENERAL IS UP are so commonplace, neither users nor web designers may be consciously aware of them. A tenet of good user interface design is to allow the user to focus on their task, rather than the tool being used, and the integration of basic-level metaphors helps to achieve that aim. For users, therefore, being unaware of the metaphoric conceptualization of Internet use is completely acceptable, or even a positive good.

For the designer, however, lacking conscious awareness of the metaphors in use may be more problematic. Some problems may be solved by intuition; for others, however, unpacking the blend of metaphors may be crucial to understanding what works and what doesn't, and constructing an optimal design solution.

References

Cooper, A. (1995), "The Myth of Metaphor", downloaded from http://www.cooper.com/articles/art_myth_of_metaphor.htm on 13 October 2001.

Deiberger, A. (1995), "On Magic Features in (Spatial) Metaphors", downloaded from http://www.mindspring.com/~juggle5/Writings/Publications/magic_features.htm on 13 October 2001.

Gaver, W. (1995), "Oh What a Tangled Web We Weave: Metaphor and Mapping in Graphical Interfaces", downloaded from http://www.acm.org/sigchi/chi95/Electronic/documnts/shortppr/wwg2bdy.htm on 13 October 2001.

Grady, J. (1997), "THEORIES ARE BUILDINGS revisited", *Cognitive Linguistics* 8:4, pp. 267-290.

Grady, J., Oakley, T. and Coulson, S. (1999) "Blending and metaphor", in R. W. Gibbs, Jr. and G. J. Steen (eds.), *Metaphor in Cognitive Linguistics*, Amsterdam: John Benjamins.

Hiraga, M. (1998), "Metaphor-Icon Link in Poetic Texts: A Cognitive Approach to Iconicity", downloaded from http://www.conknet.com/~mmagnus/SSArticles/hiraga/hiraga.html on 24 November 2001.

Holder, B. (1999), "Blending and Your Bank Account: Conceptual Blending in ATM Design", *Center for Research in Language Newsletter*, 11:6 (April 1999), downloaded from ftp://ftp.crl.ucsd.edu/pub/newsletter/pdf/11-6.pdf on 13 October 2001.

Johnson, C. (1999) "Metaphor vs. conflation in the acquisition of polysemy: the case of see", in M. Hiraga, C. Sinha, and S. Wilcox (eds.), *Cultural, Psychological and Typological Issues in Cognitive Linguistics*, Amsterdam: John Benjamins.

Johnson, M. (1987), *The Body in the Mind*, Chicago, IL: University of Chicago Press.

Lakoff, G. and Johnson, M. (1980), *Metaphors We Live By*, Chicago, IL: University of Chicago Press.

Lakoff, G. and Turner, M. (1989), *More Than Cool Reason: A Field Guide to Poetic Metaphor*, Chicago, IL: University of Chicago Press.

Maglio, P. and Matlock, T. (1999), "The Conceptual Structure of Information Space", in A. Munro, K. Hook, and D. Benyon (Eds.), *Social navigation of information space*, London: Springer-Verlag.

Nielson, J. (1992),"A Layered Interaction Analysis of Direct Manipulation", downloaded from http://www.useit.com/papers/direct_manipulation.html on 15 October 2001.

Nielson, J. (1993), *Usability Engineering*, San Diego, CA: Academic Press.

Norman, D. (1991), "Cognitive Artifacts", downloaded from http://www.cs.umu.se/kurser/TDBC12/HT99/Norman-91.html on 15 October 2001.

Reddy, M. (1979, reprinted 1993) "The Conduit Metaphor", in Ortony, A. (ed.) *Metaphor and Thought*, Cambridge: Cambridge University Press.

Rohrer, T. (1995), "Metaphors we compute by: bringing magic into interface design", downloaded from http://philosophy.uoregon.edu/metaphor/gui4web.htm on 13 October 2001.

Rohrer, T. (1997), "Conceptual Blending on the Information Highway: How Metaphorical Inferences Work", downloaded from http://philosophy.uoregon.edu/metaphor/iclacnf4.htm on 13 October 2001.

Rohrer, T. (1998) "Even the Interface is for Sale: Metaphors, Visual Blends, and the Hidden Ideology of the Internet", downloaded from http://www.tulane.edu/~howard/LangIdeo/Rohrer/Rohrer.htm on 24 November 2001 (Draft, not to be quoted in publication without author's consent).

Schriver, K. (1997), *Dynamics in Document Design*, New York, NY: John Wiley & Sons, Inc.

Smilowitz, E. (1996), "Do Metaphors Make Web Browsers Easier to Use?", downloaded from http://baddesigns.com/mswebcnf.htm on 13 October 2001.

Sweetser, E. (1992), "English metaphors for language: motivations, conventions, and creativity", *Poetics Today*, 13:4 (Winter 1992), pp. 705-724.

Sweetser, E. (1998), " Regular metaphoricity in gesture: bodily-based models of speech interaction", in Actes du VXIe Congrès International des linguistes (CIL16), (CD-ROM) Elsevier.

Taub, S. (2001), *Language from the Body: Iconicity and Metaphor in American Sign Language*, New York, NY: Cambridge University Press.

Turner, M. and Fauconnier, G. (1995), "Conceptual Integration and Formal Expression", downloaded from http://philosophy.uoregon.edu/metaphor/turner.htm on 14 November 2001.

Appendix A. Full Page Illustrations of Selected Sites

Figure A-1. Craigslist (http://www.craigslist.org/)

Figure A-2. National Geographic (http://www.nationalgeographic.com/)

Figure A-3. PBS (http://www.pbs.org/)

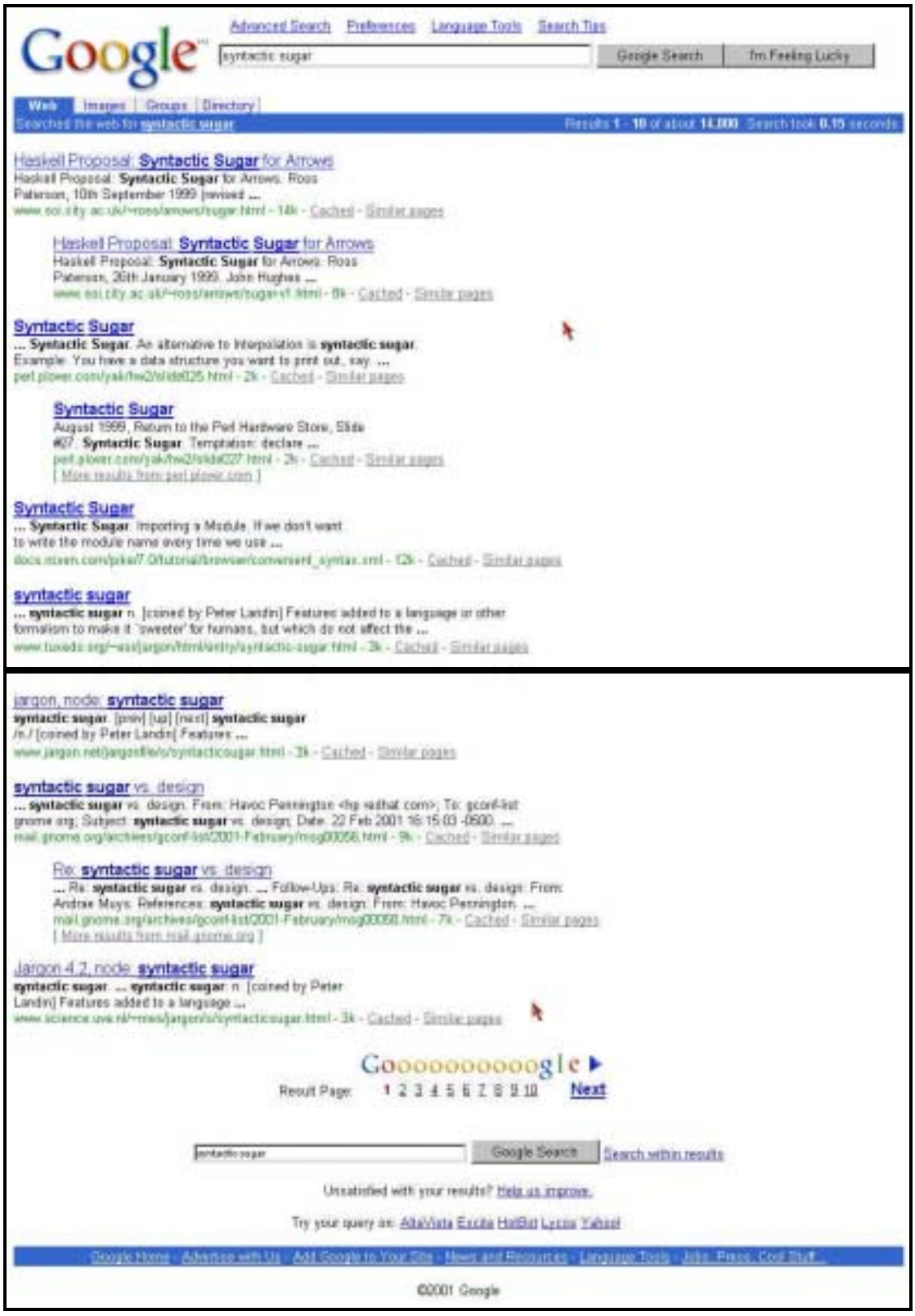

Figure A-4. Google (http://www.google.com/)

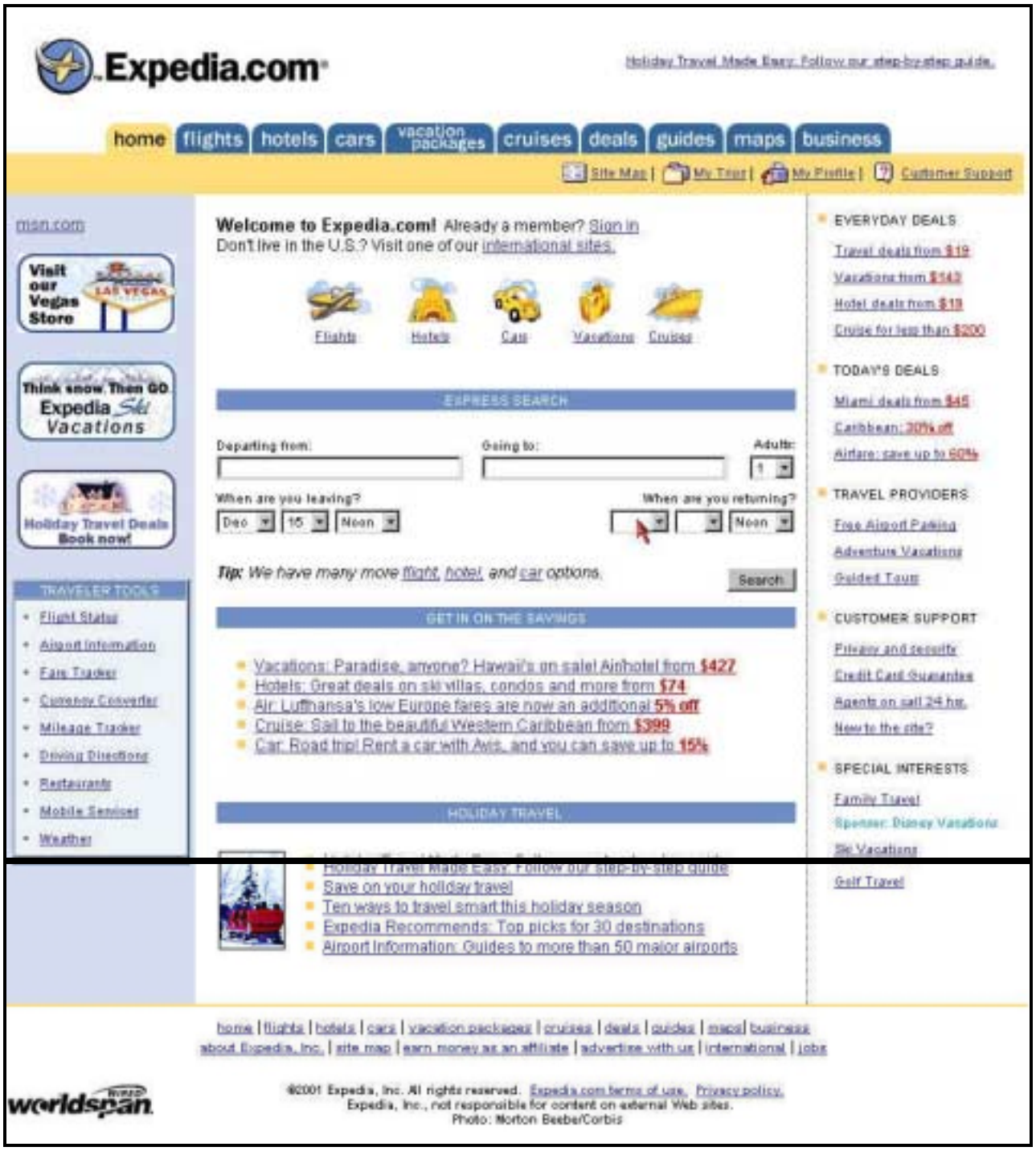

Figure A-5. Expedia (http://www.expedia.com/)

Figure A-6. BBC World Service (http://www.bbc.co.uk/worldservice/index.shtml)

(Note: content in middle of page omitted)

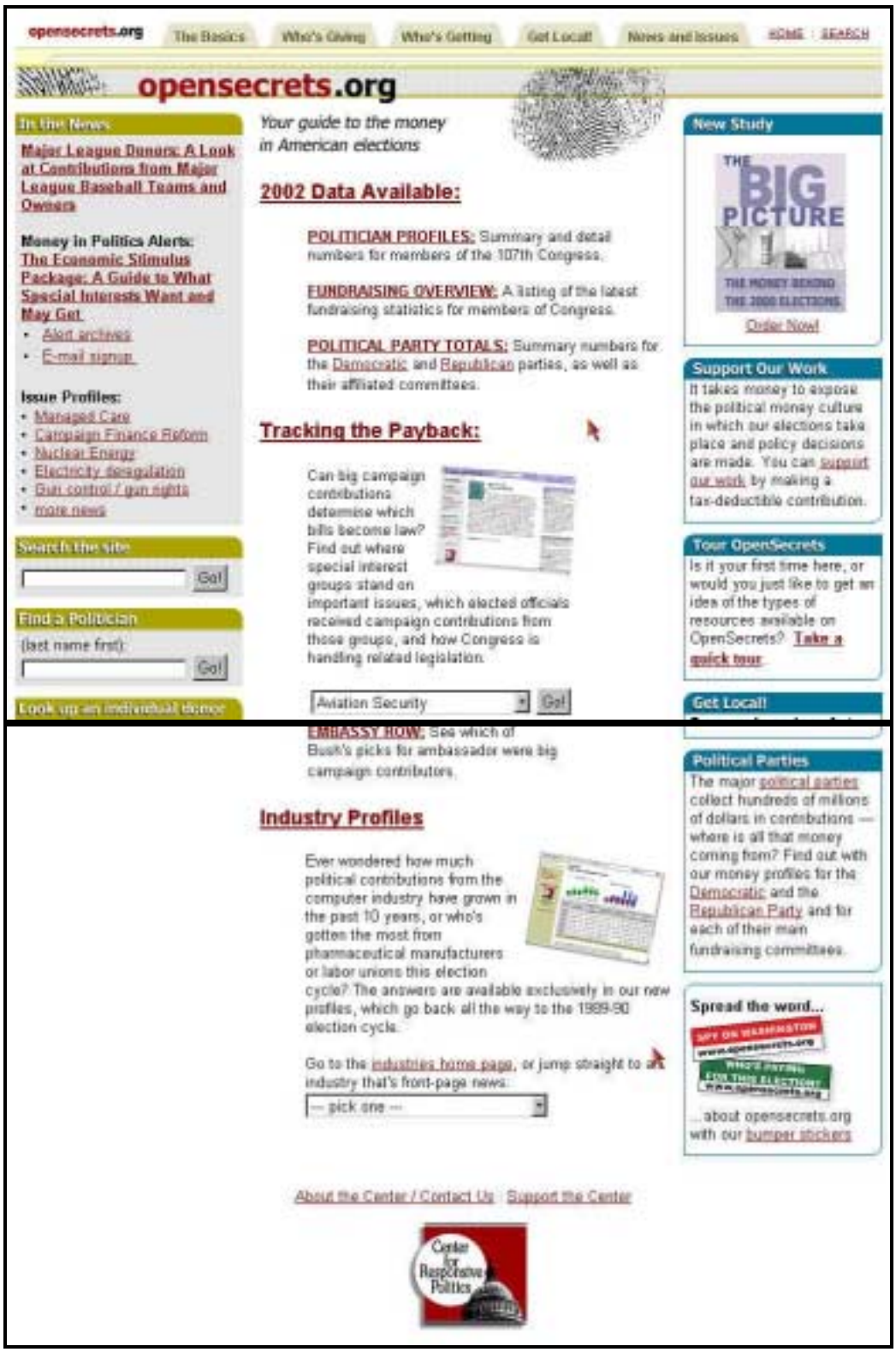

Figure A-7. Open Secrets (http://www.opensecrets.org/)

(Note: content in middle of page omitted)

Figure A-8. Fact Monster (http://www.factmonster.com/)