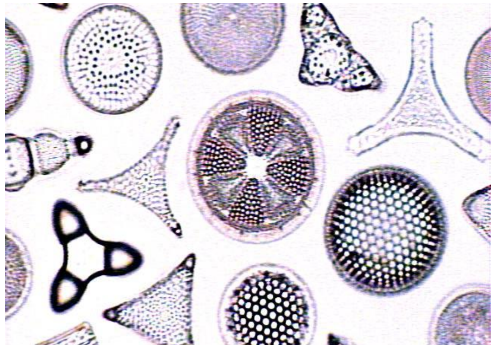
Euler Cycles for “Life”



LEFT: Seashells, **RIGHT:** Diatoms

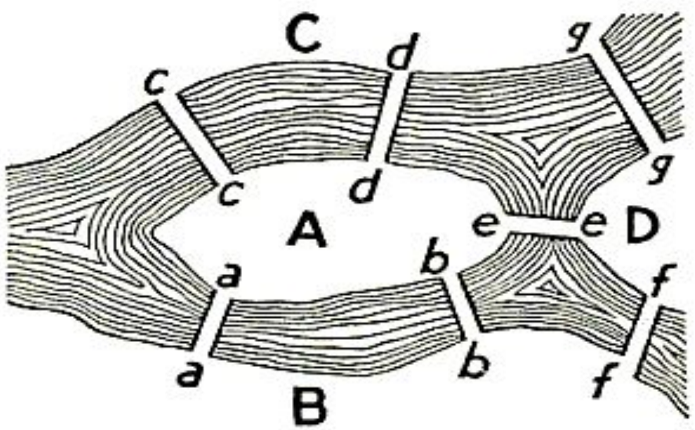
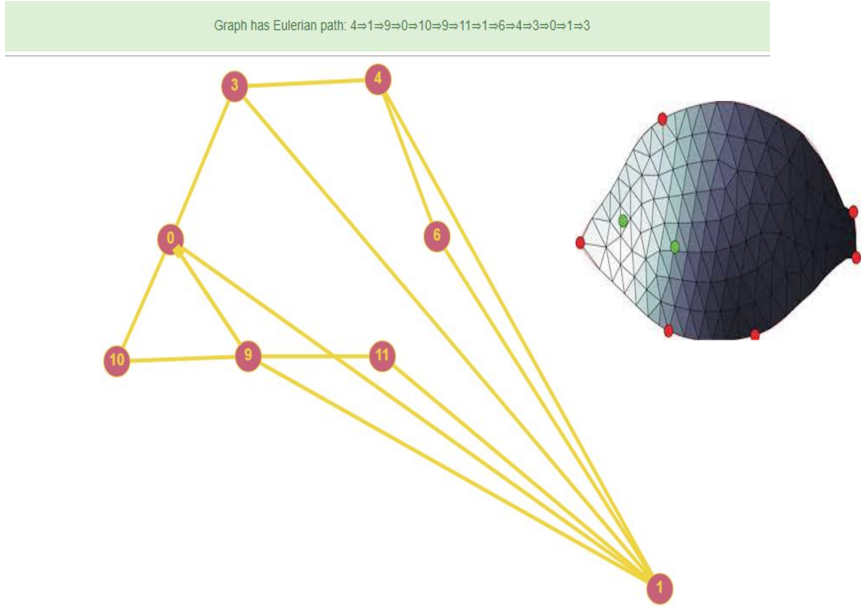


FIGURE 98. *Geographic Map: The Königsberg Bridges.*

http://mathworld.wolfram.com/KoenigsbergBridgeProblem.html

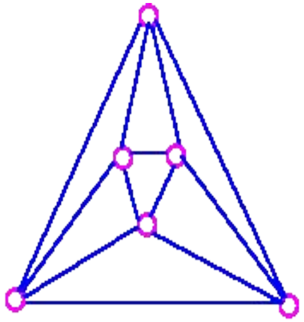
Devo Worm

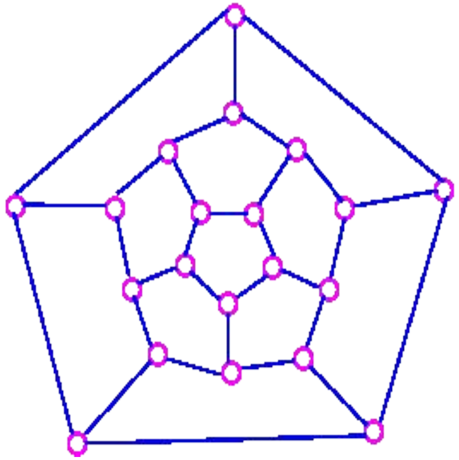


Bradly Alicea

@balicea1

Euler Paths





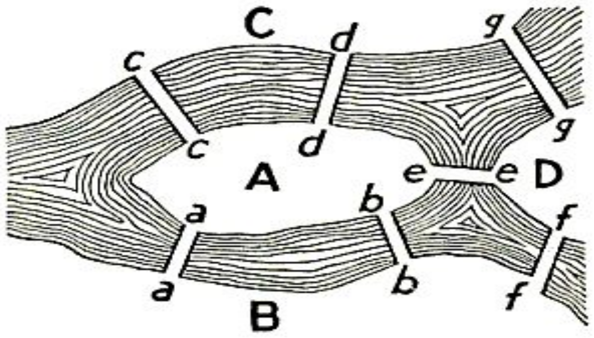
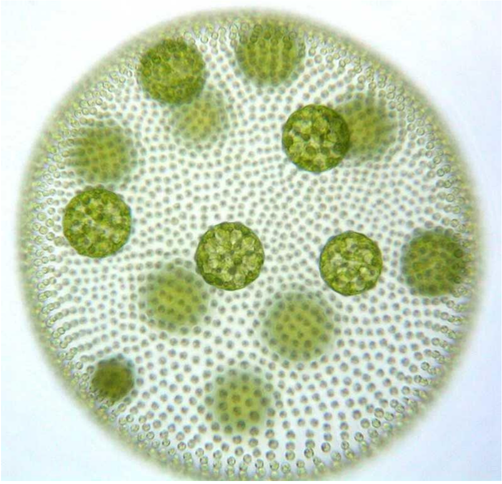
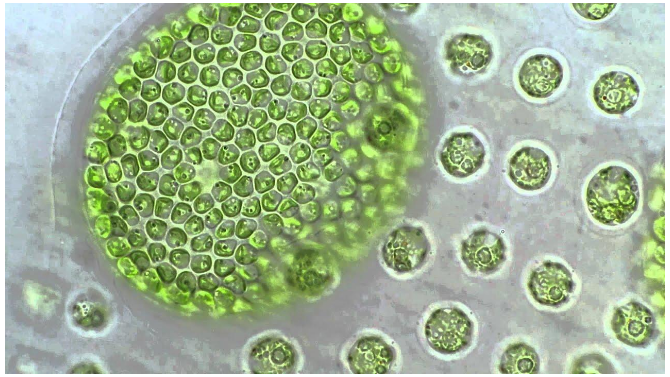
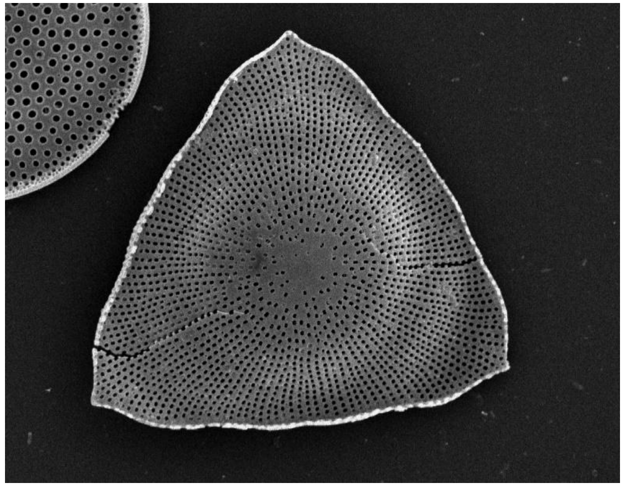


FIGURE 98. *Geographic Map: The Königsberg Bridges.*

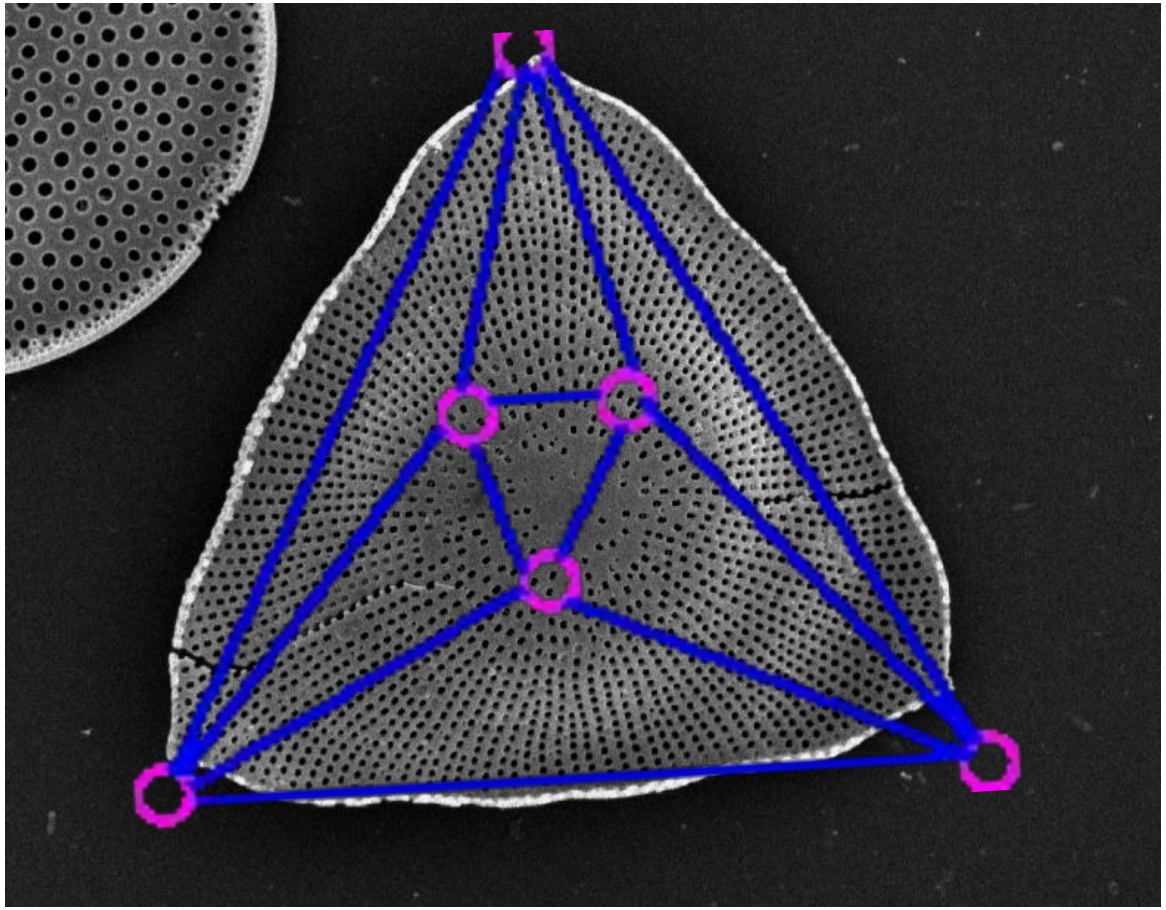


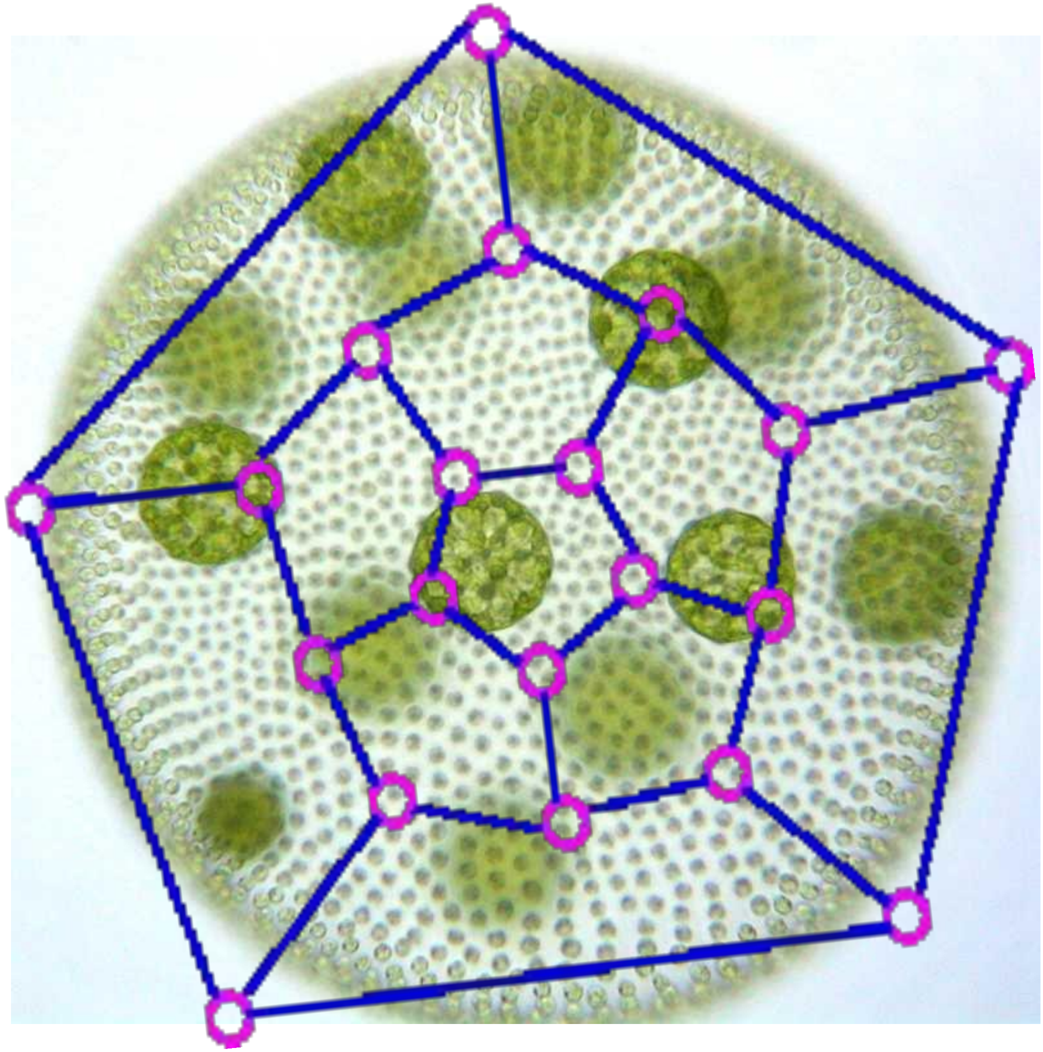
Volvox colony



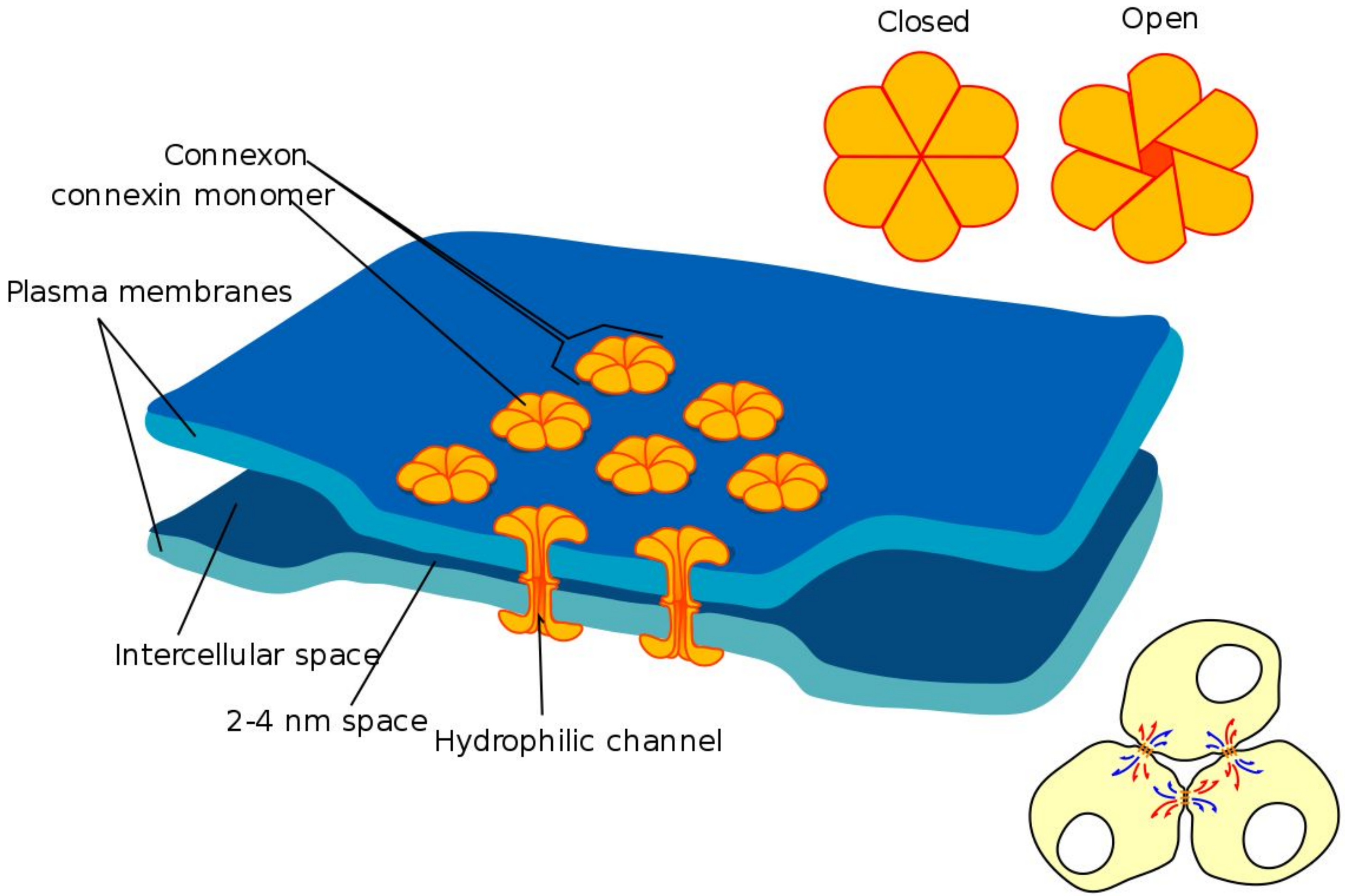


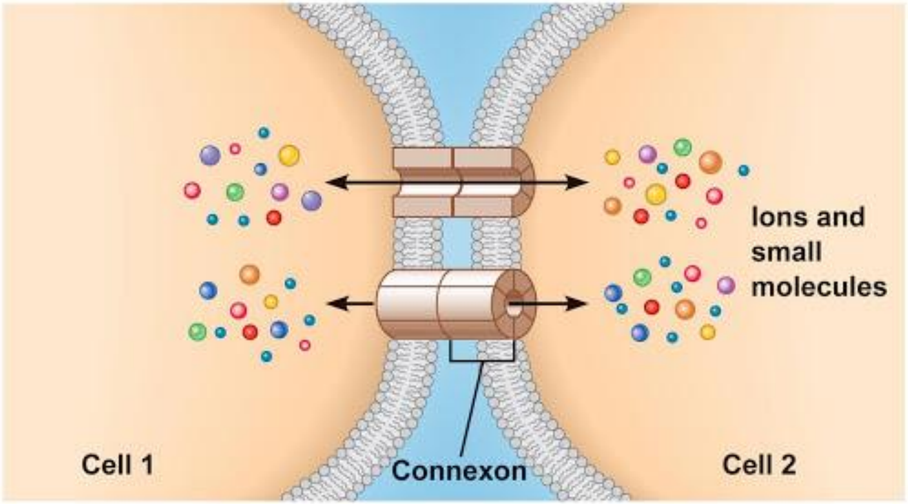
Diatom cell



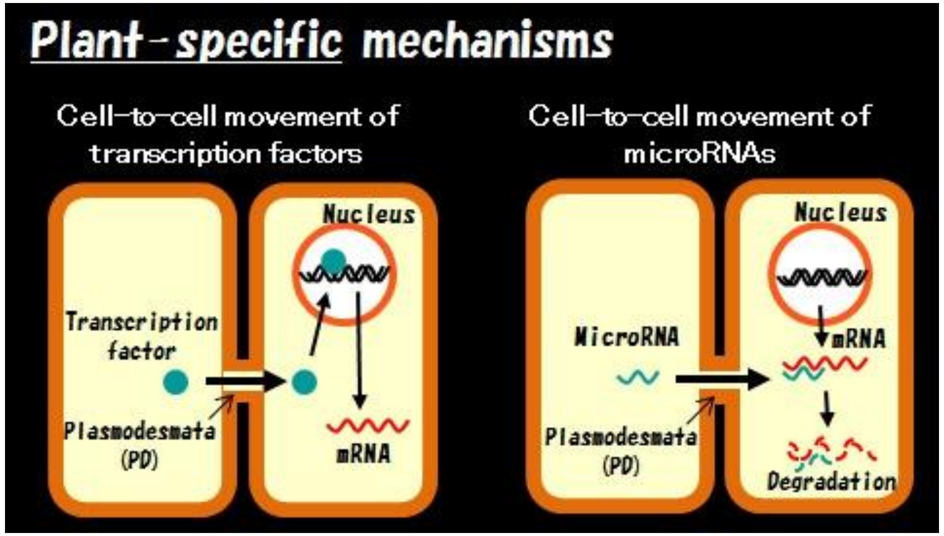


Why are cell boundaries important?





(a) Direct communication through gap junctions



Euler Circuits (EC)

1) attempt to cross every independent edge in multicell network.

2) Every edge crossed once and only once.

3) number of sides of motif and copies of motif determine EC = 0.

- even-sided shape (squares, rectangles, hexagons) arrayed in an even number of copies (or even and odd for hexagons) result in EC = 0.

Graph Online

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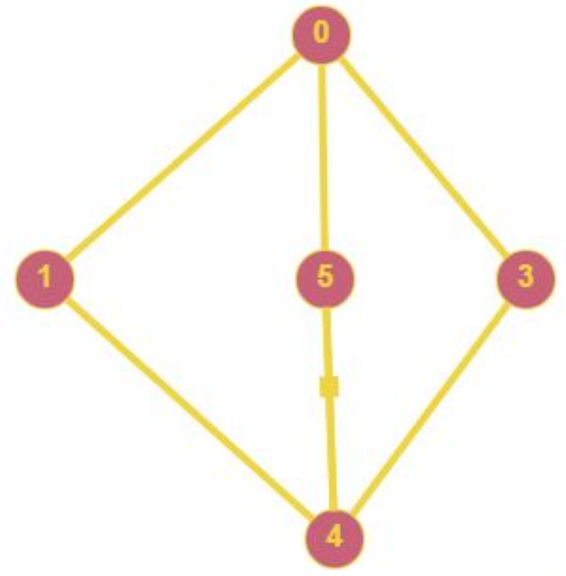
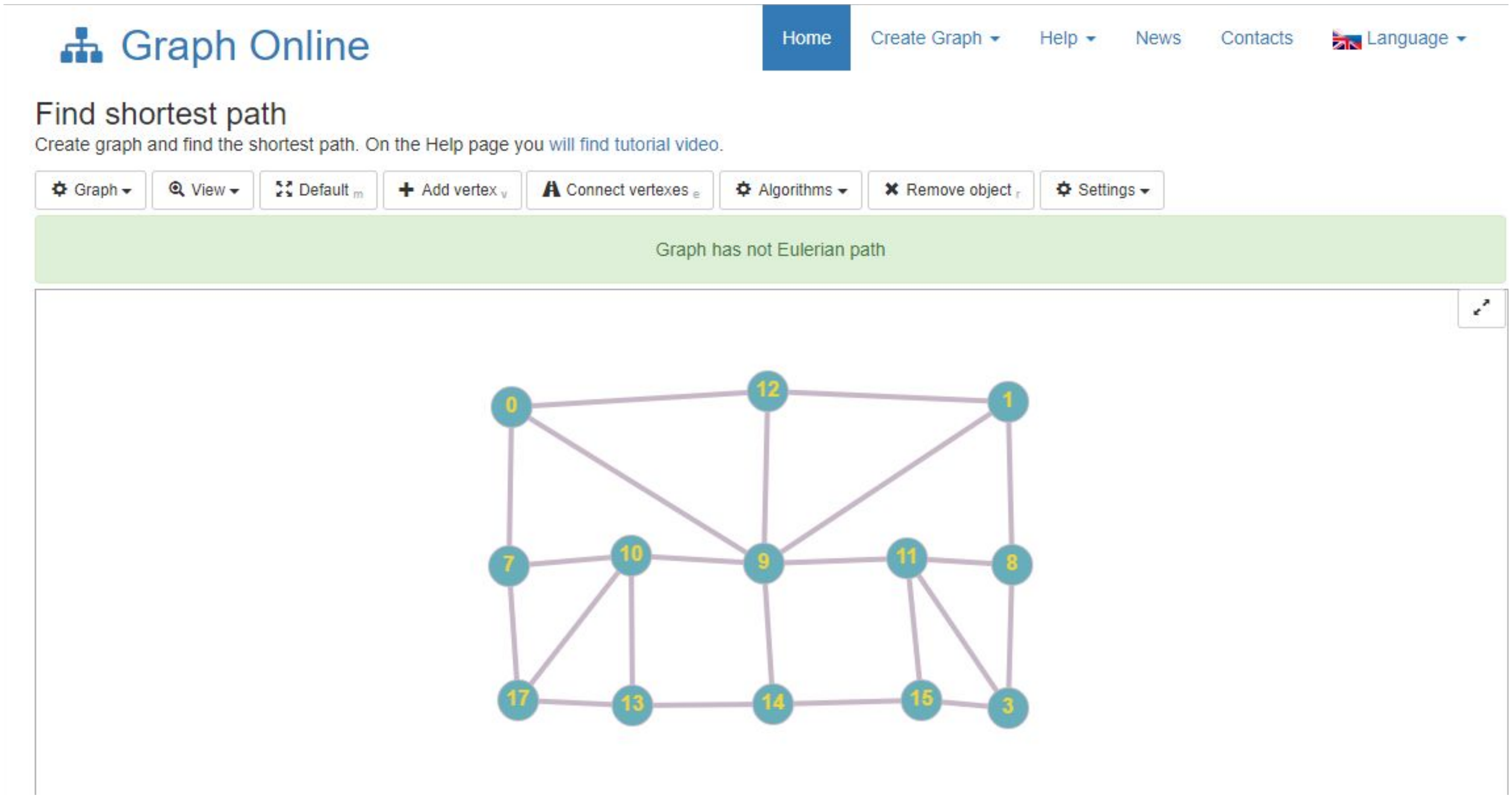
Find shortest path

Create graph and find the shortest path. On the Help page you will find tutorial video.

Graph | View | Default m | Add vertex v | Connect vertexes e | Algorithms | Remove object r | Settings

Graph has Eulerian path: 4⇒1⇒0⇒3⇒4⇒5⇒0

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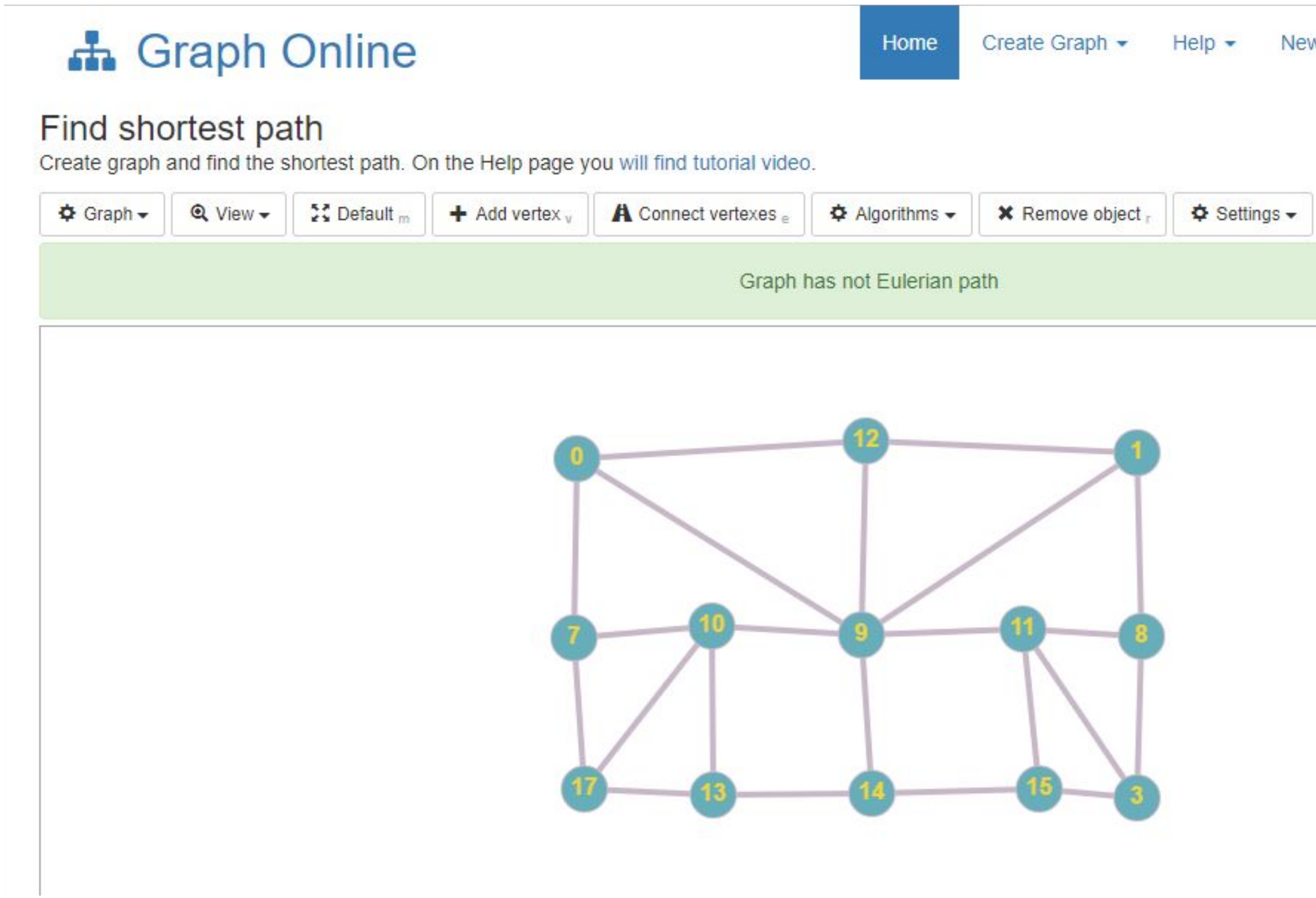
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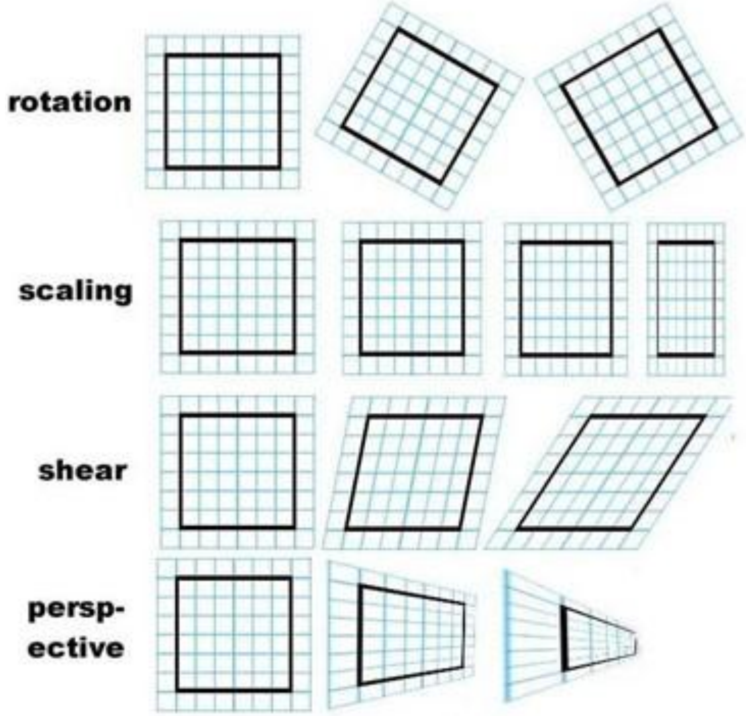
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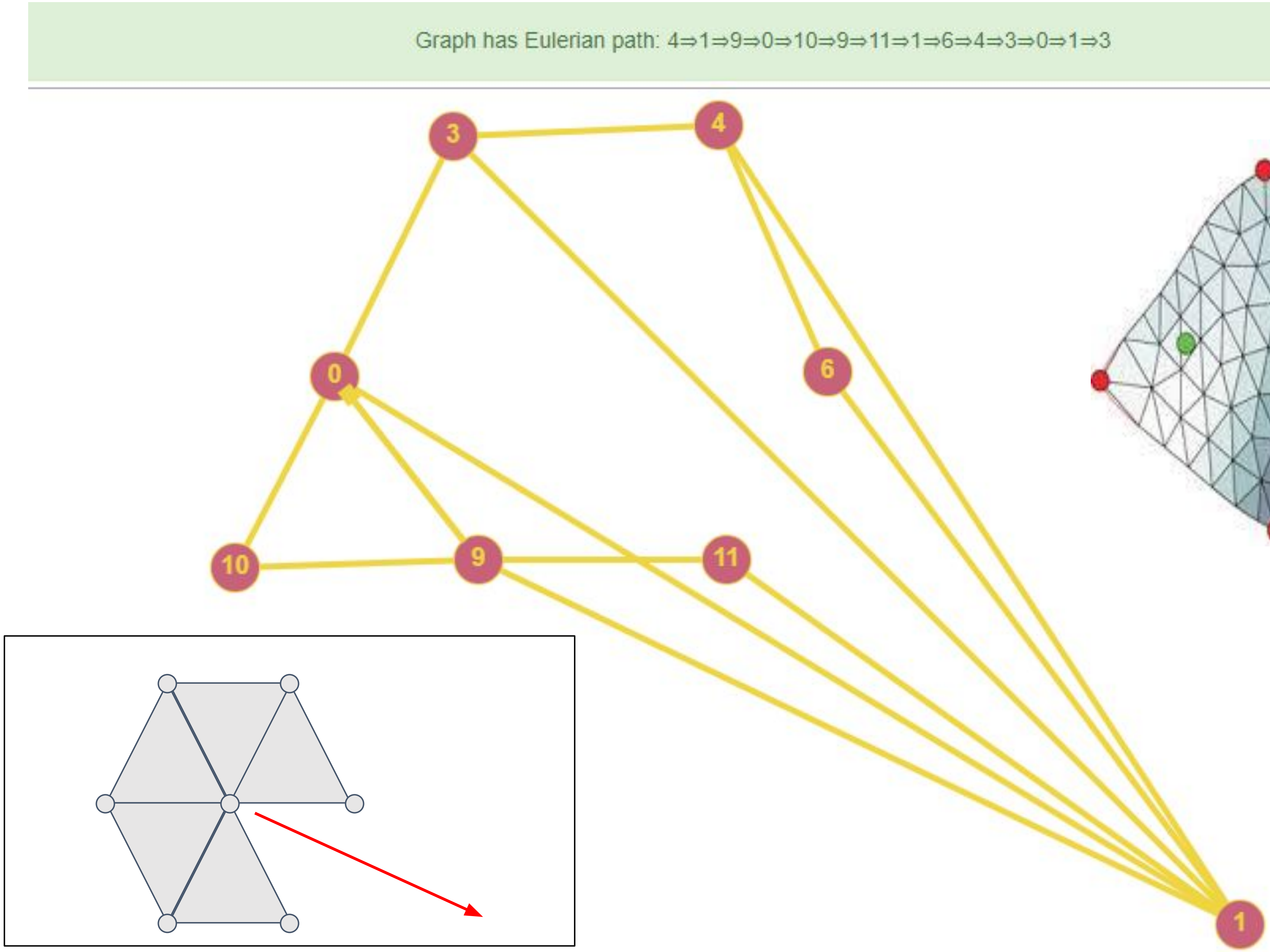
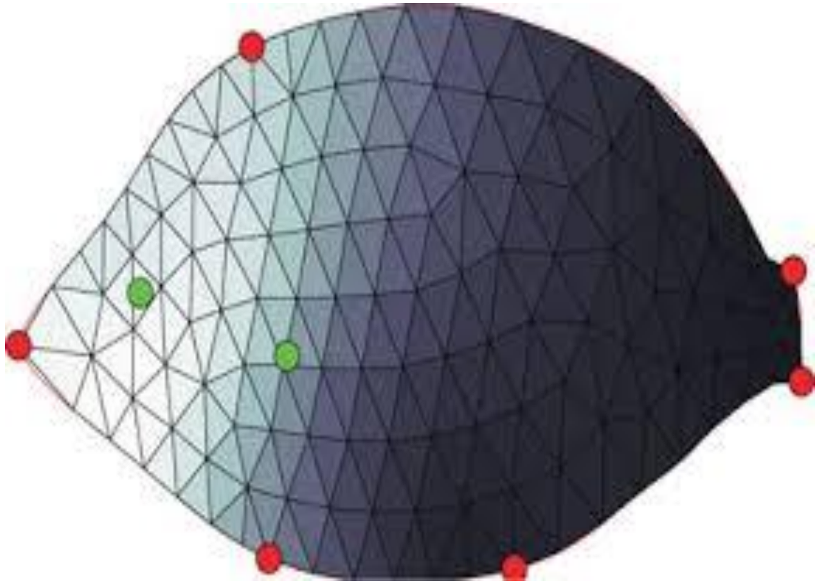
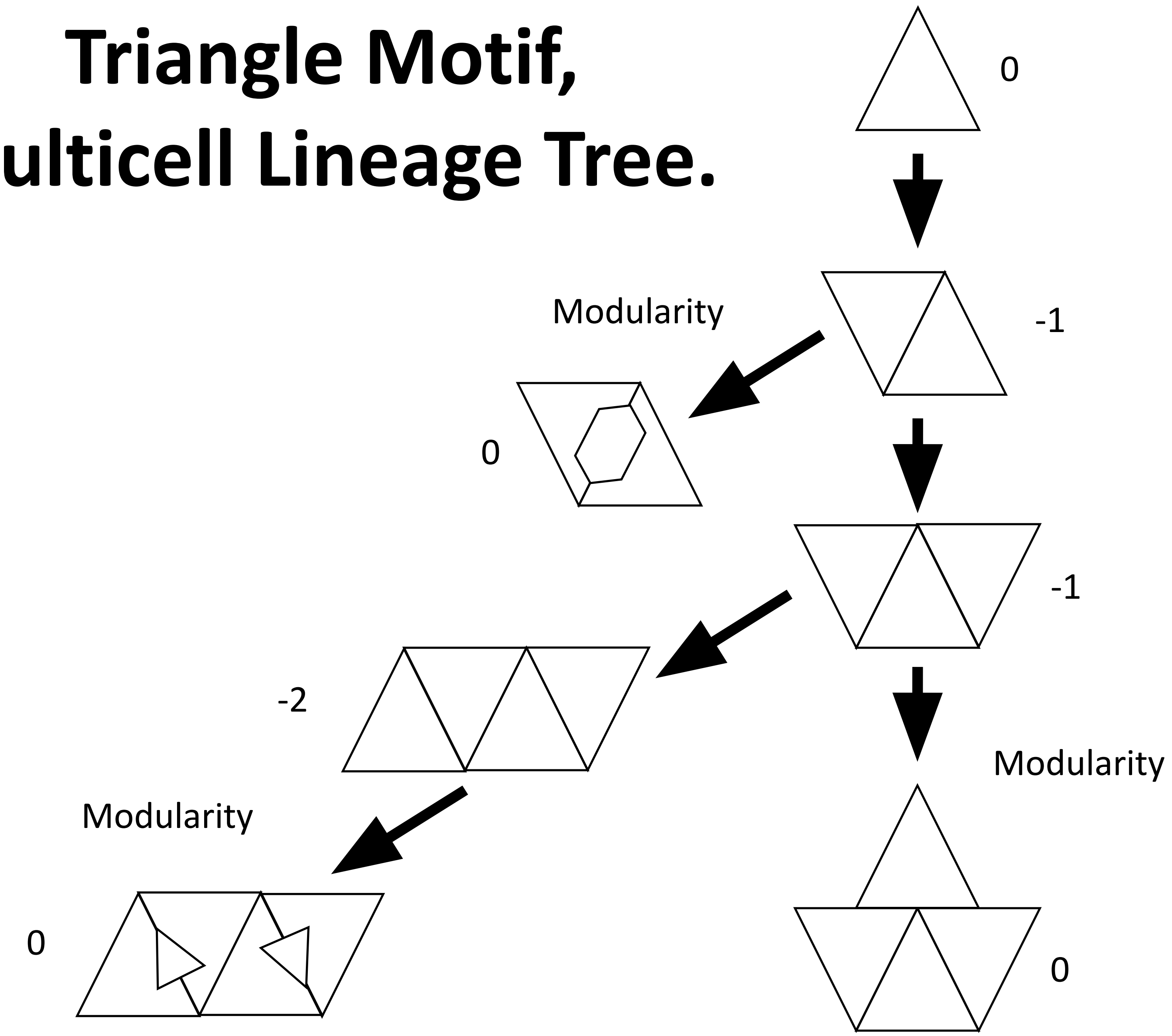




Conformal Mappings

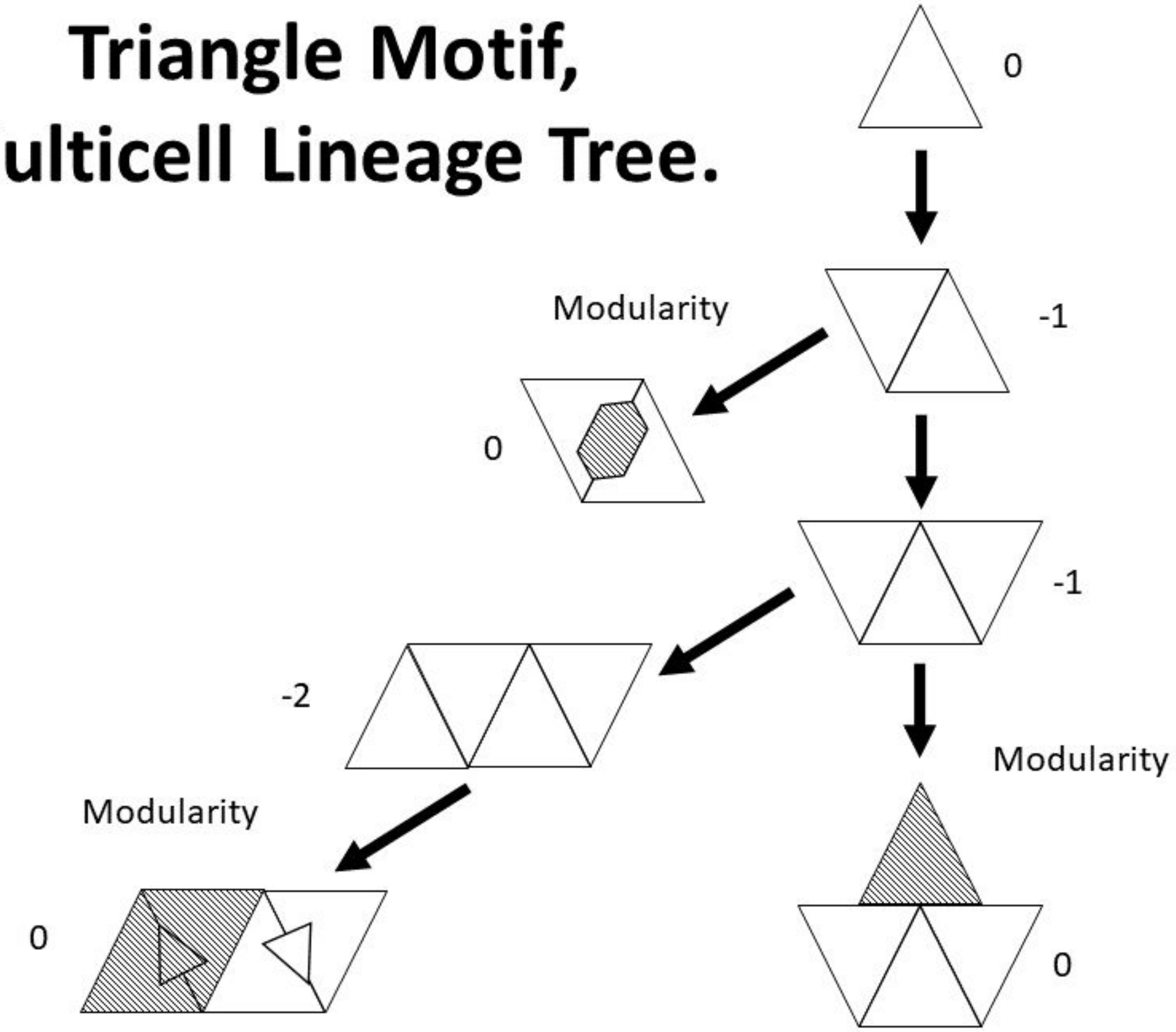
Triangle Motif, Multicell Lineage Tree.



Numbers represent number of steps from Euler Circuit Completeness*

* every edge crossed only once, no trajectory self-crossings.

Triangle Motif, Multicell Lineage Tree.



Numbers represent number of steps from Euler Circuit Completeness*

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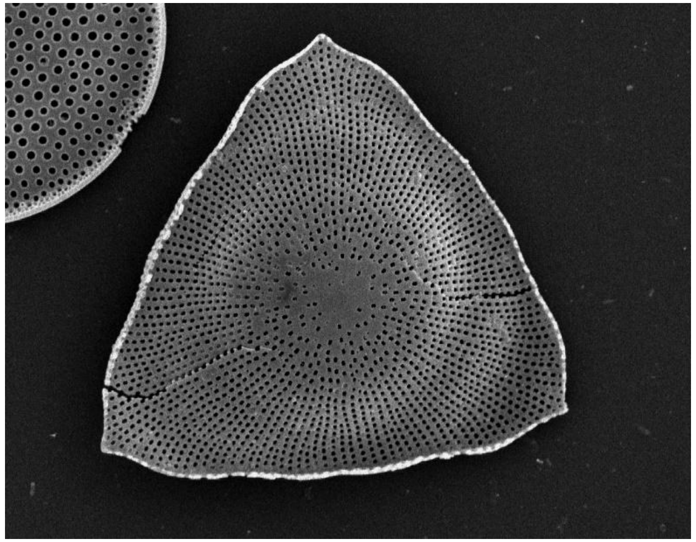
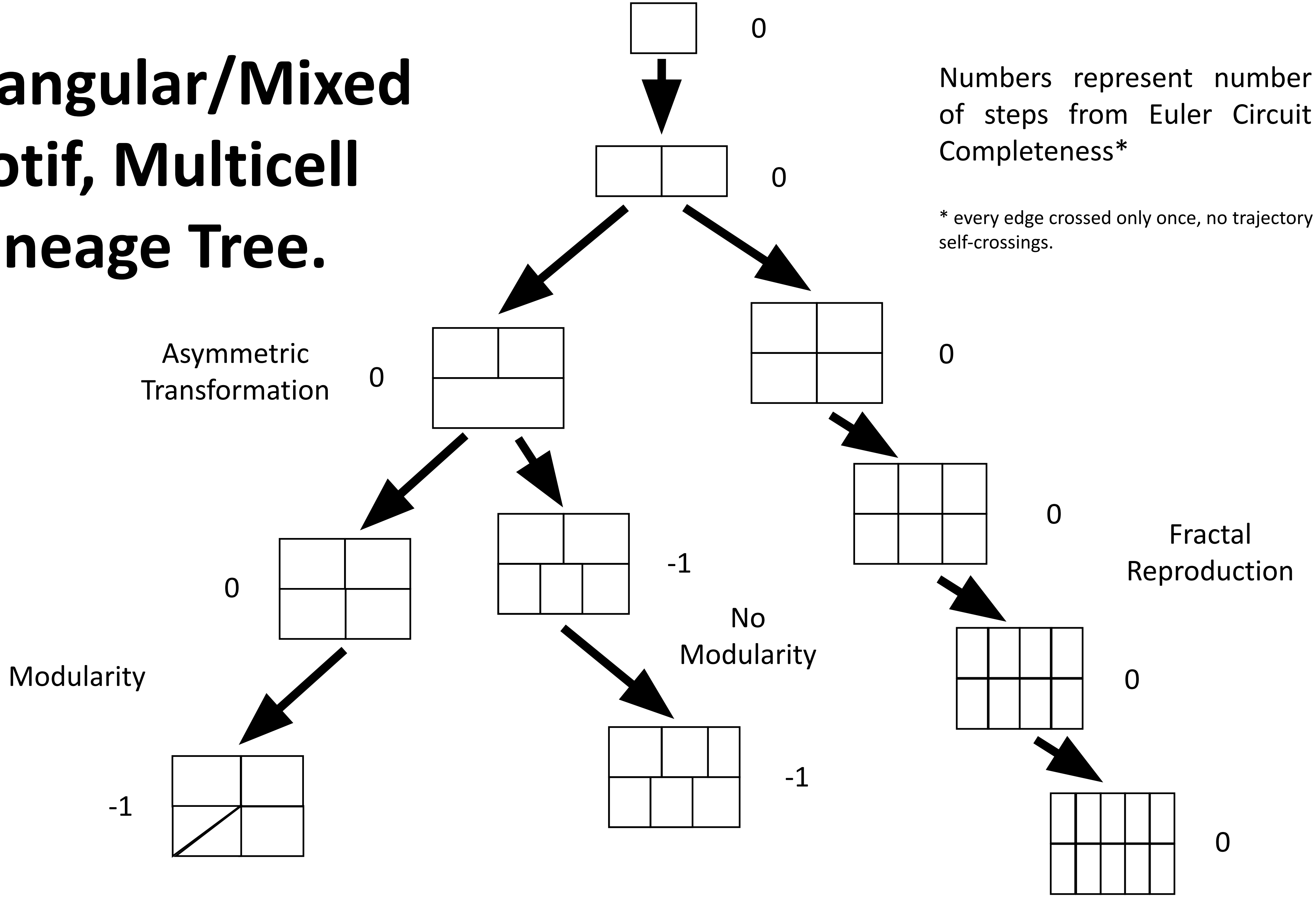
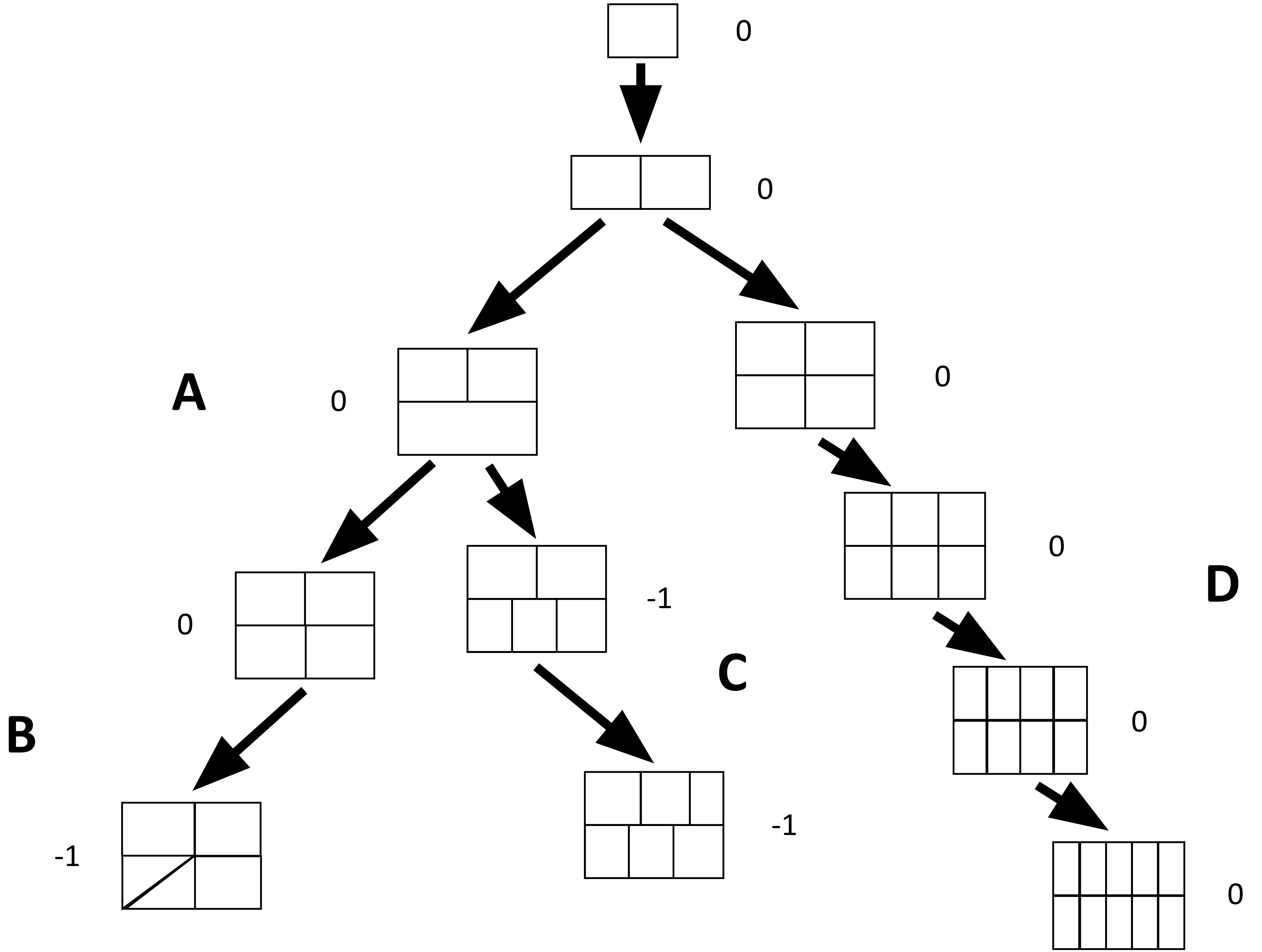


Rectangular/Mixed Motif, Multicell Lineage Tree.

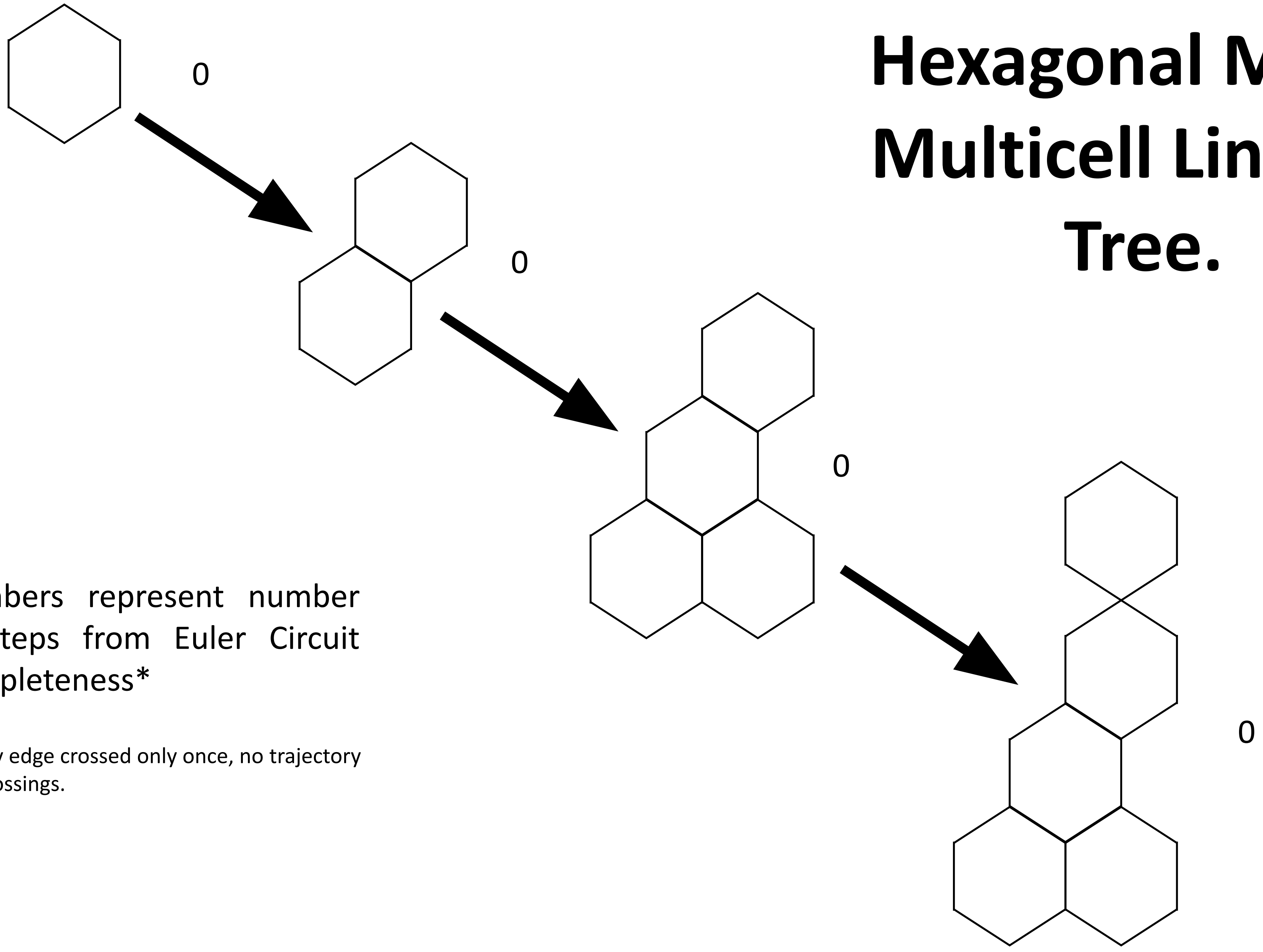
Numbers represent number of steps from Euler Circuit Completeness*

* every edge crossed only once, no trajectory self-crossings.



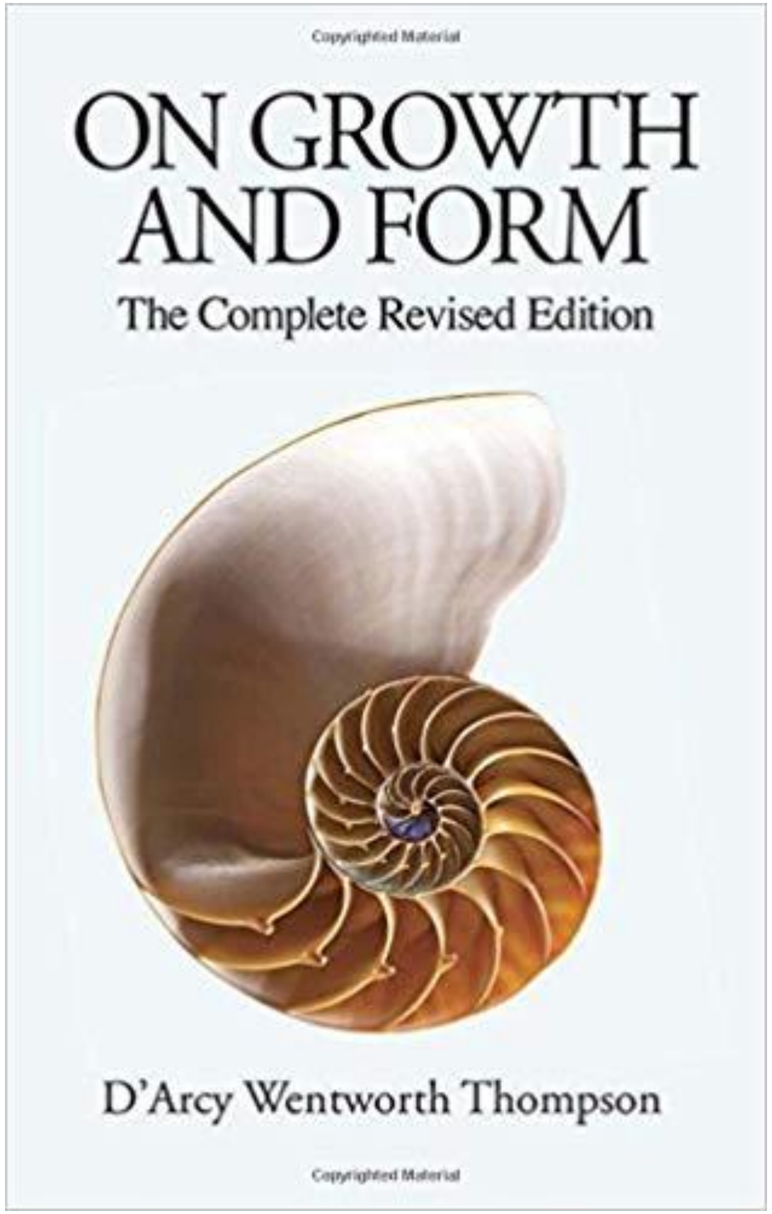

0
0
A
0
0
0
-1
0
0
D
C
B
0
-1
-1
0

Hexagonal Motif, Multicell Lineage Tree.



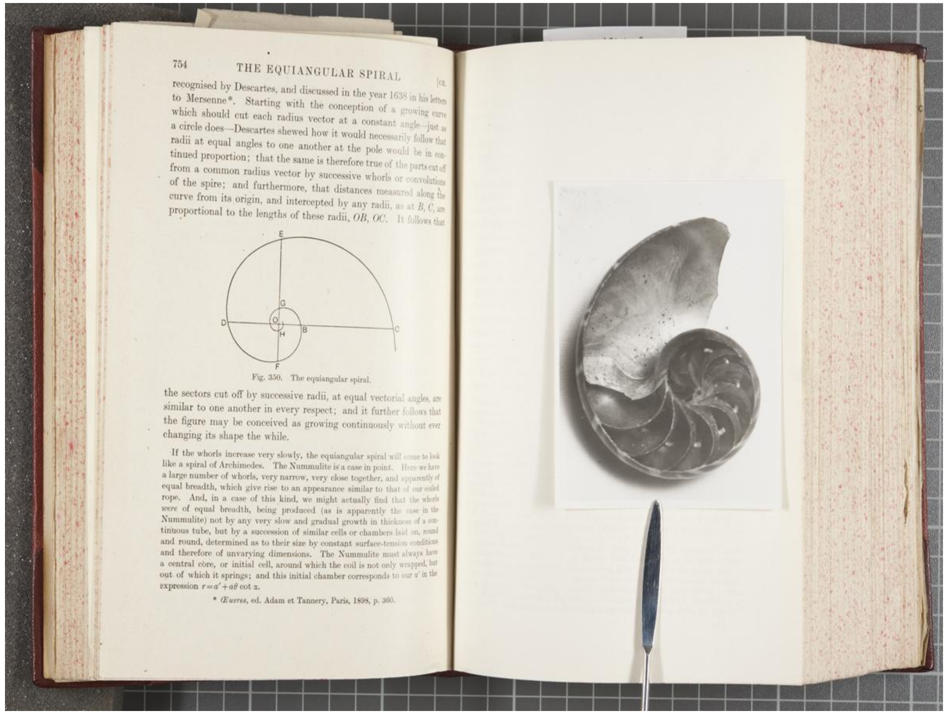
Numbers represent number of steps from Euler Circuit Completeness*

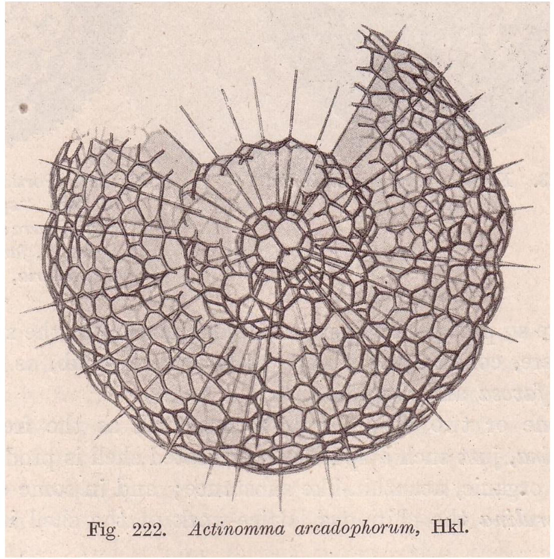
* every edge crossed only once, no trajectory self-crossings.

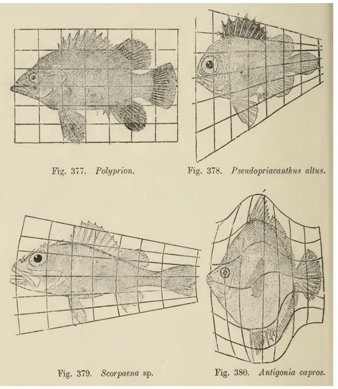


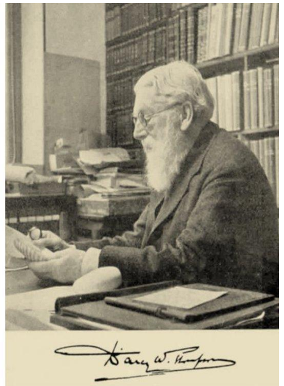
On Growth and Form

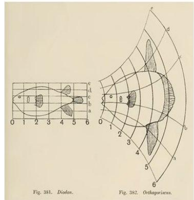
100th anniversary conference:
https://www.ongrowthandform.org/events/on-growth-and-form-centenary-conference/

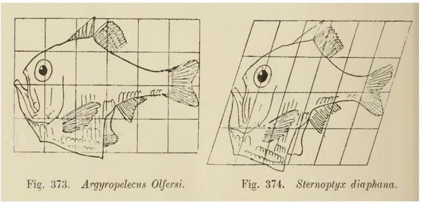




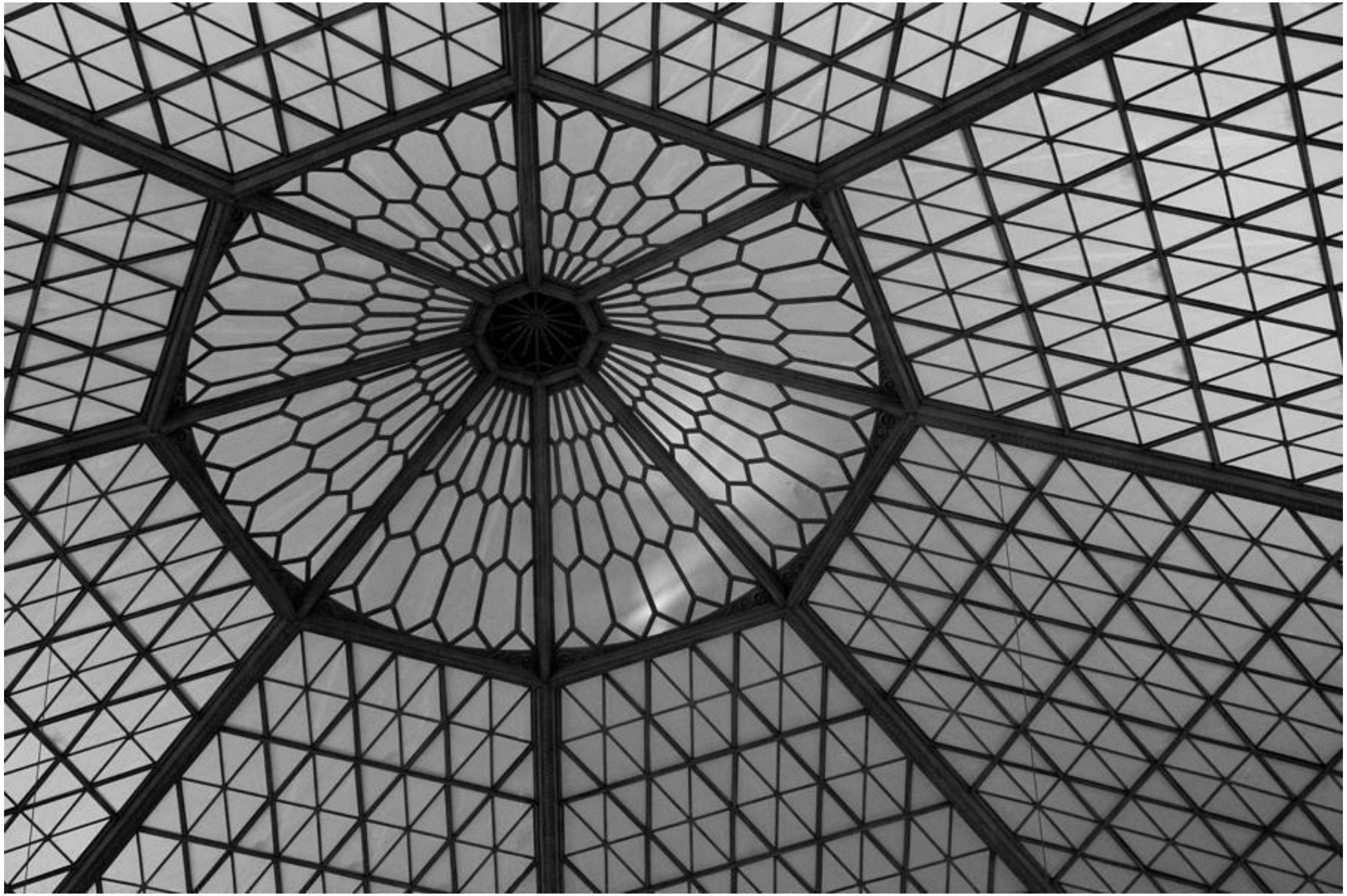








Thanks for your Attention!



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