"Comment" sent to GEOLOGY, June 22, 2010
Rejected by GSA July 4, 2010 ("past the
six month deadline").

Comment on:
"Upheaval Dome, Utah, USA: Impact origin confirmed," by
E. Buchner and T. Kenkmann, GEOLOGY, 2008,
v. 36, no. 3, pp. 227-230 *

Buchner and Kenkmann, 2008, summarize the literature of Upheaval Dome, Wayne County, Utah, USA, and discuss the controversy surrounding its origin as either 1) a salt dome, or 2) an impact structure. They go on to describe their own studies in which 120 thin sections taken from "all stratigraphic levels" and presumably many scattered locations throughout the structure were examined, indicating a rigorous, comprehensive sampling. These thin sections were all, or primarily, of sandstone, apparently. Since a thin section of sandstone contains somewhere between 50 and 100 quartz grains, they would have examined some 5000 to 10,000 quartz grains.

According to them, their studies yielded only <u>two</u> grains that showed evidence of shock. On this basis they claim "definite evidence for the impact origin of Upheaval Dome," and their title states "impact origin confirmed." In subsequent comments on their paper, GEOTIMES, May 2008, states "Dome caused by impact," and the TV Discovery Channel, on its website, dated March 11, 2008, agrees and says "Case Closed."

But are 2 grains out of 5,000-10,000 grains sufficient to prove an impact origin? They are, if we take Koeberl and Anderson, 1996, literally. They state: "The presence of rocks and minerals exhibiting evidence for shock metamorphism is an unambiguous indication for the impact origin of a structure...." This statement gives one carte blanche to claim an impact origin even if only <u>one</u> grain of shocked quartz is found at a suspected impact site. However, the second author, Anderson later had second thoughts about that statement and was quoted (Chamot, 2003) as commenting on another impact structure that "Like all impact structures, the identification won't be definitive unless

* See SPG Remarks at end of this letter.

abundant shocked quartz is found (underline mine)." He goes on to say: "Scattered quartz in any deposit may contain planar deformation features as detritus [detrital grains] from weathering [erosion] of other impact sites, so rocks must be found containing abundant [shocked] quartz grains." This would seem logical. The pressure wave that shocks a quartz grain in a sandstone passes through all adjacent grains as well and should shock all or most of these grains, as there is nothing I know of that indicates that some grains are more susceptible to shock effects than others.

What do studies of known, accepted impact structures say? I quote from five such studies here. Of the Ames, Oklahoma, structure, it was said that cores from 3 wells "contain numerous shocked quartz and felspar [grains]" (Koeberl & Anderson, 1996). Of Meteor Crater, Arizona, "shocked metamorphosed rocks are abundant (Koeberl & Anderson, 1996). Of the Newport, N. Dakota, structure, "we studied a variety of core samples... and found numerous shocked mineral grains" (Koeberl & Reimold, 1994). Of Serpent Mound, Ohio, "PDF's [planar deformation features, i.e., shocked quartz grains], lots of them [were found], in breccia sample collected at 1439 ft in the central uplift core sample..." (Schumacher, 2004) Of Manson Crater, Iowa, "There are no unshocked quartz grains in samples from 3 drill holes on the central uplift." (R. Anderson, personal communication, May 2010).

Thus, I think we must give credence to Anderson's statement that abundant shocked quartz will be created by impacts, and that a few isolated grains don't prove an impact. They may simply be detrital remnants of earlier impacts. Williams, 2010, states quite clearly in "Earth" that "[shocked quartz] can remain intact through subsequent erosion, metamorphism, and lithification." That being the case, we can see that Buchner and Kenkmann's comprehensive search for a significant amount of shocked quartz at Upheaval Dome and the lack thereof indeed proves that the "case is closed." They have proven that it is not an impact, contrary to their own statements.

S. Parker Gay, Jr.
Geologist/Geophysicist
14 December 2011

References

Anonymous, 2008, Dome caused by impact: Geotimes, v.53, n.5, p.7.

Anonymous, 2008, Long-running mystery solved: Website, Discovery Channel.

Buchner, E., and T. Kenkmann, 2008, Upheaval Dome, Utah, USA: Impact origin confirmed: Geology, v.36, n.3, pp.227-230.

Chamot, J. 2003, News Note: Jumbled Missouri geology linked to impact: Geotimes, v.48, n.7, pp.7-8.

Koeberl, C., and W. U. Reimold, 1994, Additional evidence for impact origin of the Newport, N. Dakota, structure: Geological Survey of America, Abstract with Programs, v.26, n.7, p.A-425.

_____ and R. R. Anderson, 1996, Manson and company: Impact structures in the United States, *in* Koeberl, C, and R. R. Anderson, eds., The Manson impact structure, Iowa: anatomy of an impact crater: Geological Society of America Special paper 302.

Schumacher, G. A, 2004, The thrill of discovery - PDFs hold the key: Ohio Geology, 2004, n.1, p.5.

Williams, D. B., 2010, Impact theory: Sexy geology, for better, or for worse: Earth Magazine, v.55, n.6, pp.30-39.

S. Parker Gay, Jr.
Applied Geophysics, Inc.
661 South 400 East
Salt Lake City, UT 84111
Ph: 801/328-8541
Fax: 801/363-6243
spgagi@aol.com
www.appliedgeophysics.com

2017 SPG Remarks on "Comment" on Buchner & Kenkmann 2008 Paper on Upheaval Dome, Utah

For an organization that prides itself on "good science", the Geological Society of America dropped the ball on this one. The flaws in the arguments of the authors are so obvious that one has to ask, "Where were the reviewers?" They were certainly asleep at the switch, if indeed this paper was reviewed at all. But equally as flawed as the paper is the GSA policy of requiring "Comments" to be received within six months of the date of publication of the original paper. That is only a fraction of the time that a large percentage of GSA members and subscribers, i.e. college faculty, spend on sabbaticals. If, for example, a paper was published in a GSA publication just before the author went on a sabbatical, he wouldn't arrive home to answer any "Comments" until months after the six month deadline! No other organization I know of has so restrictive a policy, if indeed it is their policy, which I find hard to believe. I have seen a comment in Geophysics published over 20 years after the original paper was published and many in the 5 to 10 year range. And I just checked my AAPG Bulletins for 2016 and found a "Discussion " of a 2002 paper - 15 years later. So we must conclude that GSA is way out of line with their 6 month policy.

x x x x x x x x x x x x x x x x x x x x x