Piccaninny, WA, and Matt Wilson, NT: Two possible complex impact craters in Australia

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We present results of field analysis, microscopy, and remote sensing mapping of two circular structures in Australia of which the meteorite impact origin is not yet confirmed.

Piccaninny, Western Australia (17°25'S, 128°26'E, 7.5 km diameter): The circular structure (Beere 1983; Shoemaker and Shoemaker, 1985) forms a plateau in the Purnululu National Park that is built up by Devonian conglomerates and sandstones. It is framed by beehive-like domes and the Piccaninny Gorge, both make the access to the elevated plain difficult. The structure is defined by a centerward dipping circular monocline (5-15° dip), a very gentle ring syncline, and a weak central rise with a stratigraphic uplift of 40-50 m. The distinct regional cleavage pattern outside the plateau displays a systematic deflection towards the center of the structure. On the plateau the vertical cleavage planes are reactivated as faults. These fault zones typically contain comminuted decimeter-wide gouge zones and meter-wide process zones in which anastomozing subsidiary fault networks occur. Some of the interconnected shear zones resemble breccia dikes. Strata are offset by faults. Minor strata tilting and the apparent lack of shock features suggest a considerable amount of erosion (>2 km) of the possible impact crater.

Matt Wilson, Northern Territory (15°30'S; 131°10'50''E): The outline of this possible impact crater is elliptical (4.5 x 6.5 km) with the long axis trending NE-SW. It has been formed in Mesoproterozoic rocks and consists of a crater rim monocline, a ring syncline and a central uplift 1.5 km across. The structure is described in detail by Sweet *et al*., 2005, who also present microstructures indicative for shock. The central uplift of the structure shows an imbrication of thrust slices in a bilateral arrangement. Such a pattern is known from other craters like Upheaval Dome or Spider (Scherler *et al*., 2006). The NE-SW trending symmetry axis is delineated by major faults. The fault pattern, preferred NE strata dipping in the central uplift, and the elliptical crater outline may indicate an oblique impact from NE.

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References

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Bugs with Bling: An experimental study of gold removal from solution by non-metabolizing bacterial cells

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The role of bacteria in the transport and deposition of gold in epithermal gold deposits is actively debated. In addition, bacterial adsorption and precipitation of gold from solution can be used for gold recovery in industrial applications. Despite the importance of Au-bacteria interactions in natural and engineered systems, the mechanisms of these interactions are poorly constrained. In this study, we measured the ability of non-metabolizing cells, of the Gram-positive species *Bacillus subtilis*, to remove gold from solution, and we determined the dominant removal mechanisms.

Gold-bacterial interaction experiments were conducted as a function of pH, time, and bacterial concentration, with fixed Au concentrations, in 0.1 M $NaClO_4$ solutions to buffer ionic strength. The bacteria-free controls exhibited negligible removal of Au from solution, except below pH 4 where some precipitation was observed. Conversely, suspensions with 10, 5, 2.5, and 1g (wet mass)/L *B. subtilis* removed 100% of the gold from a 6 ppm Au starting solution, independent of pH, over the pH range 2.5 to 8. Kinetics experiments indicated that the Au removal in these systems was rapid, with the attainment of steady-state aqueous Au concentrations in less than 30 minutes. At lower bacterial concentrations (0.5 and 0.1 g (wet mass)/L), the extent of Au removal was proportianal to the concentration of bacterial cells in suspension, and also independent of pH.

Our experiments unequivocally demonstrate that relatively low concentrations of bacteria can exert a dramatic effect on the distribution and speciation of gold over a wide range of pH conditions. The removal of gold by the bacterial cells is likely due to either reductive precipitation of gold, adsorption of gold onto the bacterial surfaces, or a combination of these processes.