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storage furniture, consideration of the needs of pest control in the design of proposed new buildings, and the on-going development of condition surveys. But major areas of concern remain. Whatever the financial gains of recently introduced out-of-hours cleaning, from the point of view of pest control the consequent loss of contact between curators and cleaners can only be seen as retrograde. And concerns remain regarding safe use of Dichlorvos, its long-term availability, and the lack of a suitable alternative.

Future progress might centre on the crystallisation of the Pinniger Recommendations into a formal pest control policy supported by museum management and readily available to all staff. Such a policy should include the following considerations:-

1. Everyone working in the Museum or acting as an agent for the Museum, should be aware of their responsibilities regarding care of the Museum's collections.

2. The specifications for collection furniture, display furniture, buildings and environmental conditions, should meet standards that do not place specimens housed therein at risk from pest attack.

3. Procedures must be in place to reduce the probability of pests being introduced through contaminated materials.

4. Associated collection practices, e.g. research, cleaning, estate management, should reflect the needs of pest control.

5. Working practices should be adopted that eliminate unnecessary exposure of specimens.

6. Pest monitoring programmes must be in place and maintained, and the results documented and acted upon as appropriate.

7. When remedial measures prove necessary, they should be carried out within the constraints of current Health & Safety legislation and documented as appropriate.

8. Any remedial measures should minimise/avoid chemical/physical changes in objects.

Phillip Ackery (Convenor - Pest Control Subgroup)
The Natural History Museum

The Thermo Lignum Process

Environmental health concerns have caused a radical change in the popular perception of chemical pest control methods. Governmental and environmental agencies seek to further limit the uses of chemicals in areas that have, till now, accepted them as routine treatments.

As an example, the German 'Dangerous Substances Act' requires that "toxic gases may no longer be employed if a toxin free procedure is effective and reasonable". Because of these concerns, non-chemical solutions to common pest problems have become a particular goal. This has led to the development of essentially two new processes designed to treat insect-pest infested objects - warm air treatment with controlled humidity, and inert gas "fumigation".

The treatment and restoration of rare and valuable objects in a sensitive and non-invasive way is a priority for anyone concerned with conservation. Insect pests account for much loss and damage every year and are responsible for the slow erosion of our cultural heritage.

In the field of building and monument preservation the basic hot air method has been applied successfully for several decades. Using high pressure heated air, roof timbers and building frames can be raised to over 55°C. At such temperatures animal protein within the insect cells becomes irreversibly denatured resulting in the insect's death. The main problem encountered in applying this sound biological principle to the treatment of high value works of art, antiques etc. has been resultant dehydration of the piece causing irreversible damage through shrinkage and cracking.

The eradication of insect pests in such a sensitive area requires precise control over all environmental parameters. This is especially true of relative humidity. The development task was to find a treatment which could guarantee the destruction of the insect pest at all stages of development while being completely harmless to the object and posing neither health nor environmental risks.

The thermal solution is a technically refined version of the previously discussed heat treatment. A chamber was designed in which objects could be placed and the environment modified precisely by computer. In both the warming-up and cooling-down phases of the treatment the relative humidity is controlled in such a way as to ensure that the humidity balance is maintained. As a result, no dehydration can occur.

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The Use of a 'Dynamic' System for Fumigating Museum Objects

The fumigation of pest-infested objects has been carried out at the Science Museum for a number of years. In April 1997 a pest strategy was written to support the Museum's Collections Management Policy Statement. The Conservation Section, in conjunction with setting up an Integrated Pest Management programme (IPM), had begun to investigate methods of fumigation which presented a non-harmful treatment for the objects but did not create a health and safety hazard to its staff.

The most common insect pests identified as harmful to the Museum's collections are *Attagenus smirnovi, Anthrenus sarnicus, Stegobium paniceum* and *Anobium punctatum*. In the past, methyl bromide had been used to fumigate infested objects coming into the store. This is still an acceptable treatment for many wooden items although it is not appropriate for most composite objects as methyl bromide will react with sulphur-containing materials and also attacks metal surfaces. Methyl bromide is known to deplete the ozone layer and can create a health hazard to those exposed (methyl bromide is specified as a Part 1 poison, Poisons Act 1972). Therefore an alternative treatment was explored.

Initially, the use of high levels of carbon dioxide was investigated. When exposed to high levels of carbon dioxide, insects open their spiracles allowing body moisture to escape, so causing them to die from dehydration. Two fumigations were carried out with good results. Although treatment using carbon dioxide appeared successful, there were a number of reasons why another method was explored, not least Health & Safety issues, availability and cost. Following a course on "Pest Management and Control For Museums", organised jointly by The Getty Conservation Institute and The Conservation Unit of the Museums & Galleries Commission, I was encouraged to investigate the use of a 'Dynamic' system using nitrogen. A 'Dynamic' system refers to a method of fumigation where an inert gas is used to flush out air from a bag/chamber until low levels of oxygen are attained. These levels are then maintained for a specified period of time.

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The Pest Problem Within The Dry Arachnida and Myriapoda Collection

Arachnid and Myriapod specimens are preferably stored in 80% methyl alcohol as this preserves soft-part anatomy, lost if specimens are dried. The Natural History Museum additionally has significant dry-pinned material dating back to the early 19th-century and housed in 208 entomological drawers (mostly Hill units). The dry collection is now not of great scientific importance as in recent years much of the type material has been restored in spirit; many specimens are just large and showy with little data. However, most of the dry specimens were donations and some have an important historical component, so the collection has been largely maintained in its original form. Unfortunately, in some parts of the collection, specimens are poorly preserved, especially tarantulas with soft abdomens, and brittle millipedes. Scorpions and centipedes with their flattened, highly keratinized bodies, appear to have fared much better. Parts of the dry collection have been subject to the ravages of the Guernsey carpet beetle - *Anthrenus sarnicus* - the larvae of which have reduced some spider specimens to a mere pile of legs and frass!

At first glance, it is not apparent how pests were able to gain access to the collection. The dry collection is separated into three discrete blocks to the rear of the store room away from the interior doors. There are no windows through which beetles can fly. However, there are several air ducts leading out of the storeroom to the roof, along with a 'dumb