

whose hand? 'Good Weekend' section, *The Sydney Morning Herald*, June 21, 1997, pp. 30-35. Most of the information for this item comes from this detailed report.

2. There are of course many other complex factors involved, and this is probably an oversimplification.

3. Quoted in *The Daily Telegraph* (Sydney), January 29, 1998, p. 18.

4. During the Flood, most water came from beneath the ground (Genesis 7:11; 8:2). Warmer oceans after the Flood meant much greater evaporation and precipitation. Thus the Ice Age in some areas. Those without a

glacial period had a pluvial period of increased rainfall. There is ample evidence of rainforests in what are now vast Australian deserts.

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Dating Method in Doubt

The dating method pioneered by a prominent geographer at the Arizona State University in Phoenix is now under critical scrutiny, due to accusations of scientific misconduct.¹ An inquiry is being conducted by the National Science Foundation and the rival University of Arizona in Tucson where some of the analytical work was performed. Legal counsel for the accused has already tried to block publication of an article in the journal **Quaternary Research**, while a critical paper is 'in the pipeline' and expected to be published in **Science** soon.

The dating method in question is the cation-ratio dating of desert or rock varnish, a mineral coating commonly found on exposed rock surfaces in semi-arid and arid environments.¹ The scientist whose work is under investigation is Dr Ronald I. Dorn. Earlier controversy over the validity of the technique and the way the data have been manipulated has already been reported, with it being concluded that

'we have much reason to be skeptical of the techniques and the derived ages'

A thin layer less than half a millimetre thick, rock varnish consists of about 70 per cent clay minerals, 20-30 per cent oxides of manganese and iron, and trace amounts of over 30 other compounds. The origin of this desert varnish is not completely known, but is believed to be due to bacterial action and/or physico-chemical precipitation.³⁵ It appears to thicken and darken with age, and cations of several trace elements in the varnish supposedly decrease with time. Dorn and co-workers have thus constructed the cation-ratio dating

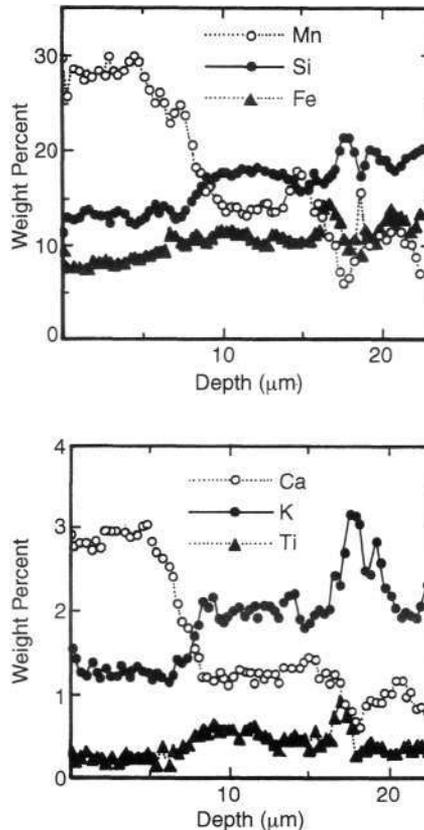


Figure 1. Plots of Fe, Mn and Si versus depth (top) and Ca, K and Ti versus depth (bottom) for a line profile across a sample of desert varnish.

method based on the ratio $(K + Ca)/Ti$, which is said to decrease with age due to the leaching of potassium and calcium (see Figure 1).

However, the 'catch' is that to make the method produce 'absolute' dates, the cation-ratio has to be 'calibrated' by AMS ¹⁴C dating of carbon in the rock varnish. Other aspects of the method have been questioned previously, but the method's accuracy of course depends upon the reliability of the calibration with ¹⁴C dates. And this is where the latest challenge has come — Dorn has

been accused of adding mixtures of charcoal and bituminous coal to desert varnish samples to secure specific radiocarbon-dated ages of rock surfaces.¹

Dorn maintains that he and other researchers have shown that charcoal and bituminous coal are naturally present in rock varnish, so the inquiry is trying to confirm this, or determine whether Dorn did add these two substances to 'doctor' samples.¹ Consequently, some of Dorn's sample residues have been subpoenaed. Inquiries are also under way into discoveries by University of Arizona scientists that may raise questions about the findings of a number of Dorn's published articles.

For several years, Dorn's methods have been of great interest — and some controversy — to a small group of scientists who try to determine the age of hard-to-date landforms. A book by Dorn is shortly to appear in print.⁶ The first allegation about Dorn's work was received by the National Science Foundation in September 1996,¹ so now the results of this probe are eagerly awaited by this fledgling discipline. If the inquiry were to find that the discrepancies were due to misconduct rather than error, this would also have wider implications because of the controversial nature of some of the sites Dorn has studied.

For instance, Dorn was involved in dating landforms at Nevada's Yucca Mountain, under investigation now for some time as a burial site for highly radioactive nuclear waste.¹ The results of Dorn's dating of rock art found in the Côa River valley, Portugal, were used during a public debate over plans to flood the valley as part of a reservoir. The threatened Stone Age

carvings were saved when the valley was eventually deemed a park. Dorn has also dated petroglyphs in Australia.

From what is already known about the findings of the University of Arizona (UA) scientists who have co-authored the forthcoming **Science** paper with others, the omens are not good for this dating method. The UA team has twice previously presented at international conferences abstracts of their research, in which they say that *'unusual and potentially very important observations'* were found when examining samples of material Dorn submitted to date petroglyphs in the Petrified Forest region of north-eastern Arizona.

'Microscopic examination of samples from these petroglyphs, collected by . . . Dorn, showed that the samples contained two types of black, carbon-rich materials. . . one type strongly resembles finely ground bituminous coal, whereas the

other strongly resembles ground pyrolyzed wood.'

These two substances have *'widely differing radiocarbon ages. . . . We have been unable to find either of these two types of carbonaceous material in equivalent samples of these same petroglyphs when subsequently resampled independently.'*¹

Dorn, of course, says that he doesn't understand what all the fuss is about, citing a 1961 article by a Russian scientist who is said to have observed *'a coal-black mineral substance'* trapped under desert varnish, and a 1986 doctoral thesis from a Texas university on US petroglyph surfaces.¹ Nevertheless, it seems too coincidental that Dorn's attorneys were involved last year in trying to prevent the UA scientists from publishing some of their findings not long after the first allegations were made, and while Dorn himself began seeking publication of papers questioning the interpretation of his

own dating in previous papers.

The jury may still be out, but already it is clear that, as was reported here two years ago, *'we have much reason to be skeptical of the techniques and the derived ages'*.²

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Cosmological Principle Under Attack

The 'cosmological principle' (also known as the Copernican principle) is a fundamental assumption in modern 'Big Bang' cosmology. It assumes that, on a big enough scale, the universe is homogenous - that is, it is the same in every direction and every place. A team of scientists led by Sylos-Labini has statistically analysed a number of red-shift surveys (these try to map structures three-dimensionally using the red-shift to assess distance) to test this idea¹ (see Figure 1). As a consequence, they argue that the universe is not uniform at all, but has a never-ending hierarchical structure. Stars are grouped in galaxies, galaxies into clusters, clusters into superclusters, superclusters into even larger groupings, and so on. The grouping appears to be based on fractal mathematics.

CEN Tech. J., vol. 12, no. 2, 1998

Their results are under attack — for one thing, their analysis of the largest such survey available seems to conflict with its visual appearance. Nevertheless, the consistency of their results is admitted to be *'impressive enough to raise doubts about the standard picture'*.

More studies are under way on an even bigger scale to try to answer the question more definitively. There is a great deal at stake, because the claims of Sylos-Labini *et al.* are *'completely at odds with the Cosmological Principle and therefore with the Friedmann models and the entire Big Bang theory'*.

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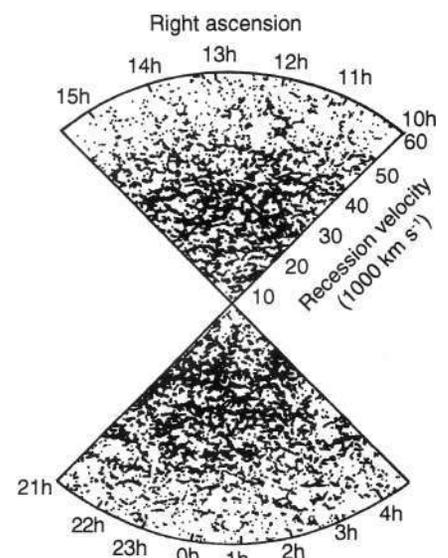


Figure 1. The Las Campanas red-shift survey, each dot marking a galaxy with a well-determined red-shift. The survey maps the Universe out to recession velocities of 60,000 km/sec, corresponding to distances of a few hundred million parsecs. No fractal structure on the largest scales is apparent (there are no clear voids or concentrations on the same scale as the whole map).