



Conference Abstract

# The biomimetics potential of cave-dwelling animals

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## Abstract

Biomimetics or biologically inspired design is a relatively new interdisciplinary field that aims to harness the processes and mechanisms in nature that have been optimised over million of years' evolution to improve our own technology. There are two main approaches to biological inspired design – the problem-driven approach starting with an engineering problem and searching through biological equivalents or the solution-driven approach which starts with a biological example or solution followed by the identification of a suitable engineering application (Lenau et al. 2018). While the former approach is the most popular and is favoured by engineers, the latter remains the most successful and is typically driven by fundamental biological research. However, no biomimetic solutions or concepts have so far been described from subterranean habitats despite the rich potential arising from the wonderfully diverse range of bizarre morphological, physiological and behavioural adaptations that have arisen in response to the environmental constraints. In this presentation I give an outline of potential biomimetics examples arising from cave-dwelling animals in three technology fields.

1. Biomaterials – the high humidity, lack of light and stable temperatures may have given rise to novel biomaterials. A promising study on the properties of silk from the Tasmanian cave spider *Hickmania troglodytes* is currently underway (Piorkowski et al. 2017).
2. Adhesion devices. The high humidity and smooth wet surfaces underground may have given rise to unique morphological adaptations to adhere to and move on

these surfaces. Potential target organisms include millipedes, springtails and cave angel fish.

### 3. Biorobotics.

The characteristics of the subterranean habitats potentially offer rich inspiration for the design of exploration robots ranging from flexible movement in constrained spaces, flight in low light conditions and non-visual navigation. The hope is that this presentation will inspire experienced biospeleologists to consider and explore potential novel biomimetic applications in their own study organisms.

## Keywords

biologically inspired design, solution-driven approach, troglomorphy, subterranean adaptations, spider silk, adhesion

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## Hosting institution

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## Conflicts of interest

None

## References

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