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The skill of the neolithic bowyers – reassessing the past through experimental archaeology

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Introduction

Within the modern profession of archaeology there is a fast developing field which has been termed *Experimental Archaeology.* That is *the controlled replication of ancient technologies in order to provide hypotheses that can be tested by actual archaeological data*. Many ancient tools, buildings and artefacts have been recreated in order to learn about the processes of manufacture, usage and decay. These experiments have shown that many of the traditionally held views, about the ways in which tasks were carried out, things were constructed, or the ways in which various objects functioned, are actually ill-founded, and many previously held notions about the past have subsequently been challenged.

One area where experimental archaeology has really come into its own is within the study of ancient archery, or to give it its proper name *Archaeotoxophily* (Archaeology "the study of antiquities" – Toxophily "archery"). Experimental archaeology has been used to great effect within archaeotoxophily and much has been learnt about the bows and arrows that the discipline has been applied to. The bows from the Mary Rose have been recreated (Hardy 1976), as has the Ice Man's bow (Spindler 1993), telling us much about craftsmanship and bow technology from these times; also many flint arrow heads have been made and tested and their incredible effectiveness has been proven thrice over. Much knowledge has been gained about archery but there is still much to learn. This paper then, will give a brief account of the recreation of a working replica of the neolithic Meare Heath bow, which was carried out using the tools and materials available to the indigenous neolithic population of Somerset. And how, through the recreation and testing, the hypothesis and interpretations previously attributed to the bow, and consequently to neolithic bow-making in general, were examined and re-appraised.

The Meare Heath Bow

In June 1961 the Eclipse Peat Company opened up some new areas for peat extraction on the Somerset Moors. Deep in the peat one half of a wooden flat-bow was discovered (see Figure 4.1 on the following page). The bow fragment was immediately taken to Cambridge University and subjected to carbowax treatment to preserve it. This bow was found to date from the Neolithic and was given the name the Meare Heath Bow (Clark and Godwin 1962). The remains consist of about half a bow of yew, broken across so that some 6cm of round-section handgrip remain. The rest of the bow-stave, about 93cm in length, has a flattened lanceolate shape of maximum width about 6cm, almost flat on one surface (the inner or belly of the bow) and convex on the outer (or back) of the bow. Part of the sub-terminal notch

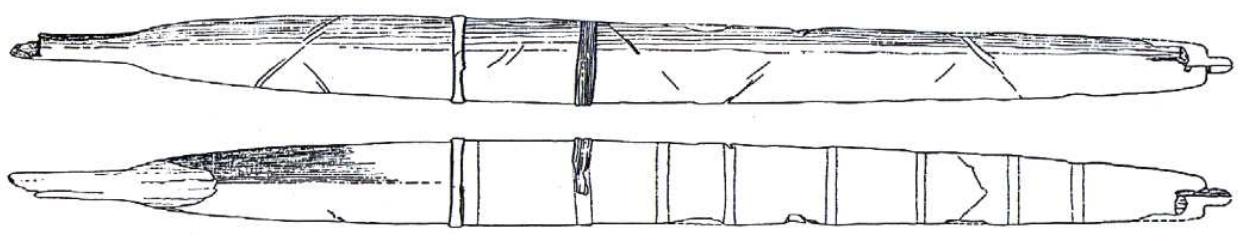

Figure 4.1: *The Meare Heath Bow*

for attachment of the bowstring remains. There are two transverse leather bands around the stave at its widest point and traces indicate that others were also originally present. In addition to which, there are clear traces of a narrow diagonal cross banding by strips of strengthening material, probably sinew. If the bow were originally symmetrical about the grip, its total length would have been around 190cm long.

The age of the bow

The age of the bow was verified in several ways. Firstly, stratigraphically the bow was found near the base of a dark humified peat previously known to have yielded a polished neolithic axe of Craig Llywd stone and several sherds of a late neolithic bowl of Peterborough Ware. Secondly, analysis of the sub-fossil pollen grains in the peat sample showed the bow to have been deposited at a time shortly after a general decline in elm pollen that is known throughout north-western Europe during the Neolithic. Also present were pollen grains of plants associated with the spread of farming. Thirdly, the radiocarbon analysis gave results fully consistent with these findings, 2690bc$\pm$120 years. The bow then can be placed firmly in the Middle Neolithic period.

Why bother reconstructing the bow?

Ever since its discovery the Meare Heath Bow has been the subject of much conjecture by both archaeologists and archers. Many people have written about the bow and their perspectives have been very wide ranging. However, this work has still left a whole range of questions unanswered. Questions such as:

- How long was the bow originally?
- Which way round was it strung?
- Was the bow made from green wood, cut straight from the tree, or from seasoned timber?
- How powerful was the bow?
- Why was it bound with criss-cross bands of leather and sinew?
- How long did it take to make?
- Why did it break?
- Was the bow made purely from the heartwood of the tree, or was sapwood used as well?
- How far would an arrow travel when shot from the bow?

In an attempt to answer these and other questions, the original bow fragment has been scrutinised, photographed, examined under microscopes, drawn, measured and recorded over and over again by a whole host of people. There is however, only so much information to be gleaned from the study of an artefact. In order to properly determine the nature of such a bow a reproduction had to be made and scientifically tested.

Previous reconstructions

Two reproductions of the Meare Heath bow have been made, prior to the current reconstruction. The first in the 1960s, by Mr C. E. Lilley, and more recently, another by Mr E. McEwen. It appears however that both Lilley and McEwen used modern tools to make their bows and neither has been properly tested. The draw-weight of Lilley's bow was apparently measured but the results were never published. It was however, shot by an archer at Dunster's Grand Western Archery Society meeting

in May 1963 where an experienced bowman hit a target at the third draw from a range of 60 yards (Clark 1963). The draw-weight of McEwen's bow was published, 41kg (90lbs) at 81cm (32") but the bow broke during during manufacture, was repaired with glue, and a backing strip was added. The backing was a tough elastic strip of hickory which strengthened the bow to make it usable but also inevitably increased its poundage (Bergman *et al.* 1988). Therefore, a proper reconstruction was necessary to answer a whole host of questions.

The prerequisites of the bow's construction

Before making an attempt at producing a replica of the Meare Heath Bow it was necessary to answer several important questions about the nature and design of the bow. In order to answer these questions the physical remains of the bow were rigorously scrutinised (again!), as were all previous articles written about the bow together with comparative texts. This study was carried out with the help of three experts from other fields: two of these experts were cabinetmakers (Mr B. Cherry and Mr M. Jolliff) who have an intimate knowledge of wood, and one was a professional bowyer (Mr N. Eddiford).

The questions that had to be addressed were:

1. Which part of the yew tree was the bow cut from?
2. Which way round was the bow held?
3. How long was the bow?
4. Was the bow jointed at the handle?
5. Was the bow made from green or seasoned timber?

These questions were considered in depth and after much thought and discussion it was eventually decided that:

1. The bow was cut from the trunk of a reasonably young yew tree (80–100 years old) and it was cut from an area just below the sapwood after the trunk had been split.
2. The convex face of the bow was the back of the bow, which faces away from the archer when the bow is strung.
3. The length of the bow was probably 190cm.
4. The bow was made out of one piece of wood and there was no joint at the handle, as had been previously suggested.
5. The bow was fashioned from seasoned timber.

The construction of the replica

The flint tools employed in the manufacture of the bow were 4 burins, 1 waisted tool, 1 small axe/chisel, 3 knives, 3 hollow scrapers (spokeshaves), 2 end scrapers, 1 convex scraper and 1 Y-shaped tool (small hand axe). The flint tools were all copies of actual neolithic tools and were made by Mr Martin Green.

Once an appropriate yew tree had been acquired, the first stage of the manufacturing process involved splitting the log down into staves and selecting the best stave for the job. This done, the stave was roughed out into the correct shape using the flint axe. It was immediately noted that the underside of the stave, which was to form the belly of the bow, was covered in shakes (small cracks running the length of the wood) and on the upper face or back of the stave there was a huge knot. It is usual practise among bowyers today to leave a millimetre or so around a knot, to strengthen an otherwise weak area, but this was not done on the Meare Heath Bow. It was decided not to follow modern practice and to to rely on the original bowyer's design skills.

Once the stave was split roughly to size, the side that was to form the back of the bow was rounded off using flint knives and long burins as draw knives. It took very little time to rough out the bow's shape quickly and effectively. The stave was then shaved to the correct thickness by taking wood off the side that was to form the belly of the bow, again using the flint knives.

A long burin was then used as a drawknife to get the stave's width, along its entire length, correct. This done, the final shaping of the back of the stave was carried out using the long burin to slowly cut out and shape the convex face. The stave at this point was starting to flex very well.

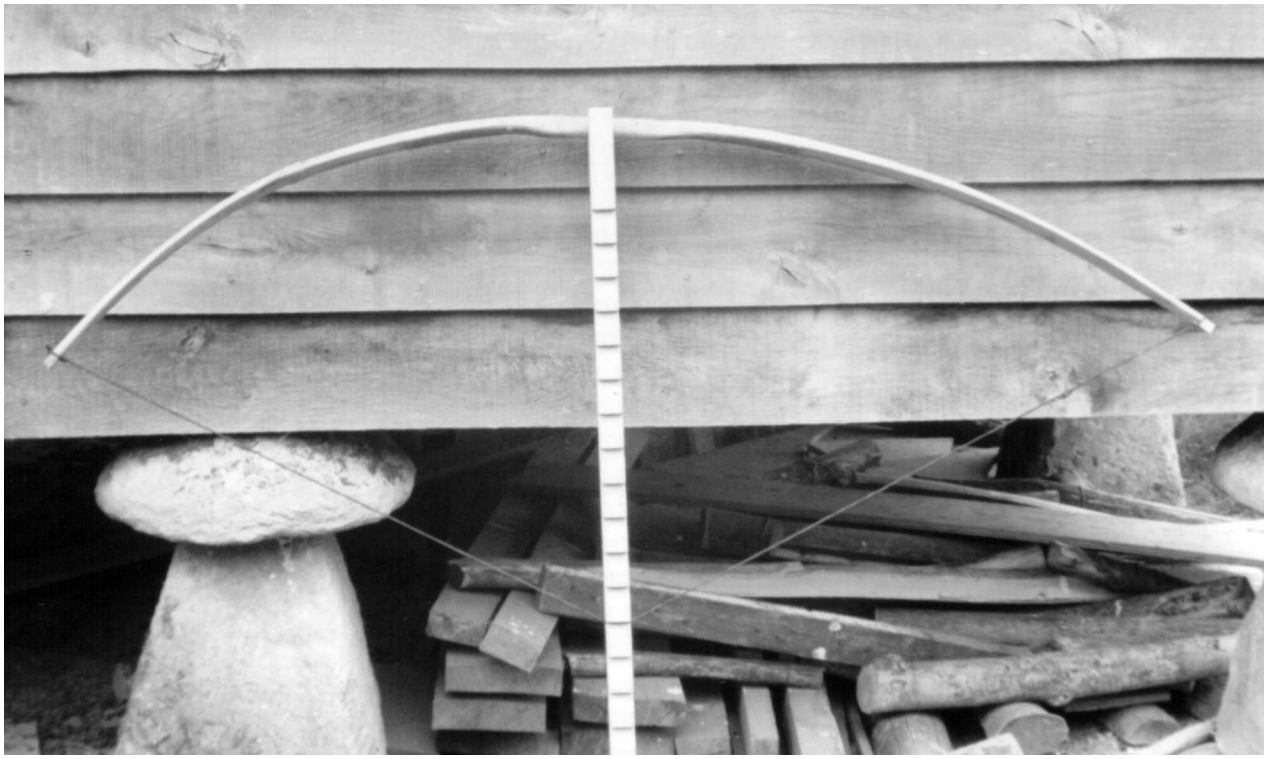

Figure 4.2: *Tillering the reconstructed bow*

As the work progressed an interesting fact was noted in connection with the flint tools. The tools naturally left a raised area of wood around the knots, due to the hardness of the yew. This for a bowyer would be an advantage, as mentioned above it would mean that an area of natural weakness would be strengthened due to the excess wood left behind around the knots. The Meare Heath Bow however, has no raised areas of wood around its knots; therefore it has to be assumed that all the wood around the knots had been removed on purpose and with considerable effort. Was the shape and finish of the bow more important than the bow actually being strong enough to work?

Once the shaping of the back of the stave was complete sandstone was used to sand out most of the tool marks. The next stage was to shape the handle on the belly side of the stave. For this job the flint end scrapers and spokeshaves were utilised. Then a flint knife was used to slowly pare away the wood either side of the nocks for the attachment of the bowstring. It was discovered that one of the knives, through use, had developed a serrated edge, this was found to make an excellent saw for cutting the shoulders of the bow. A convex scraper was then employed to remove most of the tool marks and blemishes. This done the stave was given a quick sand over, again using sandstone. It was then time to put a string on the stave and place it on the tiller. This was a worrying moment; had we been right in our suppositions? Would the stave flex enough to get it on the tiller or would it snap in half?

The stave was strung, placed on a tiller and drawn. It didn't break and actually formed a fairly good arc. There were two important points to note here, firstly how resilient yew actually is despite all the cracks, shakes and knots, and secondly the arc formed by the bow was almost perfect the first time on the tiller (see Figure 4.2). It seems that the maker of this bow was an expert bowyer who really knew his art.

It appears then that this bow can be cut straight out of the trunk of a yew tree, seemingly ignoring all modern bowmaking rules and the result is a near perfect bow! The bow was just a little stiff in the upper limb, however a few hours work soon corrected this fault.

Once the bow was tillered it was time for the moment of truth when the ideas and suppositions drawn about the bow would be proven right or wrong. The bow was strung to a reasonable bracing height and drawn... Success, it didn't break! (see Figure 4.3 on the facing page). It seems that all

Figure 4.3: *The reconstructed bow in action*

the hard work had paid off, the formula decided upon had been the correct one and a replica Meare Heath Bow had been made. All that remained was to sand the bow down and then put on the leather and rawhide bands. Hard sandstone was used to take out all the toolmarks, then a softer one was used to remove the marks left by the hard sandstone. The criss-cross webbing of rawhide and bands of leather were then applied.

The testing of the Meare Heath bow replica

The finished bow was firstly taken to The Roebuck Archery Centre at Gussage Saint Michael, Dorset. The poundage of the bow was measured and found to be 42lb at 28". On the outdoor range a dozen arrows were shot over 25m and every arrow hit the target! Two points were noted upon shooting the bow, firstly the criss-cross webbing acts as a shock absorber making the bow almost silent, and secondly, the bow was very quick. The bow was then taken into the field to try some distance shots. It was found that the bow was accurate up to about 100 yards (90m), it was capable of shooting an arrow further than this distance, but not accurately.

Following these tests the bow was taken to the largest archery suppliers in the country, Quicks in Honiton. Here a chronograph was used to measure the speed an arrow leaves the bow. The faster the arrow leaves the bow the more efficient the bow. The Meare Heath bow tested at 43 metres per second velocity, shooting an arrow with the projectile weight of 30g. This is surprisingly fast given the poundage of the bow. A longbow whose draw weight measured 45lb at 30" shooting the same arrow (30g) averaged 34 metres per second. This means that the Meare Heath bow has a velocity advantage of 9 metres per second over the longbow.

Findings and conclusions

1. The bow was shaped ignoring all the rules applied to the art of modern bowmaking and still produced a very workable bow.

2. The transverse leather bands were put on to the bow to hold faults in check, strengthening weak spots around shakes and knots, which would otherwise have caused the bow to break.

3. The cross-webbing protects the archer should the bow break, and acts as a shock absorber, helping to spread the load and stresses throughout the limbs, whilst helping to silence the bow.

4. The binding at the bow's tips, strengthen an otherwise weak area.

5. The bow took 49 hours to produce. An experienced bowyer could probably have done the work in a third of the time pointing to a bow that can be fashioned from average timber in a fairly quick time.

6. The bow's weight is 42lb (19kg) at 28" (76cm).

7. The bow is accurate up to around 100 yards (90m)

8. The bow tested at 43 metres per second velocity, shooting an arrow with a projectile weight of 30g. This was *9 metres per second faster* than a longbow (45lb at 30") shooting the same projectile.

9. The production of the replica helped to shed light upon the level of technology used in the creation of the original, which it turns out, is a highly sophisticated bow. The Meare Heath Bow actually accords with 20th century principles of scientific design and is a better weapon than the medieval longbow that followed several thousand years later. This implies a considerable amount of thought and experiment on the part of the prehistoric bowyers.

10. The creation of the replica proved that neolithic bowyers were skilled enough to know the best tree for the job, the best part of that tree and the best way to treat the wood of that tree in order to get the best results for bow manufacture. The bow is a fine example of the maximum utilisation of available raw materials to match the needs of the archer.

11. A hunter, in neolithic Somerset, using the Meare Heath bow would have been able to kill a deer at 50 metres in just over a second. With the bow silenced (as it is by the criss-cross webbing) if the arrow missed and the animal didn't see it, a second shot might have been possible.

12. The disposal of the bow is perhaps the most intriguing aspect of the bows history. It was thought for many years that the Meare Heath Bow had broken in use and had been thrown into the bog, perhaps by a disgruntled hunter. However, careful scrutiny of the break in the handle points to the bow being deliberately broken. It appears most likely that the bow was unstrung, the handle scored with a flint tool, the bow turned over and then snapped over something hard. This suggests the ritual deposit of a "broken" object — a practice well-known to archaeologists the world over.

Summary

The people of the neolithic are already known to us through the archaeological record as skilled hunters, farmers, animal rearers, builders, potters, flint-knappers and carpenters. With these facts in mind it should then comes as no surprise to learn that these people were also skilled bowyers. However, what was discovered through the manufacture of the replica was just how skilled at bow making these people actually were. The Meare Heath Bow is truly an amazing weapon. When the facts are drawn together and a picture of the bow's history emerges, great appreciation for the skills of the neolithic bowyers is gained. The Meare Heath Bow is an artefact that demonstrates just how skillful and resourceful our ancestors could be.

Postscript

As this volume went to press (May 2000) the bow has been fired 1805 times, illustrating again the functionality of the design.