# The Biodeterioration Centre, University of Hertfordshire

Richard Smith

Biodeterioration can mean business. Richard Smith describes the unit set up at the University of Hertfordshire to monitor and investigate biodegradation problems.

The Biodeterioration Centre was borne 25 years ago out of local industry's need for an independent microbiological testing facility, and the entrepreneurial motivation of its founder, and my late father, Dr Neil Smith. In the early days in the late 1970s the Centre's work began as microbiological analysis of fuel samples from the Ministry of Defence at Portsmouth and British Aerospace at Hatfield, and occasional water microbiology tests for local industry. However, the bulk of the work was research into the biodeterioration of materials, which has continued as relentlessly as the cycling of the elements that it studies.

Many research studies have been performed over the years at Hatfield. Examples of these include the microbial degradation of Polaroid sunglasses by psychrophilic fungi; false teeth degradation by artificially cultured plaque populations; microbial corrosion of military hardware; the breakdown of emulsions of bitumen; and microbial fuel spoilage within nuclear submarines. The work has always been informative and rewarding, and often innovative and swashbuckling, as Neil Smith would dart around the laboratory planning the next 'conclusive' experiment long before completion of the previous one.

It was at about the same time as the Biodeterioration Centre started out within the Hatfield Polytechnic, that Legionnaires' disease made a dramatic entrance to the world of public health in Philadelphia, USA. Widespread concerns about this industrial disease led to cumbersome and complicated *Legionella* isolation and enumeration tests being offered as a service from the Centre. The client base expanded as water treatment engineers and building maintenance companies came from far and wide to use the services of the Centre.

The Laboratory now still offers *Legionella* testing as one of its core microbiological tests, although the method has been streamlined, with the benefit of greater efficiency and reduced costs. The Centre holds UKAS accreditation for *Legionella* testing, and many other standard microbiology tests, as well as retaining its fuel testing services for companies based in airports at Luton, Stansted, Manchester, and as far away as Liege and Rome. Domestic water potability tests make up a large part of today's work at the Centre, including long-established microbiological water testing contracts for the local pharmaceutical industries.

An air quality monitoring service has also evolved over the last decade. This has provided a wealth of experience of indoor air quality testing and investigations into 'sick building syndrome' from Moscow to Madrid. Recently the Centre has also been involved in external airborne microbiology monitoring at domestic composting facilities around the south-east.

Generating valuable commercial support to the progressive University of Hertfordshire, the Biodeterioration Centre has continually evolved to provide services where there is a requirement. This diversity demonstrates our strengths, but the secret of maintaining a loyal customer base is a commitment to a high quality service at all times, in all tasks. In addition, the Biodeterioration Centre continues to play an important role in the education and industrial experience of today's undergraduates and tomorrow's microbiologists within the university. As Director of the Centre, I look forward to the next 25 years of the irresistible science that is known as biodeterioration, and as sure as eggs is eggs, they will probably go off and we will be there to investigate why.

### A typical project – fungal etching of sunglass lenses

A study of the etching of glass lens surfaces by the action of xerophilic fungi was carried out during the 1980s. Studies were done using commercial sunglasses treated with various carbon and energy sources, including artificial sweat, glucose, yeast extract and paper extract. The samples were held at a range of water activities (60–90 % relative humidity), for up to 180 days at tropical temperatures.

Etching of the glass surface was observed using the naked eye, and using optical microscopy. A rating system of etching was devised to classify the degree of biodeterioration.

Earlier research had implicated fungi of the genus *Aspergillus*, and had suggested that tropical conditions, along with a readily available nutrient source, would provide environmental conditions favourable for the surface growth of *Aspergillus*. The deteriogen had been observed to traverse the surface of the lenses. The concentrated organic acids in the water phase (hyphosphere) around the fungal hyphae were suspected of being corrosive to the glass. Deterioration of the lenses would be expected to result, providing spoilage of the product.

Indeed, experiments found that some types of sunglasses were clearly seen to be etched in this way, although the results were found to be manufacturer-dependent. For a while the Laboratory was known to hoard more unfashionable sunglasses than a Turkish tourist market! The undamaged samples were therefore generously distributed among the students of Biosciences, who were not generally known for their strict dedication to style at the time!

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### The International Biodeterioration & Biodegradation Society (www.biodeterioration.org)

The IBBS is a multidisciplinary organization concerned with the biodeterioration of commercially important materials. It aims to promote the science and technology of not only biodeterioration but also biodegradation and bioremediation. It holds scientific meetings and has an official journal, *International Biodeterioration and Biodegradation*, which is included in the annual membership subscription. Membership is open to anyone with a scientific, technical, practical or commercial interest in these fields.

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