16 Archaeological Illustration

Archaeologists frequently use **graphical information language** to describe artifacts and other archaeological phenomena in a consistent way. Drawings of lithics, pottery, plans, and stratigraphic sections are not realistic or artistic renderings of what the artist sees, but are technical drawings that present a *selection* of information that some archaeologist considers important, while omitting many details (in fact, an infinity of them) that she or he considers less relevant to the research at hand. This is not to say that the selection of information is arbitrary; in fact, archaeologists employ a wide range of conventions for the minimal information that they expect to find in an archaeological illustration. For some kinds of archaeological observations, such as those on lithics, these conventions are fairly well developed. For others, there is less agreement on conventions. In any case, it is important for archaeological publications to include clear keys that explain what these conventions are.

Today it is increasingly common for archaeologists to use computers and graphical software to produce illustrations. We will discuss some general aspects of computer graphics later in this chapter, but it is still important to have basic facility with hand-drawn illustration. For one thing, you are likely to find yourself at some point needing illustrations when, either because of field conditions or some unforseen problem, you are unable to use a computer. For example, you may have the unexpected opportunity to catalogue a small but really important collection of artifacts in some out-of-the-way museum while travelling without your computer. Drawing, photographing, and recording them now may save you a costly return trip. You do not have to be a great artist to produce a useful archaeological illustration, but you do need to have patience and some basic skills that are not too difficult to learn.

Early Archaeological Illustration

Early archaeological illustrations were much less conventional and more "artistic" than is usual today, with more emphasis on aesthetics than information content. Indeed, some (e.g., figure 16.1) use depictions of artifacts more as decoration than as visual support for the text, or sacrifice accuracy for romanticism.

Nonetheless, many early illustrations of ancient architecture, pottery, metal artifacts, and sculptures provide useful evidence for archaeological finds that, in many cases, have been damaged or have disappeared. Thanks to illustrators who attempted to provide realistic depictions, we can sometimes recognize attributes that the illustrators themselves might never have considered to be archaeologically important.

Styles of Representation and Basic Conventions

Archaeological illustrators of all stripes adhere to a number of conventions, while also varying considerably in illustrating style.

One of the first things you should do if you are about to illustrate a number of artifacts, plans, or sections from a project is to decide what styles you will use. Consistency in style will make the published drawings, indeed the whole publication, look much better, and also facilitates comparison of the items depicted. It is also important that the style *encodes information* that you want to convey to your audience. For example, will stippling indicate cortex on a stone tool, "sickle sheen" polish, or post-depositional damage? Will hatching indicate slip on a pot, red paint, or burnishing? Will reconstructed portions of broken objects be indicatedby dashed lines, dotted lines, or grey lines? For some elements that you will use regularly, such as scales and north arrows, it is useful to make up masters that can be copied easily, whether on computer or tranfers (such as Letratone™). You also need to decide what line thicknesses to use for various purposes, taking care to remember that your drawings will probably be reduced in size.

For all types of artifact illustration, artifacts are depicted as they would look with light raking down on them from the upper left, at an angle of about 45°. This ensures that all the artifacts illustrated on a single page will be illuminated in a consistent way, facilitating comparison and making the page look more unified.

For maps and plans, it is usually best to keep North more-or-less at the top, unless you have strong reason, such as orienting buildings consistently with the door at the bottom, to do otherwise.

Basic Equipment and Supplies

Although many kinds of equipment can be helpful for archaeological illustration, some are essential. Among these is a high-intensity lamp (*not* a fluorescent lamp) to illuminate details on artifacts and create sharp shadows, and a magnifying glass to examine small details on them. A magnifyer with a large lens, some 10 cm across, is best, ideally mounted on a base or swinging arm that allows you to position it with your hands free to hold artifacts. Other tools you should have are good calipers for taking measurements on artifacts, preferably with plastic "jaws" that will not mar the artifacts' surfaces when in contact with them, metal straight-edges, preferably with bevelled edges or raised up on cork bases so that ink will not bleed along them, a drafting table and stool adjusted to comfortable working heights, a guillotine-type paper cutter, plastic triangles, good scissors, x-acto knives and carpet knives, and, of course, technical pencils and drawing pens. Technical pencils that accept 0.5 mm 5H leads work well for most applications. Drawing pens are typically Staedtler or Koh-i-Noor Rapidograph™ pens with an ink cartridge that accepts Pelican™ or similar inks and a fine, tubular point in various sizes that draws the ink onto the paper. Most graphic supply stores sell such pens in sets with pens of various sizes from 000 or 00 up to 3 or 4

Figure 16.1. Illustration of vessels from British and Irish archaeological sites (Camden, 1806:plate 206).

Point Size	0000	000	00	0	1	2	3	4	6	7
Size in mm	0.18	0.25	0.30	0.35	0.50	0.60	0.80	1.0	1.4	2.0

Figure 16.2. Table of point sizes for technical pens.

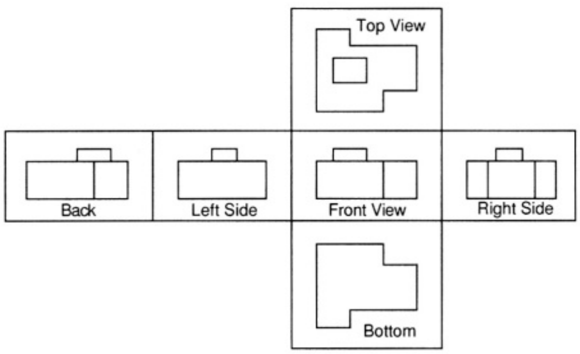


Figure 16.3. Orthographic projection of a simple shape (after Jensen and Mason, 1963:34).

(see figure 16.2). Because most archaeological illustrations are reduced for publication, you will use the larger pen sizes of 1, 3, and 4 most often. For some applications that require a variable line thickness, you should have a quill-type pen with a variety of nibs.

Equipment needs to be maintained in order to operate properly. Technical pens clog very easily and should be cleaned out after use if you do not immediately anticipate using them again. Clean them with great care, as it is easy to damage the tiny wire that transmits the ink.

In addition, you will need supplies. These include replacement leads for the pencils, ink, pen cleaner, plastic erasers, drawing paper (vellum, mylar™, or Strathmore™ single-ply), blades for the x-acto knife, drafting tape (similar to masking tape), frosted transparent tape, Pounce™ powder for keeping the drawing surface clean and dry, and lint-free, cocktail-size paper napkins. It is also extremely useful to have pencils in "nonphoto blue" or "drop-out blue" so that you put labels on drawings that will not show up when the drawings are reproduced, Mylar™ "photo-file" pages, file folders or large manila envelopes in which to sort and store drawings, large pads of layout paper with nonphoto blue grid, and glue sticks. If you will be labelling the drawings directly, rather than on the computer, you should have Letraset™ transfer letters. You will need a variety of point sizes of the last item, and should keep in mind that the point sizes should be large enough that they do not disappear or become illegible when the illustration is reduced to publication size.

For computer graphics you should have some kind of scanner, preferably a flat-bed scanner of at least 300 dpm resolution, or a large digitizing tablet, and software that allows you to trace bit-mapped graphics from scanned images with mouse or stylus to create vector-based graphics (more on this below). You should also have a plotter or laser printer with which to print test output of your drawings and plenty of disk-storage capacity; graphics tend to take up a lot of disk space.

Lithic Illustration

An excellent guide for lithics illustration is Addington (1986). This section only introduces concepts with which she deals in considerable detail. It is important to note that producing a good lithic illustration requires basic knowledge of lithics, including the ability to distinguish the various surfaces, bulbs, platforms, burin blows, retouch, polish, and so on (chapter 8).

One of the first steps is to orient the piece. Lithics illustrations conventionally include views of the dorsal (left) and ventral (right) surfaces, sometimes with a side view between them and

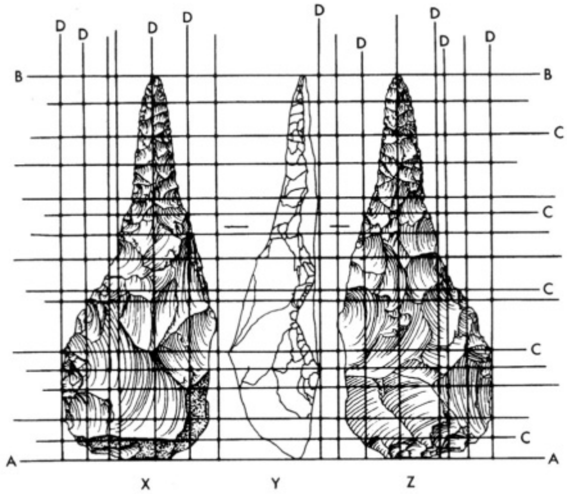


Figure 16.4. A "selective grid" used to ensure that features appearing in several adjacent views are correctly lined up (Addington, 1986).

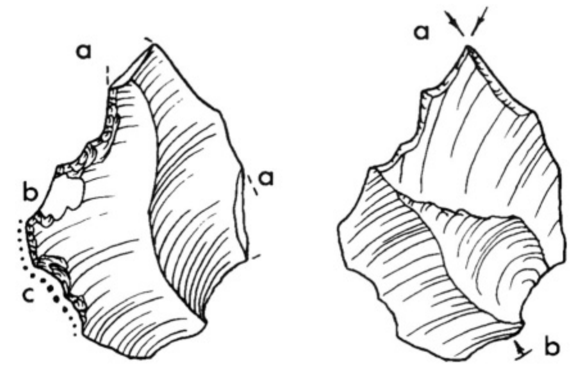


Figure 16.5. Conventions for broken (left, a), bag-retouched (left, b), and abraded (left, c) damage; and for burin blows (right, a) and atypical position of bulb (right, b) (Addington, 1986).

with end views below and above. For flakes and blades, the proximal end, where the bulb and platform would occur, is at the bottom. Bifaces (handaxes), points, drills, awls, and other pointed tools are always shown point up even when the pointed end is proximal (Addington, 1986:43, 46). Cores are oriented with a platform at the top, while choppers are shown with the cutting edge at top, burins so that the burin blows point downward, and endscrapers with the retouch at the top (Addington, 1986:44-48). The articulation of the various views in the drawing (dorsal, profile, ventral, etc.) follows standard drafting conventions by which the views can be "folded" into their correct orientation. This is called **orthographic projection,** in which each view shows the surface nearest to it in an adjacent view, but from an angle that differs by 90° (figure 16.3).

First, you will need to draw the outline of the artifact in either its dorsal or ventral view (one is simply the mirror image of the other). You should *not* do this by lying a flake on a piece of paper and tracing around it with a paper for at least two reasons. One is that even a fairly sharp pencil will add thickness to your tracing and, if the pencil edge is not exactly vertical, there will also be parallax that will distort your tracing. In either case the tracing will not be accurate and will usually tend to exaggerate the flake's size. The other reason is that your pencil will cause edge damage to the flake that could destroy evidence for use wear or retouch in later analysis. Instead, draw a thin, near-vertical line on which you will line up two landmarks, such as pointy protrusions or small points of retouch, one near the top (distal end) and one near the bottom (proximal end), use the calipers on the artifact to establish the distance between these two landmarks, and transfer this distance to marks on your near-vertical line. With a transparent straight-edge, lined up on these two landmarks, you may be able to find a third landmark near the center of the flake, such as the junction of several flake scars on the dorsal surface, that is on the line running between the first two. Then you can measure with the calipers at right angles to the first line to establish the position of landmarks on the left and right edges relative to the central landmark. Alternatively, you may want to lay the flake on a piece of graph paper so that the first two landmarks are on a line, and then draw dots at landmarks along the edge while holding the flake close to the paper, and then filling in between the dots by eye. You can then use the outline twice (trace it in reverse) to fill in the details of the dorsal and ventral surfaces.

When drawing the dorsal surface, you need to pay close attention to the direction from which flakes were struck off, as the inked drawing

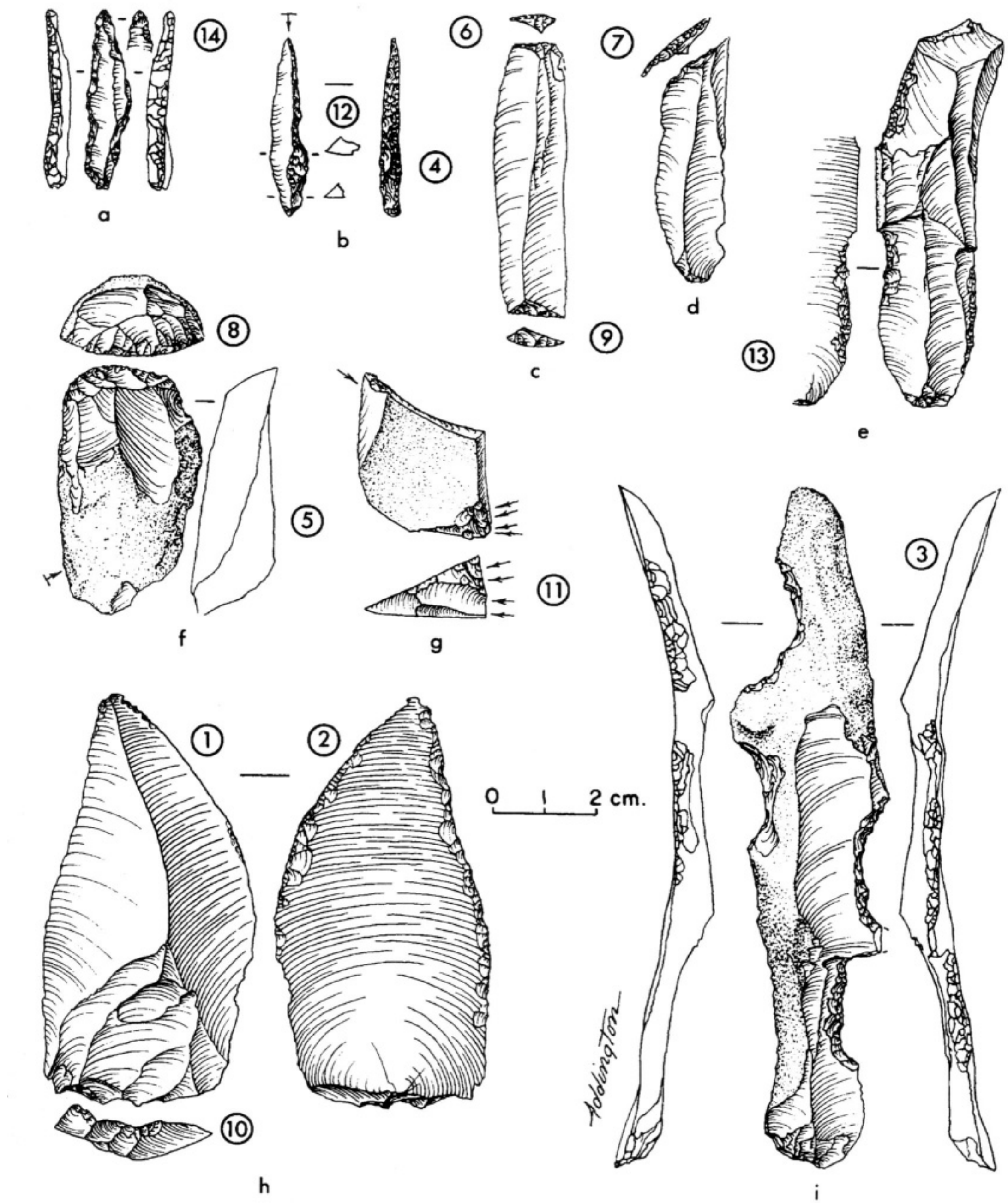


Figure 16.6. Example of a lithic plate with multiple views and correct orientation (Addington, 1986).

must have curved lines, imitating the ripples on flaked flint or glass, that extend away from the point of percussion like ripples in a pond (figures 16.5,16.6). On fine-grained materials, these ripples are generally shown smooth; on coarse materials, such as quartz or quartzite, or on badly weathered pieces, they are often shown discontinuous, in an attempt to give an impression of the rougher surface. For the smoother cases, skilled lithic illustrators often use a quill pen to ink the ripples because it allows them to start out with a fairly thick line and gradually thin it until it disappears part-way across the flake scar. This tends to result in lithic illustrations that look very three-dimensional, as long as it is done with the left-raking light convention in mind. Sometimes there is cortex on the dorsal surface, which most lithic conventions represent with stippling, which consists of randomly placed dots. You should attempt to show the sequence of flake removals wherever possible (Addington, 1986:14).

The ventral surface can be drawn much as the dorsal one, but usually shows fewer details. Apart from retouch or damage near the edges, the surface is smooth and will need to have broad, sweeping ripples inked in that extend outwards from the bulb of percussion. Be sure to include small details of the bulb and platform.

Particularly when the edges are retouched, it is common to add side and end views. To make sure that features in each view line up accurately with the same feature in a different view, you may want to make a "selective grid" in nonrepro blue lines or light pencil that can be erased later (figure 16.4).

A number of conventions for edge details, and the like, are quite important. Dashed lines can be used to indicate where parts of the flake have been broken off, while rows of large dots, graduated in size, can indicate abrasion. "Bag retouch" — flake scars due to post-excavation edge damage — are often indicated the same way as regular flake scars except that the ripples are omitted, leaving the scar white.

On burins, arrows are used to indicate the position and direction of burin blows (figure 16.5). Where burin blows were closely spaced, it is often necessary to stagger the arrows on the drawing to reduce crowding.

Barred arrows, arrows with a "T"-like bar at their base, are used in the dorsal view to indicate the position of the bulb of percussion and direction of flake detachment whenever those are not in the "usual" position at the very bottom of the drawing and oriented vertically. This usually happens on pointed tools that are oriented point-up, shifting the bulb away from the bottom position.

Dash-like line segments between multiple views of the same piece often facilitate orientation of one view to another, although this is usually not necessary unless you deviate from the normal orthographic projection. The dashes are more important when you need to show the location of sections *through* the artifact, in which case they are usually short and are called "ticks" (Addington, 1986:24-25).

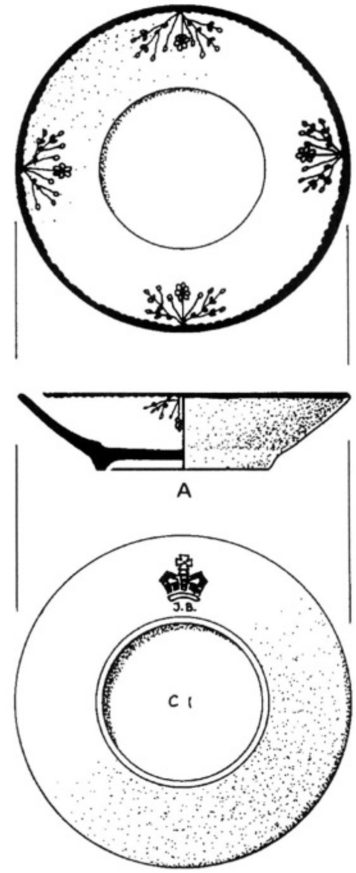


Figure 16.7. A china bowl from an historic site (Newlands and Breede, 1976:135).

Sometimes conventions are necessary to indicate thermal damage, such as pot-lid fractures and fine cracks or crackling on the surface.

Pottery Illustration

Although archaeological illustrations of pottery up to the mid-19th century depicted vessels, whether whole or fragmentary, much as they would look to a person viewing them from the outside (figure 16.1), modern pottery illustrations conventionally depict the interior, exterior, and vertical section of the pot simultaneously (figures 16.7, 16.8). In addition, for sherds they reconstruct as much as possible of the whole shape of the pot rather than just the sherd itself.

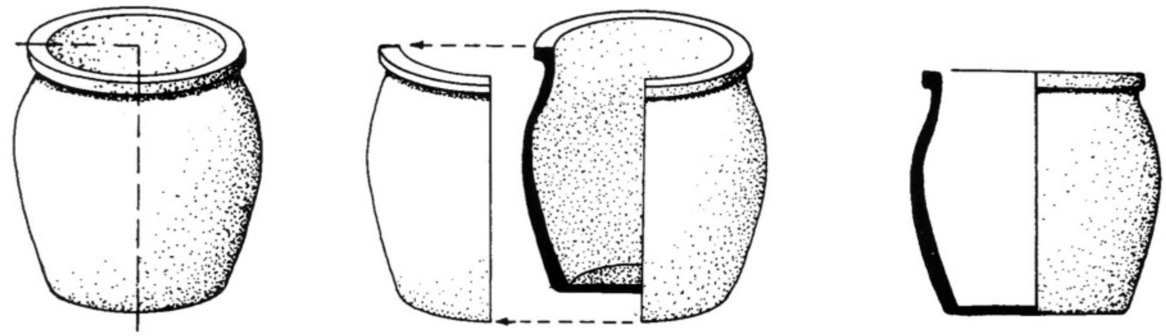


Figure 16.8. Conventional pottery illustrations are based on the concept of cutting away a quarter-section of a whole pot, although in reality the drawings are usually reconstructed from fragments (Newlands and Breede, 1976:127).

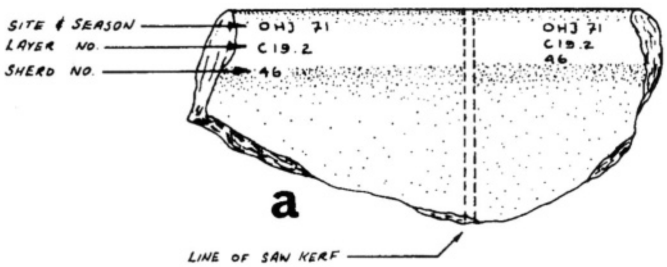
The drawing is divided in half, so that the exterior of the pot appears on one side, while the other is a cutaway view of the interior and a vertical section through the wall of the pot. Some archaeological projects (most European ones) follow the convention of putting the cut-away on the left, while others (most American ones) put it on the right. The reconstruction of the pot extends from the rim downward as far as the lowest point on the sherd, but omits the base, as there is no evidence for the form of the pot's lower portion. Sometimes a drawing of a sherd's outline is superimposed on the technical drawing to show how much was reconstructed. It may not be obvious exactly how such a reconstruction is accomplished, so let us examine the steps.

The first thing to do is to establish the inside diameter of the pot at its rim, assuming that the pot is circular in plan. Of course this will not work for pots that are oval, rectangular, or irregular in plan. For most pots, however, diameter is easily determined with a diameter chart and the sherd held "at stance" (see p. 162). Once determined, this diameter becomes the length of a horizontal line segment, the **stance line**, drawn on a piece of vellum or tracing paper, and the line is bisected by a perpendicular line segment that extends downward (figure 16.14).

Next we need to draw the profile and section of the sherd. There are several ways to do this, including complicated procedures with triangles and calipers; here we will mention two of the most common, reasonably fast ones.

One way to make an accurate tracing of the interior and exterior profiles is with a profile guage or "formaguage." This is a tool with a large number of thin, metal teeth sandwiched between metal brackets in a comb-like arrangement, and held somewhat loosely in place either magnetically or by friction. Profile guages were used by plasterers and cabinet-makers to help them reproduce the profiles of cornices and moldings, but can work just as well to record the curves of pottery surfaces. When you push the guage's teeth against an irregular surface, the teeth move to conform to its shape, and retain an image of this shape when you pull the guage away again. The guage can then be placed against the vellum to allow you to trace the profile onto paper with a sharp pencil. It is very important to be sure that you held the profile guage so that it was perpendicular to the stance plane of the rim, so that it gives you an accurate vertical profile of the sherd, and along whatever line gives you the longest profile. You will have to record the profiles of the exterior and interior separately, and then join them together in such a way as to represent the sherd's thickness accurately. To do this, measure the sherd thickness near the top, bottom, and middle of the profile with calipers and use the three measurements as a guide as to the spacing between the two profiles.

One alternative to using the profile guage to draw the profile is to trace it directly from a sherd that has been sawn along a radial section with a lapidary saw. Some archaeologists cut sherds so as to expose the interior fabric or to



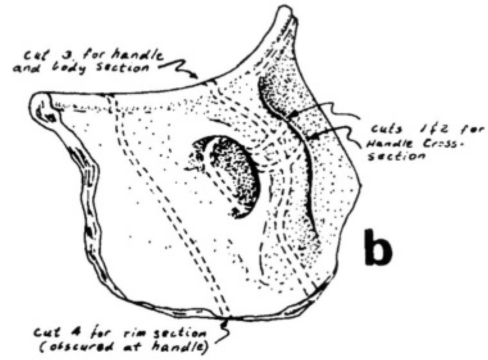


Figure 16.9. Cutting line along the longest vertical of a rim sherd (a), and the several cuts that are needed for adequate drawing of a handle sherd (b)(Holladay, 1976:227). Note that registry numbers must be located where they will not intersect cut lines, and all pieces should be labelled.

produce thin sections for mineralogical examination. As a biproduct of this analysis, the cut sherds provide ready-made radial sections and profiles that can easily be traced onto paper (Holladay 1976). If you plan to be sectioning pottery, therefore, you should consider where to make cuts so that they will also be useful for illustration (figure 16.9). Quite often, these are places where the cuts would also provide useful technological information in section. To make the tracing, first draw the stance line, and then hold a stance block (figure 16.10) so that its edge is aligned with the stance line. Place the sherd so that its rim makes continuous contact with the stance block and the section lies flat against the paper, and then trace it all around. Holladay (1976) recommends tracing with the pencil or pen refill inserted in a special block that holds the point as close as possible to the edge of the sherd (figure 16.11). Otherwise the tracing will exaggerate the thickness of the section. It is also useful to make small marks around the tracing to indicate places where there are grooves, decorative panels, or **carinations** (inflection points or sharp turns in the profile). This method results in accurate sections and profiles that can be produced much more quickly than with traditional methods that employed many measurements with calipers.

Holladay's cut-sherd method provides a correctly stanced drawing of the sherd's section. If you use a profile guage or some other method to make the section, you need to transfer it onto the drawing of the stance line in such a way that the angle between the stance line and the profile reflects the stance of the sherd itself. This can be somewhat tricky to do with a stance block and goniometer. It is generally better in these instances to stance the sherd upside-down (figure 16.13) and use a right angle triangle held along the sherd's radial plane to find the correct horizontal distance between a point on the sherd's rim and the bottom of the profile. Trace the section onto the drawing with the interior of the rim just touching the stance line (when you ink it later, the stance line should not touch) and the section arranged at the proper angle. You now have most of the cutaway half of the drawing completed.

The next step is to reflect the outer profile to the opposite side. Fold the drawing along the vertical line segment that bisects the stance line, and trace the outer surface so that it makes contact with the stance line (figure 16.14). You now have the outline of the exterior. Then draw any of the horizontal grooves that might appear on the exterior or interior on the appropriate side. Also draw lines to mark any sharp edges or

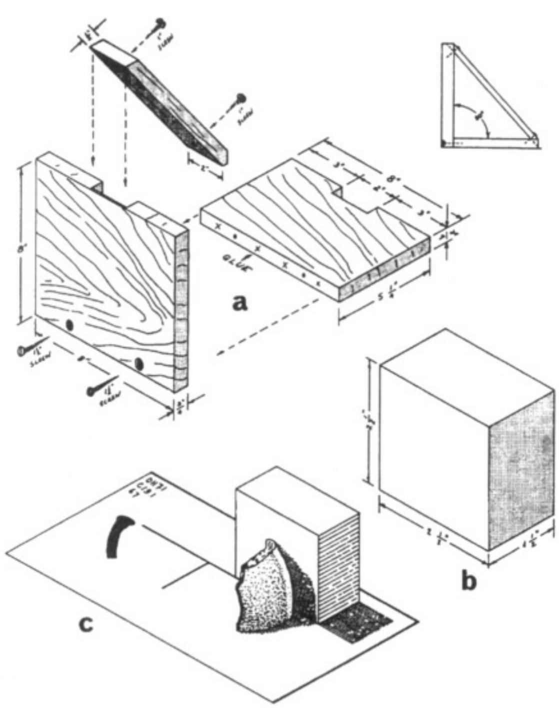


Figure 16.10. Construction of a stance block (a) for large vessels, and (b) for small sherds. Use of the stance block is shown in (c) (Holladay, 1976:226).

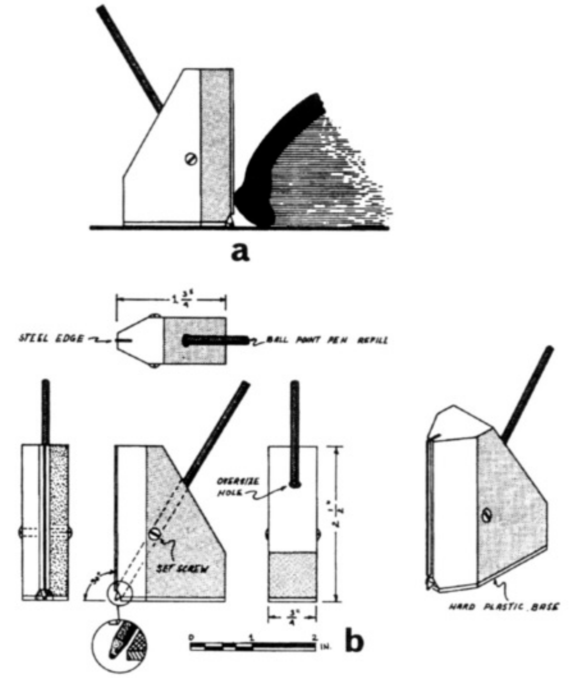


Figure 16.11. Holladay's (1976) design for a block, or 'circumference scriber' to hold the pencil or pen refill used to trace the outline of a sherd's section.

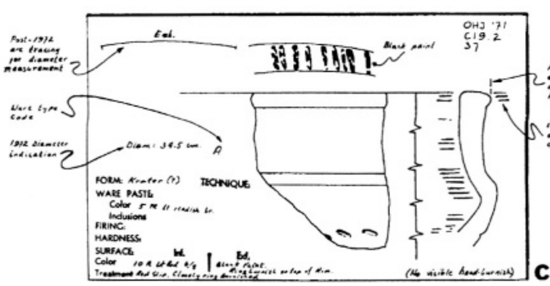


Figure 16.12. A card for recording the drawing of a sherd. Note that a tracing of the stanced rim at upper left can be used to establish the rim's diameter, and is marked "Ext" to indicate that it was traced on the exterior, not interior. The traced section is shown in correct orientation to the horizontal stance line at right, and can also be used for the exterior profile. The small "ticks" around the section can be used to mark the position of groves, carinations, and painted horizontal lines that should appear on the final drawing. Face-on views of the sherd and other details, such as the painted lip here, can also be added. Comments indicate burnish, paint colors, and so on (Holladay, 1976:227).

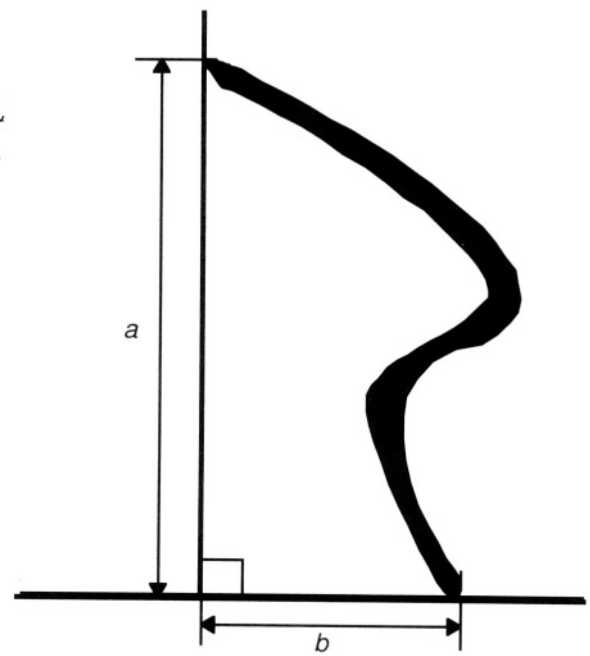
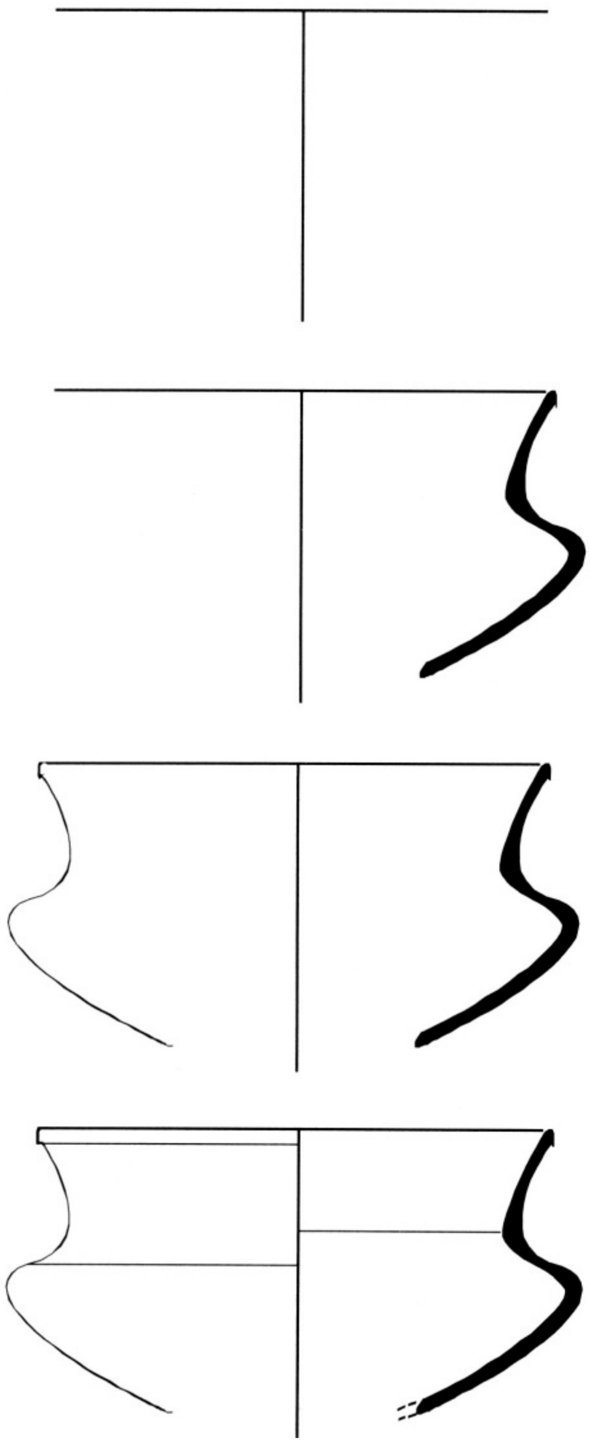


Figure 16.13. Measuring the height (a) and radial distance (b) of the sherd when stanced correctly can be used to ensure that the section is stanced correctly on the drawing.



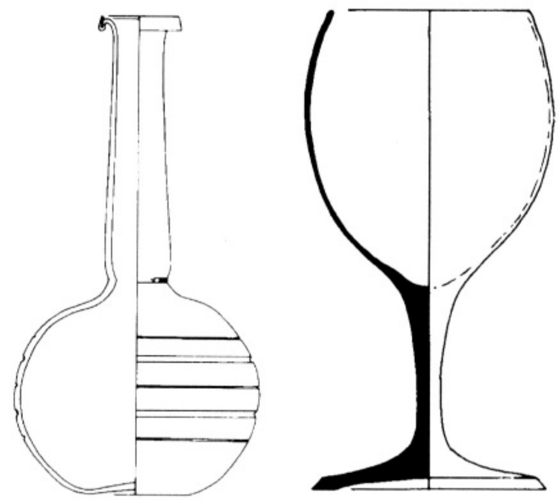


Figure 16.15. Technical drawings of glassware are typically very similar to those of pottery vessels. Left, Roman glass (Hayes, 1975:169); right, 19th-century glass (Newlands and Breede, 1976:135).

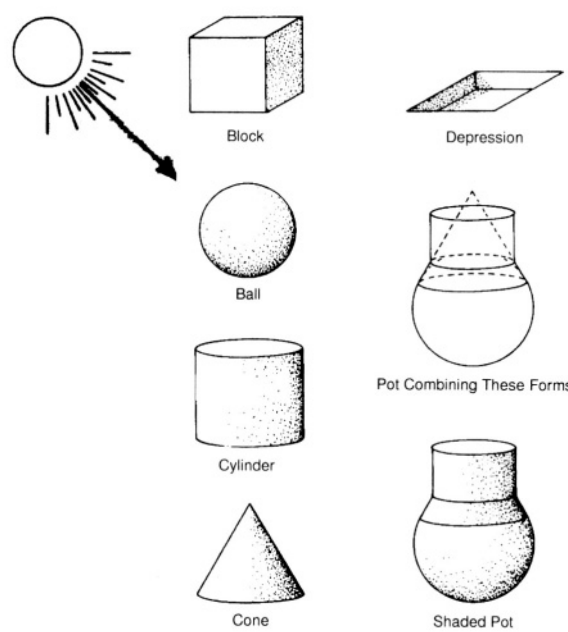


Figure 16.14. Sequence from stance line with correct diameter (top) to finished inking (bottom). Note that horizontal lines do not touch the section so as to avoid obscuring detail of lip or carination, and that the folded-over rim is not undercut on the left side.

Figure 16.16. Shading objects to simulate illumination from the upper left (Newlands and Breede, 1976:132).

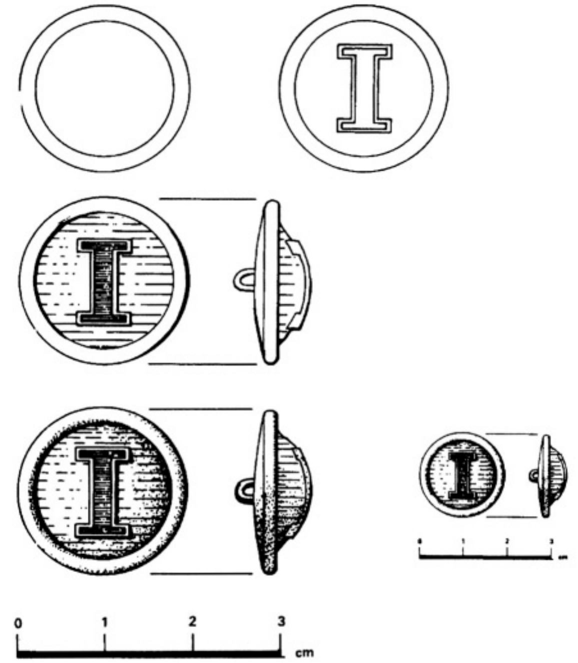


Figure 16.17. Steps in drawing a military button: drawing its outline (top), pencil drawing (middle), and finished inking (lower left), followed by reduction by 50% (Newlands and Breede, 1976:134).

carinations, such as protruding parts of the lip. Note that when you do this, you should continue the horizontal line all the way across, to represent the way a whole pot would look. Do not show indentations of the profile that would be hidden by the overlap of a rim on the exterior side, but only on the cutaway side. Finally add the representation of any decoration, such as painting or incision, that may be preserved on the sherd.

Now that the pencil drawing is complete, you should trace it in ink onto vellum or mylar™ film. Conventions for pottery inking vary, but should specify the line thicknesses used for each part of the illustration and the kinds of hatching, shading, or dot pattern to represent different surface treatments and colors.

Although it is now possible to illustrate pottery on the computer, the sequence of operations would be much the same as for hand-drawn pottery illustrations.

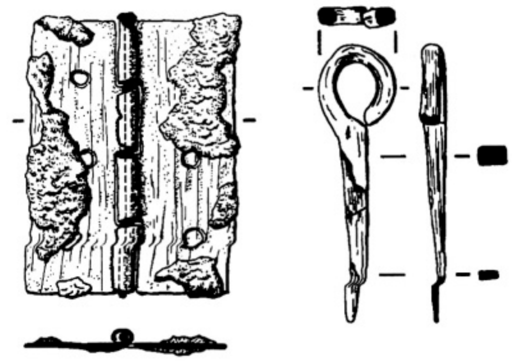


Figure 16.18. Inked illustrations of a metal hinge (left) and metal eyelet (right) with appropriate cross-sections (Newlands and Breede, 1976:135).

Illustrating "Small Finds"

Small finds are so varied that it is impossible to give a brief set of instructions that will be applicable to the illustration of all of them. Glass vessels (figure 16.15), metal and wooden tools (figure 16.18), stone beads, buttons (figure 16.17), and jewelry, and clay figurines (figure 16.18) all require their own sets of conventions for technical illustration.

Unlike pottery and lithics, which are usually drawn actual size and reduced later, small finds are often drawn at an enlarged scale in order to ensure that small details are not omitted.

One of the few conventions common to all these drawings is shading that simulates lighting from the upper left corner (figure 16.16).

Maps and Plans

Of the many sources available on cartography, a must-read is Mark Monmonier's (1991) *How to Lie with Maps.* No matter what guide you follow, it is important to remember that a map is a much simplified and often distorted model of reality. First we stretch and bend reality by trying to fit three-dimensional phenomena onto two-dimensional paper, then we omit lots of details and add new ones that are really our own interpretations.

Among the things we should keep in mind when drawing maps and plans are the degree to which they are likely to be reduced in publica-

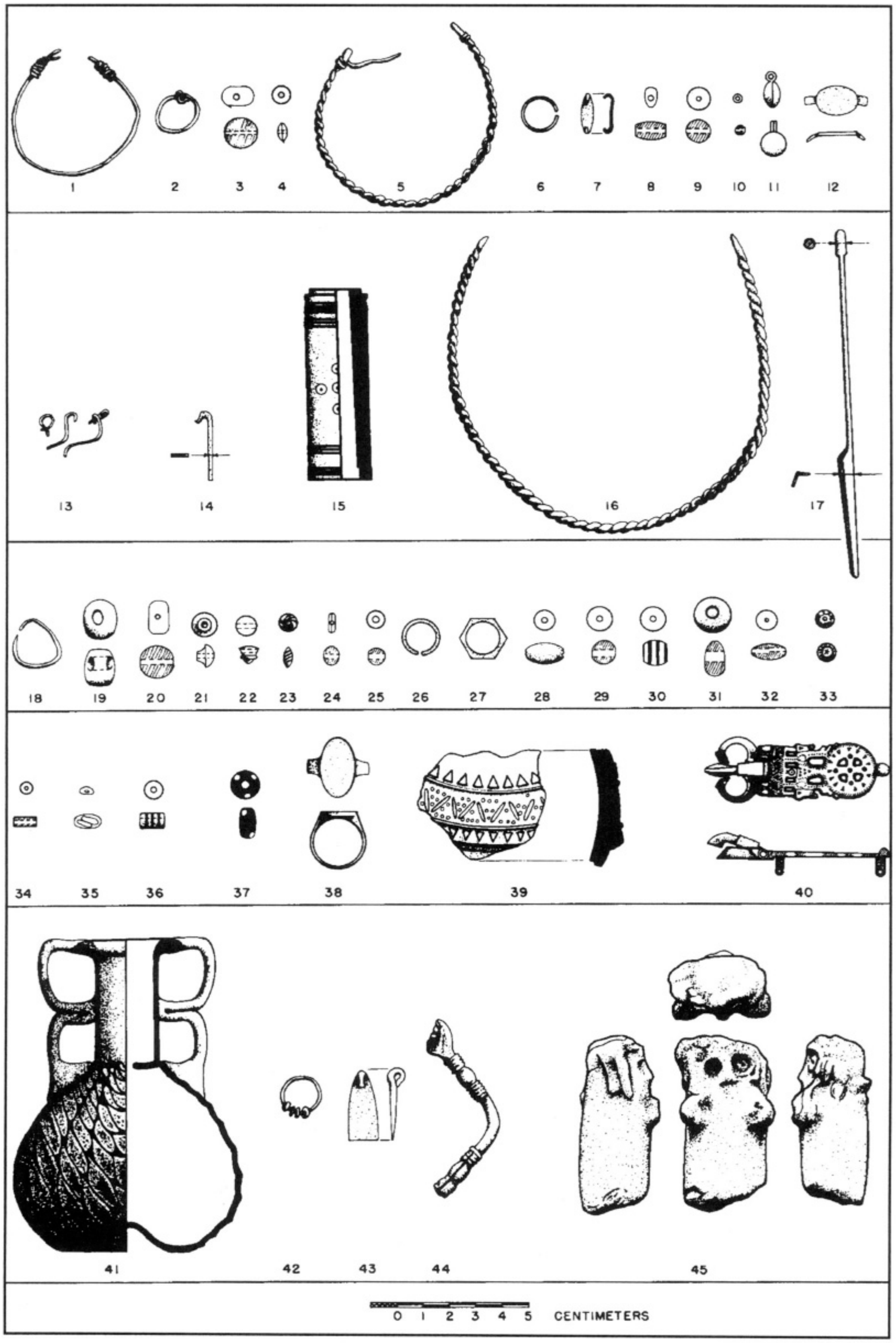


Figure 16.19. Example of a "small finds" plate from an archaeological expedition, including many small beads, metal jewellery, and a figurine (Tushingham, 1972: fig. 28).

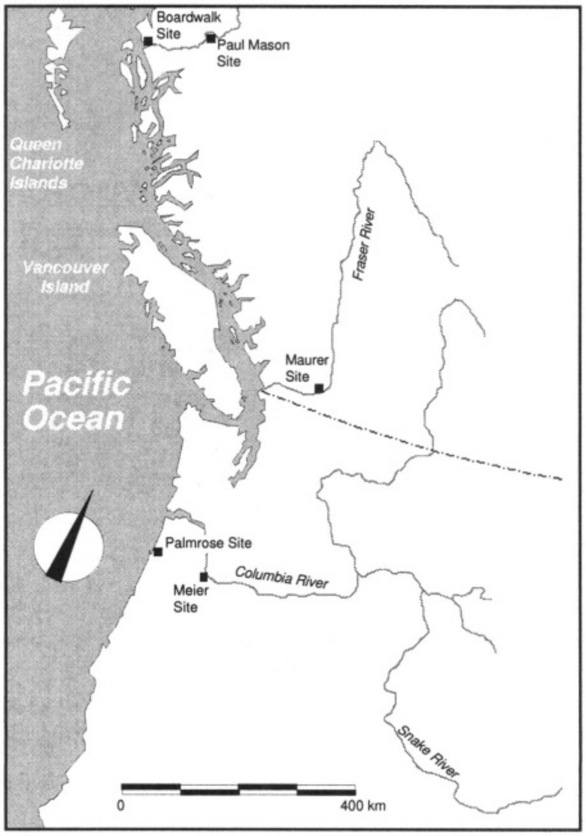


Figure 16.20. Map of the Northwest Coast of North America, showing the location of a few major sites but with only enough detail to provide orientation (Coupland and Banning, 1996).

tion, and the level of precision that is actually meaningful. Some archaeologists exert themselves to ensure that they measure their field plans with a precision of ± 1 cm, forgetting that the line thickness of a pencil at a scale of, say, 1:200 represents 20 cm! Whether or not that degree of precision will be visible on the (reduced) published plan, you should also think carefully about how meaningful it is. It is not to advocate outright sloppiness in field measurement to say that misplacing one of several dozen small stones on your map by 1 or 2 cm would be unlikely to alter your, or anyone else's, interpretation of archaeological context at the site. Consequently, you should also consider how much time you can afford to spend on ensuring extreme precision in your drawing of very small details.

Furthermore, everything that applies to graphs (chapter 2), such as ink:data ratio and chartjunk, is equally applicable to maps. Be sure your maps are not overly complicated, crowded, or misleading. A simple map that gives prominence to the information you are trying to convey (figure 16.20) is much more effective than one that crams in so many things that the point of the map is lost.

Among the things that *every* map and plan should have are the following. First and foremost, it should have a scale. It is best to make up a standard scale template on transfer paper or your computer that you can use repeatedly on maps of the same scale. Keep the scale simple and do not label more increments than is necessary to give readers a sense of magnitude. Note that it is always better to show a ruler-type scale than simply to say, for example, "1:200," because the latter will become meaningless when some printer or publisher reduces your drawing to fit a printed page. You should also have a simple, tasteful north arrow, and I would recommend orienting your drawing so that north is at least toward the top of the drawing, unless you have strong reason to do otherwise. The exception is in polar regions, where north arrows are often meaningless and lines of longitude may be much more useful for orientation. It usually helps to show where your map or plan fits into the larger picture. For the map of a small region, for example, you can show an *inset map* (or key map) of a much larger and more familiar region with a small rectangle marking the position of the territory covered on your map. In other cases, lines of latitude and longitude mark the map's position on the earth's surface. For plans of excavation areas on sites, by contrast, you should show labelled grid lines or grid corners (marked by circles or crosses) to record where the drawing fits into the overall site map, as well as the position of **benchmarks** that were used as reference points during mapping, and some levels (in meters above sea level) to position the features on the plan in their vertical dimension. Different phenomena would require different conventions for portrayal on the plans. For example, you might need conventions for different materials (stone, clay, gravel, brick), for reconstructed structure walls (perhaps dashed or greyed), for pits and postmolds, and for find-spots of individual artifacts of various kinds.

Only 15 years ago, producing a publishable map required making an original drawing on vellum or paper and then tracing it in ink onto Mylar, and the drafting room was filled with transfer sheets for lettering and applying north arrows and other devices onto the Mylar. Today you can still do maps this way, but increasingly it is better to do them on a computer. Often the first map you prepare on the computer takes even more time than drawing the map by hand with pen and ink. The great advantage is that, once you have stored a base map on your computer's disk, you can re-use it as many times as you like with variations. For example, you can modify the base map to show sites of different periods, vegetation zones, and so on. Computerized base maps are particularly convenient when you have just done a survey and would like to show a series of maps depicting site distributions at different points in time. They are also very useful for excavation maps. To copies of a base map you can add different layers or features and thus document the site's stratigraphic history or show distributions of lithics, bone, or pottery.

Stratigraphic Sections

As Harris (1979) notes, the style of stratigraphic sections varies considerably from project to project. As with maps and artifact illustrations, it is important to remember that a section drawing is an archaeologist's interpretation, in this case the interpretation of the depositional relationships represented in the section. Consequently, rather than attempting to illustrate sediments realistically, it is often better to use conventions that clearly represent the archaeologist's understanding of what is going on in the section, and to complement it with photographs and sediment samples.

No matter what conventions you use to represent interfaces and various kinds of sediments in the section drawings, there are some things that every section drawing should include. As with maps, the section drawing should include reference points that indicate where the section fits in space. First, there should be at least one horizontal line labelled with its elevation above sea level, or else a vertical scale labelled in meters above sea level. Either there should be vertical lines to mark the position of any grid lines that intersect the section, or there should be arrows and labels that relate the two ends of the section to points on an accompanying map. The vertical and horizontal scale of the drawing should be obvious, and there should be a clear label, such as "North Section" to make it easy for viewers to orient themselves. Unexcavated sediments are usually distinguished in some way, often with a "woven" type of hatching.

Computer Scanners

Today it is remarkably cheap and effective to scan drawings and even flat artifacts into a computer file that can then be edited with graphic software. The scanners and the software that accompanies them allow you to adjust the contrast, darkness, resolution (number of pixels per inch) and, where relevant, color. For most illustrations, which will normally appear in black and white, you should set the scanner on black and white or greyscale, and no more resolution than you need, to minimize the file's space on disk. Small hand-held scanners are convenient when you need to produce digitized images in the field or in a museum. Flat-bed scanners, which look like photocopiers, are much better for most work because they allow you to scan a fairly large area in one pass. For digitizing large or irregular objects you may want to capture images with a video camera connected to a computer. For maps, plans, and sections, a digitizing tablet on which you trace the image with a stylus can be very useful, and makes it unnecessary to trace the image on the screen. Most of these produce what is called a "bit-mapped" image, which consists of a matrix of numbers corresponding to the pixels on your monitor or printer. For black and white images, the numbers at each pixel position represent either 0 or 1; for greyscale and color images each pixel carries more data. Bit-mapped files are very wasteful of disk space because even white pixels must be recorded.

Computer Graphics

A "raw" scanned image will probably not be suitable for publication and, at a minimum, will have to be "cleaned up" on the computer with graphics software. Except for photographs that you would like to publish as halftones or on the internet, usually it is much better to trace the scanned image with a mouse or stylus, omitting details that are not necessary for your illustration, and then to discard the original scanned image. This results in a much cleaner-looking image that can be manipulated easily and takes up less disk space because it is no longer bitmapped. Typically the tracing is called a vector image because a line segment is represented as the vector between two points (thus the computer only needs to record the position of two points and the thickness and color of the line that joins them). The graphic software allows you to make a wide array of line segments, polygons, rectangles, circles, arcs, and smooth, curvy lines called "bezier curves." When selecting a graphics package, you should pay attention not only to its own features but also to the various file formats that it will read and write. Otherwise you may find that your beautiful illustrations do not output properly to your publisher's page-layout software or printer.

Preparing Graphics for Publication

All illustrations, whether hand-inked or computer-generated, must be produced with the requirements of publication in mind. One of the most common mistakes archaeologists make when they produce their own illustrations is to forget what will happen to the illustration once submitted to a publisher. Most importantly, they should keep in mind that the illustrations will usually be reduced in size. Reduction can often improve the illustrations' appearance, as small defects will tend to disappear. Unfortunately, reduction will also cause thin lines to disappear or too-dense hatching to "bleed" together, so that it looks black instead of hatched. Many people who see the originals of good archaeological illustrations think they look too "blocky" because the lines are thick. In fact, heavy lines are necessary to prevent them from disappearing when reduced. The same thing applies to the point size of text in any labels on your maps and figures.

One very helpful way to avoid this problem is to make a test sheet that allows you to see the effect of various degrees of reduction. Print or ink a variety of your common symbols and conventions along with a row of line segments of varying thicknesses, and label each with a font in a different point size. Then make copies of the test graphic at several different reductions and display the result next to your drafting table or graphics computer. Keep in mind that plates illustrating several artifacts are commonly reduced to as little as 20% or 25% of the original size, while maps and section drawings are often published at 40% or 50%. The width of text columns in the journal or book series in which you intend to publish will give you some idea of the likely finished size of your graphic.

You should also pay close attention to publishers' instructions about the form and format of your illustrations. Typically publishers will ask for PMTs (photo-mechanical transfers) or black-and-white glossies of a particular size. They will also ask you to mark the back of each with a figure number or plate number, your name, and an arrow pointing to the top of the graphic. Some publishers will ask for copies of computer-generated graphics on disk. In that case you will need to know what file format they require, such as TIFF or EPS (encapsulated postscript).

Conclusions

Illustrations are an important aspect of communicating archaeological information to colleagues and the public, yet they are coded representations of our observations, and not merely artists' impressions. Illustration conventions are like the lexical conventions of digital databases. Technical drawing requires patience and basic skills rather than artistic creativity. Effective illustration also requires care to ensure that important information is obvious and clear, and not lost among unimportant detail or obliterated by size reduction during publication.

References Cited

Addington, L. R., 1986, *Lithic Illustration. Drawing Flaked Stone Artifacts for Publication.* University of Chicago Press, Chicago.

Adkins, L., and Adkins, R. A., 1989, *Archaeological Illustration.* Cambridge University Press, Cambridge.

Byrd, B. F., 1989, *The Natufian Encampment at Beidha. Late Pleistocene Adaptation in the Southern Levant.* Jutland Archaeological Society Publications 23. Aarhus University Press, Aarhus.

Cambden, W., 1806, *Britannia: Chorographical Description of the Flourishing Kingdoms of England, Scotland, and Ireland, and the Islands Adjacent from the Earliest Antiquity,* vol. 1, 2nd ed. John Stockdale, London.

Coupland, G., and Banning, E. B., eds., 1996, *People Who Lived in Big Houses: Archaeological Perspectives on Large Domestic Structures.* Prehistory Press, Madison, WI.

Harris, E. C., 1979, *Principles of Archaeological Stratigraphy.* Academic Press, London.

Hayes, J. W., 1975, *Roman and Pre-Roman Glass in the Royal Ontario Museum.* Royal Ontario Museum, Toronto.

Hoernes, M., 1892, *Die Urgeschichte des Menschen.* Vienna.

Hole, F., 1977, *Studies in the Archeological History of the Deh Luran Plain. The Excavation of Chagha Sefid.* Memoirs of the Museum of Anthropology 9. University of Michigan, Ann Arbor.

Holladay, J., 1976, A technical aid to pottery drawing. *Antiquity* 50:223-29.

Jensen, C. H., and Mason, F. H. S., 1963, *Drafting Fundamentals.* McGraw-Hill, Toronto.

Monmonier, M., 1991, *How to Lie with Maps.* University of Chicago Press, Chicago.

Newlands, D. L., and Breede, C., 1976, *An Introduction to Canadian Archaeology.* McGraw-Hill, Toronto.

Tushingham, A. D., 1972, *The Excavations at Dibon (Dhíbân) in Moab. The Third Campaign 1952-53.* American Schools of Oriental Research, Cambridge, MA.