## February 2018 Meeting—John French

John had been asked to do a presentation on adhesives and said that he would talk about them up to coffee time and then would show something different but related.

He started with the question: Glue or Adhesive? Basically, there is no difference. but the term glue seems to be applied to natural product based while adhesive is generally used to describe synthesised products.

A timeline for development of adhesives was presented which showed that for millennia natural product, based adhesives were used and it was not until the early 1900s that synthetic adhesives started to appear. It showed that there was a great surge in the different types of adhesive during the first and second world wars.

John explained that adhesives "stick" because of various forces and explained the difference between cohesive forces and adhesive forces and the role they play in adhesion. He also discussed mechanical adhesion.

The importance of good surface preparation was explained so that a good bond can be achieved. Types of joint likely to be encountered in woodturning were shown, i.e. side grain to side grain, end grain to end grain and side grain to end grain. Stresses to such joints were shown, i.e. tensile, compression, flexural and torsional. The various failure modes were displayed.

He then went on to discuss the various adhesives that could be used in woodturning.
***Natural products*** - Casein based on milk protein. Hide glues where animal skins are boiled to extract collagen and gelatine. Rabbit skin is believed to make the best glue. Fish glue is also possible being made from the skin and swim bladders of fish such as the sturgeon.
***Urea-formaldehyde adhesives*** - there are two types, two component such as Aerolite 306 which uses a liquid hardener. The other is a "one-shot" such as Cascamite which incorporates an organic salt as hardener. Both resins come as powders and are reconstituted with water.
***Hot melt adhesives*** - these are thermoplastic materials that soften on heating and then harden on cooling. They are used as a means to temporarily glue components to a faceplate to allow light turning.
***Cyanoacrylate adhesives*** - these use moisture to effect the cure and the joint requires holding tight for a short time until set. They are generally low viscosity materials and so can penetrate the surface of the wood. They are commonly used to repair cracks and are often used as a form of lacquer to give a durable coating on pens.
***Polyurethane adhesives***—these are based on isocyanate chemistry and require moisture to cure. Joints need to be clamped to get a good bond as PU tends to foam. When hard they are moisture resistant.
***Polyvinyl acetate adhesives*** - these come as an emulsion of PVA/polyvinyl alcohol/water. They cure by loss of water and dry clear. They come in two forms, one for indoor use and the other, a weatherproof adhesive, for outdoors.
***Epoxy adhesives*** - these come in various packs such as tubes and syringes and in various cure speeds from 90 seconds to 24 hours. They are not the best for bonding wood and are more suitable for metals,

The American magazine Fine Woodworking in their July/August 2007 edition had reported on a comparison of various woodworking adhesives and under their test conditions they concluded that External grade PVA gave the best results and PU gave the worst result.
John ended the presentation with some Health and Safety advice:

***Always read the information supplied with the product or look on-line for safety data sheets***
***Use gloves – nitrile rubber gloves give the best chemical resistance***
***Be aware of any fumes that may be given off***
***Wear eye protection***
***Wash your hands thoroughly after using adhesives***
***Carefully dispose any items you used to mix the adhesives***

In the second half of the evening John introduced some epoxy putty and some of the ways it can be used. Epoxy putty is commonly used in model making as once mixed it can be shaped and left to harden. John had brought along some Milliput which comes in the form of two sticks, one the resin and the other the hardener. Equal amounts are cut from each stick and then mixed thoroughly while wearing gloves. To show the available Milliput colours John had prepared two boxes with simple patterns.


The colours are yellow/grey, superfine white and silver/grey in the top photo. In the bottom photo the colours are terracotta and black.

The resin/hardener mix should be left for 24 hours to fully harden when the surplus can be turned away using a scraper.

The resin can be sanded to 600 grit and then some “Yorkshire Grit” can be applied to get a good finish. Burnishing cream can then be used to get a good shine.

John showed the mixing and application of black Milliput into grooves cut into this box. The bands were cut with a thin parting tool and a carving tool was used for the zig-zag cuts. The putty was pressed into the grooves, allowed to harden and finished as above. Wood dyes were used to colour the triangles.