

[10]. Then it should be clear why there are not pseudotachylites older than 2 Ga. Secondly, the low ages could be due to post-2-Ga thermal overprint. Host rocks were then more or less intensely affected in accordance with the different Ar retentivities of different minerals, or different closure temperatures in the case of Rb-Sr isotope systematics. A major problem is seen in the different intensities of the resetting events at different localities within the dome. This may be explained partly by additional hydrothermal activity.

Future investigations are still needed to completely clarify the nature and the duration of post-2-Ga processes that took place in the Vredefort structure.

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**AL UMCHAIMIN DEPRESSION, WESTERN IRAQ: AN IMPACT STRUCTURE?** James R. Underwood Jr., Department of Geology, Kansas State University, Manhattan KS 66506-3201, USA.

Al Umchaimin, in Arabic "hiding place" or "place of ambush" [1], is located at latitude 32° 35.5'N and longitude 39° 25'E. It lies some 43 km S36° of the H-3 pump station on the abandoned Kirkuk-Haifa oil pipeline [2] and 60 km S49°W of the western desert town of Rutba. The nearly circular depression averages 2.75 km in diameter and is 33–42 m deep. It is floored with fine-grained, clay-rich deposits, estimated to be 36 m thick [3], the surface of which shows well-developed desiccation fissures or mudcracks when dry. Because of its nearly circular planimetric shape and its apparent isolation from other surface and subsurface features, it has been considered by some to be a possible meteorite impact structure [4] and by others [5] to be a surface collapse feature that originated following removal of magma from the subsurface as the magma extruded elsewhere. Al Umchaimin was listed in the U.S. Geological Survey tabulation of 110 structures worldwide for which a meteorite impact origin had been suggested [6]. It was placed in Category VI Structures for which more data are required for classification.

K. M. Al Naqib, Iraq Petroleum Company, reported [7] that the petroleum geology community considered that Al Umchaimin had originated by fracture-controlled dissolution in the subsurface and eventual collapse into the resulting solution cavity. Al-Din and others [3] made geological and geophysical surveys of the depression in 1969 and 1970 and found no evidence for an impact origin. They concluded, as did Al Naqib, that a solution-collapse origin was likely.

Abbas and others [8] conducted additional geophysical studies and arrived at similar conclusions: (1) Al Umchaimin was not formed by meteorite impact and (2) probably it represents a solution-collapse feature. Greeley and others [9], in preparation for the Magellan mission to Venus, studied shuttle radar images of nine maar volcanos, one volcanic caldera dome, one impact structure, and one possible impact structure (Al Umchaimin). Concerning Al Umchaimin, they wrote: "Although no definitive impact features have been reported, the circularity and slightly uplifted rims suggest an impact origin."

In 1965, the author and the late Randolph Chapman, both visiting professors at the College of Science, University of Baghdad, spent half a day at Al Umchaimin during which a section was measured up the east wall, samples were collected for later thin sectioning, and a search made for meteoritic debris, shatter cones, impact glass, melt breccia, and so on. No evidence was found for an impact origin of the depression, nor did study of the thin sections from the east wall of the depression reveal any microscopic evidence of impact.

It is concluded that, on the basis of the studies that have been made of Al Umchaimin and on the basis of the brief site visit made, Al Umchaimin probably is not an impact structure but most likely resulted from the enlargement and coalescence of sink holes and eventual collapse of the roof material into the resulting cavity.

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**A LATE DEVONIAN IMPACT EVENT AND ITS ASSOCIATION WITH A POSSIBLE EXTINCTION EVENT ON EASTERN GONDWANA.** K. Wang<sup>1</sup> and H. H. J. Geldsetzer<sup>2</sup>, <sup>1</sup>Department of Geology, University of Alberta, Edmonton, Alberta T6G 2E3, Canada, <sup>2</sup>Geological Survey of Canada, 3303-33rd Street, N.W., Calgary, Alberta T2L 2A7, Canada.

Evidence from South China and Western Australia for a 365-Ma impact event in the Lower *crepida* conodont zone of the Famennian stage of the Late Devonian (about 1.5 Ma after the Frasnian/Famennian extinction event) includes microtektitelike glassy microspherules [1], geochemical anomalies (including a weak Ir), a probable impact crater (>70 km) at Taihu in South China [2], and an Ir anomaly in Western Australia [3]. A brachiopod faunal turnover in South China, and the "strangelove ocean"-like  $\delta^{13}\text{C}$  excursions in both Chinese and Australian sections indicate that at least a regional-scale extinction might have occurred at the time of the impact. A paleoreconstruction shows that South China was very close to and facing Western Australia in the Late Devonian [4].

**South China:** An Upper Devonian carbonate section exposed at Qidong, Hunan, was studied for biostratigraphy, geochemistry, and sedimentology. A brachiopod faunal changeover from the traditional *Yunnanellina* to *Yunnanella* faunas [5] was recognized in the section. Abundant microspherules were found in a single stratigraphic horizon immediately below a 3-cm clay with a geochemical anomaly. The microspherule horizon occurs in the Lower

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