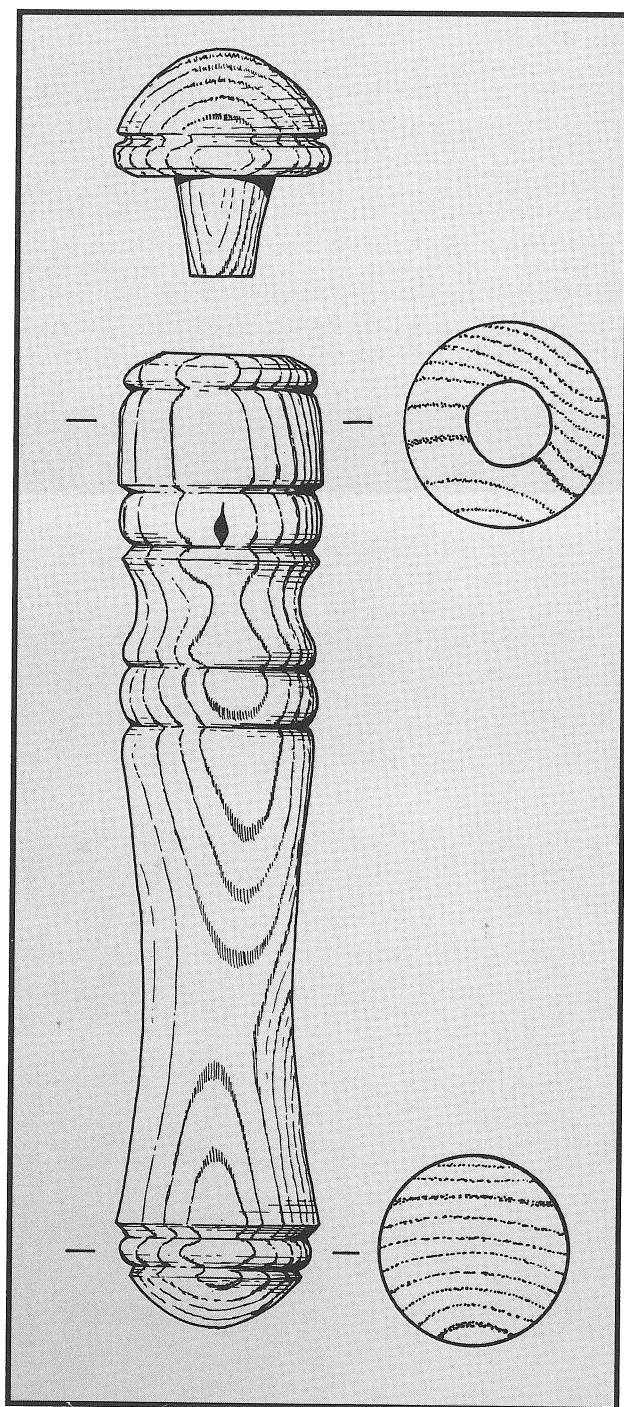


# THE ILLUSTRATION OF WOODEN ARTEFACTS:

An introduction and guide  
to the depiction of wooden objects

by STEVEN J ALLEN



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ASSOCIATION OF  
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# **THE ILLUSTRATION OF WOODEN ARTEFACTS:**

**An introduction and guide to the depiction of wooden objects  
from archaeological excavations.**

*by* STEVEN J ALLEN

(Technical Paper Editors: Barbara Hurman, Mélanie Steiner)



**ASSOCIATION OF ARCHAEOLOGICAL  
ILLUSTRATORS & SURVEYORS**

OXFORD 1994

Cover illustration:  
Yew needle case by Lesley Collett  
Scale: x 1 1/2 (Modern)

# ASSOCIATION OF ARCHAEOLOGICAL ILLUSTRATORS AND SURVEYORS

Technical Paper Number 11, 1994

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## ***INTRODUCTION.***

For those illustrators who are not confident drawing wooden finds, there is little information available. They may not know the features which should be reproduced and may have no-one associated with their place of work who can be approached for specialist advice. This Technical Paper is intended to assist those illustrators who have the job of drawing wooden small finds but lack reference material or training facilities.

Wooden finds, may be expected to be recovered whenever waterlogged deposits are excavated on archaeological sites. An illustrator working on material from such a site, needs to be familiar with the information which drawings of wood must convey, if their work is to be of use to finds researchers or as a part of the site archive.

Organic finds study and that of wood in particular, has received a raised profile in recent years. However there are still few archaeologists who have made a study of wood and many reports are still written by non-specialists. Although dimensions and possible functions of objects are usually noted, species identifications are not always given and the methods of manufacture are often omitted altogether. This is partly due to the limited number of courses available at universities and also to the reluctance of archaeological units to pay for external specialist expertise. Sometimes the responsibility for the publication of wooden small finds and structures is devolved upon the illustrator. A good illustration may well compensate for the rather basic written description given to the object in the report.

Section 1 is an introduction to the features which can be found on a wooden object.

It is intended to provide some background and to demonstrate the sort of evidence which should be looked for and illustrated.

Section 2 is concerned with the techniques which can be used to illustrate this evidence and offers some thoughts on conventions.

Section 3 covers the application of these techniques to actual small finds.

Section 4 covers larger timbers and the structures they can form.

A glossary of technical terms is appended. The terms which appear in the glossary are printed in the text in *italic*. A bibliography is provided, covering those works which are referred to in the text, and these are recommended to the illustrator for further reading. Should readers have any constructive comments or criticisms arising from this paper they are invited to contact the author for further discussion, through the Association of Archaeological Illustrators & Surveyors.

## 1.1 The structure of wood.

In order to illustrate a wooden artefact it is essential to know something of the structure of the natural material from which it was made. It is not proposed to repeat here any definitive botanical description of the range of wood species which can be found but rather to identify general points which can assist the illustrator. For a popular introduction to trees and their structure, Mitchell (1986) is available. More detailed information can be found in Jane (1956) and for specialist species identification the reader is referred to Schweingruber (1982).

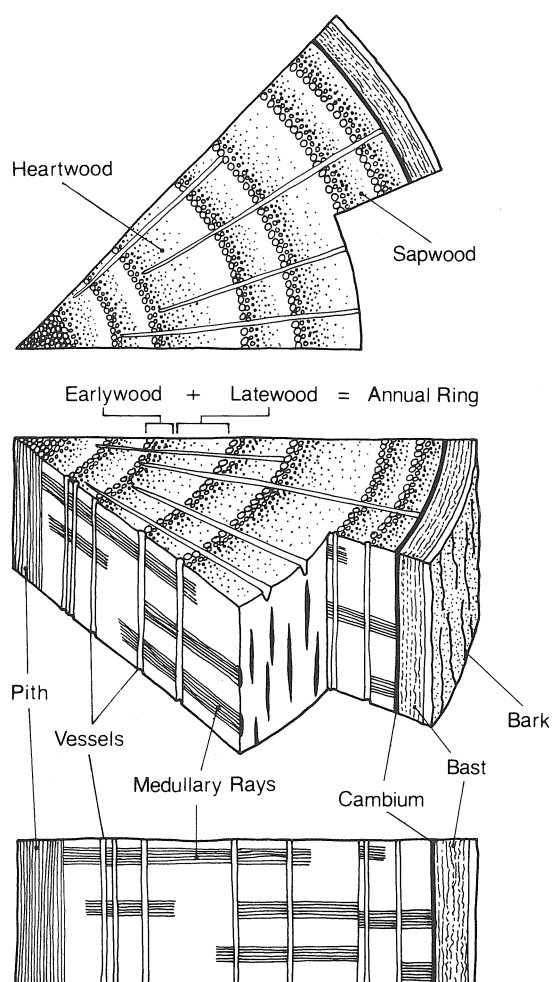
Very broadly, wood can be divided into hardwoods, those derived from deciduous (broadleaved) trees, and softwoods, derived

from coniferous trees. Their wood has distinct cellular structures which allow them to be identified (Figures 1 and 2). Many species of hardwood produce large vessels or pores in the early part of the growing season and smaller ones in the later part of the year. These form growth rings which, in northern temperate climates, usually correspond with one year's growth, hence the alternative term 'annual ring' and the trees are known as *ring porous* hardwoods. Other species of hardwood which do not form distinct growth rings from vessels are *diffuse porous*. Softwoods can have very fine ring divisions; a few have large *resin canals*.

The exact arrangement of the cells, their relative size, distribution and the detail of certain cell structures are diagnostic of a particular *genus* or even *species*. Whilst an illustrator cannot be expected to carry out specialist species identification, the illustration of the artefact must reflect the macroscopic characteristics of the wood from which the object was cut. It must also be shown how the object was related to its parent log. The reasons for this and the techniques which may be used will be discussed below (Section 2.2).

The appearance of wood structure when seen from certain angles is shown in Figures 1 and 2. The *transverse* section (Figures 1a and 2a) is a horizontal section through the tree which shows the annual rings and *medullary rays* in plan. These rings, of *vessels*, *fibres* and/or *tracheids*, are concentric to the core of the tree or *pith* and appear as bands of tiny holes. The *medullary rays* radiate from the centre of the tree and appear as broad or fine lines. In many species the rings may not be visible to the naked eye. In others the rays may be much more prominent, especially if some degradation has taken place.

1a Transverse Section



1b Radial Longitudinal Section



1c Tangential Longitudinal Section

Figure 1. Macroscopic structure of a hardwood

The *radial longitudinal section* (Figures 1b and 2b) is a vertical section taken through the length of the tree along one of the rays. In this section the pores forming the rings are sectioned longitudinally and appear as a series of long, fine lines crossed at right angles by fine shorter lines (the rays) which in some species such as Oak (*Quercus* sp.) can be grouped in 'flame-like' sheets.

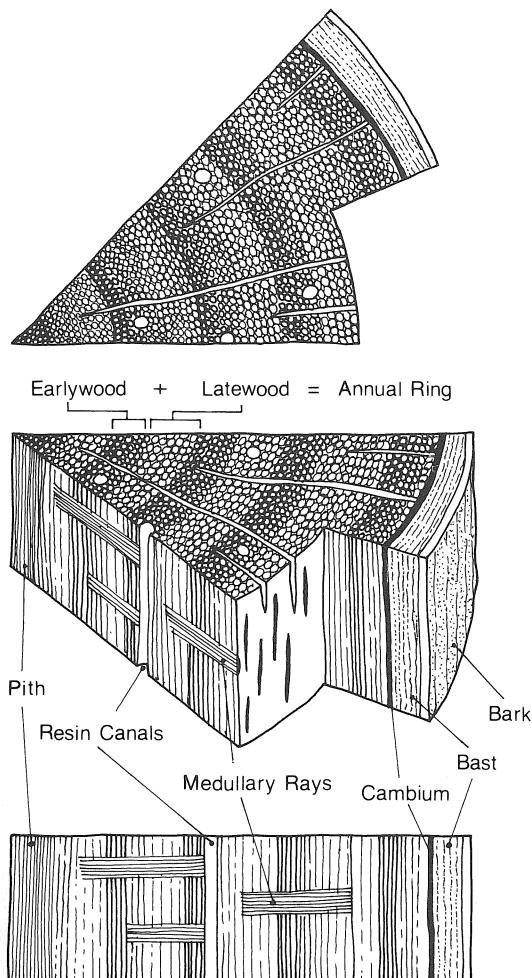
The *tangential longitudinal section* (Figures 1c and 2c) is a vertical section through the length of the tree at right angles to the axis of the rays. Several rings may be cut across and these will appear as bands of short, fine, discontinuous lines, streaks or ellipses, depending on the size of the wood in question. The ends of the rays themselves will appear as quite short, broad lines.

It will not always be possible to see each of these sections directly on any given object, since many surfaces will have been rounded off or cut obliquely across the grain. Bowls are a case in point. However, at least one will usually be visible somewhere on the artefact. Once found, the planes of the other two sections can be readily determined. Identifying these features allows the object to be orientated to its parent log, an essential step in understanding how the object has been made.

It should be stressed that such features as ring and ray orientation may be difficult to identify at first, but this will become easier with practice. Every opportunity to examine modern wooden artefacts such as T-squares or even rolling pins, should be taken and compared with Figures 1 and 2. Practice with solid wood is essential, and plywood veneering or formica should not be substituted.

Although the bark will follow the general pattern of the wood grain beneath, its appearance is very different. Bark is quite variable and that at the base of the trunk will be different to that on its branches and twigs.

2a Transverse section



2b Radial longitudinal section

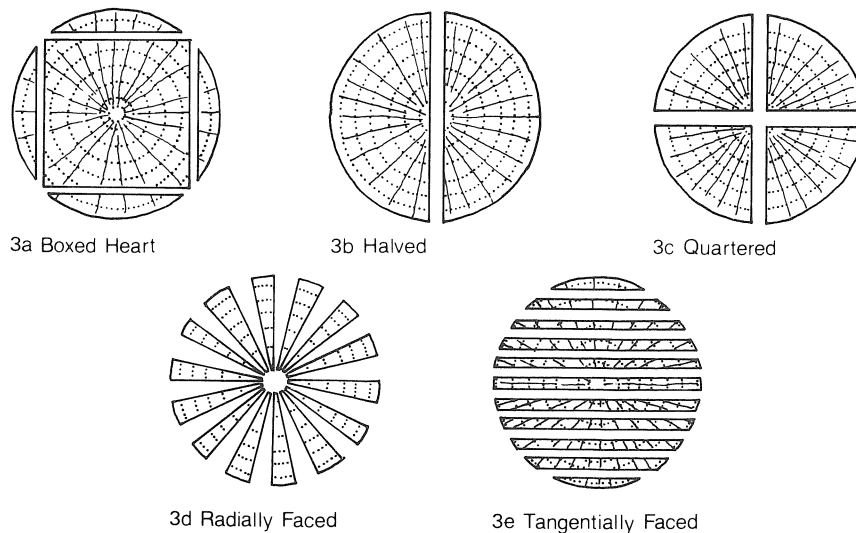
## 1.2 The conversion of wood.

The process of breaking up a tree into selected sizes and shapes of timber is called *conversion*. Knowing where the wood came from in the tree will suggest how the tree was converted and can suggest what tools were used to achieve it. The conversion affects the appearance of the wood, determining the configuration of the grain. It will also, to a large extent, determine how the object was subsequently worked and why the tools were used in a particular way. The conversion establishes the properties of the piece of wood and suggests how these might have been exploited by its users. Finally, conversion defines the weak spots of the artefact and may reveal how and why the object broke up and was discarded.



2c Tangential longitudinal section

**Figure 2. Macroscopic structure of a softwood**



**Figure 3. Common types of conversion**

Common conversions include squaring off the faces and edges (Figure 3a Boxed heart), cutting into two parts along its length (Figure 3b Halving), or four (Figure 3c Quartering), cutting into segments radiating around the centre along the *medullary rays* (Figure 3d Radial facing), or cutting into parallel slices (Figure 3e Tangential facing). Some pieces of wood merely have the bark stripped from them and are not further divided.

### 1.3 Working marks.

On small objects the working marks created during the conversion of the timber will rarely be found due to subsequent shaping processes. The marks which should survive best are those from the tools used last, from the final stage of working. These can be used to help identify the types of tools and the way in which they were used. The fine ridges and grooves on turned artefacts are frequently present and can indicate the use of chisels and gouges. Marks produced by a blade strike such as that delivered by an adze or axe have two important characteristics; the *stop line* and the *signature*.

The *stop line* is the point at which the cutting stroke ended. The edge of the blade digs slightly into the surface of the wood to leave a straight or slightly curved cut, depending on the profile of the blade, which can subsequently be worn to leave a fine ridge or depression. The length of this cut can be used to measure the minimum width of the tool blade.

The *signature* is the set of extremely fine parallel ridges running along the facet at an angle of 30-90 degrees. These marks are caused by irregularities in the cutting edge of

the tool blade which are unique to an individual tool at a particular time. Where two or more signatures from the same tool are found it may be possible to overlap them and so extend the minimum width of the blade impression. If the same signature is found on different artefacts, it is likely that they were worked at about the same time with the very same blade. Their depiction is therefore highly important.

Sawing produces a distinctive series of ridges which are created by each cutting stroke of the saw. Machine saws produce very fine parallel ridges on a fairly smooth surface. Hand-saws tend to produce coarse, non-parallel ridges. Some pieces of wood are sawn through from both sides, the wood being turned over at some stage during the cutting process. The sawn face therefore usually exhibits at least two sets of saw marks, the last set tending to remove those of the first set(s). Even this may not result in the wood being completely cut through but leave a small stub linking the two pieces together. The two parts are then finally separated by snapping. Such a process will leave a small scar of broken wood in the angle between the sets of saw marks.

Worked artefacts can carry the remains of marking-out lines; shallow lines scored into a surface to mark where to cut a joint and where to finish working. These may have been ruled with a square or compass or cut with a knife.

Modern damage to a wooden artefact can be recognised by the lack of abrasion on the broken fibres and the generally fresher appearance of the exposed wood. Damage to waterlogged oak best exemplifies this. The surface of oak tends to be a greyish-black or brown colour. Damage removes this leaving the exposed wood completely clean and unstained.

## 2.0 THE DEPICTION OF ARCHAEOLOGICAL WOOD.

The features referred to above provide primary evidence for the various crafts concerned with the production and use of wooden artefacts. They are essential to an understanding of the object and must therefore be included in the illustration. In contrast to other finds materials such as pottery, glass, flint, leather and metalwork, there are few established conventions for wood and there has been little discussion of them. There is perhaps less published guidance on the illustration of wooden artefacts than on almost any other class of material.

Some preferred methods of depicting the natural and man-made features of various common artefacts will be described here. The views to be drawn should be chosen to show the most information. Suggestions for dealing with particular object types will be discussed in Section 3.

### 2.1 *The working environment.*

Wood should be approached with care and a few words of warning may be of help. These are necessary to reduce the possibility of accidents and damage. It may be best to start by stating some obvious points; waterlogged wood is wet! Small artefacts may have lost much of their structural strength. They can be very fragile and soft. Wood should be drawn before conservation, since the latter processes can lead to shrinkage, with the consequent loss of the original proportions of the artefact and in some cases, the destruction of surface detail.

The object may very well arrive on the illustrator's desk after an indeterminate period in storage. The packaging will vary but should correspond to the advice published in Watkinson *et. al* (1987). Before opening, check to see whether the contents include any biocides or other chemicals and ask those responsible if these create any health and safety hazards. If so, the appropriate precautions must be taken, such as wearing gloves and protective clothing. Dangers caused by inhalation or splashing should be rare but if necessary goggles, a face mask and adequate ventilation must be used.

Where the artefact has been wet-packaged and not monitored by a conservator, the water will almost certainly not have been changed. Minerals absorbed during burial will in consequence have leached out into the water. The dull slimy orange staining frequently

present on such artefacts is the result of this process. This, and any mould which may have formed can be gently washed off with cold, clean water. Hard mineral concretions should not be removed since this can damage the underlying wood surface. Some decay may have set in, the amount of which depends on the length of time since the initial processing and the storage conditions. Decaying wood will therefore smell quite bad when the packaging is opened, but this odour will disperse after a few minutes. The object may be in several pieces within the packaging. Fitting these together involves careful manipulation which can require several pairs of hands and much patience. Quantities of wrapped modelling clay and/or a light padded flexible wire frame may be useful for holding the artefact together temporarily whilst it is drawn. Care should be taken that the object is not marked or damaged during this process.

Fragile but intact objects can be stood on a padded board. If suitable material is not available then one can easily be made up from a small rigid board covered with a double layer of 'bubble pack', each layer firmly secured with masking tape. This can be used to move the object whilst measuring and minimises the amount of contact with the wood.

As a general point on packaging, artefacts such as barrel staves, should be treated with great care when packing to avoid any careless damage.

Wood cannot be properly drawn whilst it is dripping wet. A good supply of tissue or other acid-free absorbent paper should be used to soak up excess water from the surface of the artefact, using a gentle dabbing action to leave a semi-matt finish to the surface being drawn. The working surface itself can be covered with a sheet of clear polythene to protect any underlying paper and to make the surface easier to wipe clean. A supply of clean fresh water should be kept available for the periodic rinsing of the pieces of wood in order to prevent them drying out. Take care that the light source that is used does not dry out the wood too much. A small houseplant spray bottle can also be used to damp the wood.

If the object has to be kept out of its original packaging for any length of time, for instance overnight, a good sized plastic container with a re-sealable lid can be used for temporary wet storage. The object must be completely immersed within the container, the lid closed and then left in as safe, cool and dark a place as can be found.



A good adjustable light source, such as an angle-poise lamp is essential. This should be used to provide oblique lighting to search the object for toolmarks and facets which may only show up under such conditions. Take care not to get any water onto the lamp or to handle electrical equipment with wet hands or gloves.

The use of flat sheets of clear acetate film are to be recommended as drawing material. This may be laid over the flat portions of objects which can then simply be traced off on to the film and then transferred to drawing film or paper with the aid of a light-box. It is especially useful when trying to reproduce complex grain patterns or toolmarks and *signatures*, or on complex objects such as combs. Acetate has the advantage over tracing paper in that it does not take up moisture from the object and subsequently warp or distort, as well as being fully transparent. It is better than standard drawing film in that it is re-usable, as drawing ink can be wiped off with a damp cloth or tissue. For this reason it is not suitable for a permanent archive record or for a publication drawing. One piece can last for an entire assemblage until the surface is too scratched to be of any further use. All traced measurements should be checked against the original artefact with a pair of dividers.

A visualiser can be used to draw objects to scale. The object is placed on the lower shelf with a ruler next to it. Tracing paper or drafting film is placed on the glass sheet, located above this, and the image projected on to the paper. Check the size of the image by placing another ruler next to it. Once the image has been adjusted for size and focus, usually by turning two handles at the front of the machine, the outline and detail can be drawn in. Fluorescent tubes will not throw out as much heat as an incandescent light source. Whilst such visualisers are useful for flat objects, the limited depth of field makes them unsuitable for rounded or lumpy objects. One alternative is the use of a drawing machine similar to those described in Goddard (1993).

A pair of dividers, callipers and an engineer's square will be of particular value in measuring from the object. A number of setsquares of different sizes will also be useful. If frequently drawing at a scale other than 1:1 it may be worth investing in proportional dividers. A radius chart can be used for bowl fragments, but the results should be used with caution (Section 3.1). Profile gauges or template formers, 'toothcombs' should be avoided when drawing profiles as the teeth will

permanently mark the soft surface of the wood. Even plastic equivalents can damage or crush a thin, soft bowl fragment if used carelessly.

Standard illustrative methods of presentation should be used when considering the drawing. The light source should strike the object from the top left hand corner of the page. End views and side views should be projected from the main view. Cross sections should usually be located on the right hand side of the drawing and the points at which they were taken indicated to distinguish them from end views.

Pen sizes are of some importance in defining texture, grain and markings. When illustrating these artefacts the problems of reduction should be borne in mind. Most lines should not be reduced to 0.1mm at the very least for publication at a reduced scale, although the quality of reprographic equipment may permit thinner lines. Smaller pen lines may not be suitable for isolated lines but can be used to emphasise thicker lines and for subdued shading. For large objects and correspondingly greater reductions, similar proportions of pen size may be employed. Some illustrators favour the use of a Gillott mapping pen which can provide a good deal of flexibility in line thickness, particularly where extremely fine lines are required. The results achieved can be quite impressive. In general, a flexible response to the choice of pen sizes should be encouraged where features of the artefact demand them.

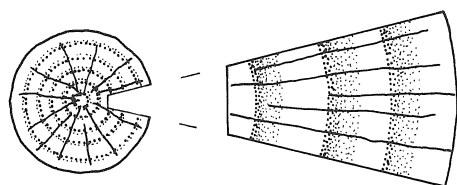
Lines should always be drawn freehand, observing the irregularities of the artefact. Ruled and compass drawn lines should be confined to the suggestion of missing parts of the object. Only where a ruled marking out line has been preserved on the artefact and not subsequently distorted is it acceptable to rule a line on the illustration.

## 2.2 *Natural features.*

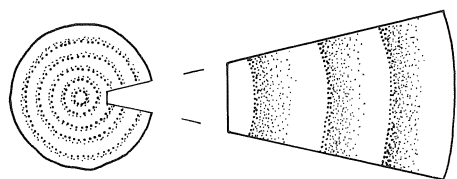
Natural features can be defined as all those aspects of the artefact which are a direct result of the growth of the wood. They include such features as grain (rings, rays) and knots. Essentially this becomes a problem of depicting the various parts of the *transverse*, *radial* and *tangential sections*. The way in which these should be drawn forms the key to the accurate illustration of wooden objects.

The *transverse section* is essential for the detail of the conversion technique employed. In this section the *vessels* and *tracheids* are seen end on and appear as tiny holes which may or

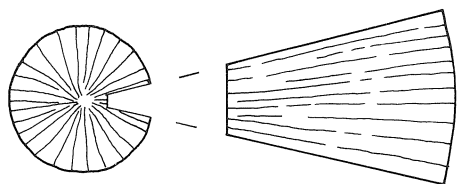
may not be visible to the naked eye. As these are the ends of round tubes, it is best to depict them on small artefacts using stipple. The hardwood species which are *ring porous* with prominent rays are shown as in Figure 4a.



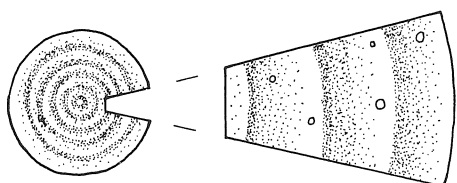
4a Ring Porous Hardwood with prominent rays



4b Ring Porous Hardwood without prominent rays



4c Diffuse Porous Hardwood



4d Softwood with Resin Canals

**Figure 4. Conventions for depicting cross sections of different wood types**

The *earlywood* is distinguished using a single row of dots in a larger pen size, the same size as that used for the outline of the object. The *latewood* is shown with a more random stipple in a smaller pen size, dense where it is close to the earlywood and more dispersed towards the outside of the ring. The resulting concentric bands of stipple are quite effective in showing the orientation of the rings and distinguishing them from other features. Some pieces of

wood, such as slow grown oak, may have rings which are extremely close together. If it is not practical to draw every ring, then a selection should be shown, but these should reflect the real density.

The rays are seen in plan as broad or narrow discontinuous lines and if they can be seen clearly by the naked eye they should be drawn. Ash (*Fraxinus excelsior* L) is a *ring porous* hardwood, but the rays are normally too small to be seen without a microscope. Such hardwoods without prominent rays may be depicted as Figure 4b. Some hardwoods do not have a very prominent ring structure or are *diffuse porous*. In such cases only the ray structure may be apparent. With such species the vessels should be omitted altogether and a representation of the rays drawn in, as illustrated in Figure 4c.

Softwood sections should be stippled with a uniform pen size to define their more porous character. The stipple should still be arranged in broad bands to define any observable ring boundaries. Care should be taken not to make the stipple so dense as to reproduce in solid black when reduced. Their rays are extremely narrow, visible only under a microscope and so may be omitted. Where *resin canals* are present, they may be depicted with a small open circle (Figure 4d).

Knots, the stubs of side shoots or branches, should be drawn in the manner appropriate to their wood type where they are viewed end on. Care should always be taken to depict the flow of the grain around the knot.

The other views should be drawn using line to reflect the fibrous nature of the material. Prominent lines of grain can be drawn and used to provide the framework for the shading. Such lines may be thickened or emphasised with a thinner parallel line, especially on open grained woods such as oak.

Areas of bark can be shown using a light stipple (Figure 16). An object will not always show a uniform, straight grain pattern on the surface which is to be depicted. Where, for example, the end grain is cut across obliquely, the *vessels* and *tracheids* will appear as bands of short, fine lines, increasing in length as the form of the surface approximates to one of the longitudinal sections.

### 2.3 Cross sections.

Whatever surface views are drawn of the object, the *conversion* of the wood must be shown. This has important implications for the

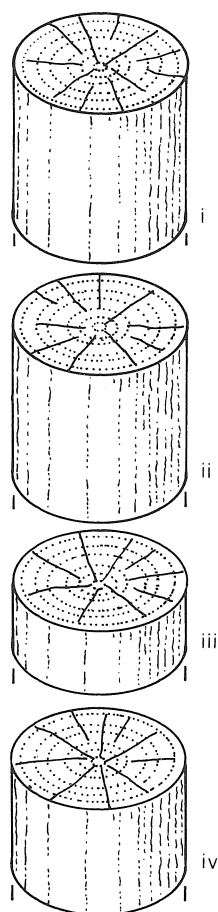


manufacture of the artefact and any possible shrinkage since burial. By depicting the *conversion*, there is the additional advantage that it will automatically differentiate drawings of wooden artefacts from those of similar form but different material, such as bone.

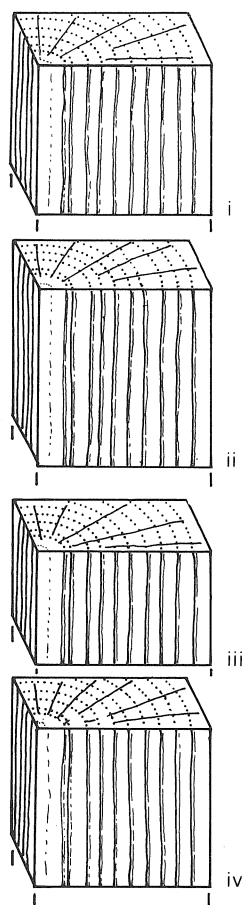
The most straightforward and logical place to show the conversion is on the cross section. Although most artefacts drawn have cross sections either blacked in or hatched, it is absolutely not acceptable for wooden artefacts. Their macroscopic structure is relatively predictable and can be compared to a stick of seaside rock. Figure 5 shows the *transverse sections* of a piece of wood at various points along its length. 5a shows a simple piece of straight roundwood. A cross section cut anywhere along this piece of wood at (ii), (iii), (iv), will show the same relationship of the rings and rays to the outer visible part of the wood. The cross section at (i) is the same as at (iv), there are no anomalies present along the

length of the wood, therefore the centre of the *pith* will be in the same place relative to the bark at sections (ii) and (iii) as it is at each end and anywhere else along this piece of wood. Figure 5b makes the same point in relation to a straight grained, converted piece of wood or timber. Figure 5c shows what happens when an anomaly is present. In this case a piece of wood not cut parallel to the axis of the centre of the tree.

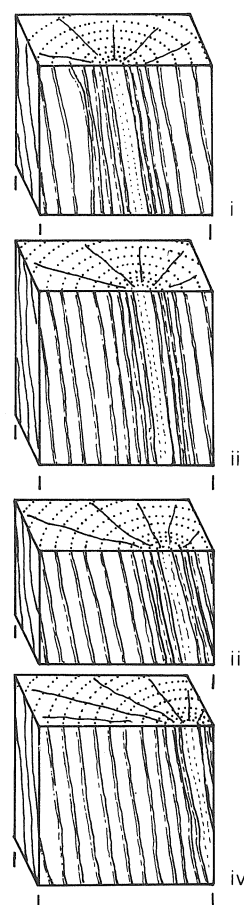
Note especially the relationship of the rings to the grain. The centre of the tree, and hence the centre, to which the rings are concentric and the rays radiate from, drifts off to the right of the nearest face the further down the timber we look. Knowing what pattern is present on the exposed ends (i) and (iv) and looking at the pattern of the grain allows us to predict that the relationship of rings and rays to the outer surface of the object will be as shown should we choose to place a cross section at, for example (ii) or (iii).



5a Sectioned Roundwood



5b Sectioned Converted Wood



5c Sectioned Converted Wood with off centre heart

Figure 5. Depicting transverse sections

Some recent publications have begun to show *conversions* on their wooden small finds, for example those from medieval Exeter (Allan and Morris 1984), and this trend is likely to continue. An alternative method of showing conversions can be seen on some wood from the Somerset Levels drawn by Sue Rouillard (Orme and Coles 1983), where the rings are omitted and the *medullary rays* are shown.

When a cross section is drawn of a wooden artefact, it is perfectly possible to project the

*transverse section* onto it. It presents the *conversion* in a readily understood and convenient form without the need for supplementary diagrams. It also distinguishes wooden objects from all others. Hatching or blacking in such sections without indicating the conversion adds nothing to our understanding of an artefact and conceals information which is essential to complete comparative studies and object identification.

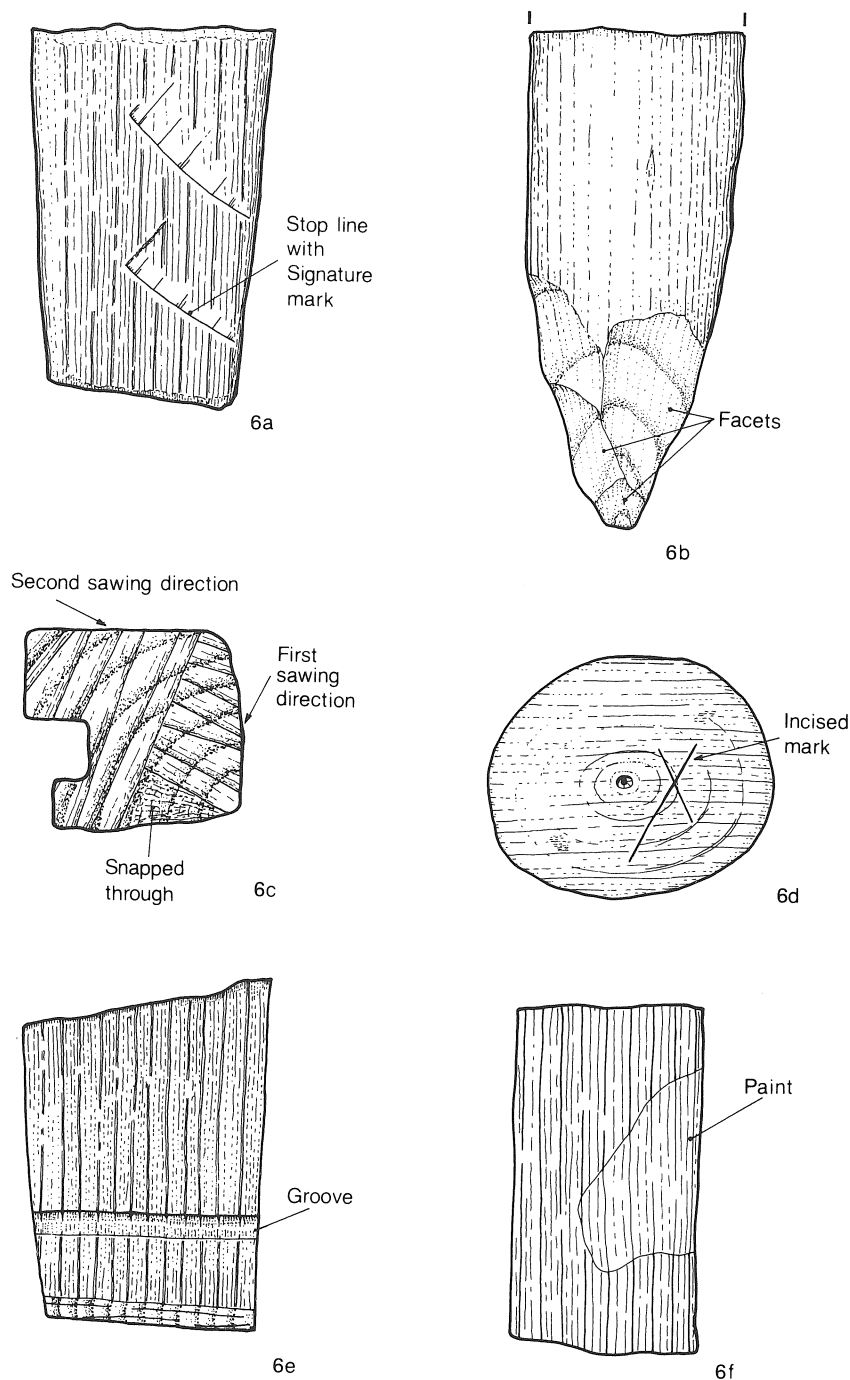


Figure 6. Artificial modifications to wood

If it is not possible to determine the finds' conversion by non-destructive examination of the artefact it may be better to draw the section in outline only. A specialist may be able to determine it at a later date. A conversion diagram, showing which part of the log the piece was made from, may be added if desired.

## 2.4 Artificial features

These are the features imposed on the natural material by the processes of manufacture, use and breakage. Woodworking, like flint knapping, is a subtractive industry. Any working of an artefact will leave traces on the object which will tend to be removed by subsequent working. Usually, therefore, the toolmarks which do survive are the result of the last stage of working which can have important implications for reconstructing the processes of manufacture. These marks can be caused by single blows, shaving or sawing processes, each of which produce characteristic marks. Often these may be specific to individual tools. Those found on wooden small finds can be readily depicted, but the object must be carefully examined under oblique lighting for their presence to be detected.

The characteristics of single tool strikes mentioned in Section 1.3 should be shown using line. The *stop mark* should be shown as a heavy line (Figure 6a). Attention should be paid to the ends of the cut in case one of the corners of the blade has also dug into the surface. Such returns of the cut line should be drawn with the same pen size as that used for the stop line. It is not necessary to show any undercutting of the surface by the blade. *Signature marks* should be drawn as a series of fine parallel lines (Figure 6a). Any prominent ridges and their spacing should be drawn exactly, as should the angle between them and the *stop line*.

In many cases the stop line and the signature marks will have been abraded by subsequent wear, or the stop line can have been removed by subsequent blows. All that survives in such cases is the facet. Its edges should be clearly defined by differential shading and any change in the appearance of the grain. (Figure 6b).

Shaving marks will most commonly be found on turned objects. Stop lines will invariably be absent and the signature of the blade will be almost continuous around the circumference of the artefact. They can be emphasised at the edges of the drawing to enhance the curvature

of round objects. Their alignment relative to the axis of the artefact should be correctly shown.

Saw marks on small objects usually cut across the grain (Figure 6c). Excessive tearing of the wood may obscure the end grain and *transverse section*. As noted in Section 1.3, the use of a hand-saw will leave successive coarse torn ridges in the direction of the cutting stroke, and these can be depicted with line. Such lines will rarely be parallel and contrast with signature marks which are always parallel. The two or more sets of ridges left by turning the object part of the way through cutting should be shown and used to define the scar of unawn wood left by subsequently snapping or breaking the wood.

Incised markings or features such as graffiti, marking out lines, trenches or grooves are best represented with a single line if the cut is fairly fine (Figure 6d). Thicker incisions should be shown with a thick line on the side nearest to the imagined light source and a thinner line on the side facing the light source. Any sloping edges to such grooves can be shaded. Where the groove cuts across the grain, hatching can be used (Figure 6e).

Where a thin coating of a single colour covers most or all of a surface and the wood grain can still be seen, it may be useful to 'fade' the drawn wood grain in this area (Figure 6f). This may be drawn with a finer pen size than that used for the unpainted area, provided that any caption to the drawing indicates why this has been done and the colour of the coating.

Among the applied features which can be found on wooden artefacts are paint and tar. It is suggested that areas of tar are shown in solid black or heavily stippled whilst paint colours are shown using whatever in-house colour conventions are used. Naturally, a key should be provided. It is not recommended that a system of close hatching is superimposed over wood grain.

Other deposits which may be found on archaeological wood may include mud and mineral concretions. The former should have been removed by careful washing unless the object is as yet too fragile to be dislodged from its matrix. In such cases, co-operation with a conservator is essential so that once the exposed portion of an object is drawn, it can be returned for further cleaning and consolidation, after which the drawing can be extended as previously hidden areas of the object are exposed.

Mineral concretions are very difficult to

remove without damaging the wood surface beneath and should be left alone by the illustrator. The significance of the concretion should be determined by consultation with the finds specialist and conservator. Concretions should only be drawn if they are integral to the wooden artefact, such as a nail, tool blade or similar, or at the specific request of a specialist. Otherwise the wood grain can be projected over it and a caption such as 'concretions omitted for clarity' appended. If necessary, a separate overlay with correct register marks defining the area and nature of the concretion can be used for archive drawings.

A few artefacts will have suffered damage during the excavation. Cracks and break lines should be shown, paying attention to the angularity of most breaks in wood. Deep cracks can be treated in a similar fashion to incised lines, or shaded solid black according to preference. Oblique breaks at the ends of artefacts may require attention owing to the ragged nature of the torn cells.

Damage may have included the crushing and distortion of the object. This affects its form and should be considered when its component pieces are being reassembled. Crushed and folded areas can be shown using differential shading. No attempt should be made to correct the shape of an artefact by bending or twisting it to its original form since this may cause further damage. Draw the artefact as it is, even if the damage is very recent and confine restorations of its original form to a reconstruction on paper.

## 2.5 A note on emphasis and suppression.

In describing the above techniques a priority has been to select methods which reflect the character of the material. They are intended to be complementary and result in a drawing which is both technically correct and aesthetically pleasing. There may however, be occasions when a complex object causes these techniques to clash. In such situations, use common sense. Some ways of reconciling such clashes have been indicated above. In case of doubt, employ the following priorities:

1. Wood conversion
2. Working marks
3. Wood grain
4. Painting
5. Ancient (original) damage
6. Mineral concretion
7. Modern damage

## 3.0 SPECIFIC OBJECT TYPES.

This section concerns specific object types to be found on excavations.

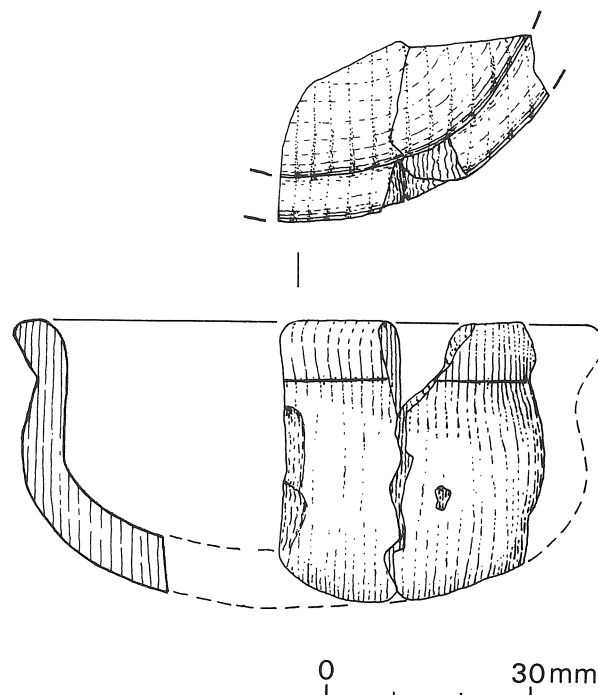
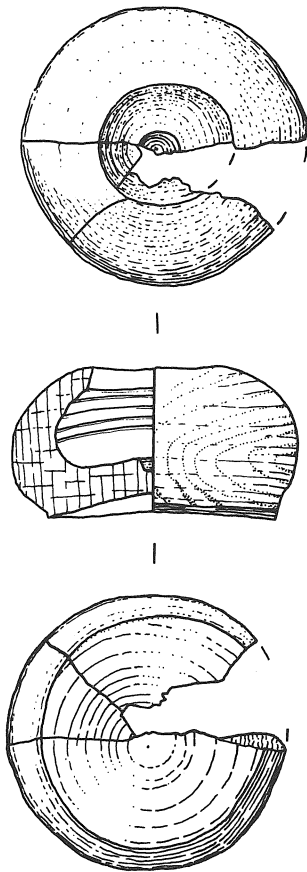


Figure 7a. Roman wooden bowl, Austin Friars, London. Drawn and reproduced at 1:1

### 3.1 Turned bowls.

As these are hollowed vessels, it would seem appropriate to present them using a similar approach to that adopted for pottery, with a plan view and a half section on the elevation. Some differences are worth noting. The most important of these is that a turned wooden object is almost never circular in plan. The wood of which it is made will have shrunk across the grain and its plan will therefore tend to be nearer an oval than a true circle. Consequently a radius chart is of limited value in establishing the true diameter of a fragmented vessel and these measurements should only be regarded as approximations. Such an object should not be reconstructed on paper with a pair of compasses. Continuation lines (Figure 7a) should be sufficient to indicate where the vessel is incomplete.

The curved surface of the bowl will cut across the grain creating distinctive patterns which should be shown and which indeed help to create some depth to the depiction. Turning marks can be used to similar effect but these are not always concentric to the axis of the



**Figure 7b. Roman turned object, Austin Friars, London. Drawn and reproduced at 1:1**

object (Figure 7b). Note that on all these objects the conversion is depicted on the cross section and the plan view is orientated on this.

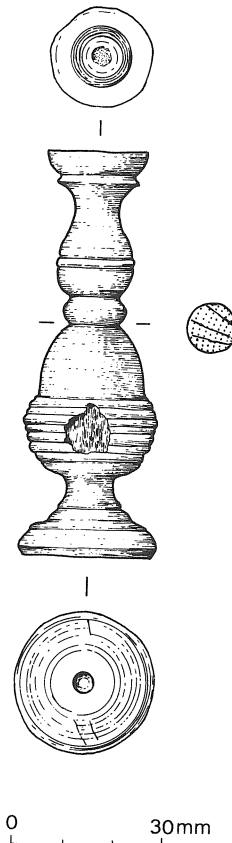
### **3.2 Other turned objects.**

These can be treated like the outer surfaces of turned bowls. One side of the artefact should be emphasised by shading (again using the turning marks as a guide, Figures 8a and 8b)

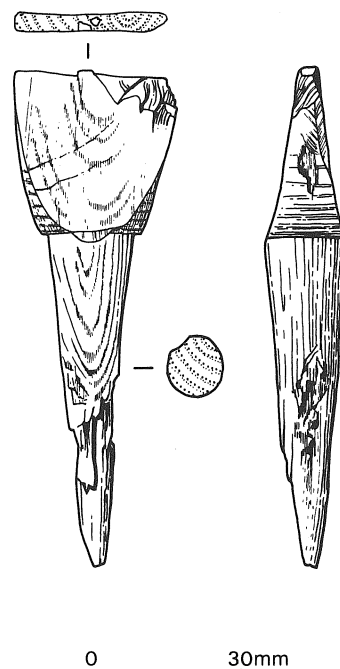
### **3.3 Pins, needles and pegs.**

These small artefacts are grouped here since they are all relatively long in relation to their cross section. Problems may arise in depicting such artefacts owing to the relatively small area in which to depict what may be a complex shape.

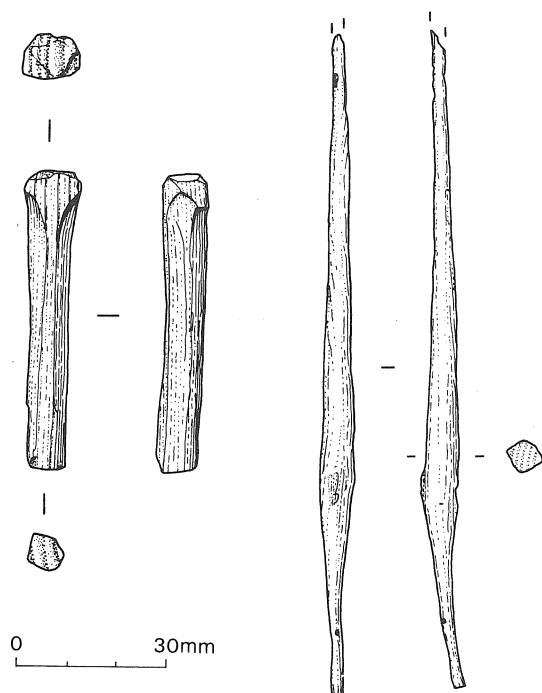
Lines drawn should be chosen with particular care and economy. Sometimes the grain of the wood may help if it is especially prominent (Figure 9a). Sometimes it does not. (Figure 9b). The spiralling grain on this spindle had to be suppressed in places in order to provide



**Figure 8a. Medieval gaming piece, London. Drawn at 1:1 and reproduced at 2:3**



**Figure 8b. Medieval peg, London, turned and reworked. Drawn 1:1 and reproduced at 2:3 (G.Hale)**

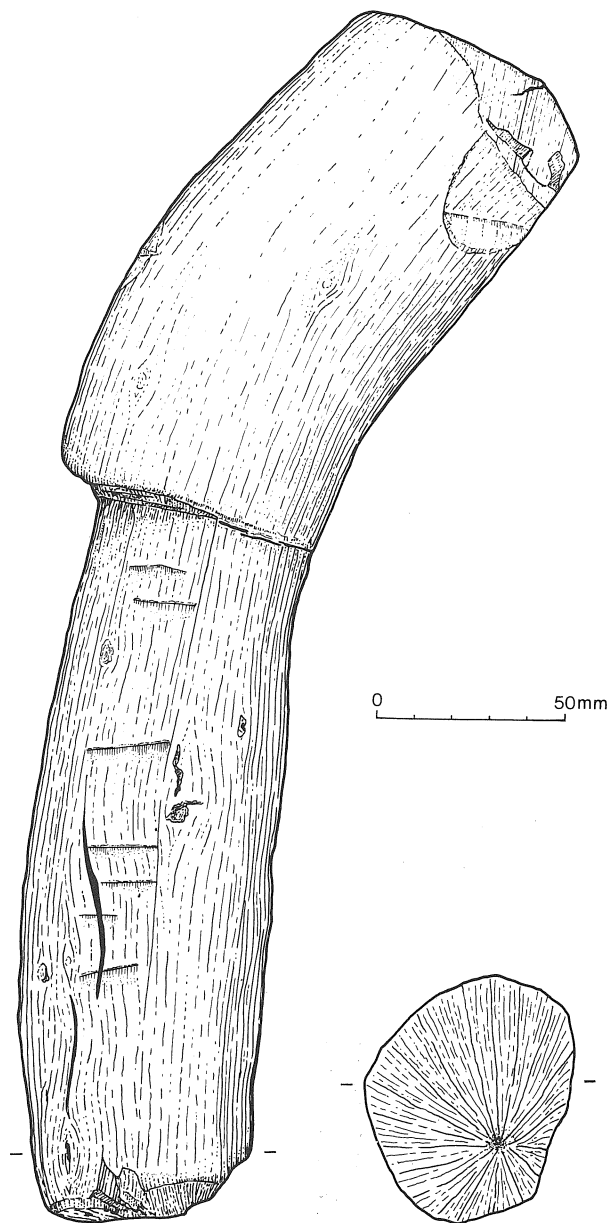


**Figure 9a. Small peg, 9b. Spindle, London**  
**Drawn at 1:1 and reproduced at 2:3**

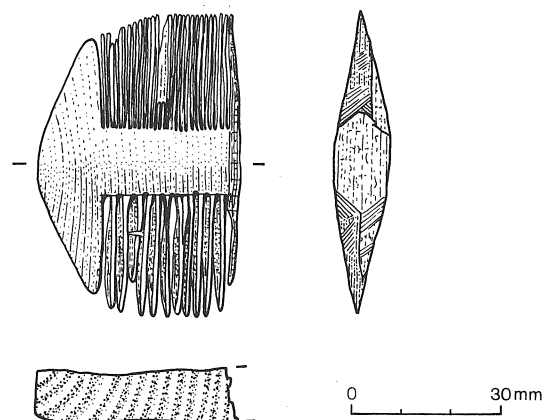
some depth to the illustration. The grain pattern on the cross section may have to be predicted in order to locate it at a point where it is needed to depict a useful profile (Figure 9c).

### 3.4 Combs.

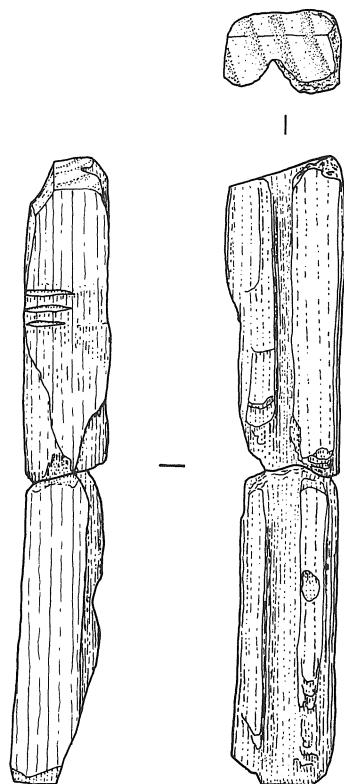
These artefacts are not as worrying to draw as they first appear. The problem lies in the method of depicting the teeth. A solution is to orient the illustration so that the smaller teeth are at the top and nearer to the light source (Figure 10). The outline of the solid body of the comb is drawn like any other artefact. For the smaller teeth, the same pen size is used for the right hand side of each tooth and a smaller pen size for the tip and the left hand side, creating the effect of a shadow cast on to one tooth from its right hand neighbour. Where there is a twist in a tooth, the visible portion should be shown in outline, unshaded, with the smaller pen. The larger teeth should be drawn using the same pen as for the comb body outline but a thicker pen used to draw the left hand side of the tooth.



**Figure 9c. Twelfth century cog/gear peg, Bordesley Abbey, Worcestershire.**  
**Drawn at 1:1 and reproduced at 1:2**



**Figure 10. Roman comb, London.**  
**Drawn at 1:1 and reproduced at 2:3**

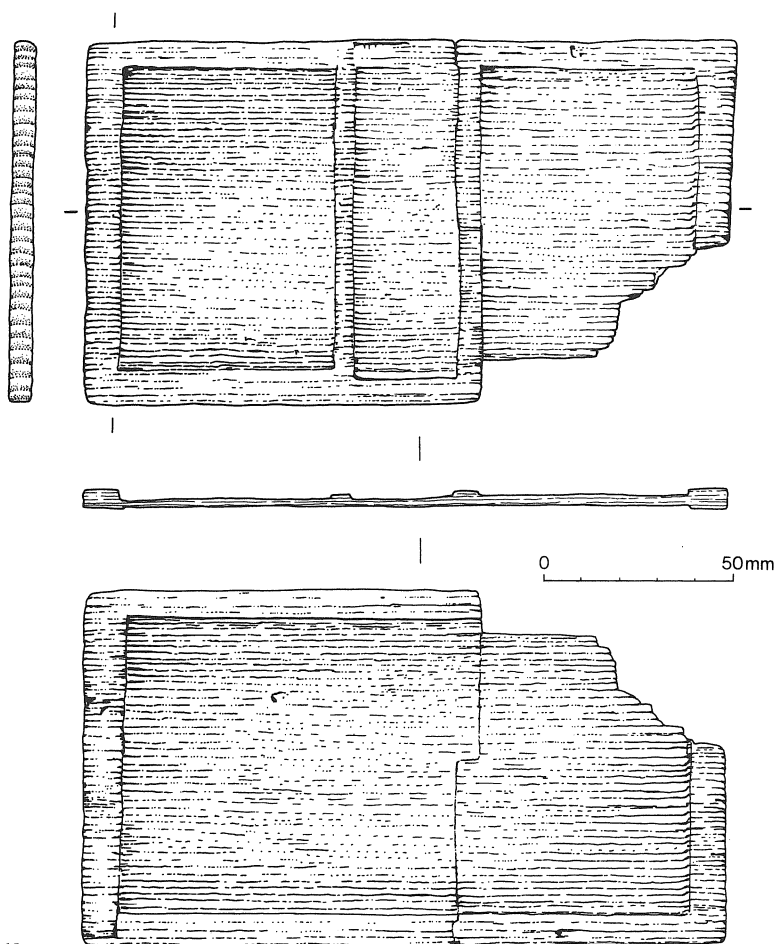


The end view is used to show the sawing pattern produced during the manufacture of the comb and the profile of the teeth. If there are any loose teeth present which cannot be placed, it may be worth showing them to one side of the main view.

### 3.5 Panels, Boards and Staves.

These are relatively simple to draw and may be traced off using clear acetate, checking the dimensions with dividers before inking in. Features cut into the surface, such as the sunken portion of a writing tablet (Figure 11b) or a groove (Figure 11a) may be shown using the methods outlined earlier. Grain can be emphasised or played down to highlight the form of the artefact.

**Figure 11a.** Window frame, London (possibly Roman). Drawn at 1:1 and reproduced at 2:3

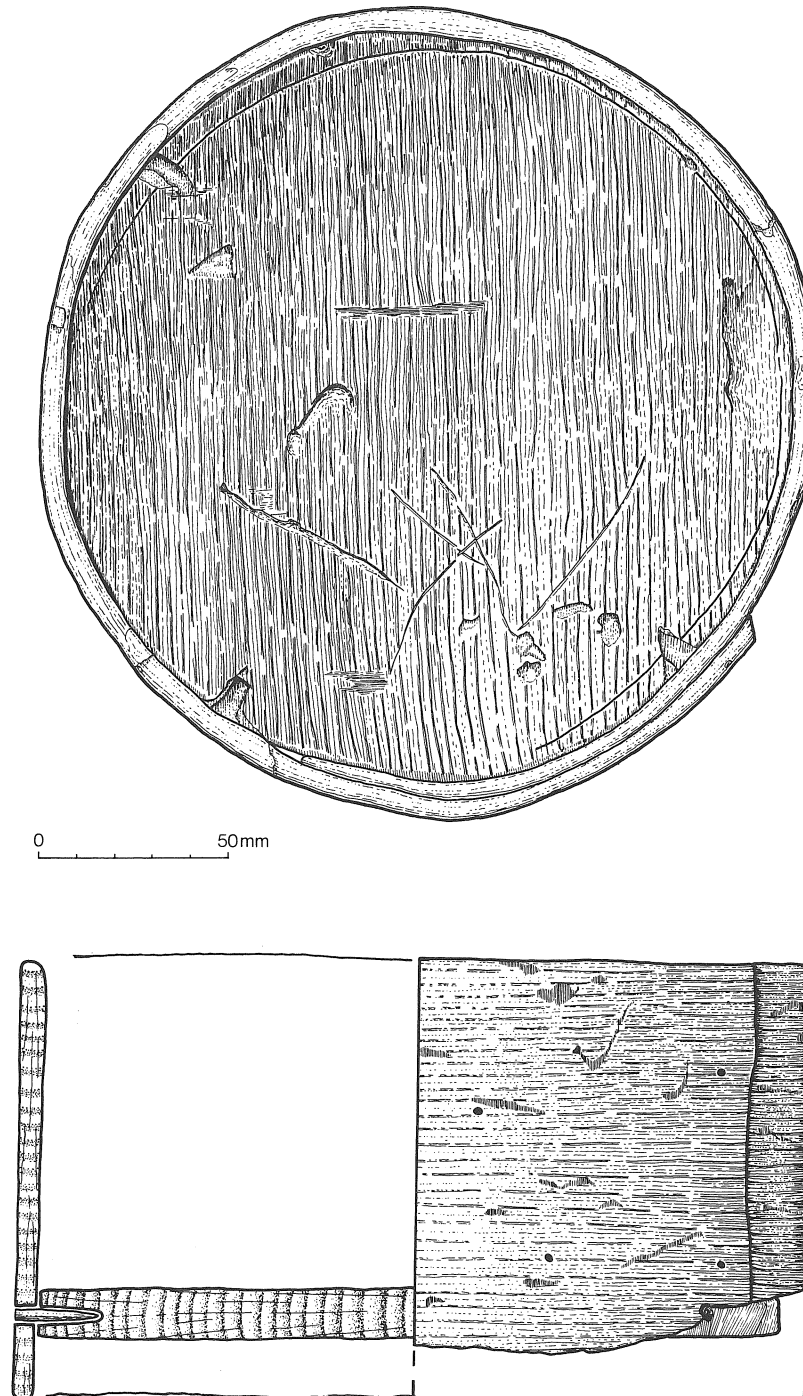


**Figure 11b.** Roman writing tablet, London. Drawn at 1:1 and reproduced at 2:3 (after Miller)

### 3.6 Multiple Component Artefacts.

Objects such as looms, barrels, or buckets are made up of a number of smaller components. If there are enough pieces, a reconstruction can be drawn. The presentation of such an artefact will depend on its size and completeness. A bucket illustrated in MacGregor (1978) is shown with the left hand side partially cut away much in

the style of a pottery vessel, showing the profile and constructional detail. Only its composite base is shown in plan. Figure 12 below also shows this approach. An alternative is to depict the barrel 'rolled out' to show all the internal faces of its staves. (as in Allan and Morris 1984). Individual components must retain their integrity and details of construction and conversion be shown.



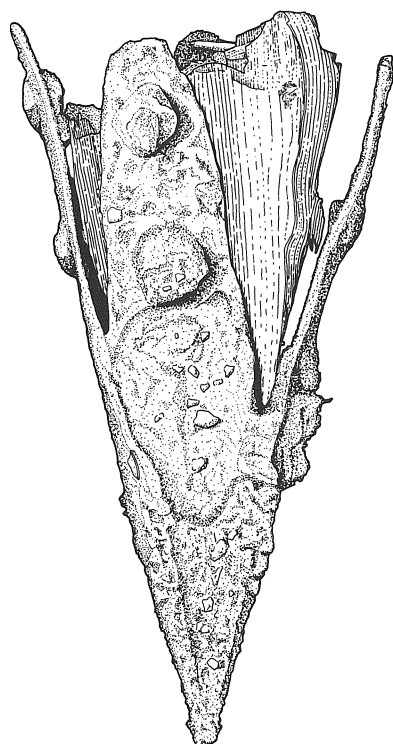
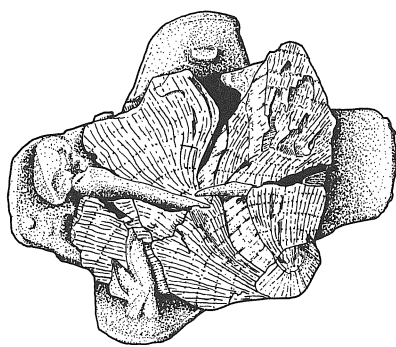
**Figure 12. Post-medieval bentwood tub (partially reconstructed). Thames exchange, London.  
Drawn at 1:1 and reproduced at 1:2**



### 3.7 Wooden objects with some non-wooden components.

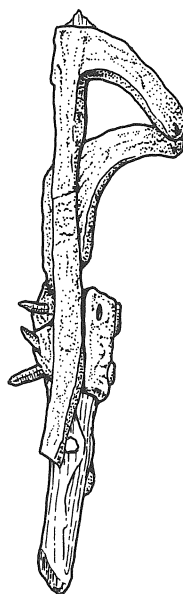
The drawing technique used to depict non-wooden components of a find will depend on the material used. Metals, often present in the form of nails, binding, tool blades or sheathing (Figures 13a and 13b) should be shown using whatever house style and conventions are already used. Leather may be drawn flat and in outline only, or stippled (Figure 13b), and it

may be desirable to show it separately. Bone is problematic, since the style used often resembles wood. If care is taken in applying techniques of illustration, it should be clear from what material the object is made.

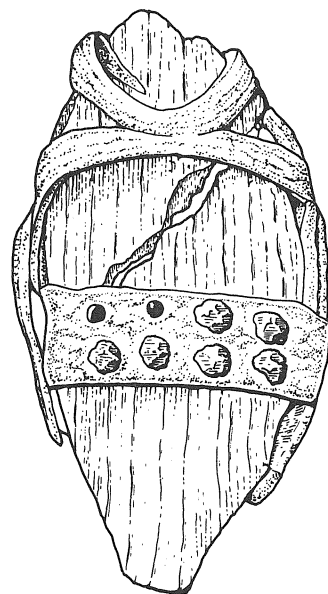


0 50mm

**Figure 13a. Pile point, London.**  
(wood and iron) Drawn at 1:1,  
and reproduced at 1:2



0 30mm



**Figure 13b. Patten, Trig Lane, London**  
(wood and leather) Drawn at 1:1,  
and reproduced at 2:3

### 3.8 Decorative treatment.

Wooden artefacts are often decorated. This usually takes the form of carving, which can be depicted using differential shading, following the wood grain (Figure 14). Some examples of carved wood are published in Lang (1988), though these seem to have reproduced very faintly. A good selection of carved wooden anthropomorphic figures, illustrated by S.Goddard and M.Rouillard can be found in Coles (1990). Incised lines, graffiti and paintwork can be depicted using the techniques described in Section 2.4.

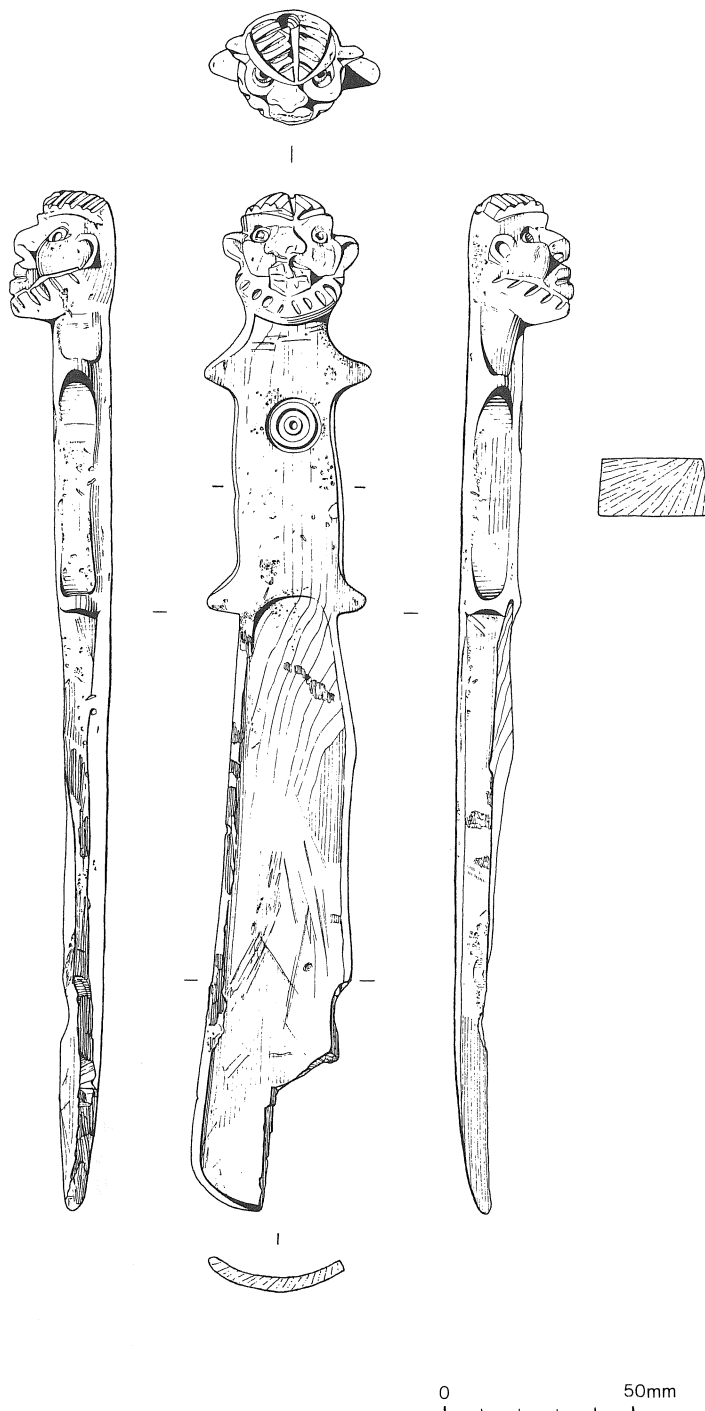


Figure 14. Roman scoop, Thames exchange, London. Drawn at 1:1 and reproduced at 1:2 (D.O'Carroll)

### 3.9 Twisted Wooden Ties.

These are made of one or more strands of small 15mm diameter roundwood. The roundwood is first twisted, to prevent it breaking, when it is then wrapped around itself. Turns through 180 degrees are quite common. The spiralling of the

grain caused by the initial twisting must be faithfully depicted. Frequently the ends of these discarded strands will have frayed and the outer wood split both lengthwise, following the grain, and also cracked across the grain, especially on the outside of a turn. Quite severe shadows are needed to bring out the three dimensional aspect of the artefact. The example shown (Figure 15) is a late prehistoric piece from Goldcliff, Gwent (1992). The shading has been exaggerated to define the individual strand as it wraps back around itself. The cross section is schematic at this stage, since the artefact was drawn immediately after excavation, still encased in the clay block in which it was lifted.

### 3.10 Stakes.

Stakes and similar partially worked pieces of roundwood are common finds, especially on waterlogged prehistoric sites. They may vary in size from small pieces of brushwood to massive timber piles. The size of the artefact will, to a large extent, dictate the approach to be taken by the illustrator. Large structural pieces which are to be shown in their entirety should be drawn using the conventions indicated in Section 4. It is common practice, once a basic record has been completed, for excavators to saw off and retain the worked portion of the stake for study, using the rest for dendrochronological, tree-ring, species identification studies, and microbiological studies. Generally therefore, the illustrator will only have to draw detailed views of the worked end of the stake and a small part of the shaft.

Stakes are frequently covered with bark adhering to the outer surface, the cracked and split nature of this material can be very awkward to illustrate. In addition, the *cambium* has usually rotted away, leaving the bark as a very loose sleeve and this can slip or slide off the stake unless great care is taken when handling. Long round-headed map pins of the sort used for attaching plastic labels, can be used to keep this bark in place. Care should be taken with such pins. Do not drive them in further than absolutely necessary and watch that the points remain within the wood and that no sharp metal shafts protrude. As noted earlier, bark varies in texture and appearance even on different parts of the same tree. Smooth bark surfaces may be rendered using stipple. Where

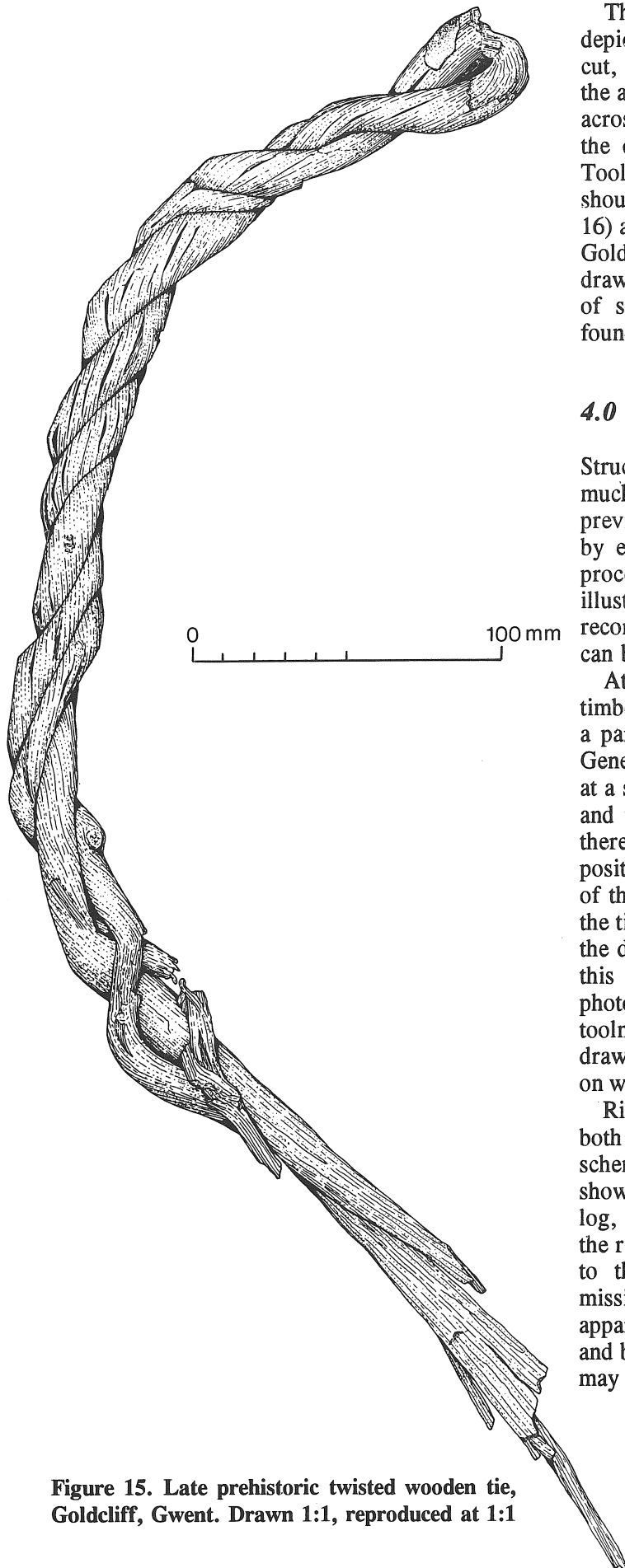


Figure 15. Late prehistoric twisted wooden tie, Goldcliff, Gwent. Drawn 1:1, reproduced at 1:1

The facets of the worked ends are easier to depict. The angles at which the wood has been cut, creates patterns on the surface caused by the angles at which the tree rings have been cut across. These patterns can be exploited to show the changes from one facet to that adjacent. Tool *signature marks* may also be apparent and should be drawn. The examples shown (Figure 16) are some of the late prehistoric stakes from Goldcliff, Gwent, (Bell 1992), which have been drawn before conservation and show the variety of sizes, forms and textures which can be found.

#### 4.0 STRUCTURAL TIMBERS.

Structural timbers are by their very nature much larger than the small finds described previously. They are frequently drawn on site by excavation staff, as part of the recording process, sampled and then discarded. Should illustrators be sent out on site to prepare such records, a guide to drawing individual timbers can be found in Goodburn *et al.* (1990).

At some point, it is inevitable that the timbers and/or the structure of which they form a part will need to be drawn for publication. Generally, structural timbers are initially drawn at a scale smaller than 1:1, usually 1:5 or 1:10 and then reduced. The timber drawing must therefore be more schematic, still depicting the positions of knots, but only indicating the trend of the grain pattern on the edges and faces of the timber. It is not really necessary to attempt the depiction of the texture of the timber since this will be apparent from the published photographs, and will only obscure any toolmarks, fittings or fixings which need to be drawn. The aim is to produce a clear drawing on which structural details are readily apparent.

Rings and rays on the ends of a timber may both be represented using line, again schematically, since it will not be possible to show each ring individually. The centre of the log, if present, must be located accurately and the rings and rays shown in the correct relation to the presumed centre if it is physically missing. The *conversion* should be readily apparent when looking at the ends of the timber and both ends must be examined, since the *pith* may have wandered.

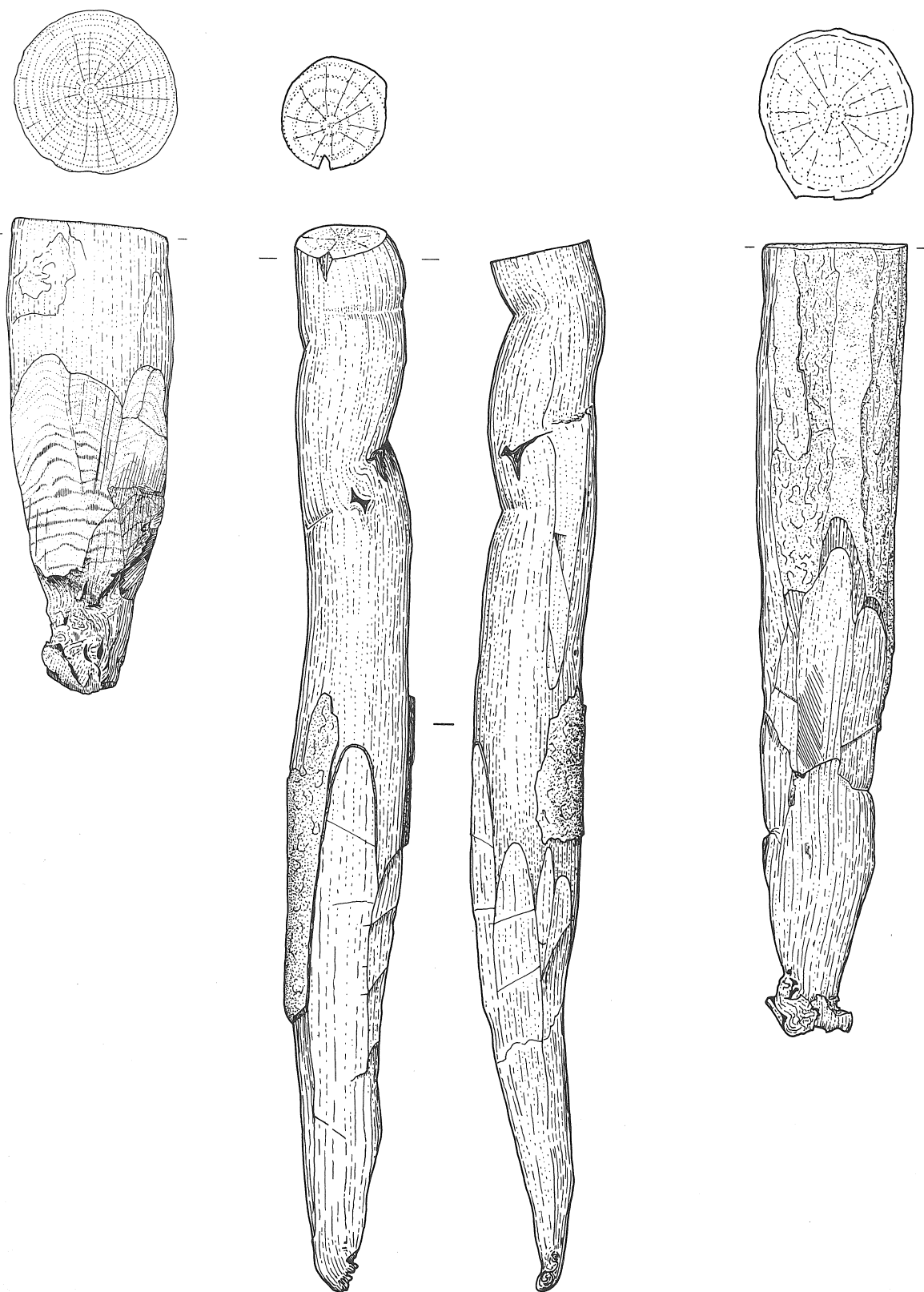
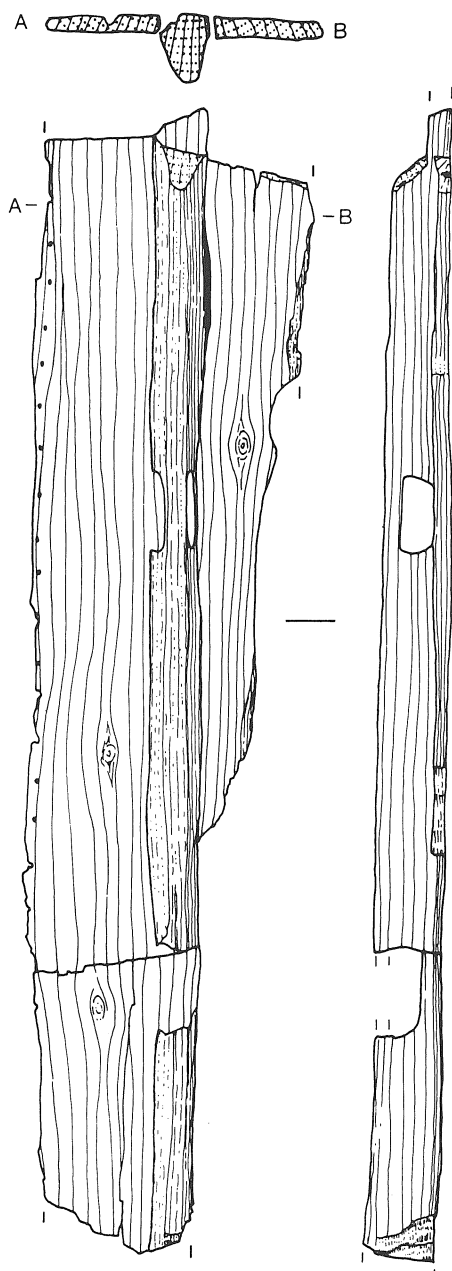


Figure 16. Late prehistoric stakes, Goldcliff, Gwent. Drawn at 1:2 and reproduced at 1:4

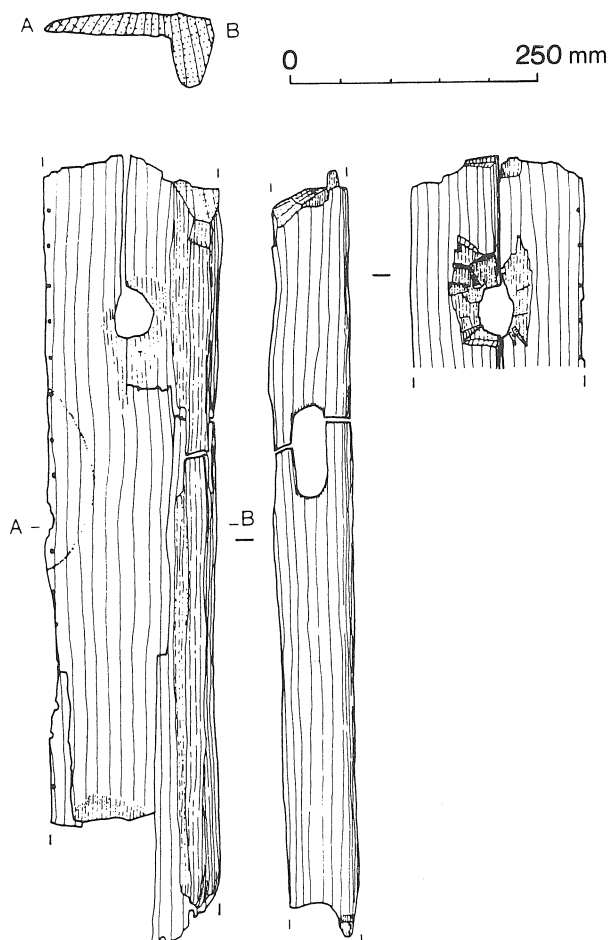
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**Figure 17. Late bronze age sewn boat planks, Goldcliff, Gwent. Drawn at 1:5 for reduction to 1:10. Reproduced here at 2:3 drawn size**

Figure 17 shows two structural timber drawings prepared for publication (Bell, 1992). The grain is shown using simple lines, knots are indicated and the rows of stitch holes along the edges of this boat plank are shown as solid dots. The conversion is shown schematically. Some shading has been necessary to bring out the central ridge of the plank.

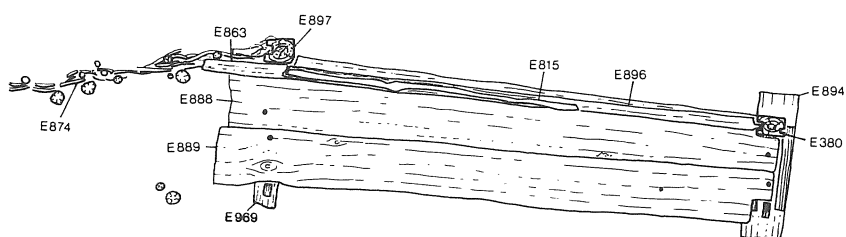
Figure 18 is timber reconstruction (Allen 1993). The toolmarks have been omitted but the direction of the grain and conversions are accurately rendered. To give depth, different pen sizes have been used for the outline. The



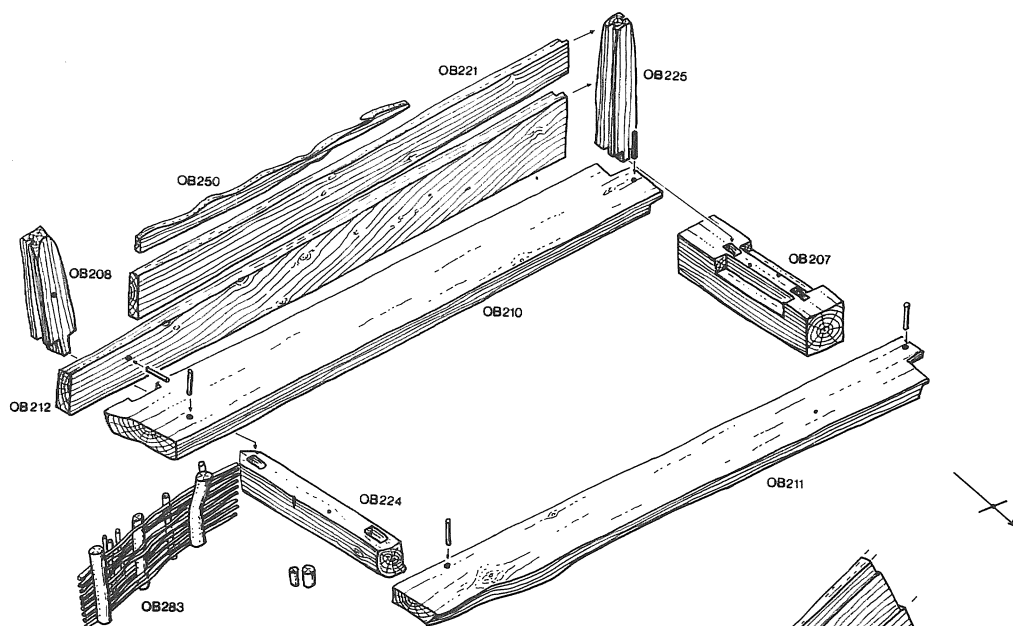
density of the drawn lines representing the wood grain is also varied with respect to the attitude of the surface to the incident light. Peg holes and *in situ* pegs, are shown solid black for emphasis. Overall the figure is intended to relate the plan of the structure as found to the exploded isometric assembly, which shows how the timbers fit together, with a reconstruction of the original appearance of the structure as determined by a study of the carpentry.

Wood is an extraordinary medium. A wooden artefact combines information about technological, structural and constructional developments with evidence for the growing conditions of the tree, and the environment. It is exceptionally fragile. Although perhaps the most widely used natural resource in antiquity, little of it has survived. Its recording and study is therefore of the utmost importance and surely the work of an archaeological illustrator is the most important part of that process. It is hoped that this paper will be useful to illustrators asked to produce drawings of wooden objects.

Plan



Assembly



Reconstruction

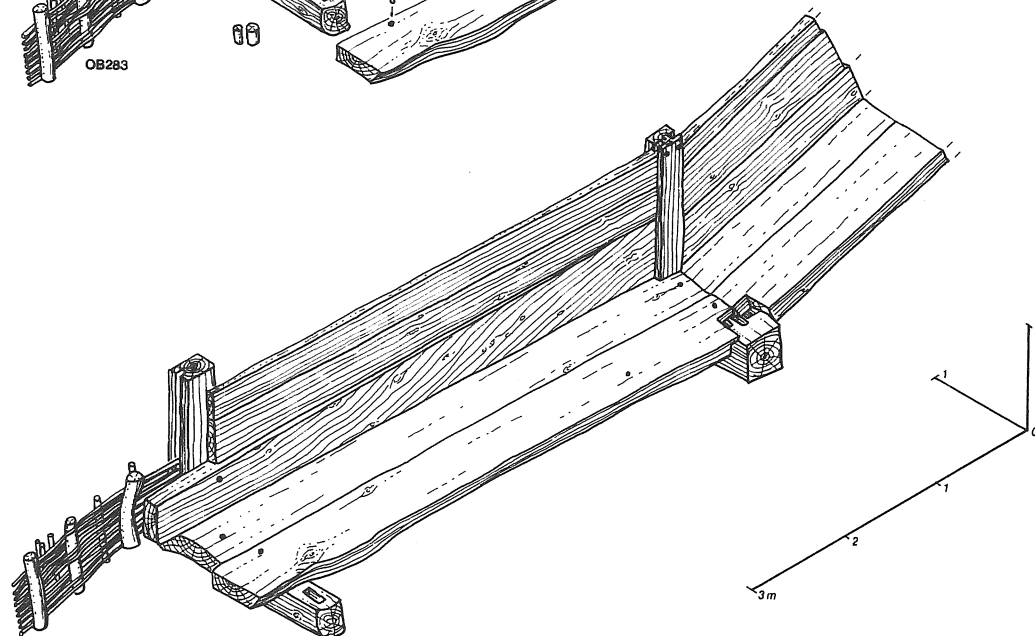


Figure 18. Late twelfth century mill race structure, Bordesley Abbey, Redditch, Worcestershire. Drawn at 1:20 and reproduced at 1:70

## GLOSSARY

<b><i>Bark.</i></b>	The hard outermost layer of a tree which protects the cambium and wood below.
<b><i>Bast.</i></b>	The soft protective layer of a tree found immediately below the bark.
<b><i>Cambium.</i></b>	More properly known as the vascular cambium. The thin layer of active cells in the outer part of a tree which divide and thereby produce new xylem and bast cells.
<b><i>Conversion.</i></b>	The process of breaking up a tree into usable pieces of wood and timber. Also the relationship of a piece of worked wood to its parent log.
<b><i>Dendrochronology.</i></b>	The science of tree-ring dating.
<b><i>Diffuse Porous.</i></b>	Species of hardwood tree in which the annual growth cycle does not lead to differential vessel size formation and distribution in the early and later parts of the season. They do not always produce growth rings.
<b><i>Earlywood.</i></b>	The wood produced during the early part of the growing season. Characterised by the production of larger vessels in ring porous species.
<b><i>End Grain.</i></b>	Common term for the exposed transverse section on a wooden artefact.
<b><i>Fibre.</i></b>	A cell found in hardwoods, having very thick walls. They give structural strength to the growing part of the wood.
<b><i>Genus.</i></b>	A group of botanically related species to which an organism belongs.
<b><i>Growth ring.</i></b>	Feature of many wood species in which the cells produced early in the growing season are larger than those produced later on. This leads to the formation of rings concentric to the pith. In northern temperate climates, where winter brings a halt to the growing season, these rings normally correspond to activity-rings being formed on an annual basis and hence the alternative term 'Annual ring'.
<b><i>Heartwood.</i></b>	Common term for the mass of hard, lignified cells which no longer contain or transport any nutrients within the tree but which give the tree its structural strength.
<b><i>Latewood.</i></b>	The wood produced during the later part of the growing season. Characterised by the production of smaller cells with thicker walls.
<b><i>Medullary rays.</i></b>	The linear arrangements of parenchyma cells which radiate from the core of the tree to its outer parts. Found in both hardwoods and softwoods.
<b><i>Parenchyma.</i></b>	A cell found in hardwoods and softwoods, having fairly thin walls. They are joined together to form medullary rays which radiate from the centre of the tree to the cambium. They may also form axial tubes similar to, but much smaller than Tracheids and Vessels. Their function is to store those nutrients within the tree which are needed to begin the growth cycle in the spring.
<b><i>Pith.</i></b>	The centre of the tree stem. Consists of a mass of redundant cells derived from the bud from which the trunk, branch or twig originally grew.

***Radial Longitudinal Section.***

A slice through the length of a tree or piece of wood taken along one of the rays. Also the name given to the view of a piece of wood which shows this.

***Resin Canals.*** Tubes found running through the length of some species of softwoods. They are not found in rings but tend to be dispersed across the transverse section. They are the means by which resins are carried up through the tree.

***Ring Porous.*** Species of tree in which the growth cycle leads to the formation of rings. Those cells produced early in the year are larger than those produced later in the year and this pattern is repeated in successive seasons.

***Sapwood.*** The cells in which sap transmission and storage takes place.

***Signature.*** The fine striations or marks left on the surface of a facet by irregularities or nicks in the cutting edge of a tool blade.

***Species.*** A specific tree within a genus.

***Stop Line.*** or 'Stop Mark', occasionally though less frequently, the term 'Jam curve' is employed. The mark found at the end of a blow or cutting stroke when the cutting edge of the blade cuts in to the wood surface.

***Tangential Longitudinal Section.***

A slice through the length of a tree or piece of wood, along the grain, which cuts the rays at right angles or nearly so. Also the view of part of a wooden object which shows this.

***Tracheid.*** A cell having fairly thick walls. They are joined end to end to form long narrow tubes running from the base of the tree to its upper extremities. They have a dual function; to draw nutrients from the roots to the growing parts of the tree and to provide the growing part of the tree with structural strength.

***Transverse Section.***

A slice through a piece of wood or tree taken at right angles to the direction of the grain and which shows the rings and rays in plan. Also the view of part of a wooden object which shows them.

***Vessel.*** Found in hardwoods, formed of many cells having quite thin walls. They are joined end to end to form long narrow tubes running from the base of the tree to its upper extremities. Their function is to draw nutrients from the roots to the growing parts of the tree. They thus duplicate the function of the tracheids in hardwoods but are larger and more specialised.

***Xylem.*** Botanic term for all wood cells, both heartwood and sapwood.



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