bilized compound rapidly.

These findings rule out the use of highly fluorinated C_{60} as a lubricant because, while attack of the solid form by water is slow, it will occur over time to release HF. They also account for the fact that the fluorine content of crystalline fluorinated C_{60}, tentatively attributed by us[4] to $C_{60}F_{60}$, decreased gradually on standing in air, with accompanying etching of the container: slow nucleophilic substitution by atmospheric moisture occurs to release HF. Other halogenated C_{60} derivatives may be even more reactive, in which case care may be necessary in handling them. We are now investigating the synthetic use of reactions of fluorinated C_{60} with a wide range of nucleophiles.

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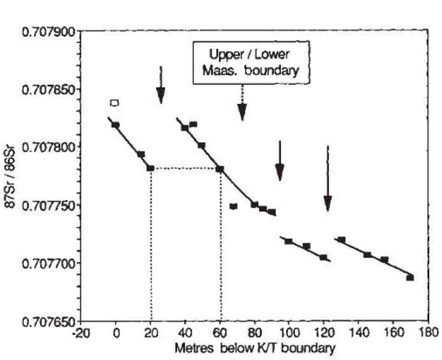
Strontium isotopes at K/T boundary

SIR — Nelson *et al.*[1] attempt to bring needed objectivity to an examination of the evolution of marine $^{87}Sr/^{86}Sr$ near the Cretaceous/Tertiary (K/T) boundary. In our view, the complexity of their section, together with conflicts within their own biostratigraphy, invalidate their treatment. The calculation of $\Delta^{87}Sr/^{86}Sr\ Myr^{-1}$ for the section at Bidart is possible only if numerically dated levels can be accurately placed in the section and the $\Delta^{87}Sr/^{86}Sr$ between them accurately assessed. Neither has been accomplished for the following reasons.

Nelson *et al.* calculated $\Delta^{87}Sr/^{86}Sr\ Myr^{-1}$ for part of Maastrichtian time. Critical to this calculation is the assignment of a date of 2.5 Myr before the K/T boundary to the first appearance of *Abathomphalus mayaroensis*. This date derives from a zonal diagram in ref. 2. Derived from ref. 3, this date is 1 Myr. Neither figure is reliable, as no radiometric markers for these horizons are known to us. Furthermore, their placement of the base of the *A. mayaroensis* zone conflicts with their own nannofossil zonation. The zone of the planktonic foraminiferid *A. mayaroensis* is commonly equated with the upper part of the Upper Maastrichtian. The calcareous nannofossil zone of *L. praequadratus* is usually placed in the Lower Maastrichtian. On Fig. 1 of ref. 1, bases of the zones almost coincide (108 and 110 m). The nannofossil evidence is more reliable, and it identifies the section around 100 m as Lower Maastrichtian, not Upper Maastrichtian, as Nelson *et al.* claim. The Upper Maastrichtian probably starts around 70 m at the base of the *L. quadratus* zone, and it is at about 70 m that Late Maastrichtian macrofossils first appear[4].

Nelson *et al.* assume that their composite section is complete. But Clauser[5] remarks "*Toutefois les biozones peuvent être légèrement incomplètes, du fait de contacts tectoniques mineurs*". Furthermore, the parts of the composite section of Nelson *et al.* are not "separated by a fault" but by numerous faults within 0.5 km of intervening, folded, section[5]. In addition, all parts are extensively faulted.

In the figure we offer an alternative interpretation of the data of Nelson *et al.* The three Cretaceous samples from the upper part of the composite section define a $\Delta^{87}Sr/^{86}Sr$ per metre of section that is equal to that shown by samples between 40 and 60 m from the lower part. It seems likely that strata in these parts of the section have been mismatched and repetition has occurred, with the 'Danian' sample being merely the highest point in a tectonically interrupted



Alternative interpretation (heavy lines) of the data of Nelson *et al.*[1], plotted as in their Fig. 1. Open square, 'Danian' sample; dotted lines, extent of overlap of the two parts of the composite section: solid arrows, positions of apparent geological breaks in the section (refs 1 and 5).

upward trend of $^{87}Sr/^{86}Sr$. In the figure the gradients of the two parts of the section are used to measure the overlap, which is 40 m. The figure also shows the position of apparent breaks in the section[5], which in our interpretation seem to coincide with isotope discontinuities. Furthermore, there was a marked decrease in sedimentation rate in the area between Early and Late Maastrichtian times[4,5]. We suggest this caused the break-in-slope at about 70 m shown by our figure. An Early Maastrichtian age for the section immediately below 70 m is supported by the occurrence of *Pachydiscus neubergicus*[4], which is predominantly Early Maastrichtian.

A calculation of $\Delta^{87}Sr/^{86}Sr\ Myr^{-1}$ requires acceptance of some assumptions, foremost of which is that the Campanian/Maastrichtian (C/M) boundary can be located in the section. Macropalaeontological criteria will place it at a higher level than will micropalaeontological criteria. Our interpretation of the non-standard nannofossil zonation of Nelson *et al.* places the nannofossil C/M boundary at about 130 ± 30 m below the K/T boundary (our unpublished nannofossil zonation places it at about 160 m). The macrofossil C/M boundary must be below the first appearance of *P. neubergicus* at about 125 m[2]. We adopt a figure of 130–140 m for the approximate level of the macrofossil C/M boundary. Further assumptions are that the data of Nelson *et al.* show that $\Delta\ ^{87}Sr/^{86}Sr$ between the K/T and C/M boundaries is about 110×10^{-6}, and that the numerical ages of these boundaries are 66 ± and 72 ± 2 Myr, respectively. If one accepts these assumptions, the mean $\Delta^{87}Sr/^{86}Sr\ Myr^{-1}$ during Maastrichtian time is between 11 and $55 \times 10^{-6}\ Myr^{-1}$, with a mean of $18 \times 10^{-6}\ Myr^{-1}$, which is 15% of the rate claimed by Nelson *et al.* and less than the long-term increase of $25 \pm 5 \times 10^{-6}\ Myr^{-1}$ that occurred during most of the Late Cretaceous[6].

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