

THREE RINGS FOR THE ELVEN-KINGS...

This seems a good moment to remind ourselves that not all circular structures that are ‘anomalous in the regional geology’ (to quote from our opening article) are produced by impacts. Indeed, it is striking that the subsidiary criteria for an impact origin listed in Box 2 (page 22) all require that we look close-up at petrological and geochemical features. Is it possible that little green men, out there in the galaxy, scanning us with some super-high-resolution telescope that we have not yet invented, are overestimating the number of impact structures on Earth?

Looking at the Moon, one feature of impact structures is obvious. Because they form explosively, they are very perfectly circular. But so are some structures that form in a much more leisurely way. In a previous Parting Shot (*Elements* 4: 79), I showed a satellite image of igneous ring complexes in the Aïr region of Niger, some of which form nearly perfectly circular composite plutons built mainly of alkali gabbro. The most dramatic feature of the image is the spectacular Meugueur-Meugueur ring dyke, 65 km in diameter and 250 m thick. Whether it is expressed as a deep, curving valley or stands up as a wall in the great sand sea at the eastern edge of the Aïr, the dyke seems to have been inscribed using a giant compass. Geophysical work suggests that it is a steep cone sheet focussed somewhere in the upper mantle.



The Great Eucrite ring of Centre 3, Ardnamurchan. Photo ©THE HIGHLAND COUNCIL

Cone sheets are one of the most celebrated features of the Palaeocene Ardnamurchan ring complex in western Scotland. An early, black-and-white air photograph of the dramatic ring structure is known all over the world and adorns the walls of several North American universities. The most striking feature is a ring of hills, not perfectly circular and about 5 km in diameter, which correspond to a unit that J. E. Ritchie, who mapped the complex for the British Geological Survey in the 1920s, gloriously called The Great Eucrite¹. Until recently it was considered a perfect example of a ring dyke – a structure shaped like an upturned flower pot – formed when magma was injected around the edge of a sinking block possibly underlying a caldera. However, recent remapping, which took account of laminations and inward-dipping layering, has suggested it may have the form of a saucer-shaped lopolith.

¹ Eucrite is a variety of gabbro with unusually calcic plagioclase.



A cone-sheet of Centre 2, Ardnamurchan, with inclined jointing, cutting Triassic sedimentary rocks. A second, thicker, cone-sheet forms the skyline.

What is remarkable about Ardnamurchan is the extraordinary number of basalt cone sheets, each usually around 5 m thick. There are many hundreds of them, piled up like ice cream cones waiting to be filled, sometimes tightly packed, sometimes separated by country rocks. Ritchie calculated that the top of the sequence was elevated by more than 1 km by their emplacement. His careful mapping and measuring of dips showed that the sheets were focussed on three centres and that the dip of sheets in each of the three sets was steepest near the focus. The Ardnamurchan volcano was probably active for two million years and, as in modern volcanoes, the magma chamber that fed the rings moved with time.

“Three Rings for the Elven-kings under the sky!” I hope all readers have read *Lord of the Rings*; if not, do so now!

Ian Parsons, University of Edinburgh

PARTING QUOTE

The moon is the first milestone on the road to the stars.

ARTHUR C. CLARKE

ADVERTISERS IN THIS ISSUE

49 ^e Exposition Sainte-Marie-aux-Mines	60
Australian Science Instruments (ASI)	17
Bruker	16
Bruker Nano GmbH	Inside front cover
Cambridge University Press	77
CAMECA	7
Electron Backscatter Diffraction meeting	79
Excalibur Mineral Corporation	6
FEI	18
International Center for Diffraction Data	16
John de Laeter Centre	54
Savillex	Inside back cover
SPECTRO	8
The Geochemist's Workbench	Back cover

JOB POSTINGS

Carleton University	77
NanoGeoScience, University of Copenhagen	77

See www.elementsmagazine.org/jobpostings