APPENDIX A

DRAWING ANALOGIES

Drawing Analogies is a program that uses a Sketchbook module to serve as an interface to various knowledge-based design tools. The Sketchbook module enables designers to keep their personal sketches as visual bookmarks, which can then be used to query several databases, including a commercial CD-ROM of famous architecture called “The Great Buildings Collection” (Matthews 1994), the Archie case based library, various FileMaker Pro and HyperCard databases, and the World Wide Web pages (through the Netscape browser). While browsing these databases, a designer draws a diagram on the Sketchbook to link it with the currently displayed database record, forming a visual bookmark. To retrieve a record, a designer draws a diagram on the Drawing Board, and the Drawing Analogies module compares the query with previously linked diagrams to find the closest match. Designers can keep their personal Sketchbooks and refer to different information for future use. In this drawing environment, the connections to various design tools are direct, one-to-one, and require the designer to take explicit action to invoke them.
A.1. FINDING AND USING VISUAL REFERENCES IN DESIGN

Imagine an architect engaged in the design of a natural history library. She is an experienced designer and sophisticated in layout arrangement, and for years she has kept a journal containing sketches, notes, and clippings from magazines and design folios. We join her in the early stages of design as she seeks inspiration for her building form. Often she finds ideas in her journal for the physical shape of the building and incorporates them into her design. As we join her, she has proposed a basic scheme for the building’s spatial arrangement by drawing a bubble diagram on her tracing paper (see Figure A-1). In her diagram, four bubbles surround a central object depicting the four major functional spaces in the library program. The adult’s section, children’s reading room, reference area, and staff office are all connected with via a central service lobby with to the patron’s entrance and the service entrance on opposite sides.

![Figure A-1](image)

*Figure A-1.* Designer’s basic scheme for spatial arrangement; [a] minimal bubble diagram; [b] developed version with functions labeled and some size and positional information.

Now she wants to arrange the elements of her scheme in an interesting way so that the building’s shape will recall the natural history theme. To find appropriate and compelling shapes she flips through her journal to find forms similar to her current
drawing. The objective of her search is to find appropriate shapes that can accommodate both the functions of the library program and the spatial arrangements she has already developed. Believing that form should follow function, she searches for shapes that are similar to her drawing, to guide the translation of bubbles into a building form. She decides that if she finds any shape interesting or similar in shape to her bubble diagram, she will draw it on her tracing paper and make notes so later she can later use those drawings for her current design project or include them in her journal for future use. She also decides that the shapes should come from the design theme—natural history. So she browses her journal to find shapes of natural objects. Some notes in her journal point her to books on plants and animals. She copies what she finds in her journal and books (Figure A-2) to her drawing as a reference for design (Figure A-1).

![Figure A-2](https://example.com/image.png)

**Figure A-2.** Forms found in a handbook of the natural world. (Drawings by author, after (Gibbons 1984), and (Webb 1948; Alexander, Ishikawa et al. 1977))

After finding an interesting form in her journal, she makes a diagram to record her thoughts about the object’s shape (Figure A-3b). She might also look in her books for the
original picture (Figure A-3c). After finding the photograph she flips through the rest of the book looking for other interesting forms (Figure A-2). For example, she might copy a few plant and shell shapes to her tracing paper and add annotations on describing how she might use the shapes in her design. She considers using flower petals or round seashell forms for her floor plan because both have organize shapes surrounding around a central object. Or she might find an arrangement of plant forms suitable for her atrium column and skylight structure (flower stalks rising from a central point of the stem end to create an umbrella effect), or a fan- shaped sea shell for her arched window (Figure A-3e).

**Figure A-3.** Graphic representations used in design development.
Our designer’s journal also contains magazine clippings and drawings of architectural precedents—buildings she has found interesting in the past. While browsing her journal, perhaps she finds a building whose form seems relevant (it may be a library, a church, or an office building) and she uses tracing paper to copy it into her design drawing. Then she might ask herself, ‘How about extending this form to fit the children’s reading room?’ She gradually traces over the drawing, adjusting the shape to fit the functional program (Figure A-4).

![Figure A-4](image)

After fitting the children’s reading room into the form, she decides to flip the drawing so the entrance will be from the west side as in her functional arrangement diagram (Figure A-1), and she adjusts the drawing again to fit the adult’s section. Then she combines her previous flower petal concept (intervals of large and small petals; Figure A-1) with the modified flipped floor plan. She finishes her schematic design of the building shape, arriving finally at the schematic design shown in Figure A-5.
A.2. REMARKS ON THE SCENARIO

In the scenario describe above, the designer first moves fluidly between different graphic media, which include the drawing board, where the actual design takes shape; a journal, or sketchbook where she stores interesting fragments of designs; tracing paper, by which she transfers items into the journal or into the design; and a collection of books, magazines, and design folios, in which she searches for and copies interesting reference images. The designer knows what task she is doing and what kinds of tools she wants.

Second, the designer uses various operations. She browses her journal and her collection of books. She selects interesting items from them and traces and copies them into her design. She adapts the forms she finds to her design, using one part here and another there, stretching, rotating, and moving her traced references in order to make them ‘work’ with the design. And she finds ways to map her functional library program with the reference forms she adopts.
Third, the designer explicitly chooses explicitly to adopt a shape for her building associated that is associated with a concept derived from the architectural program—the natural history theme. It is common that designers borrow forms that are associated quite literally with the building concept.