POSTER

SYNTHESISING STALACTITE MORPHOLOGY

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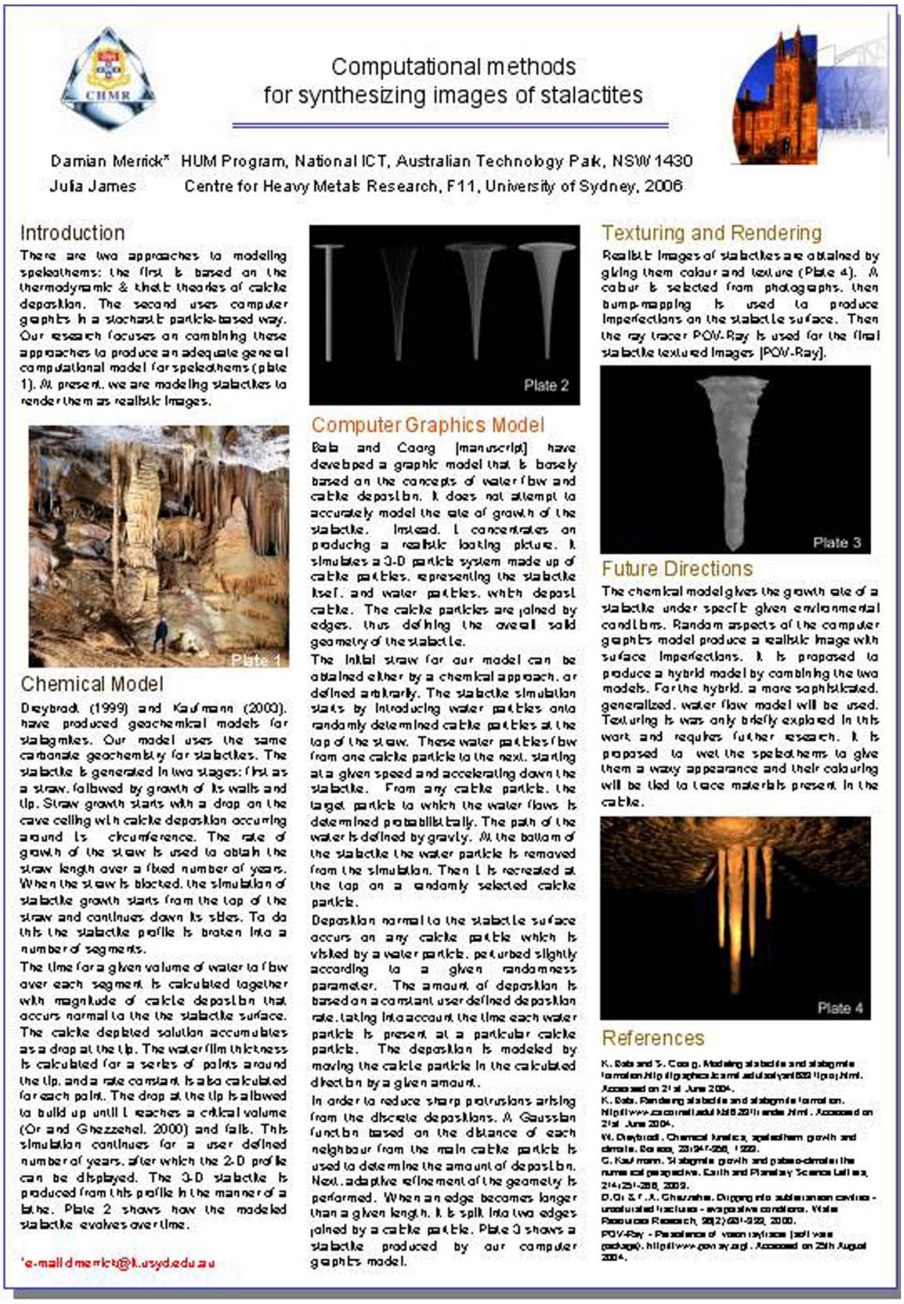
A topic of major interest in speleology is the morphology of speleothems. However, the chemical and physical processes that occur to form speleothems in nature are quite complex. Speleothem growth can be modeled computationally with the input of various parameters. One could easily explore the vast variety of potential shapes that may arise from different conditions in a cave.

Our research aims toward the goal of computationally modeling the morphology of speleothems. We have investigated two models for generating stalactite geometries, and rendered these geometries as realistic images.

The first of these is a rigorous model based on the thermodynamic and kinetic theory of calcite deposition. It first generates the shape of a calcite straw, based on a linear approximation of the rate of deposition. It then blocks the straw and builds up the sides and tip of the stalactite.

The second model is a stochastic particle-based approach from computer graphics. This model starts off with a cylinder, representing the straw speleothem, which is made up of calcite particles joined together by edges in the geometry. Water particles are generated at the top of the straw and allowed to flow along edges between calcite particles. Deposition occurs on every calcite particle visited by a water particle, according to the length of time the water particle is present there.

The water particles accelerate down the sides of the stalactite until they reach the tip, where they are removed, causing new water particles to be created back at the top of the stalactite.



Stalactites generated by both models were rendered as images with realistic texturing and lighting in a ray-tracer. Although the first model provided a more chemically accurate approach to generating geometry for a stalactite, the images produced by the second model appeared much more realistic. We aim towards a hybrid of these two approaches that may result in more realistic images.