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Conservation Issues: Las Pozas monument biodeterioration commentary.

"Conserving iron-rodded concrete in a tropical environment is certainly a difficult undertaking. Iron stains are hard to remove. Lichens and fungi, on the other hand are relatively straight forward.

Choice of biocidal treatment must not poison the water table, the people applying the biocide, or stain the sculptures (the iron rods will probably react with most biocides). Different organisms and groups of organisms (often in a so-called biofilm) may react differently to the same biocidal treatment. Testing for possible effects should be carried out before wide-spread application of any biocide.

A regular maintenance program, probably annually, will have to be implemented to keep the sculptures free of biological growths.

Sheltering of the sculptures from rainfall may be desirable, although in this case probably impractical.

"I have found fungi frequently in mortar samples from around the world; Easily seen with our scanning electron microscope. One of the more benign treatments is calcium hypochlorite. This leaves calcium in the stone (a problem where freeze-thaw occurs) and may interact with other chemicals and biocides (e.g, the biocide organoiodide--giving a bright orange appearance to the stone!)

A treatment popular in England is a combination of organotin and quaternary ammoniums. Use of heavy metals, like tin, are being reduced in the US, and may even be banned in the future.

The organotin component is good at removing growths, while the quaternary ammoniums are good at maintaining a clean surface. (Concrete buildings in Singapore have algal growth problems--I don't recall off hand the treatment, but will search for the paper I saw a few years ago.)

Another problem is that the calicolous lichens (i.e., calcium-loving) send their rhizines deep into the stone (or concrete). This attaches the lichen to the stone very strongly. Consequently, when trying to remove them, a layer of the surface comes with them. Other kinds of lichens attach less tenaciously, and deeply, and cause only minor loss."

Correspondence from Robert J. Koestler to N. J. Bud Goldstone 12/98