COLLAPSE

Corrosion of Lead and Lead-Tin Alloys of Organ Pipes in Europe – a research project supported by the European Commission under the „Fifth Framework Programme"

Korrosion von Blei- und Blei-Zinn-Legierungen von Orgelpfeifen in Europa – ein Forschungsprojekt unterstützt von der Europäischen Kommission innerhalb des „Fünften Rahmenprogramms"

FIFTH FRAMEWORK PROGRAMME

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Further tests in the lab looked at other corrosive agents that might be involved. Common atmospheric pollutants such as sulphur dioxide, nitrogen oxides and ozone did little damage to samples from the pipes.But acetic acid, at concentrations similar to those found in organ pipes, was highly corrosive. "I've never seen such a good correlation between laboratory and field results,"says Svensson.

Subsequent investigations revealed the likely source of the acid. New oak wood gives off high concentrations of acetic acid, and restoring an organ often entails rebuilding oak components in its bellows and wind chest — the box from which high-pressure air is delivered to the pipes. Most of the organs suffering from corrosion had been restored in the recent past — the Lübeck Stellwagen was overhauled in the 1970s, for example.

But many old organs have had their wooden parts replaced several times without falling victim to corrosion. So why has the problem only started to emerge in recent years? This could be where the enthusiasts' hunch about central heating fits in. Svensson is eagerly awaiting the results of humidity and temperature monitoring; it could be that warmer church air is driving off more acetic acid from the new wood,he says.

Winded: many lead organ pipes in Europe, such as this one, are disintegrating.

Another key piece of evidence to emerge from the COLLAPSE study is that all the affected organs were built in the 'North German'style, and their lead pipes contain a small percentage of tin. This lead was first cast into sheets on sand, and tin was added both to harden the pipes and to increase their lustre. But when most of the organs that are now corroding were made, tin was scarce and expensive, and so could only be used sparingly. Metallurgist Carla Martini at the University of Bologna in Italy and her colleagues are probing the affected pipes'composition using atomic absorption and X-ray fluorescence spectroscopy. This has confirmed that the corrosion seems to occur only in pipes containing 1.5–2% tin. "These traces of tin seem to have a big influence on corrosion,"Martini says.

Tinned goods

This may explain why most organ pipes in Britain seem to be immune to the phenomenon. "I've only seen two cases in my 30-year career," says John Norman, a London-based consultant who advises the Churches Conservation Trust on organ preservation. At the time the corroded pipes were made, the main source of Europe's tin was Cornwall. As a result, it was much cheaper in Britain than in continental Europe — so British organ pipes contain up to 20% tin.

Why corrosion should occur only in lowtin pipes remains a mystery. The metal itself isn't responsible, says Martini. Her optical- and electron-microscope analyses are revealing that the low tin-content pipes also contain large amounts of impurities such as copper, antimony and bismuth. These influence the pipes' micro-structure — the size and arrangement of crystal-like pieces of metal separated by air spaces and impurities.Martini suspects that understanding how the impurities promote corrosion is likely to provide the key to the mystery. But after hundreds of years, it is difficult to know how the pipes' composition has changed over time. "There's a lot we may never understand," says Martini. "One thing you cannot emulate is time passing."

Lovers of organ music can only hope that the COLLAPSE project produces a cure for the corrosive condition before too much more time elapses. Bergsten and his colleagues aim to devise a way to treat the pipes chemically to prevent the reaction that is gnawing away at them. In the longer term, they hope to understand the relationship between the composition and manufacture of the old pipes, and their wonderful sound. Then it might be possible to replace badly corroded pipes with new ones, without compromising the instruments'distinctive voices.

Aficionados can only hope that the project makes rapid progress. For now, the Lübeck Stellwagen is still playable, says Lutz Jedeck, pastor of St Jakobi's. "Works take on a special freshness due to the glorious and unmistakable tonal colour of the instrument," he enthuses. "But the holes get larger and larger."

Tom Clarke was until recently in Nature's online news team; he is now science reporter for Channel 4 News in London.

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