WHAT IS IT MADE OF?
Brian Lemin (Editor)

Introduction

From time to time questions get asked about what a particular needle work / handwork tool is made from. These notes look at the most common confusions and how to test which material is being used. It specifically excludes wood, as which wood a tool is made from is for a more specialist approach than I can offer. It is better investigated through books on the identification of wood.

Bone or Ivory.

This relates mostly to crochet hooks, tatting shuttles and lace bobbins. On the whole crochet hooks might well be made of either but bone is more common, tatting shuttles are more likely to be made from ivory and lace bobbins are unlikely to made from ivory.

Firstly there is a potentially destructive test. Basically bone "burns" Ivory does not. Put a lighted match to the objects! Ivory will not really be effected by it. It just goes black and you can wipe it off. (that is unless you really subject it to a lot of heat). Bone will have a good shot at burning and will have the flesh smell. The object might be physically damaged by the experience.
The red hot needle test is less destructive. With this you push the red hot needle into the object where it will not show. With bone it will enter more easily and burn with a smell of flesh, with ivory it will be quite hard to push it in and it smells like the burning caused by a dentists drill.
Basically it comes down to if you want to tell the differences
between bone and ivory, don't bother with hot needle or burn test. For the
person who can't visually tell the difference, the burn test is a good way
to ruin what you have.
always
assume bobbins and sewing tools are bone unless I have *very* good reason to believe otherwise. >

Secondly test of the visible differences.

Basically tusks (Ivory) are teeth (incisors from the upper jaw.) They are therefore made up of dentine as opposed to the softer material of bone.

The visible structure comprises many many minute longitudinal tubes, which when fresh are filled with oil. It is this oil that gives it the polish and the very gradual loss with age. Bone on the other hand is has all its "fat" boiled out before being turned.

So, you should offer the ivory to the light and look for faint longitudinal lines and then revolve the bobbin , very slowly, through 90 degrees. These lines should, on revolving, become less pronounced or even disappear from the angle at which you are observing them. (if the ivory is simulated i.e. casein based compound the dark/light lines will remain and they are more pronounced on the simulated ivory You will need to practice this to "see" what the description is saying.

Now to bone.

The characteristic of bone is that it is provided with a blood supply and therefore has minute pores (which are the channels through which the bone is kept alive) They look like tiny brown or black spots (or channels depending on the angle of the turning.

So to sum up. Ivory has longish lines (tubes). Bone has black or brown flecks (channels) You will need a good light source to see the lines (tubes) on ivory but the flecks are reasonably visible with a magnifying glass in bone.

Other possibilities for Ivory are Casein type simulations or plastic. Casein will have more pronounced parallel lines and will be visible at all light angles. Un simulated plastic will not have the weight density neither the simulated "grain".

Other plastics chip like glass and feel warmer than true ivory

Walrus tusk is hard to distinguish unless part of the object has a cross section of the tusk being used. If so the core is granular dentine not hard like the true dentine.

Main source of information was by Bly. J. Is it genuine. 1986. Mitchell Beazley. London., but I went to the public library and surrounded myself with books on antiques.!!!! He explained it best.

Here is another letter that I received.

Since ancient times, ivory was known, used and counterfeited too! Anyway I write you what I know about the argument.

Ivory
I don' t know any way to distinguish between ivory from elephants, mammoth (fossil ivory), hippopotamus and sea elephant. The only difference I know is that ivory from hippopotamus, considered the finest, can only be used for small objects. Another aspect is that elephant' s fang grows like tree-trunk, forming a series of concentrical rings (not too regular, often they appear elliptical) that can be evidenced at low magnification (10-20 x) with a good lens (or better a stereomicroscope) and lateral light, incident from small angle. This characteristic can be used to tell elephant's
ivory from other materials.

Artificial Ivory
The rings can be mimed, but they are too regular; there are chemical tests (using organic solvents) that can tell the difference.

Narwhal tooth (Up to 2 m long, diameter up to 3 cm) It can only be used for long and thin objects; generally (if the object is not too little) you can see the vascular canal at one end of the object.

Bone and Horn

They show (under low magnification, in the conditions of light as ivory) several nervous and vascular canals (i.e. darker and long strips or lines). The material is also less compact and elastic, more opaque and not so heavy as ivory (because they are more porous).

I have microscopic photos of the materials I mentioned, but I don' t have a scanner to send them to you.

The ""match test"" indeed is quite drastic but definitive (the smell of burned hair, flesh or plastic is characteristic of horn, bone and plastic).
The definitive test could be immunofluorescence with monoclonal antibodies, but I don' t if there is a commercial source and it requires a complex instrumentation (fluorescence microscope).

Luigi Vecchia.

Bakelite, Tortoiseshell, Horn or Plastic?

Plastic is a material capable of being molded. This covers both synthetic and natural materials of which this report will only cover the synthetic

The earliest synthetic plastic as celluloid discovered in mid 1850's but developed in the early 1870 by John Wesley Hyatt from nitro-cellulose and camphor. He hoped to find a material for billiard balls. But the celluloid he found was too brittle, but by the end of the century was widely used for all sorts of household items including buttons and shuttles.

Bakelite, a phenol compound was discovered by Leo Baideland in 1907. Dr
Baekeland, in a makeshift laboratory in the back yard stable at his home in Yonders, New York, was trying to produce a synthetic shellac. He combined phenol (carbolic acid) with formaldehyde and found the mixture refused to be poured from his test tube. Because he was not one to throw away a test tube, he

was determined to clean it. But even with heat and a series of solvents, it did not work. The material was petrified. Even though he failed to find shellac, he was excited by what he had found, or as it turned out, the first thermosetting plastic.

In 1910, Baekeland formed the General Bakelite Company. There are two types of Bakelite, molded and cast. The early molded type of phenolic resin was mixed with fillers as wood flour and asbestos for added strength which made it dark in colour. The cast without the fillers had better decorative and colour properties and did not require expensive molds and equipment. They were cast in liquid form, hardened, cooled and converted to goods by machining.

Bakelite became more widely used after the patent expired in 1926 when other firms began to improve and market it under names especially Catalin. This newer phenol compound took colour better and was very attractive. It came from the factory in tubes, rods and sheets of various lengths and sizes. It was then easily worked, it could be sawed, sliced, ground, drilled, sanded and carved into intricate shapes. it was then polished in big rolling tumblers. This is the material we not tend to call Bakelite and it is material of some of the most beautiful ""plastic"" buttons.

The overall industry made great gains in the 20's when a German chemist, Hermann Standinger recognised the nature of the substances as giant molecules he named polymers. From this, the rest of the industry developed, and there appeared acrylics such as Lucite and plexiglass and then nylon in 1940.
This was sent to me by an Arachne member and acknowledged with thanks.

Tortoise shell

Tortoiseshell is just what it says and it was obtained in a most horrible way. Basically the tortoise was caught and cooked (baked I think). The heat made the shell flake off the body. This is the beautiful material we call tortoiseshell. The tortoise was then released for a year to swim in the sea and recover. It was then caught again and cooked again so that more tortoiseshell could be obtained. As

this torture went on, the
tortoiseshell became of finer and finer quality. I don't know at what stage the tortoise finally gave up the ghost. But I'm very glad that tortoiseshell is now a banned material (ivory has nothing on it). Having said that, I also think it is a very beautiful material, and antique tortoiseshell items should be cherished both for their beauty and the pain that went into them!

Testing

Tortoise is not the easiest material to identify for sure. The surest way might be by testing with a hot needle. Stuff a needle into an erasure or something, heat with a candle until the needle is red hot or almost that hot. Then on a place on the inside of the tool where a mark will not be seen, touch the tip of the hot needle to the surface. Tortoise, when tested produces an acrid, fishy or seaweed-like smell.

Horn can be identifies by the highly characteristic smell of burning hair or feathers.

Celluloid smells like camphor, usually a very strong smell. I think you probably will know the plastic smell.

This information comes from the Big Book of Buttons by Elizabeth Hughes. It was sent to me by Ann Kovalchick email: woodnspl@rma.edu. However Ann wrote the article on Bakelite and tortoiseshell that is reproduced above.

Conclusion

Certainly we do want to know what our tools are made from, and sometimes this is difficult. I must say that I shrink form doing the potentially destructive tests, but I think it is possible to do the red hot needle tests if your *really* must know (Like to value it for sale). Certainly do the visual assessments, but for the most part I would recommend just enjoying your tools for what they are, beautiful works of art showing the skills of the craftsman or the ingenuity of modern science.

What is it made of?
(Part Two).

Fabric tests.
Editor. Brian Lemin

Introduction.

In order to add this to the original article on “What is it made from?” I have culled and combined the information from two published sources and also a technical contribution from Luigi (and advice from his wife) The two articles were sent to me by, Tammy ………..
Many thanks to all involved.

Which Test?
I can not emphasise enough the need to avoid destructive testing, therefore visual and feeling, testing skills should first be developed by those wishing to identify fabrics.

Of course, we should always try to identify the fabric with a non-destructive test first. So I will deal with the “Look and Feel Test” first, then the “Break Test” and finally the “Burn Test.” What follows is a technical comment by Luigi.

Look and Feel Testing.

Cotton: It is soft, inelastic and cool to the touch. If you visually examine it, it is dull to look at and has short soft fibres.

Linen: This has a leathery (stiffer) feel about it. Visually it has longer (than cotton) fibres and is more lustrous.
To differentiate further between Cotton and Linen, pull a thread through your tight finger and thumb. The cotton is limp and the linen has some stiffness with it. Cotton tears easier than linen and linen is believed to

absorb a drop of saline quicker than a cotton fabric.
Examine a linen handkerchief, it can be creased easily.
In ancient laces (18^{th} Century), the most used thread was linen, because cotton was too "woolly" and opaque. Only in the 19th Century the introduction of a new way of working the fibre (in Italian is called "mercerizzazione" [presumably “mercerised” in English]- immersion in caustic soda) allowed the use of cotton for artistic laces.

Wool: Warm, springy, and elastic to touch. Visually it has short soft fibres.

Silk: Soft, smooth (almost shiny smooth) and warm to touch. It is somewhat elastic. Visually it looks somewhat lustrous.
In earliest Chantilly laces was used a silk called "grenadine"; tightly twisted, it was less bright than normal silk, resembling linen. The colours used were ivory and black.

Rayon: Has a cool feeling, inelastic, but smooth. Does not have the “quality” feel like silk does.

Break Testing:

Before you break test a fibre you will need to untwist about a foot of it, so that it resembles its unspun state.

Cotton: It breaks with a snap. But look at the broken ends; they are very fuzzy short fibres. (You know how difficult it is to thread needle with a broken cotton end as opposed to a cut end) There will be evidence of the curl of the twist too.
Linen: Has more resistance to breaking than cotton. The broken ends are more straight than cotton and the lusterousness can be seen.

Wool: Stretches quite a bit before it breaks. The ends are wavy and Wrigley.

Silk: Stretches before breaking, then breaks with a snap. The broken ends are quite fine and wispy.

Rayon: Really quite strong and inelastic. Almost have to break it not by pressure but with a jerk. If you moisten it with your tongue then it breaks more easily.

The Burn Tests

Please remember that this is potentially dangerous. (Like ending up with your house on fire and all your lace projects and bobbins gone up in smoke!) Remember too that your kids may be watching and they LOVE to copy you. I do not want to appear stupid about this but fires really do happen and they can sometimes happen to you. So please, please, please, do not take short cuts with your safety.

The key descriptors in these tests are *shrink, curl*, and *melt*. The differentiation is *shrink away* from the flame or *does not shrink away* from the flame. Smell also comes into it.

Before we start the specific reactions of fibres to flame, I offer the following basic review of the three main groups of fibres.

Vegetal fibres (cellulose): e.g. linen, cotton and rayon: they burn
Animal fibres: (cheratine, and other animal proteins): they don't burn easily
Artificial fibres: they burn or mainly melt

So here we go. Use a match and slowly bring a few unravelled threads of the fabric into the flame and see what happens.

Cotton and Linen: Does not shrink away from the flame. Burns with a yellow flame. Burns well, even quickly. (blazes?) Still burns after you have taken it from the flame. The smell is like burning paper. There are two types of ash that you may see fluffy and grey or fluffy and black (That shows it is mercerised) Linen could be said to burn slower than cotton if you are able to judge that.

Wool: Curls away from the flame. Slow to start burning and burns slowly. The flame flickers, the wool melts a bit and sort of sizzles. It almost stops burning immediately when the flame is withdrawn. The smell is said to resemble burning feathers or burning hair and the ash is lumpy and brittle, quite crushable.

Silk: Pure silk curls away from the flame. Burns slowly and stops burning when withdrawn from the flame. There is some melting. Smell is said to be of burning feathers. Filled / weighted silk hardly burns with a flame, It sort of glows and smoulders. The ash forms a brittle, black crushable bead. If a piece of silk is burned as opposed to some threads, then a skeleton of the fabric is left after burning.

Rayon: Does not shrink from the flame. Burns sprightly and with a yellow flame. It continues to burn after being removed from the flame. Very little ash. Smells like burning wood.

Acetate: Melts away from the flame. It seems to combine blazing with melting as the flame consumes it. The smell is of vinegar. The ash is a brittle irregular blackish bead.

Polyester and Nylon: Shrinks away from the flame and fuses. Burns slowly with very little or no flame. Ceases to burn when the flame is removed. The ash distinguishes between polyester and nylon. The polyester ash is round hard black beads and has a chemical smell. The nylon ash is also hard round beads but they are gray and are said to smell like “boiling string beans!”

Acrylic: Fuses away from the flame. Burns and melts rapidly this continues after the flame is removed. The ash smell is acrid and is a brittle black irregular bead.

Microscopic examination
High magnification microscope (100 - 600 x). The fibre must be prepared untwisting threads, with an apposite needle, and the elementary fibres must be isolated.
You must prepare a solution of 10 ml of distilled water and 1 ml of glycerol.
A little tuft of the tissue must be posed on a glass slide, then a drop of the water solution and then a cover slide.

Vision under the Microscope:

- **Cotton**: a plain and spiralled tape. A central channel can be seen.

- **Linen**: the fibres are cylindrical with regular enlargements: they resemble bamboo.

- **Wool**: the fibres are cylindrical and fully covered with little scales (like a tile roof).

- **Silk**: raw silk: a double band (kept together by a protein called "sericin"; worked silk (in Italian "seta cotta"): a single band, very regular and bright.

- **Rayon and all other artificial fibres**: they are extremely regular; the shape and diameter of the section depends on the wire gauge

NOTE
Some ancient laces have also metallic threads (generally gold)

Chemical test
The only simple test is based on the solubility of Rayon in acetone. Other tests are more complex, expensive and require special instrumentation.

Conclusion

It is a pity to think that most of the fabric that we want to identify is very old or antique. The look and feel tools must be emphasised and developed by would be testers. The somewhat lesser destructive test, the break test will also give valuable clues. So, do try those methods before you start burning potentially valuable fabrics.

References.

- Terreni V., Amandola G.; Merceologia 2000; Masson; Milano; 1988; page 467-501; ISBN 88.214.0482X

The Identification of Fabrics is from the
book Antique Children's Fashions 1880-1900, A Handbook for Doll Costumers by
Hazel Ulseth & Helen Shannon. ISBN 0-87588-192-0, published by Hobby House
Press, Inc. Cumberland, Maryland 21502, 3rd printing 1985. It is a cool book
:-)

The Burn Test is from a book called All About Cotton, A Fabric dictionary &
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