Two HyperCard applications: Seismic dataset catalog Geology field guide

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ABSTRACT

HyperCard is a program for designing and traversing a network of images. A seismic dataset catalog is a collection of seismic data snapshots and textural descriptions. A geology field guide consists of text, photographs, and schematics for each stop-site along with regional maps and geologic columns.

INTRODUCTION

Many applications in the Earth Sciences have a need for interactively displaying a succession of images and text. HyperCard is a program on Apple Macintosh computers for designing and traversing a network of images. Figure 1 illustrates such a network of images. The basic building block is a screen-sized image called a card. Images consist of bitmap graphics, text, and buttons. Buttons primarily jump to new images. In addition buttons may execute user-written programs to perform calculations or a sequence of graphical operations. HyperCard also has other capabilities, but they are outside the scope of this article.

The applications presented in this article consist of two main parts. First, is a *body* of regular units of images. The unit of a seismic data catalog is the individual seismic dataset. The unit of a geology field guide is a stop-site. Second, is a *preface* with introductory material, indexes into the body, and supporting material. For example, the indexes of the geology field guide are (1) a road map, (2) a geology map, and (3) a geologic time column.

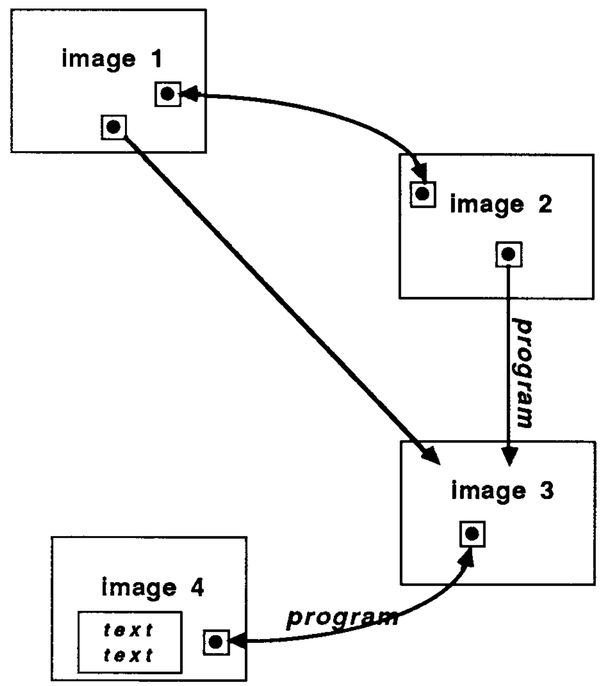

FIG. 1. A HyperCard network of images. Images are linked by hot spots or buttons. Images may be annotated with text, programs, or other images.

SEISMIC DATASET CATALOG

One shortcoming at SEP is a usable catalog of the hundred seismic datasets we possess. Currently we have tape racks, section plots, on-line manual pages, and some on-line data movies. We need a better way to integrate this material, index it, and make it more accessible. HyperCard is good at integrating heterogeneous material and interactively retrieving it.

Figure 2 illustrates the overall structure of the catalog. The main body is a rectangular array of images. Each column is a dataset. Each row element is a piece of the dataset, a different processing stage or location. Each part consists of a data image (Figure 4) and a text card (Figure 5) describing the data geometry and file format.

The rectangular image array is not an a-priori structure of HyperCard, but is simulated through the use of buttons and visual effects. Arrow buttons (see Figures 4 and 5) jump to neighboring images in the array. The next image is brought to the screen by sliding it over the old image in the direction of the arrow. This enhances the illusion of traversing an array.

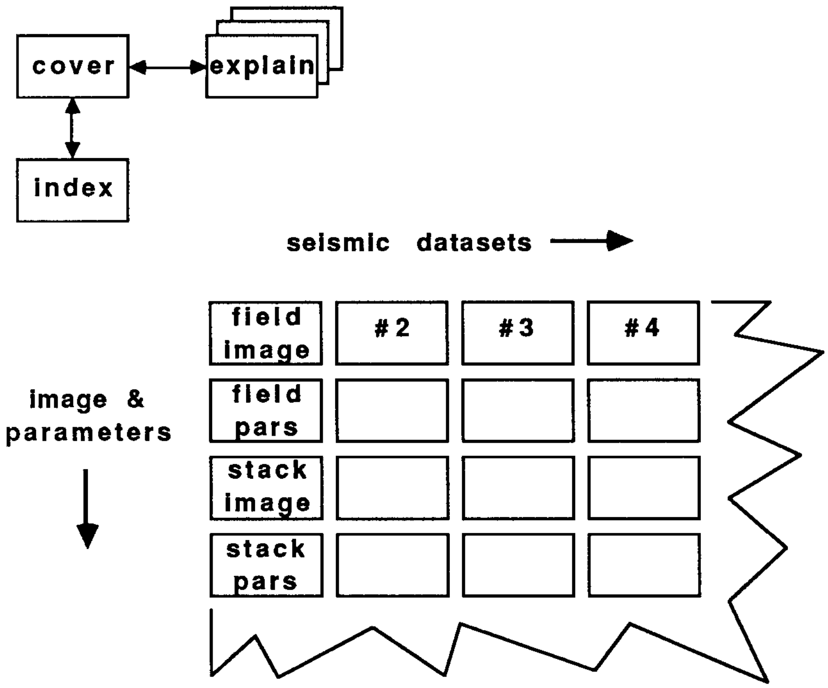

FIG. 2. HyperCard structure of the seismic dataset catalog. The preface material consists of cover, introduction and index. The dataset images are laid out as an array.

The preface material consists of a cover image, an introduction and an index. The cover (Figure 6) has five buttons: a help button (balloon), two jump-off points to the main body, a data selection function, and a data addition function.

The first step in constructing the catalog is to create the image network using menu-based drawing functions. Then the dataset images and text parameters are downloaded from the Convex computer through a terminal emulation program (Versaterm). Finally, special features are added by writing short programs. One program was written for data selection and another for automating the addition of new datasets.

I have several ideas for improving the catalog. A location map index could be added. Another enhancement is button routines to automatically generate data processing commands.

A common question from observers of the catalog is whether one can display an arbitrary set of traces from a seismic dataset. The answer is no. HyperCard was designed to manage an already computed set of images rather than build new images on the fly. HyperCard contains a full, but slow, programming language. It then can be coerced to implement anything, but inefficiently, and contrary to the ease-of-use philosophy.

GEOLOGY FIELD GUIDE

Geology field guides are a heterogeneous assemblage of text and graphics. Graphics include maps, photographs, time columns, schematics, cross sections, genetic sequences, and other material. Field geology itself is an intricate web of spatial and temporal relations between the pieces of field evidence. HyperCard is well suited for capturing and representing this web.

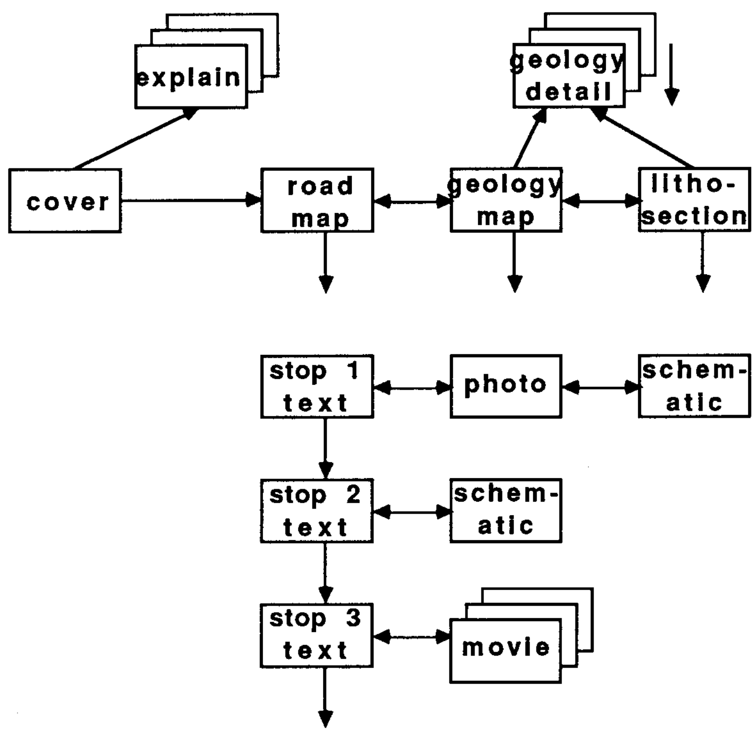

FIG. 3. Structure of a HyperCard geology field guide.

Figure 3 illustrates the structure of a geology field guide. The body consists of a set of stop-sites. Each stop-site has some text (Figure 8) and graphics (Figures 9 and 10). The stop-sites may be indexed by a road-log sequence, road-map, geologic map, geologic cross section, and geologic time-column. This field guide has a road-map (Figure 11), geologic map (Figure 12), and lithologic column (Figure 13). Numbered dots on the maps jump to the stop-site material. Additional preface material includes a California geology map and annotated time section. Explanation windows pop up when the mouse cursor clicks a significant geologic feature.

Stanford geology Professor John Harbaugh's (1974) Yosemite-Mono Craters field guide supplied the material for this example. In general, published field guides are deficient in graphical material, but I used one to save time. I recommend primary material for more graphics and greater image resolution.

Photographs and schematics were digitized with a desktop scanner. Additional graphics were created with the drawing tools of HyperCard, e.g. photograph tracings. Text was typed in, though it could be copied from a computer file.

This field guide has 70 images. The practical limit of a HyperCard application is the floppy disk capacity for back-up and distribution. Although HyperCard has excellent image compression algorithms, the digitized images occupy the bulk of the disk file.

I have several ideas for related projects. I would like to develop an interactive simulation of geologic field mapping for educational purposes. I would also like to make a field guide to the Stanford area geology.

CONCLUSIONS

HyperCard is a powerful facility to manage images. Many applications in the earth sciences, from databases to courseware, can benefit from this facility. HyperCard is strongest with images, complicated spatial relationships between data, heterogeneous data, and easy-to-construct Mac-like interfaces. HyperCard is weaker when it competes against the text-based database programs or when one must write lots of programs.

ACKNOWLEDGMENTS

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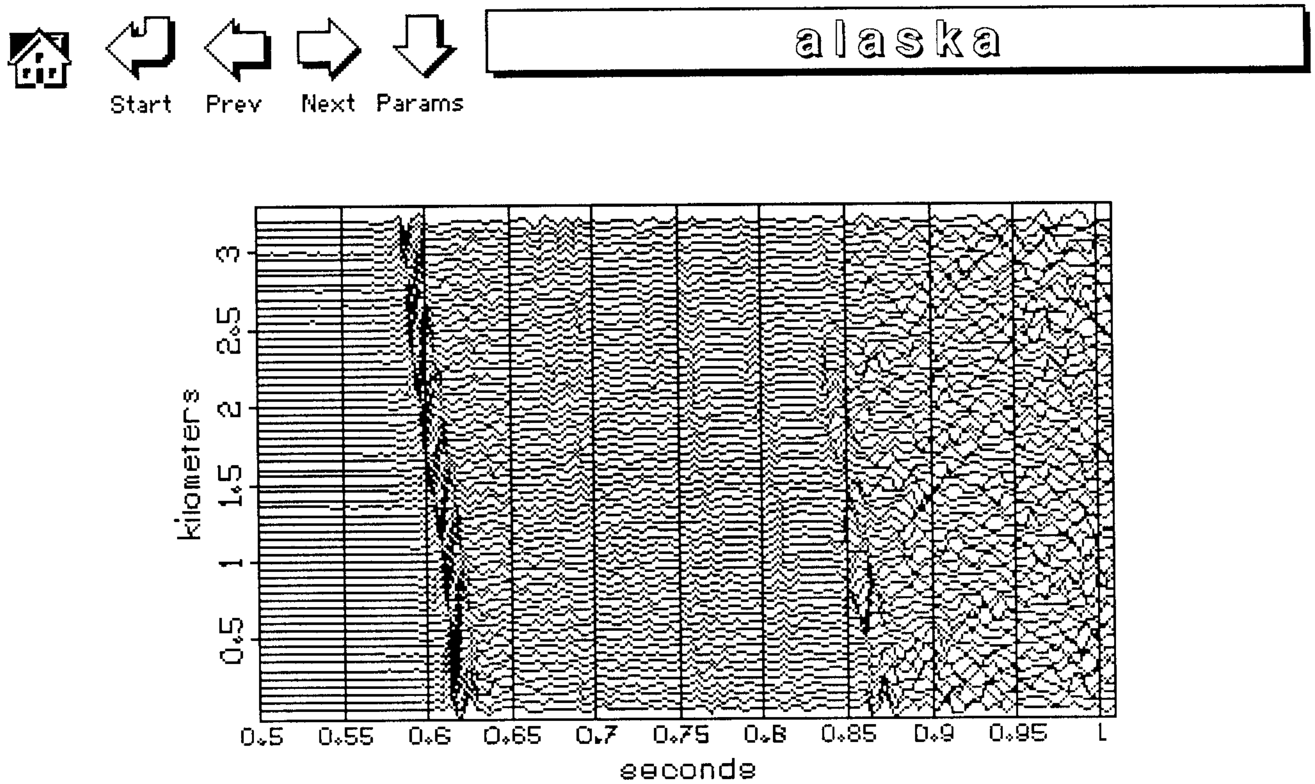

FIG. 4. Sample data image from the catalog. The arrow buttons along the top move laterally between datasets or vertically within parts of a dataset.

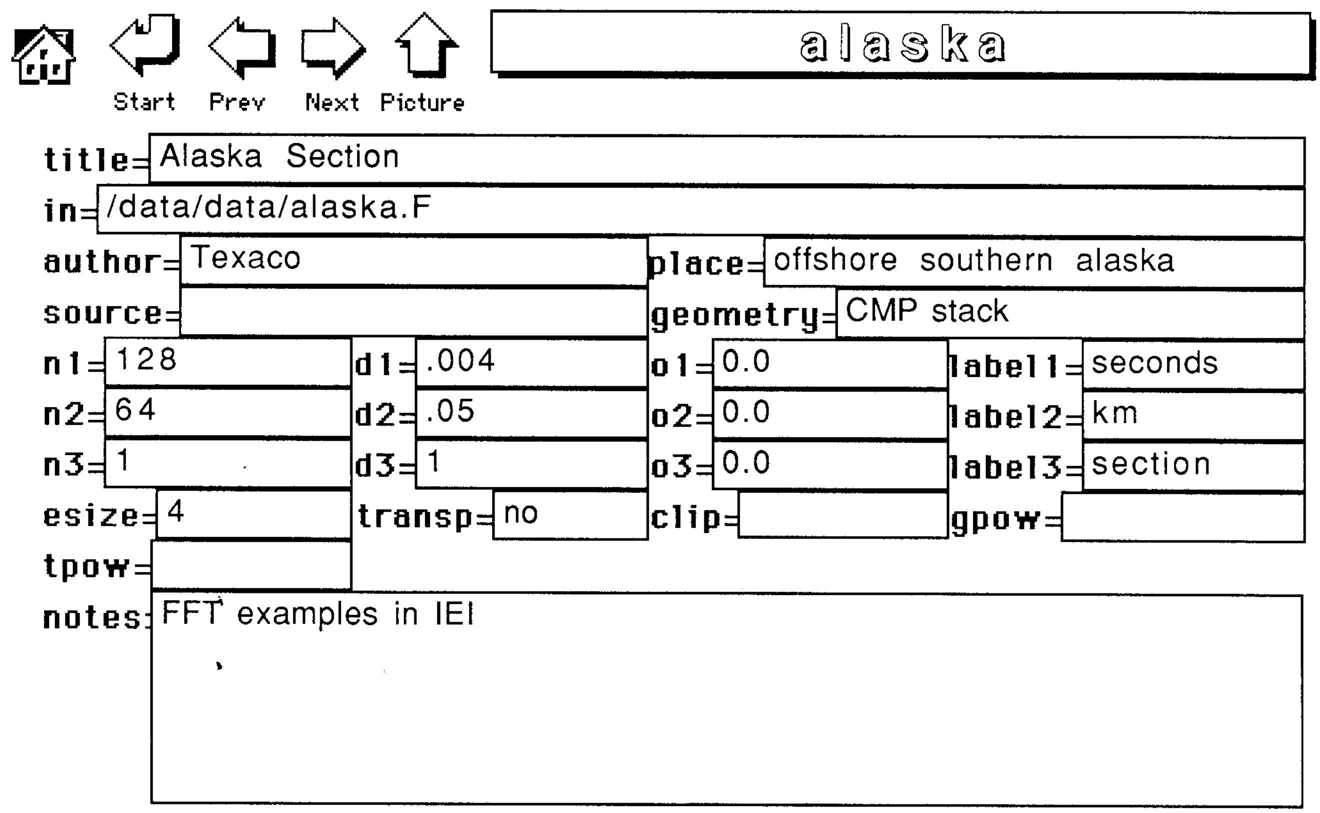

FIG. 5. Sample parameter image from the catalog. Parameter names are from the SEP cubelib database. or vertically within parts of a dataset.

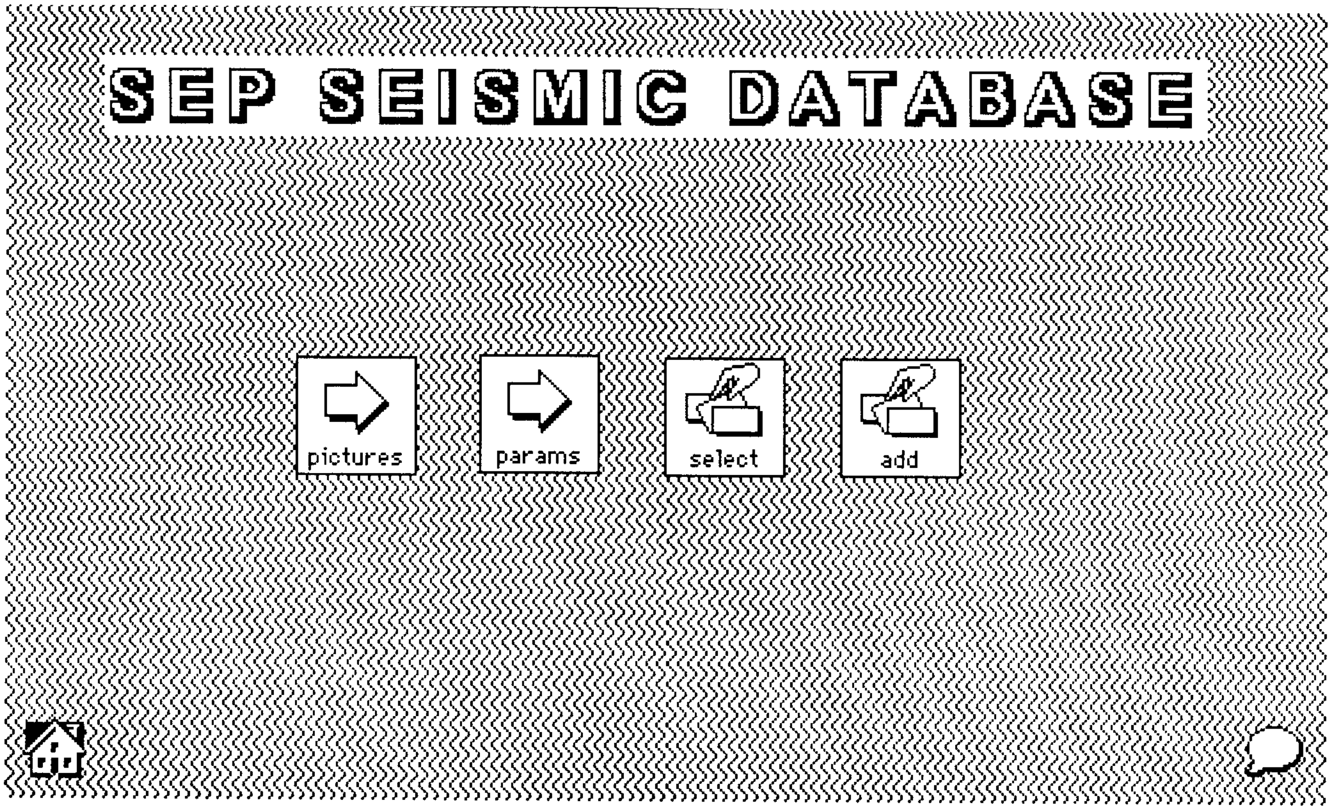

FIG. 6. Cover image of the seismic dataset catalog. The first two buttons display data images and data parameters. The third button selects datasets with parameters of a specified value. The last button automates the importation of new datasets.

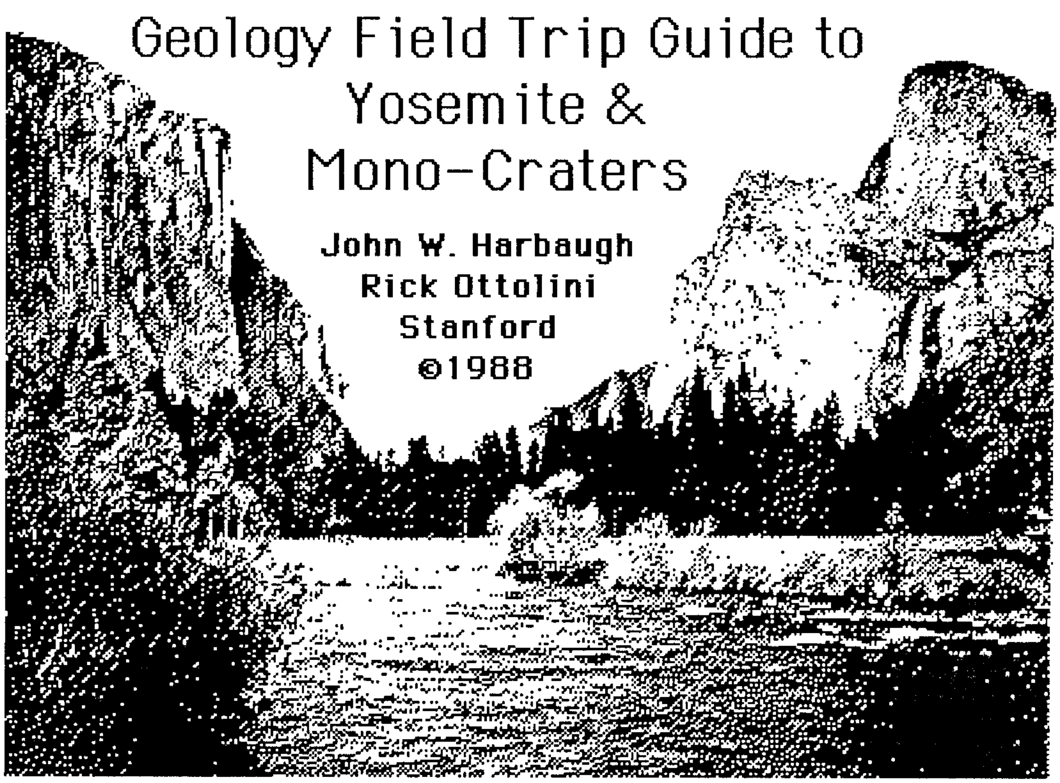

FIG. 7. Cover image of the geology field guide described in this article.

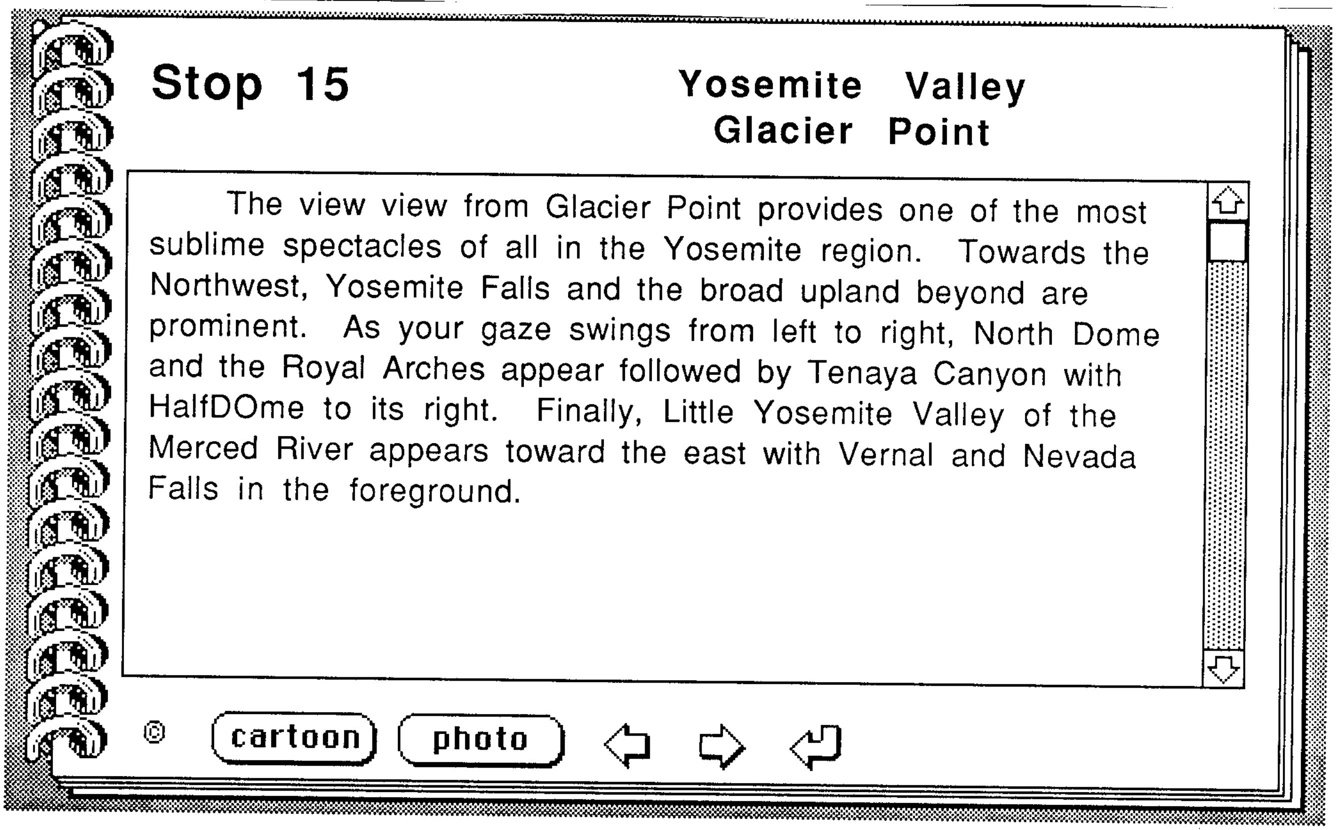

FIG. 8. Text description from a sample site-stop. The arrow buttons move to adjacent site-stops or to the calling map. The labeled buttons display graphics. The copyright button displays credits.

FIG. 9. Photograph from a sample site-stop. Pressing the mouse cursor anywhere on this photo calls up a line-drawing overlay with significant features labeled.

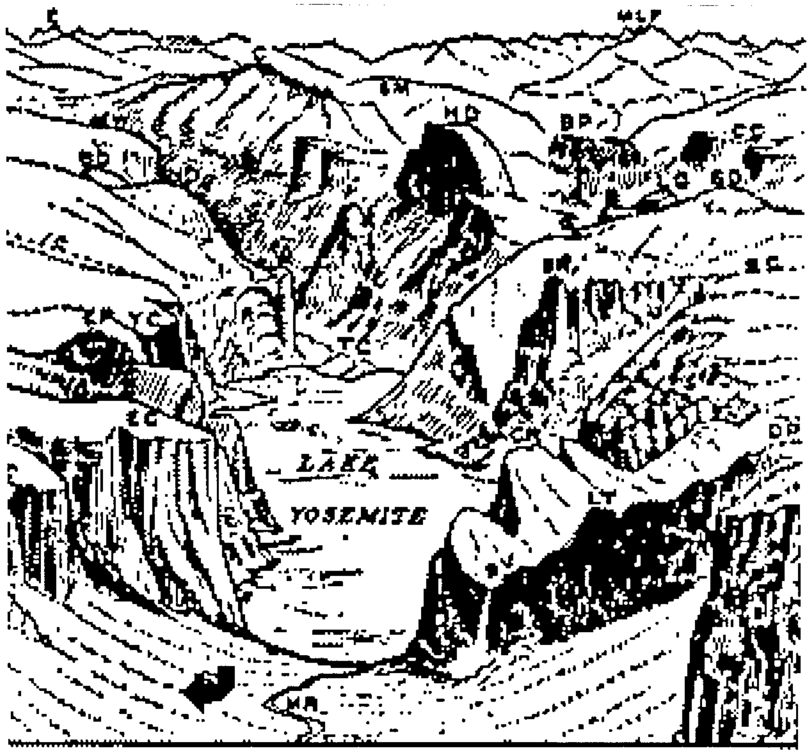

FIG. 10. Cartoon from a sample site-stop. Last frame of short animation loop show the evolution of this geologic feature.

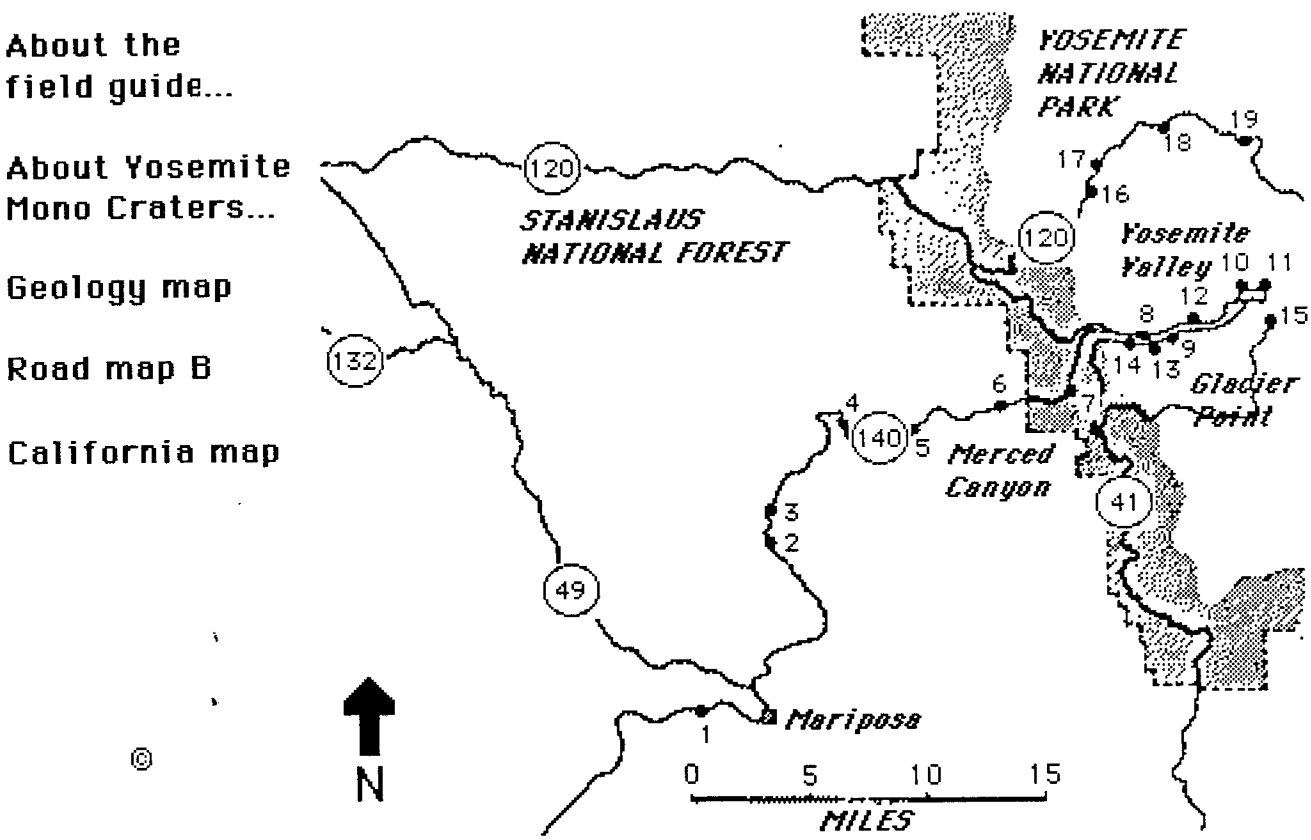

FIG. 11. Road map index. The buttons on the left shift to other maps or bring explanatory material. Clicking the numbers on map jumps to that site-stop.

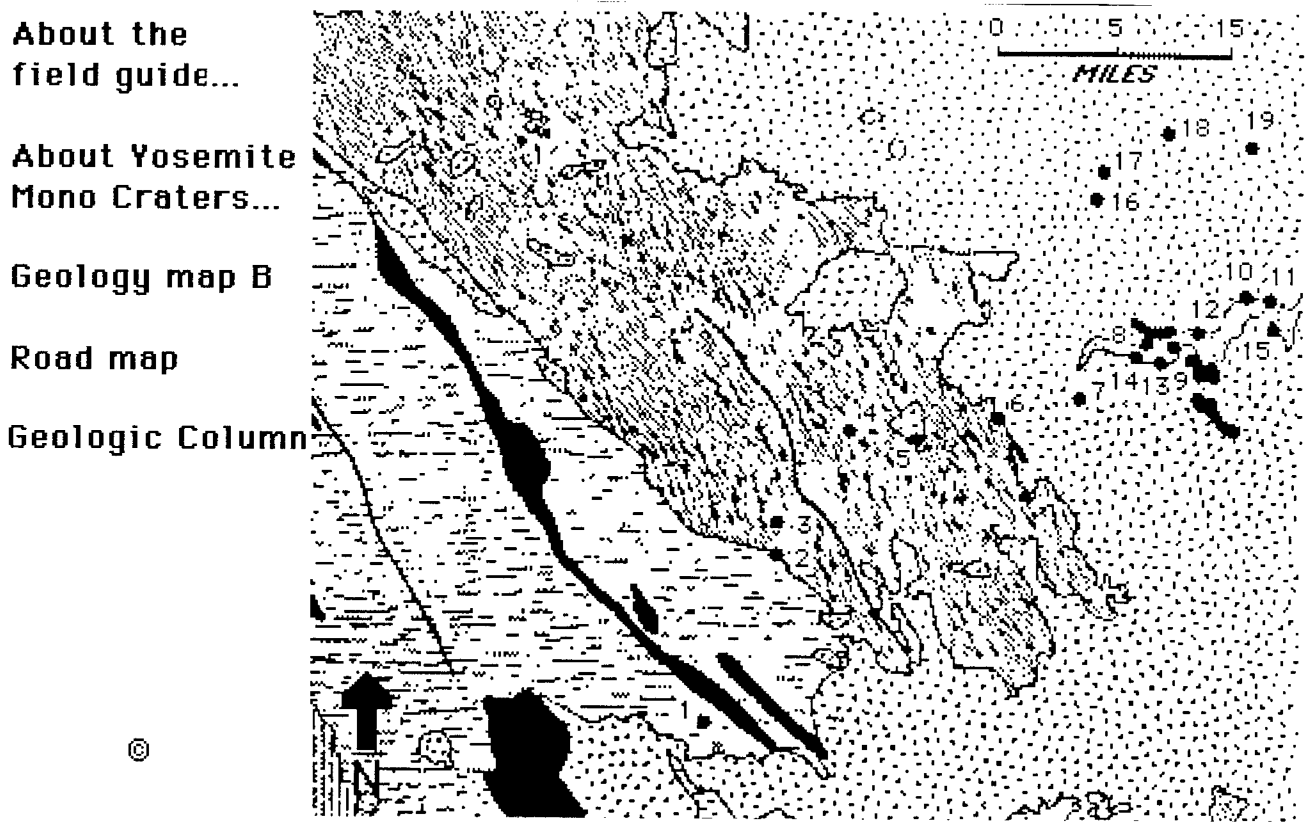

FIG. 12. Geology map index of same area as figure 10. The buttons on the left shift to other maps or bring explanatory material. Clicking the numbers on map jumps to that site-stop.

Prinicpal Igneous Formations of the Yosemite Region

Tuolumne Intrusive Series	Johnson Granite Porphory Cathedral Peak Granite Half Dome Quartz Monzonite Sentinel Granodiorite
Minor Intrusive Bodies	"Map of North America" Diorite Quartz-mica Diorite Bridaveil Granite
Western Intrusive Series	Leaning Tower Quartz Monzonite Taft Granite El Capitan Granite Granodiorite of the Gateway Granite of Arch Rock Diorite of the rockslides

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FIG. 13. Lithologic column of field area. Clicking units with the mouse-cursor pops-up descriptive captions.