

I was extremely interested in Tania Collas's helpful article on insect growth regulator pest control trials in the January 2016 *WAAC Newsletter*. It is a shame that the moveable and immovable sides of cultural heritage conservation do not have more linkages in literature searches and dialogue, for there is so much to learn from one another. I'm on the buildings side of the aisle and empathize entirely with the collection care problems of insect infestations, due to my dealings with termites, and in my native England, with the dreaded deathwatch beetle (*Xestovium refovillosum* sp).

For subterranean termites, the baited systems deploying growth and digestion inhibitors do show good results. But for dry wood termite eradication, the method of choice at least in California for building complexes remains fumigation. I know artwork and collections conservators have grave concerns about some of the insecticides so deployed for their impacts on the museum objects, but as we found out in the UK with attempted fumigant systems for the deathwatch beetles in medieval cathedral roof spaces, impacts are low and infestations soon reappear.

Sterilization of museum object by irradiation (Eastern Europe); anoxic environments; etc tends to leave the artefacts unharmed by the process = impacts are low. But if the infestation is in the cabinet or building within which

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**Art and Fumigation: Should It Stay or Should It Go, cont'd.**

When tested during the secondary clearance, most of the bags had an undetectable level of SF inside. A few had levels of 1ppm and one was at 3ppm, 5ppm being the safe level. In these cases, the bags were opened and left to air out for some additional time before unwrapping.

The paintings, sculptures, and other materials were re-installed, again over 3 days with a crew of 5 art handlers. At this time hanging hardware was inspected and upgraded, earthquake mitigation was added as appropriate, and batteries on the wireless transmitters for the alarm system were changed.

SF provides no ongoing protection against reinfestation. Once it diffuses out of the structure, it is done. That's good as there is no residue or after effect. It's bad in that after all that effort, a new colony of termites can move in the day after the treatment is completed.

Recognizing this and realizing that the fumigation treatment was a process no one wanted to ever repeat, we contracted with the extermination company to treat any wooden structural members that were accessible with Tim-bor, (disodium octaborate tetrahydrate). The borate system was dissolved in water and sprayed generously onto all surfaces that could be accessed from crawl spaces and access panels. As the water evaporates, a thin layer of the non-volatile product is left behind. According to Wikipedia it is "non-carcinogenic and has a low toxicity to humans and pets," however it kills "termites, powder post beetles, carpenter ants, fungi, and algae."

\*"Visual Effects of Selected Biocides on Easel Painting Materials," Koestler et al, *Studies in Conservation*, Vol 38, no 4, 1993.

the artefact is kept, and the 'container' or display case is not also treated, and external conditions remain the same, then the chances of re-infestation are high. And this could also be true for museum objects and other larvae-based wood-eating insects, regardless of how "object sterilization" takes place (e.g., cold temperatures, irradiation, NOx gassing etc). But why?

In the European Commission DG-XII research grant aided project Woodcare (for which I was project manager at English Heritage), a consortium of scientists from the UK, Ireland, and the Netherlands led by consultant mycologist / entomologist Dr. Brian Ridout, closely studied the ecology of the deathwatch beetle in its habitat. We found that larvae remained completely untouched by gas / powder fumigants, well insulated in their tunnels. Furthermore, when mature insects surfaced through 'flight holes,' they could sense the poison and avoid those areas remaining treated (usually horizontal upper surfaces where gas / dust settles). We also discovered that natural predators (certain flies and spiders) were being killed by the non-target specific insecticides. So what to do?

Through complementary research at the Universities of Oxford, Birkbeck College, London and Abertay, Scotland, we learned that egg-laying mother beetles are attracted to fungi-infested wood as an indicator of moisture and nitrogen nutrition release; that there were no pheromone or anti-feedant odors that could be utilized in targeted traps (though pheromone traps remain promising for the furniture beetle); and that light attraction looked like the most promising killing vector.

Therefore, fine-tuning wavelengths of the old butcher's shop blue light 'insectocutors' proved the best approach: we avoided harm to spider predators, protected bat species, and killed up to 60% of egg laying mothers emerging in the spring and taking flight to colonize fresh wood. [See [www.insect-o-cutor.com](http://www.insect-o-cutor.com) and similar. Certain flying insects are attracted by specific light wavelengths. Upon approaching the lamp, they are burnt to a crisp and collected in a tray. As the website says – a 1938 technology that still works today.] As the deathwatch beetle can live for up to 10 years in its larval stage, eradication of the pest in huge cathedral roof spaces is an on-going project. But studying how beetles and their larvae behave and then targeting (combinations of) treatments, seems the way ahead.

By the way, in the process of the research, TNO-Bouw (the Dutch building research establishment) was able to trial a beetle-sniffer (larvae fart, so lots of off-gassing methane to track) but settled on a patentable transducer-based detector able to pick up vibrations from noisy larvae jaws chewing on all that wood when concealed deep in roof beams and the like.

The work was published in Ridout B and Teutonico J (Eds), "Timber: the EC Woodcare Project – deathwatch beetles in historic buildings," *English Heritage Research Transactions*, Vol. 4, James & James (now Maney), London, 2001. It appears to be selling still on Amazon for approximately \$12.50 plus shipping and tax.