

Cover Page



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# Propositions

accompanying the thesis

## The Evolution of Shell Form in Tropical Terrestrial Microsnails

by Liew Thor Seng

1. Biologically-informative shell characters that are useful for taxonomy can be obtained when the shell is viewed as a petrified ontogeny, rather than as a solid geometrical object (This thesis).
2. Gastropod shell form and ontogeny can be simultaneously quantified using 3D technology (This thesis).
3. In order to understand the development and evolution of a gastropod solid shell, the animal's soft body organs, particularly the mantle edge that produces the shell and the columellar muscle that supports the shell, must be understood (This thesis).
4. *Plectostoma*'s distorted coiled whorl and projected radial ribs cannot fully protect this landsnail from its predator's (a slug) shell-drilling attack (This thesis).
5. Phylogenetic history does not constrain changes in shell ontogeny, and the resultant shell forms in *Plectostoma* (This thesis).
6. Taxonomy is an information-rich science, but there has been little advancement in the manner in which taxonomists maintain, share and create taxonomic information. However, internet technology can provide solutions to address this.
7. Biologists need to pay more attention to the work of computation artists, who have been leaders in capturing, manipulating and transferring the organic forms of nature to their digital 3D models.
8. The current state of 3D technology, in terms of hardware and software, allows not only geometric comparisons among an organism's form, but it also allows comparisons of the biological and physical properties of an organism's form in an accurate and quantitative manner.

9. Many conventional theories involving gastropod shells are not accurate and need to be revised. For example, the imaginary coiling axis is not predetermined, but is an outcome of shell ontogeny.
10. A successful career in science is not about making more papers, or obtaining more citations. It is also not about achieving a position of power and fame. It is about inspiring other people to improve themselves intellectually in order to improve science as a collective enterprise.
11. One impediment to the progress of science is the emotion of fear among scientists. This fear arises when their conventional practices are challenged by new practices, and when they have to venture into unfamiliar territories in science.