multilocus DNA fingerprinting, based on a single probe, have been shown to reflect genetic relatedness accurately in the red-winged blackbird (*Agelaius phoeniceus*)[3]. We maintain that our application of this method in testing for differences in the average level of relatedness between groups is justified.

We agree with Griffith and Montgomerie that alternative explanations may need to be considered before concluding that mate choice is based on genetic diversity and kin discrimination. But, as we saw a similar pattern in three species with different ecology and social behaviour[1], we contend that our proposal of adaptive extra-pair copulation with genetically dissimilar mates warrants further testing in these and other species.

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COMMUNICATIONS ARISING

Astrophysics

How did the metals in a giant star originate?

The chemical composition of stars with extremely low metal contents (taking 'metals' to mean all elements other than hydrogen and helium) provides us with information on the masses of the stars that produced the first metals. Such a direct connection is not possible, however, if the surface of the star has been polluted by enriched material, either dredged from the star's interior or transferred from a companion star. Here we argue that, in the case of HE0107–5240 (ref. 1), the most iron-poor star known, the oxygen abundance could be a discriminant: a ratio of [O/Fe] exceeding $+3.5$ would favour a pristine origin of metals, whereas an [O/Fe] ratio of less than $+3$ would favour the pollution hypothesis. Using this criterion, we suggest how the required information on oxygen abundance might be obtained.

HE0107-5240 shows carbon, nitrogen and sodium enhanced, respectively, by factors of 10^4, $10^{2.3}$ and 10 relative to iron, whereas magnesium, which is usually more abundant in metal-poor stars, is present in almost the same amounts as iron; no single supernova (SNII) model seems to show this pattern[2]. Although several models may be worth considering, we evaluate two here: a pristine origin due to the combined enrichment of at least two SNIIs, or a pollution of the surface of the star after its formation.

If the metals are pristine, then HE0107–5240 must have formed from a cloud enriched by the ejecta of at least two zero-metallicity SNIIs of quite different initial masses. The first supernova, which was presumably rather massive, would have produced the light elements observed in HE0107–5240, but none of the heavier ones, because of an extensive fallback, up to the base of the helium shell. This would have prevented the ratios [C/N] and [Mg/C] from becoming too high. The second supernova, which was less massive, would have provided all of the elements heavier than and including magnesium.

In contrast, in the case of pollution enrichment, HE0107–5240 would be either a low-mass, zero-metallicity star that accreted matter enriched by the first generation of SNII, or a second-generation low-mass star of very low metallicity. The high [C,N,Na/Fe] ratios would be the result of subsequent enrichment of the surface of the star, due either to an internal process or to the accretion of matter synthesized by an asymptotic giant branch (AGB) star in a binary system.

One way to discriminate between pristine and pollution origins of C and N is to measure the abundance of oxygen. In the pristine case, the more massive supernova would provide a large amount of oxygen, leading to a high [O/Fe] ($>+3.5$), as can be derived from the yields of zero-metal massive stars[2]. In the pollution case, a lower [O/Fe] is expected ($<+3.0$), as implied by the yields of zero-metal, intermediate-mass stars[3].

An upper limit of 0.1 pm (where 1 pm is 10^{-12} m) on the equivalent width of the [O I] 630-nm line would provide a limit on oxygen, namely $[O/H]<-2.3$ or $[O/Fe]<+3$. With the Ultraviolet–Visual Echelle Spectrograph on the European Southern Observatory's Very Large Telescope, we estimate that such a limit could be achieved in about 30 h of exposure. The situation is slightly better for OH ultraviolet lines, for which we estimate that an upper limit of $[O/Fe]<+2.0$ could be derived even at moderate signal-to-noise ratios (>20), which should be achieved in about 4 h of exposure. At this signal-to-noise ratio, it is possible to discriminate between $[O/Fe]<+3.0$ and $[O/Fe]>+3.5$; however, lower oxygen abundances would be very difficult to measure, whatever the signal-to-noise ratio. As high-resolution spectra have already been obtained, including the ultraviolet region containing the OH lines, for a total of about 30 h of exposure (ESO/ST-ECF Science Archive), it may now be possible to carry out the test that we propose.

Among extremely metal-poor stars, oxygen has been observed only in the star CS 22949–037 (ref. 4), for which $[O/Fe]=+2.0$; all other known stars have oxygen features that are below the detection threshold. However, CS 29498–043 (ref. 5) has a very similar pattern of marked overabundance of the lighter elements; its oxygen abundance, which has not yet been measured, may prove to be strongly enhanced as well.

We note that the high observed [C/N] in HE0107-5240 is difficult to explain in terms of pollution, whether internal or from an AGB companion, because of the high abundance of primary nitrogen in both cases. We argue that a pristine origin is more likely, which implies that the [O/Fe] ratio is higher than in any other known metal-poor star.

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addendum

Adult persistence of head-turning asymmetry

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Some confusion over the definition of the term 'right kiss' as used in this communication has resulted from the depiction of Auguste Rodin's statue *The Kiss*, in which the male turns his head in the vertical plane to the left. However, this sculpture only served to illustrate the definition of a right kiss, which corresponds to a position in which the nose of each participant is to the right of the nose of the other. The strict criteria applied during my observations excluded couples in the position of Rodin's statue and ensured that a right kiss incorporated a turn and a tilt with the head to the right side.