16

■ Preparing Illustrations and Writing Reports

16-1. From Field Study to Report Writing

On returning from the field, the following preparations for report writing can be done at once:

1. Have films developed and printed.
2. Unpack rock samples and lay them out in order by age, by collecting date, or by geographic position.
3. Get help from paleontologists to identify fossils, make geologic age assignments, and assess depositional facies.
4. Read through the field notes carefully, making lists of (a) samples that should be prepared for petrographic or other laboratory analyses, and (b) data and ideas that are significant in light of the full field study.
5. Read all field summaries and unit descriptions, listing or indexing significant items.
6. Study pertinent literature and geologic maps, taking notes on: (a) items that will help in describing the regional setting of the study; (b) data that can be added directly to the main results of the study; and (c) disagreements in unit names or other specifics that will require further research or correspondence with the authors or suitable experts.
7. Begin final assembly and checking of the geologic map, cross sections, and columnar sections, as described in Section 16-2.

Composing a plan for the report should not be difficult if the purpose of the project was clear (Section 1-3) and if evidence and interpretations have been reviewed periodically during the field season (Section 1-6). The purpose of the project predetermines the general nature of the report as well as its readers, who must be considered during all stages of organization and writing. Reports for nongeologists require careful organization and use of only the most common geologic terms. Geologist readers vary in degree of specialization, field experience, and access to a library, so the rule, again, is to write as simply and clearly as possible. This rule applies especially to reports intended for a broad spectrum of geologists and for the permanent scientific record, and this is the general case assumed in this chapter. Reports on specialized studies that will be published in journals must be so brief as to require thorough planning and tight writing, but they should be directed to a general audience as much as possible (Cochran and others, 1974). Reports making specific recommendations, such as for drilling sites or engineered

structures, have the thrust of selling ideas, often to specific readers, and must be organized and worded accordingly.

Outlines and further suggestions for several kinds of reports are presented in Section 16-4. No preexisting outline, however, provides a basis for actually beginning a specific report, whereas the following questions may:

1. In view of the project's purpose and a final review of the literature, what are the more valuable conclusions resulting from the study?
2. What data and relations led to these conclusions?
3. Were the methods of the study unusual enough so that they should be described? Regardless of their originality, will a description be needed to convince the reader of their validity and precision?

In order to adopt a direct writing style at the outset, respond to these questions as if they were being asked by a reader. For question 2, for example, list the data and relations in the order that will be most convincing to the reader. Write as though you were talking to the reader, or perhaps as though you were talking informally to several geologists. Go over what you have written several times, on several days, and at times when you are not rushed.

When you are satisfied with your answers to the three questions, recompose the answers into a summary of the project. Give the purpose first, then the methods, then the chief findings, and finally the conclusions. This summary will be a brief version of your report and might be condensed later into the report's abstract. The purpose and conclusions may be brought together to make the first paragraph of the report itself. Before organizing further sections, however, complete and study the map and sections as well as other illustrations that will contribute directly to the statements of your summary. You may want to modify your summary after doing these things.

16-2. Major Illustrations First

Maps, cross sections, and columnar sections convey most of the data in geologic reports. If they are prepared before the report is written, the report is likely: (1) to be more accurate than otherwise; (2) not to repeat information shown clearly on these illustrations; and (3) include descriptions of data and relations not apparent in the illustrations. If pencil drafts of the illustrations have not been completed in the field (Sections 1-7,6-5, and 11-9), they should be completed before summarizing the field study, as described above.

The final illustrations should meet the needs of the project yet require as little time and expense as possible. If the map and cross sections are placed on one plate, readers can visualize the geology in three dimensions conveniently. The plate should be as small as consistent with clarity, and Fig.

16-1 suggests a layout. Use of color on the final map is desirable and practical when only a few copies will be needed, whereas colored maps and sections are costly to reproduce and are usually published only by government agencies. When planning a map for publication, the publisher's requirements must be determined at the outset.

A major question is whether the geologic map will need a topographic base or whether a planimetric base of drainage and roads will be adequate. An inexpensive way to produce a combined topographic and geologic map is to draft the geology in black ink on a green chronoflex topographic base (Section 6-1) or on a screened black reproduction of the topographic base. When printed by most of the methods described below, the black ink lines will reproduce distinctly darker than the green or screened lines, so that topography can be distinguished from geology. If mapping was done on plane table sheets, and the contours and other geographic features will obscure the geology if all are shown in black, the geography and contours can be traced first in black and reproduced as a screened transparent positive on which the geology is inked. Use of a standard topographic map as a base is limited by the fact that it will be illegible when reduced more than 50%.

Geographic names must be accurate, and all names used in the text of a report should appear on at least one map accompanying the report. The Domestic Names Committee of the U.S. Board on Geographic Names supervises the standardization of geographic names in the United States, and only names authorized by this committee appear on published maps and charts of the U.S. Geological Survey, the U.S. Forest Service, and the National Ocean Survey. These sources thus serve as standards for use on new geologic maps and in reports. The basic policy of the committee is to

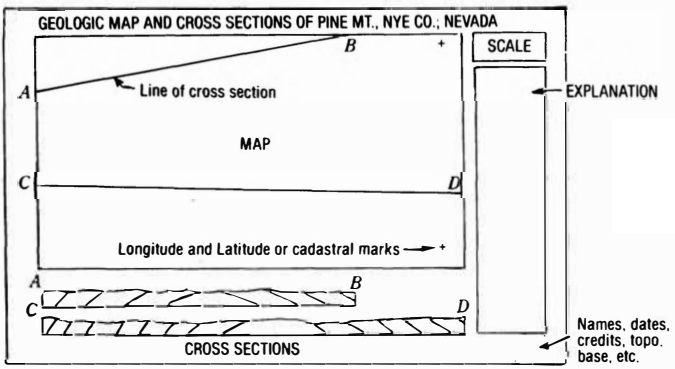

Fig. 16-1. Layout of map, cross sections, and explanation. The title is generally placed along the upper or lower margin or in a box in one of the corners. See figures and text that follow for details.

follow present-day local usage of names. If locally named features that would be useful on a map are not named on the published maps and charts mentioned above, it is advisable to write the committee about the use of the new name. Before concocting names for completely unnamed features, it is recommended to read the section on geographic names in Bishop, Eckel, and others (1978) before proposing a new name to the committee.

Engineering geologic maps may cover such a wide variety of rock properties and other information that more than one map may be needed. *Documentation maps* show locations of all measurements, samples, or observations as well as the data obtained. *Derived maps* present information extrapolated over relevant areas, generally by colors, patterns, or contours. *Structure contour maps* are derived maps showing elevations on a unit contact or other surface of interest, and *isopach maps* are contoured so as to show thicknesses of a unit or of overburden. Additional kinds of derived maps show various grades of a rock property, or presence or absence of a property or a critical unit (Section 5-7). Where a surficial deposit covers another deposit of interest, the colors or patterns for the two units are interstriped, or other patterns or colors are used to indicate the unit sequence. Complex sequences can be indicated by brief logs at data sites (Fig. 5-10). Still another kind of derived map shows areal distributions of units and structures at some specific depth or at some elevation above a datum. Varnes (1974) has described and illustrated several kinds of engineering geologic maps, and examples of actual map series are those by Easterbrook (1973,1976) and Pewe and Bell (1976).

Duplication processes range greatly in cost, convenience, and nature of products, and may limit the size of the final plate. The information given here is general and should be checked thoroughly at local blueprint companies. For large plates, such as geologic maps, the least-expensive prints are made from a transparent or translucent original by the diazo process (and similar processes), which give black, blue, or brown lines on white paper or transparent Mylar base. The paper copies often yellow with age and are not strong enough for repeated handling; however, "card stock" gives white-based durable prints. The Xerox Large Document Printer produces copies up to 24 in. wide on paper of good quality and permits reduction from either an opaque or transparent original.

The various "blueprint" processes are generally more expensive because they produce a negative print, and therefore a transparent negative must be prepared first. They give durable prints on high quality paper, with maximum size limited by the size of the vacuum frame available.

Generally the most expensive process is that of having the plate photographed and copies printed from the negative. This procedure permits precise enlargement or reduction and can give large copies (e.g., 42 in. wide) on high quality paper or Mylar.

If copies 18 x 24 in. or smaller will be adequate, *Photomechanical transfer* (PMT) provides excellent copies on a variety of materials at moderate cost. Small illustrations can also be reproduced inexpensively by Xerox or Color Xerox, with enlargement or reduction commonly available.

Drawing the map usually consists of taping a transparent sheet over a penciled compilation and tracing the geologic features in black ink. The features are inked in an order such that features inked later are broken so as not to obscure features already inked (Fig. 16-2). A suggested order is: (1) locations of fossil collections; (2) structure symbols without numbers; (3) faults; (4) contacts; (5) cross-section lines; (6) numbers for structure symbols; (7) numbers for fossil locations; and (8) letter symbols for rock units. If the tracing is not made on a chronoflex or screened map base, these items are inked in order before item 8: (1) culture; (2) drainage; (3) geographic names; (4) contours; and (5) lines of longitude and latitude or lines of cadastral surveys (in most cases these are shown as ticks in the margin rather than across the entire map).

If the units will be patterned in black and white, the patterns are added after the map has been checked and cleaned. Patterns, like colors, are used to emphasize structural relations and to point up locations of certain units. It is generally desirable to keep patterns light except for units that need emphasis and carry no structural symbols (Fig. 16-2). Commonly, alternate units (or more) need not be patterned, because unit symbols identify them adequately. Prepared stick-on patterns (Craftint, Zipatone) are always uniform but are difficult to apply to small irregular areas and to trim around structure symbols and geographic names. It may thus be quicker and easier to hand-pattern all units except those that form large, simple areas. Maps of foliated rocks are more expressive if patterned parallel to the strike of foliation (Fig. 16-2). If structure symbols and numbers prove difficult to draw, stick-on and rub-on copy is available commercially.

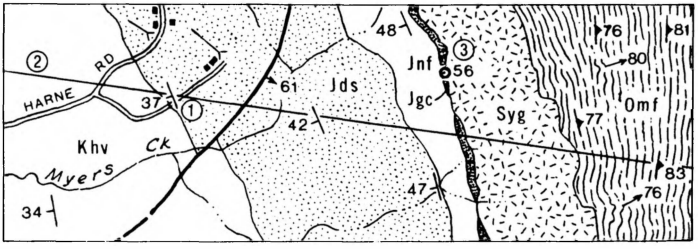

Fig. 16-2. Part of a geologic map, showing features broken for crucial data, as at 1, where section line and road are broken for a structure symbol. Point 2 indicates the section line and point 3 a fossil locality. The patterning of schist, on the right, is drawn parallel to local strike of the foliation.