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Don't say 'glue', it's 'adhesive'!
Personal View of Adhesives seminar held at the Natural History Museum, London,
Tuesday 19th November 2008

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Introduction

Although I am now no longer officially a student, I am still volunteering at the NHM and gaining valuable experience, so I was very glad to have the opportunity to go to the seminar on adhesives led by Simon Moore and I am very grateful to NATSCA for again providing the bursary.

Adhesives are one of the most widely used and important substances in practical conservation. Whether it is analysing previous ones used or judging which one will be the most appropriate for a repair, it is important that people are aware of the choices of products there are and the properties that they have.

So many choices

The first two presentations were by Velson Horie from the British Library, the first being, '*How to choose? The properties of suitable adhesives*' and the second, '*What to choose? Which are the most suitable for my specimens?*'

There are many things to be considered and Velson took us through a whirlwind tour of criteria, processes, definitions, considerations, and tips on how to evaluate the best adhesive for the job. Some of the criteria included points such as: the application of the adhesive must not harm the object; the setting process must not harm the object physically or chemically; the material must be removable without harming the object; the application must not harm the worker; the adhesive must be water white, should remain water white; should be strong enough and must not alter to become irremovable.

If the properties of the object material are known then the most appropriate adhesive can be chosen, taking into consideration the solvent and how the adhesive will interact with the object; does it have a different pH, how reactive is the adhesive, etc .

There was also practical advice on the application of adhesives, explaining that bond thickness must be thin and that setting can be through liquid solidification, evaporation or chemical cure. Does the adhesive shrink on setting? Most, except those which are pressure sensitive do (i.e. cello tape), and it is important to know how much, as this could affect the strength of bond or the object. He listed many types of adhesive, for example natural protein, cellulose derivatives and synthetic PVA, and listed their properties and explained a little about each, which was very useful. As there was so much information in such a short space of time, I was very grateful that he provided hand-outs containing all his slides!

Herbaria adhesives

Next was Jovita Yesilyurt from the Botany department at the Natural History Museum, London (NHM) talking about botanical related adhesives and consolidants. There are a number of methods which can be employed to mount botanical specimens, they can be loose, pinned, stitched, strapped or glued. There were many adhesives that were tried but were found not to be suitable. Methyl cellulose dissolves in water and was found to be stable but was too weak; wheat starch paste was unstable and attracted pests; Evacon-R was difficult to apply, dried too quickly and was affected by temperature. Latex was used in the past as alcohol cannot be used on organic material and the reason it was used was because it is water soluble, does not set too fast and has a strong bond.

Since 1993 the Botany department started using PVA, which is a thermoplastic! polymer resin that is flexible and used on objects containing organic material. Jovita explained that it was a good consolidant and as well as plant material can also be used on bone, shell and antlers. It has good adhesion, is water soluble, stable and durable but no adhesive is perfect and so it was highlighted that even though they have been using PVA for years they always consider new products that come on the market.

In a bit of a pickle?

After coffee it was Simon Moore, from Hampshire County Council Museums Service, who told us about adhesives for fluid preserved specimens. The two main adhesives that are used are Celloidin (or Collodion) used for objects stored in alcohol based preservatives and gelatine, which is used in formaldehyde-based preservative solutions.

Celloidin comes in different forms including pyroxylin and necoloidine, and can be used as a cement to glue specimens in IMS to glass, for reattaching fallen labels in educational jars, rejoining broken or degraded bone, reattaching arthropod limbs with the reinforcement of glass needles (made by stretching glass rods over a flame) and even repairing a sponge or the split bell of a jellyfish! The gelatine for formaldehyde preserved specimens can be made only from leaf gelatine, not the powder form and objects must be rinsed in water and be fairly dry so that the gelatine does not gel too quickly. After 30 years or so hydrolysis will eventually weaken the bond and it will need replacing. It is astounding the results that can be achieved, even from specimens that have been corroded by fungal enzymes and gives encouragement to anyone that is faced with a collection that is desperately in need of a little TLC. You would be surprised at what is still salvageable.

A bit of an animal

Nanke Schellmann from the V&A gave a very comprehensive talk on animal glues, their adhesive properties, longevity and suggested uses for repairing taxidermy specimens. There are different types of animal glue with different chemical, physical and mechanical properties and they come in varying forms: raw, refined, dry and ready-to-use. Nanke went into detail on the structure of animal glue and how it is processed and formed from the raw ingredient. The raw ingredient, collagen, is formed of long strands of naturally occurring amino acids linked together by covalent bonds. By denaturing the collagen gelatine is formed, which is the active ingredient in animal glue. Depending on where the collagen comes from, i.e. mammal, marine, bone, skin or bladder, how it is extracted and how it is prepared produces different results and can improve or reduce the quality of the glue. If the gelatine is overheated then that reduces the gel strength, which is important for high cohesive strength, greater stiffness, higher resistance to impact and reduced swelling and increased stress development in rising RH.

Animal glues do not react well in dry conditions, as they shrink and become brittle, and in high RH their elasticity reduces and there is increased stress development. The more impurities in the glue then the lower the gel strength and the more discoloured the glue will become over time, so the purer the product the better.

Many ready-made glues may contain unknown additives which promote cross-linking, that will reduce solubility and allow the glue to become more brittle over time. Nanke highlighted that the properties required from a glue used in taxidermy are: appropriate adhesion qualities, 'reversibility' or re-treatability, stability with aging and minimal disturbance! of the original skin. The chemical nature of the glue means that there is good adhesion with animal skin and they both require the same environments to stay stable. If the skin was treated with metal salts then this may cause the glue to become insoluble and if the specimen is light or transparent in colour then only the best/purest gelatine or isinglass can be used.

Fossil fillers

Geological specimens were dealt with by Kate Andrew from Hertfordshire County Council Museums Service. Kate described numerous terrible things that were used in the past to gap-fill and piece together objects and also discussed more recent methods which are considerably more effective. Of the materials that Kate has found holding fossils together the list includes: compo, bees wax, AJK dough, plaster, glaziers putty and many more. Plaster of Paris produces many problems, as it expands when it sets and contains water which encourages pyrite decay.

Of the substances that are recommended, Milliput and Paraloid with glass beads are the most popular, all depending on what you are trying to achieve, and there was also another product called Apoxysculpt that was mentioned. Gap-fills can be used as adhesives, for structural support and for appearance and can be adapted accordingly. The size of the glass beads can be varied when mixed with Paraloid, as larger beads can be used for structural fills and then micro-glass beads can be mixed with Paraloid for the surface layer that needs to be smoother. Fills can then be painted with acrylic paint so that they blend in and are not quite so obvious.

Hands on conservation

After lunch it was time for the demonstrations. For the first two we were taken into the Palaeontological Conservation Unit (PCU) and Adrian Doyle and Lu Allington-Jones showed us examples of solvent gels for the removal of adhesives, yellowed resins, gap-fills with resins and other materials. Lu had some examples of historical paper labels that were removed from mounted boards. It is important to salvage these, firstly for their historical value but also so that once the specimens were re-packed they would still have all their original information. It was quite remarkable that something which seems to be irretrievable can be retrieved and add to the provenance of the specimen.

Adrian Doyle, after being in the PCU for over 30 years had collected samples of adhesives which at the time were considered conservation grade, but that now were in some cases bright orange! It goes to show that just because we are told to use something we should always remain sceptical and keep a close eye out for any changes and constantly try to improve on the materials we use.

Liesa Stertz had brought out examples of some of the NHM's Blaschka glass models that she had cleaned and repaired. Compared to what they had looked like before she had done a remarkable job, and part of her work involved the reattachment of very fine glass spines and pieces using micro-tubing. It is a testament to her skill that the repairs are virtually invisible until you really get up close and shows what can be done with some time, patience and a very steady hand.

Lastly, everyone went back upstairs for the demonstration by the Botany department on the mounting of plant material with PVA. The lady that gave the demonstration was very deft and made it look easy, but there is a skill in presenting all the relevant parts of a plant, making sure that it stays intact and judging each plants' texture, as they are so varied, from woody to succulent, spines, flowers, roots, etc. Once dried plant material can be so brittle, so it is quite incredible the results that they can produce.

The seminar was very informative and to someone that is just starting out in a career in conservation it was invaluable. I spoke to people that have been working in conservation for years and they too thoroughly enjoyed the day, as it was a good chance to observe other people's craft, discuss methods, materials and learn new tricks of the trade. I would like to thank everyone that was involved in organising such a great day, all your efforts were much appreciated.

Geological Curator's Group Seminar

Casting Geological Specimens

At the British Geological Survey, Keyworth, Nottingham

A two day practical workshop to include moulding and casting of geological material, presentations and a field trip to Charnwood Forest to consider the practical problems of moulding in the field.

An evening 'pub meal' is planned for delegates.

The workshop will be beneficial to curators, display technicians and conservators. The course will be lead by Sue Martin (BGS), Caroline Butler (NMGW), Annette Townsend (NMGW) and Mike Howe (BGS).

Costs: £10 per day per person (£20 for the workshop). Includes: tea/coffee, lunches, all materials, information pack and field trip.

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