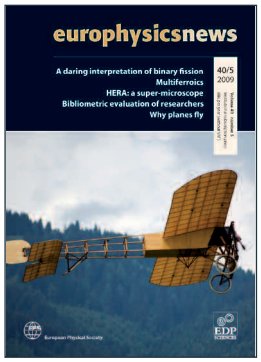

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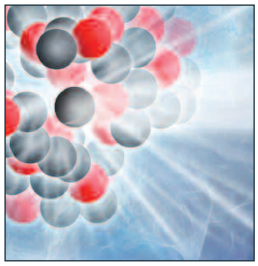
Cover picture: The plane gained immortality on July 25, 1909 when Louis Blériot successfully crossed the English Channel from Calais to Dover in 36.5 minutes and using an Anzani engine designed by the Italian engineer Alessandro Anzani. ©iStockPhoto. See p.30 "Why planes fly"



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Daring interpretation of binary fission

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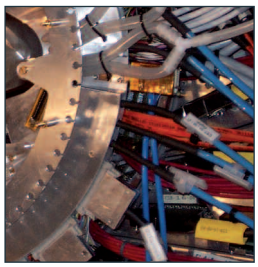
Multiferroics



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HERA: a super microscope

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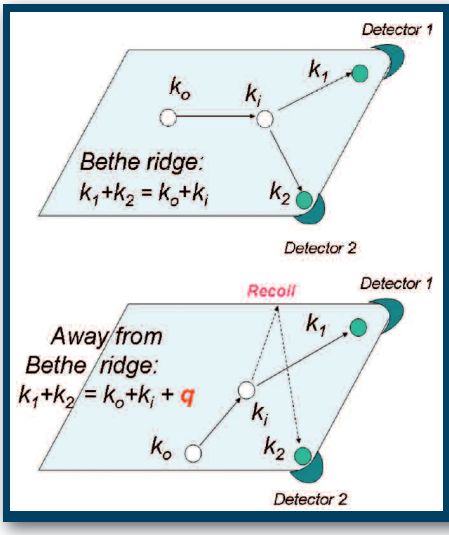
Energetic (e, 2e) reaction **away from Bethe ridge**

We analyse the recoil-to-binary peak ratio in an energetic (e,2e) reaction on the valence ns sub-shell of noble gas atoms. Dramatic qualitative change in this ratio dependence on the ejected electron energy can be explained by variation of reflectivity of the short-range target potential. The reflectivity increases profoundly from lighter (He) to heavier (Ne and Ar) noble gas atoms because of modification of the scattering phases due to occupation of the target *np* orbitals (Levinson theorem). This effect is further modified due to strong inter-shell correlations in Ar. These theoretical predictions are confirmed experimentally.



◀ Billiard ball analogy for the recoil and binary electron collisions in the energetic (e,2e) reaction on (left) and away (right) the Bethe ridge.

This effect can be illustrated using a simple billiard-ball analogy as is shown in the figure. Binary (e,2e) reaction satisfies the momentum conservation also known as the Bethe ridge condition (upper diagram). Accordingly, the ejected electron is well confined within a narrow angular range in the forward direction (binary peak). If the Bethe ridge condition is no longer satisfied, there is a need for a momentum exchange with the nucleus (lower diagram). This results in an additional recoil peak roughly in the direction opposite to the binary peak.
Conventionally, it was believed that the relative recoil peak intensity would fall with increase of the projectile energy which is indeed is the case in light atoms like H and He. This happens because the bare nucleus Coulomb barrier ("billiard wall") is a poor reflector of energetic electrons. This, however, changes in many-electron noble gases. In these systems, electron reflection from the target core potential is increasing with energy because of occupied target orbitals which change profoundly the scattering phases of the ejected electron. ■

A. S. Kheifets, **A. Naja**, **E. M. Staicu Casagrande** and **A. Lahmam-Bennani**,
'An energetic (e, 2e) reaction away from the Bethe ridge: recoil versus binary', *J. Phys. B: At. Mol. Opt. Phys.* **42**, 165204 (2009).