QUATERNARY RESEARCH 43, 272–273 (1995)

LETTER TO THE EDITOR

Comment on "Evidence Suggesting That Methods of Rock-Varnish Cation-Ratio Dating Are neither Comparable nor Consistently Reliable," by Paul R. Bierman and Alan R. Gillespie

If Bierman and Gillespie's (1994) test of the scraping method of cation-ratio (CR) dating is not flawed in design, their data show that CRs in subaerial varnishes lower with time, supporting previous observations (Glasovskiy, 1985; Pineda *et al.*, 1988, 1990; Zhang *et al.*, 1990; Bull, 1991; Whitney and Harrington, 1993; Dorn, 1994).

If a plot of CR vs. time were attempted, error bars on the time scale would have to be so broad as to make the test effectively meaningless, because "the actual age of the varnish we analyzed is unknown" (Bierman and Gillespie, 1994, p. 83). There are *no* numerical or any other objective data presented from which to judge any time trends, with the sole exception of the reasonable assumption that the flake scar ["cultural"] is younger than the cortex ["noncultural"] varnish. There is no evidence, however, as to whether the cortex position is 10^2, 10^3, 10^4, or 10^5 yr older than the flake scar. No objective data are available to indicate whether varnish on the bedrock position is younger or older than varnish on the cortex position.

Based upon data in Bierman and Gillespie (1994), it is not possible to determine whether the varnish they analyzed is suitable for CR dating. For example, the cortex varnish could be ground-line band or interdigitated with silica glaze. The "better-looking" bedrock varnish at this site is due to its initial formation in protected rock joints. I examined every natural bedrock face at the site, and all bedrock varnishes started in rock joints *prior* to subaerial exposure—which precludes their use in any CR dating. Rock varnish is like any other datable material in that not all samples are appropriate for age determination, and there is no evidence that Bierman and Gillespie (1994) conducted *any* of the known tests to assess sample suitability *for the scraping CR method* (e.g., tests in Krinsley *et al.*, 1990; Dorn *et al.*, 1990; Nobbs and Dorn, 1993; Dorn, 1994). This is analogous to avoiding pretreatment in ^{14}C dating, or collecting ^{14}C samples and ignoring the possibility of bioturbation.

For the sake of discussion, assume that the only potentially reliable age sequence, of flake scar and cortex varnish, was suitable for CR dating. Bierman and Gillespie's (1994) data show that *the scraping technique* yields a valid age sequence: "on both the mixed [scraped] samples, cultural [younger] varnish had higher CRs than adjacent noncultural [older] varnish (p. 87)." The "grand mean" CR of the five cultural surfaces is higher [younger] than the "grand mean" of the four cortex [noncultural] surfaces. Even the "grand mean" of the bedrock samples (which started in a rock joint and are inappropriate for any comparison) were lower than the cultural CRs. It is inappropriate to transfer calibration curves to this site in assigning specific ages, but the scraped CRs on the cultural material (assumed to be Holocene) agree with CRs for Holocene varnishes elsewhere in the Mojave Desert (e.g., Dorn, 1994; Peterson *et al.*, 1995).

In summary, Bierman and Gillespie's (1994) experimental design lacked age control, compared subaerial and nonsubaerial varnishes, and did not attempt to assess sample suitability for dating. Yet their data support CR dating with the scraping method (Dorn, 1989).

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https://doi.org/10.1006/qres.1995.1031 Published online by Cambridge University Press