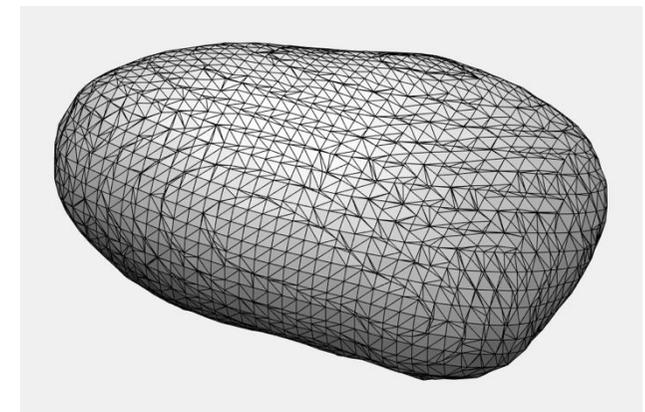
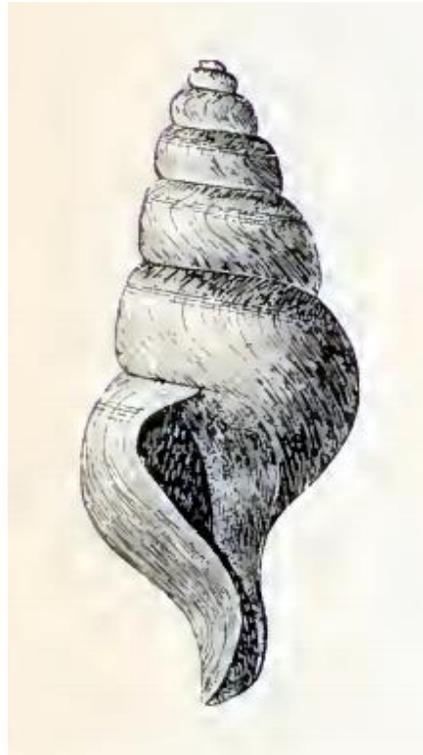
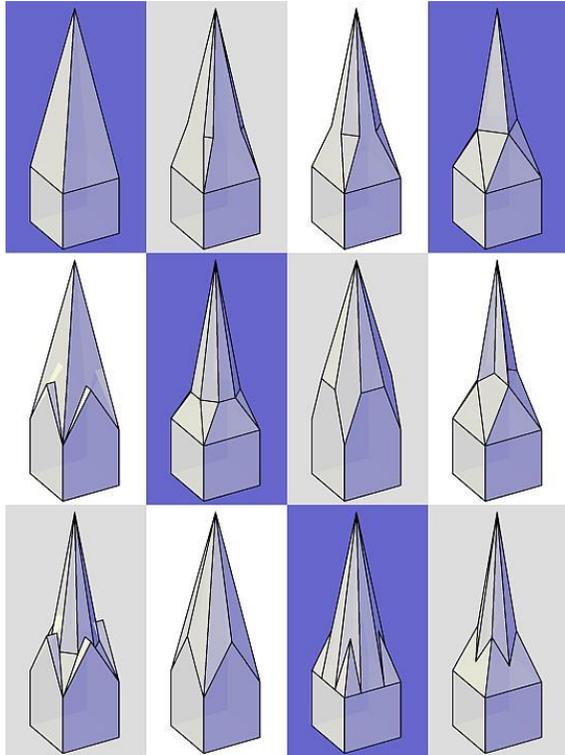


# TDK 2022 – Topics

## Department of Morphology and Geometric Modeling



<http://www.epab.bme.hu/>

**András Árpád Sipos PhD**  
associate professor

### **Coiling forms in the animal world**

Among many others, the high variety of sea- and gastropod shell demonstrate that coiling shapes are widespread in the living world. The specific shapes are explained by growth and evolutionary traits in the literature. It is still mysterious, why the evolution prefers a small set in the possible range of geometries. We aim to study the geometric and mechanic reasons behind this mystery. We aim to analyze shapes obtained by CT scanning.

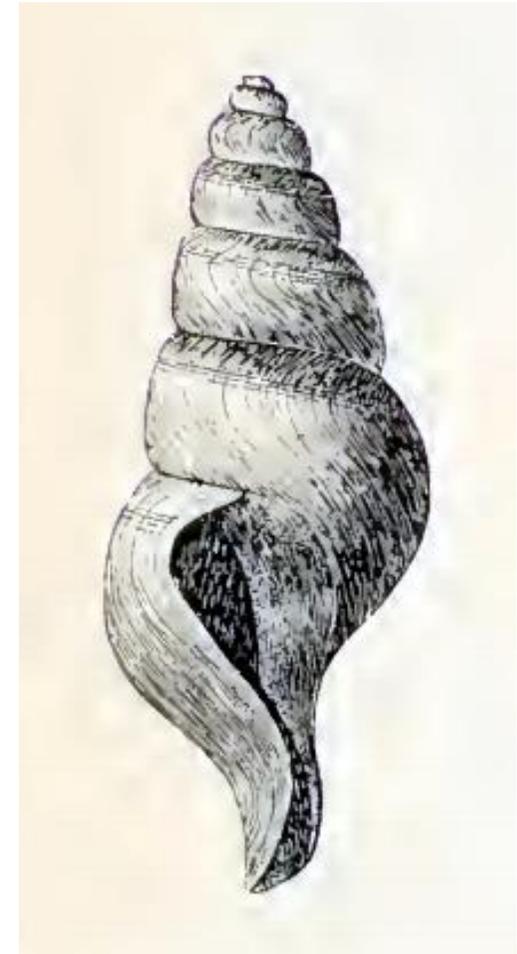
The topic is more into considering different options and studying literature.

Some knowledge in programing / experimental work is a plus.

References:

M. Hansell: *Animal Architecture*, Oxford University Press, 2005.

D.W. Thompson: *On Growth and Form: The Complete Revised Edition*, Dover Publications, 2005



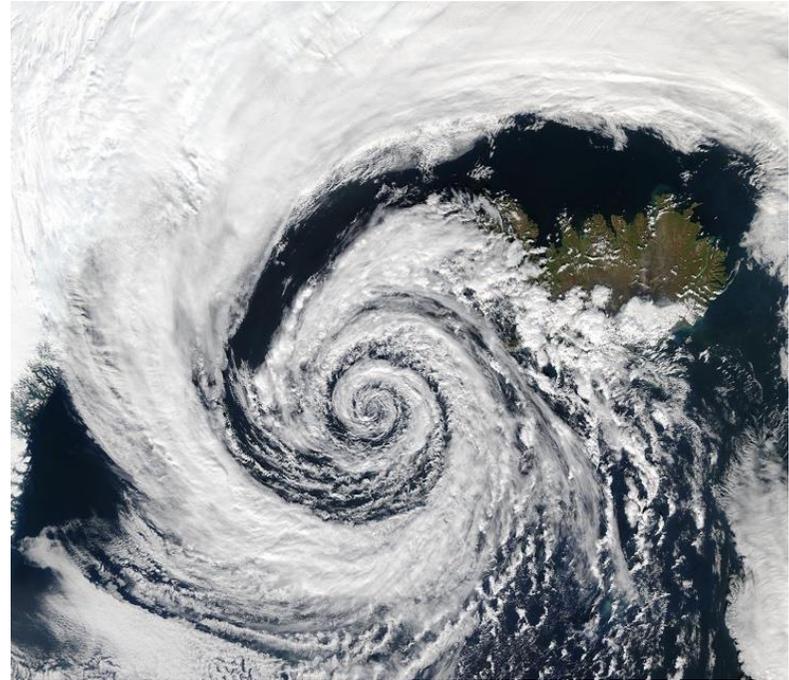
**András Árpád Sipos PhD**  
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### **The logarithmic spiral in 3D**

The logarithmic spiral ("spira mirabilis") is basically a two-dimensional object, which can be recognized in countless natural phenomena (e.g., spiral galaxies, cyclones, gastropod shells, etc.). During the TDK work we aim to collect examples, when a form, being a logarithmic spiral in its projection, also exhibit extension into the third dimension. As the logarithmic spiral results from a simple rule on growth, we aim to describe the growth in the spatial case and compare our model against the collected data on natural shapes.

The topic is more into considering different options.

Programing skills are needed.



References:

Bourbaki, N. "The Most Mysterious Shape of All." *Quantum*, 32-35, March/April 1994.

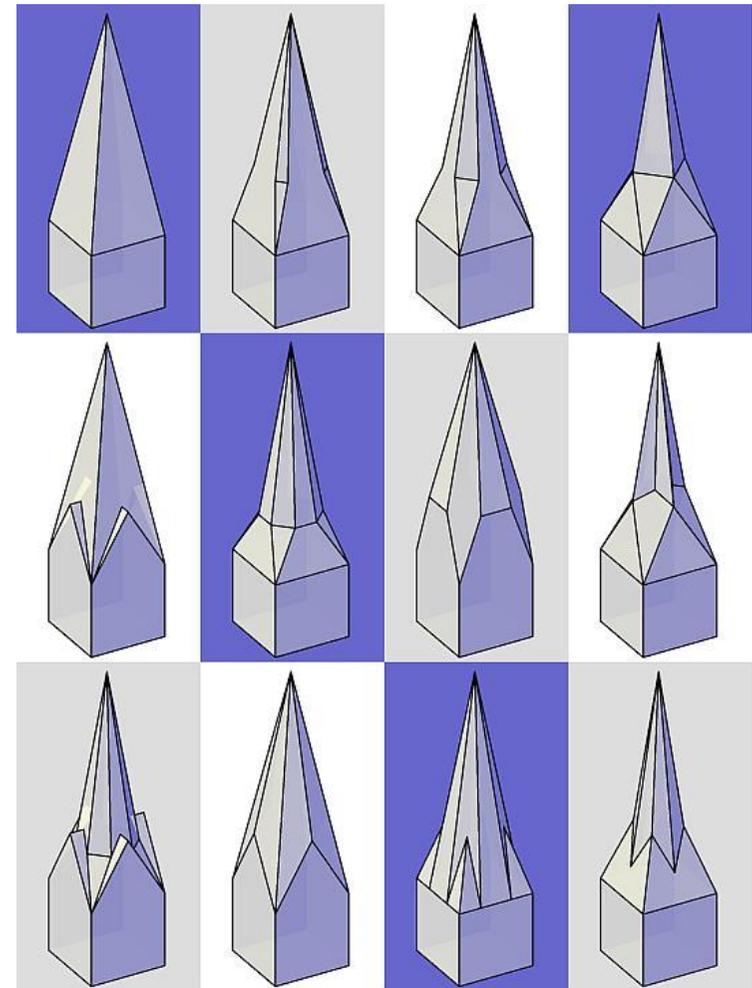
D.W. Thompson: *On Growth and Form: The Complete Revised Edition*, Dover Publications, 2005

## Geometry of polyhedral spires

Towers often serve as accentuated architectural signs, significant beyond their function. Due to their typically regular polygonal floor plan and rotationally symmetrical shape, the roofs of towers bounded by planar surfaces represent a geometrically interesting group of polyhedra. The shapes themselves, the principles of their construction, their geometric design, and their possible classification offer interesting topics in several respects from the most common through the area-specific to the individual solutions.

<http://www.heldermann.de/JGG/JGG11/JGG111/jgg11011.htm>

[http://www.arch.bme.hu/caadence-proceedings/DOI\\_10.3311\\_CAADence.1672.pdf](http://www.arch.bme.hu/caadence-proceedings/DOI_10.3311_CAADence.1672.pdf)



**Eszter Fehér PhD**

assistant professor

## **Benchmarking and testing method for 3D scanners**

There exist multiple methods for the 3D scanning of surfaces. The ELKH-BME Morphodynamics Research Group has multiple 3D scanners to capture the shape of rocks. However, they are produced by different manufacturers that provide no comparable data about their precision. The task is to develop a method to measure the scanner's precision depending on the size of the scanned object. The method consists of physical objects of different sizes and shapes (e.g., sphere, cube, concave, or void objects) and software that calculates the precision. We also wish to have a trial scanning that would be carried out before an actual scanning to check the experiment's settings.

Software to use: Blender, Matlab

Literature, links:

<https://doi.org/10.5446/45980>

<https://structure.io>

