acid solution (0.05 M acetic acid). The resulting 'degelled' mixture is more easily and completely removed than are viscous gels, in this case by absorption into a cotton swab. Further clearance of any remaining residue is facilitated by the fact that the gelling agent is now readily soluble.

Working on a small area of a fourteenth-century icon (Fig. 1) from the National Gallery in Siena, Italy, Carretti *et al.*[1] have demonstrated that their rheoreversible gels can remove material from the surface of a painting. The spectrum of X-rays absorbed by the removed material indicated that no mercury was present, which implies that none of the vermilion pigment (mercuric sulphide) of the original paint layer had been removed. However, removal of inorganic pigments is not often the major problem, because most are insoluble in the standard cleaning agents. More serious is the extraction of organic material such as organic dyes and pigments, or the low-molecular-weight compounds in the medium that function as plasticizers in maintaining the flexibility of the paint film.

Carretti and colleagues' infrared analysis of the removed material showed that the varnish was a natural resin. But infrared analysis does not find the minor amounts (relative to varnish) of paint media that are typically extracted. Infrared spectra of the common resin varnishes are quite variable, and also change with age, making the interpretation of resin spectra difficult to begin with, and the detection of minor components even less likely. Methods such as gas chromatography are much more useful in this context for evaluating the amount of paint media removed (with chromatography it is quite easy to look for compounds, such as fatty acids in oil paint, that are specific to the paint rather than to the resin). Similarly, infrared analysis of the cleaned surface cannot adequately demonstrate that no traces of cleaning mixture remain on the surface. Even scanning electron micrographs of the surface that show a surface similar to an uncoated paint film cannot unequivocally demonstrate that components of the paint film have not leached out.

The development and testing of new cleaning techniques and reagents for the restoration of paintings is a daunting task. Both techniques and reagents must be shown to be safe, causing no significant alteration of, or damage to, the original layers of the artwork. And this must be proved before advocating or promoting their use, which has not always been done by other researchers. Carretti *et al.*[1] have made significant progress in developing their new method, but much still remains to be done in evaluating the results and refining the technique to minimize any undesired effects. The rheoreversible gels developed by this team are a positive step in the development of gelled cleaning mixtures that are safer than those presently in use. The field should look forward to their further contributions on the subject. ■

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1. Carretti, E., Dei, L., Macherelli, A. & Weiss, R. G. *Langmuir* doi:10.1021/la0495175 (2004).
2. Scholten, J. H., Teule, J. M., Zafiropulos, V. & Heeren, R. M. A. *J. Cultural Heritage* **1,** 215–220 (2000).
3. Wolbers, R. *Cleaning Painted Surfaces, Aqueous Methods* (Archetype, London, 2000).
4. Erhardt, D. & Bischoff, J. *Studies Conserv.* **39,** 3–27 (1994).

Environmental geography

Treeless at Easter

MARY EVANS

Easter Island in the eastern Pacific is one of the remotest spots on Earth, but distance need not lend enchantment to the view. When Easter was discovered by the Dutch explorer Jacob Roggeveen in 1722, he found it a treeless wasteland rather than the palm-fringed paradise one usually associates with the Pacific. Captain James Cook (writing in 1774) described the islanders as "small, lean, timid and miserable", hanging on as subsistence farmers amid the ruins of the giant statues erected by their ancestors (see picture).

The statues were erected between the eleventh and seventeenth centuries, and could have been the immediate cause of the islanders' plight. At its height, Easter Island society was based on a system of clans, who outdid one another in feats of megalithic excess. The strain cost the island all its native birds and all but a few of its native trees, which included the tallest species of palm tree in the world. Having turned their island's natural capital into artefacts, the islanders relapsed into war, savagery and cannibalism. In "Twilight at Easter", an article in *The New York Review of Books* (25 March 2004), Jared Diamond tells the story of Easter Island as a tragic parable for modern times.

But the islanders were, in addition, cursed by poor location. Elsewhere in this issue (*Nature* **431,** 443–446; 2004), Barry Rolett and Diamond present an analysis of environmental factors that might be associated with the deforestation of Pacific islands. They show that Easter had drawn a losing hand even before the first Polynesian colonists stepped ashore.

Islands most likely to lose their forests are small, dry, remote from other islands (and from continental dust inputs), low-lying and relatively distant from the Equator. Easter scores high on all these factors. "Easter's collapse was not because its people were especially improvident but because they faced one of the Pacific's most fragile environments," according to Rolett and Diamond. Or, in the words of the blues standard: "If it wasn't for bad luck, I wouldn't have no luck at all." In the final analysis, megalithomania was probably the last straw. Easter Island's current environmental profile cannot be wholly explained by natural factors, as Rolett and Diamond's model shows — and neither can the state of relatively well-wooded Pacific Islands such as Tonga, whose society employs its own protective measures against deforestation. **Henry Gee**