

The Midas Bug -- the bacterial alchemy of gold

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Bacteria play an important role in the formation of gold nuggets in Australia according to new research published this month in the international journal *Science*.

The paper highlights the findings of a Cooperative Research Centre for Landscape Environments and Mineral Exploration (CRC LEME) project by CSIRO researcher, Frank Reith.

Dr Reith's research has shown that bacteria play a significant role in the formation of secondary gold grains.

His study of gold grains from the Tomakin Park and Hit or Miss gold mines in southern New South Wales and northern Queensland, respectively, led to a series of discoveries, which showed that specific bacteria present on these gold grains precipitate gold from solution.

"The origin of secondary gold grains is a controversial topic that is widely debated within the scientific community," Dr Reith said.

"There are those who believe the grains are purely detrital, while others believe they form by chemical accretion.

"A third theory suggest that microbial processes are involved in gold grain formation which may be responsible for one of the largest gold deposits in the world, the Witwatersrand deposit in South Africa."

Applying molecular biology techniques, Dr Reith discovered a living biofilm on the surface of gold grains collected. DNA profiling of this biofilm identified 30 bacterial species with populations unique to the gold grains when compared to the surrounding soils.

One species was identified on all of the DNA-positive gold grains from both locations. DNA sequence analysis of this species identified it as the bacterium *Ralstonia metallidurans*.

"The next step was to see if we could observe gold precipitation in the presence of a culture of this bacteria," Dr Reith said.

"By placing a culture of the *R. metallidurans* in the presence of dissolved gold, which is highly toxic to microorganisms, I observed active gold precipitation.

"A unique attribute of *R. metallidurans* is that it is able to survive in concentrations of gold that would kill most other micro-organisms."

This research has significance for the mineral exploration industry – as current models of gold formation do not include a biological mechanism.

"There may be new opportunities for the bio-processing of gold ores now that we have discovered bacteria that precipitate gold out of solution," Dr Reith said.

Source: CSIRO

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