

It's Fall Break, I don't want to teach

CS 2800: Discrete Structures, Fall 2014

Sid Chaudhuri











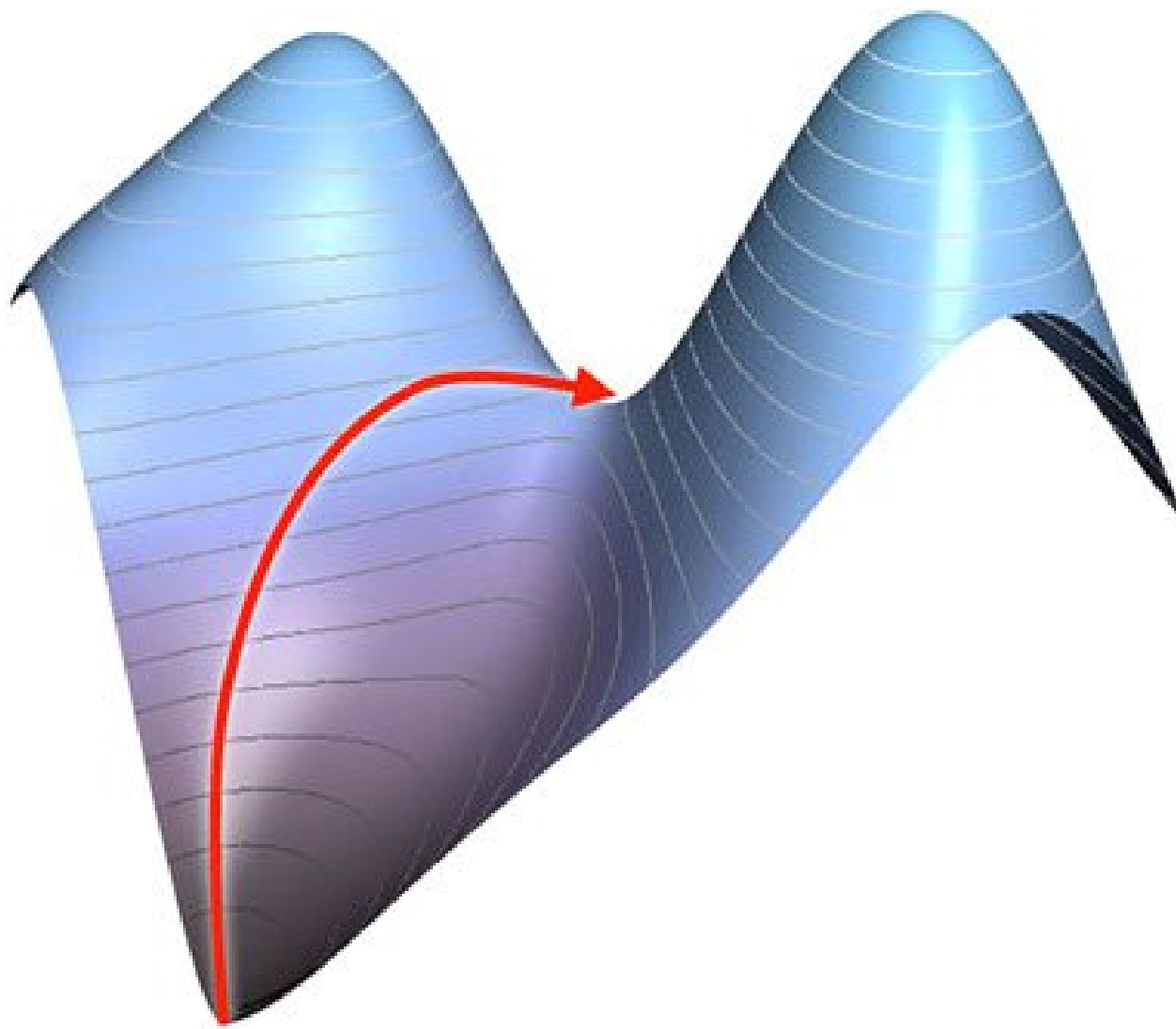


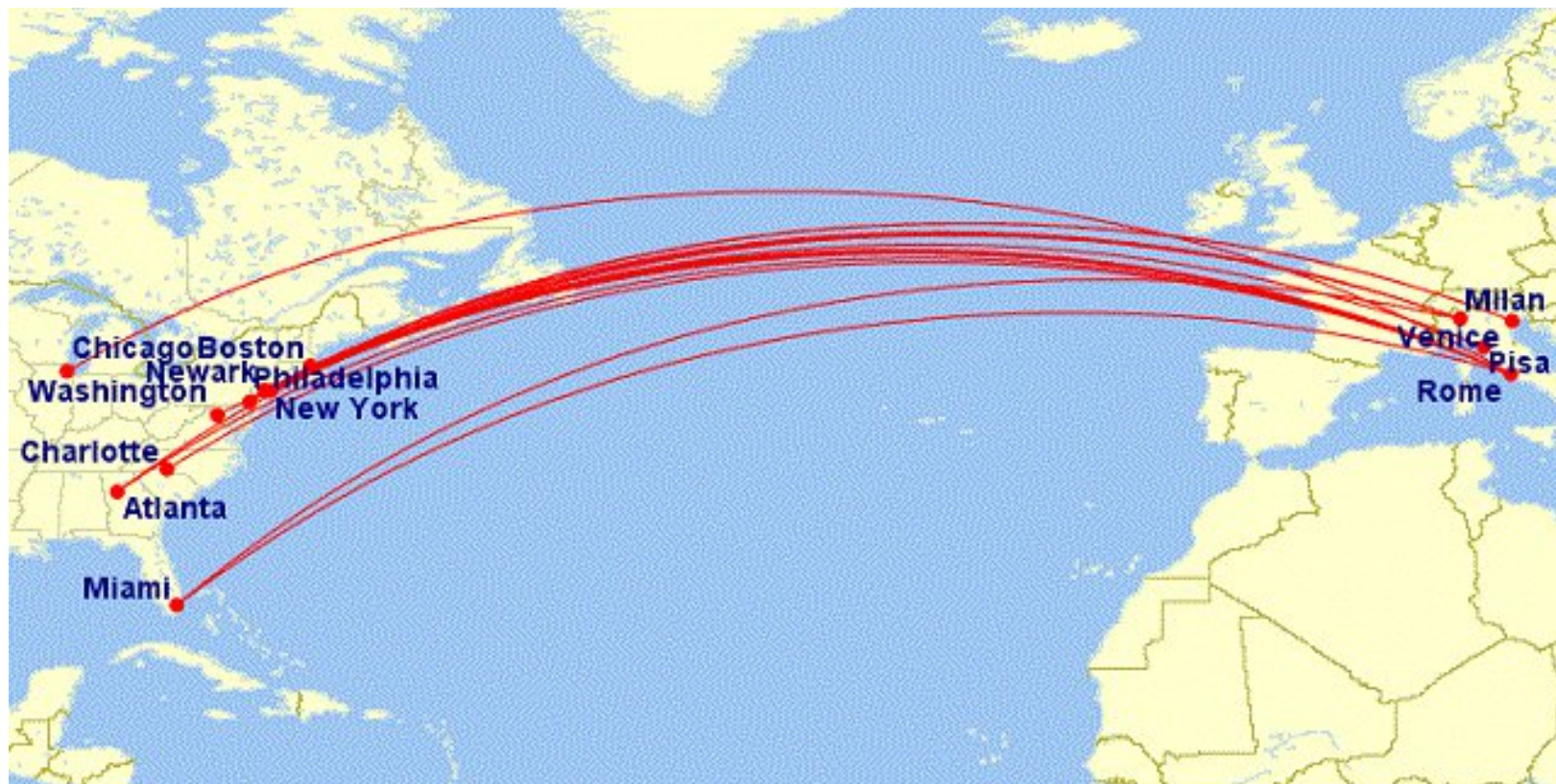






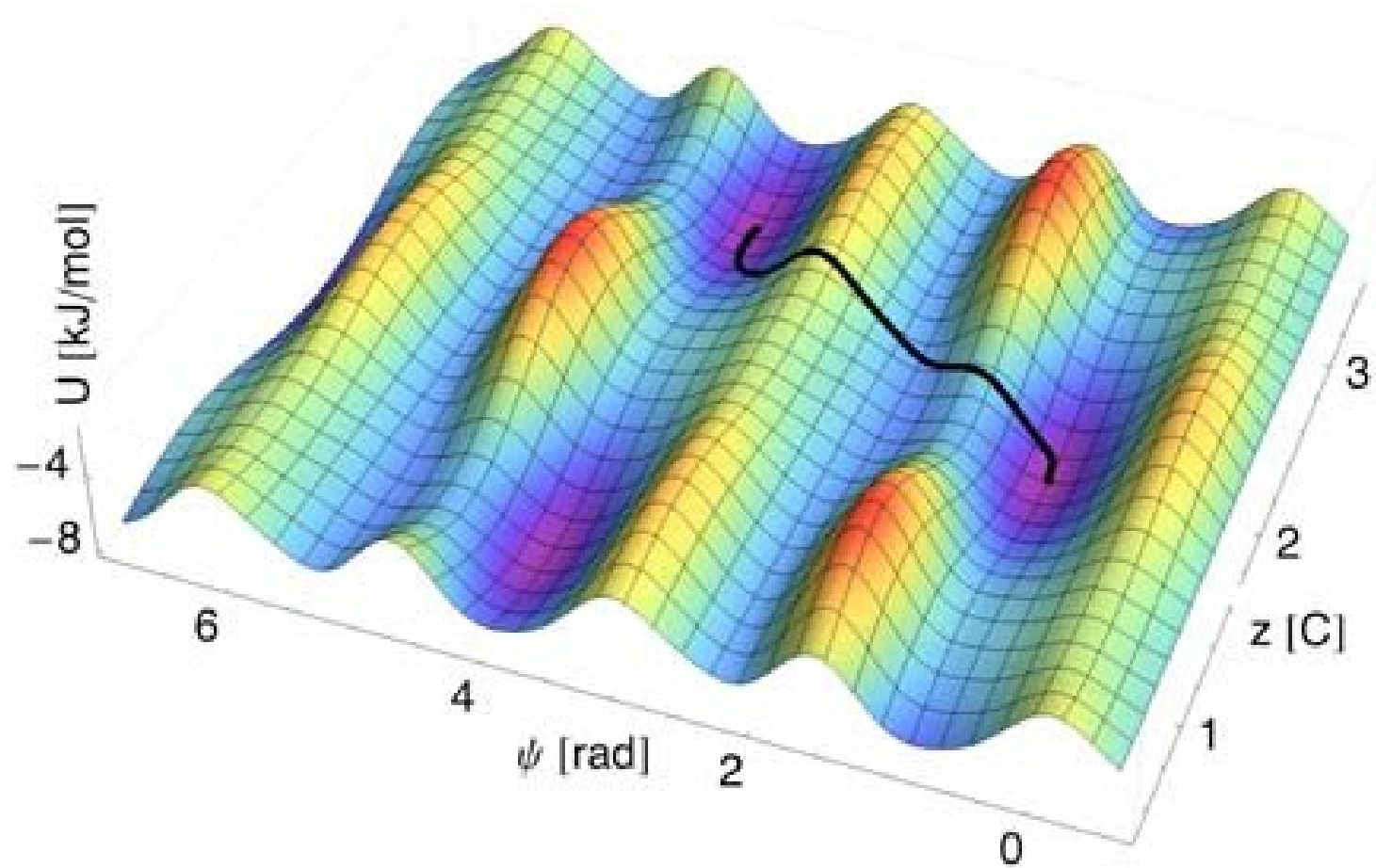


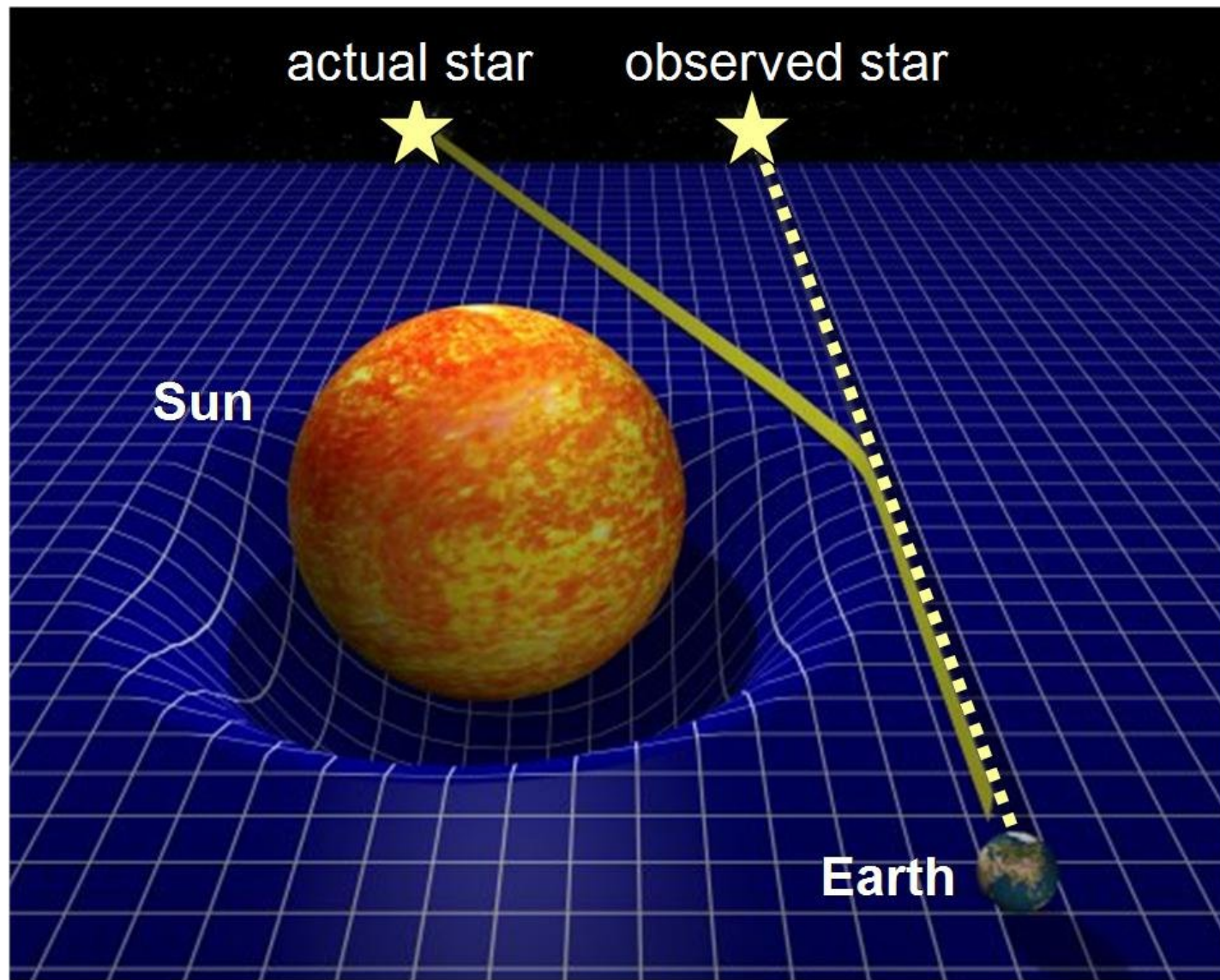


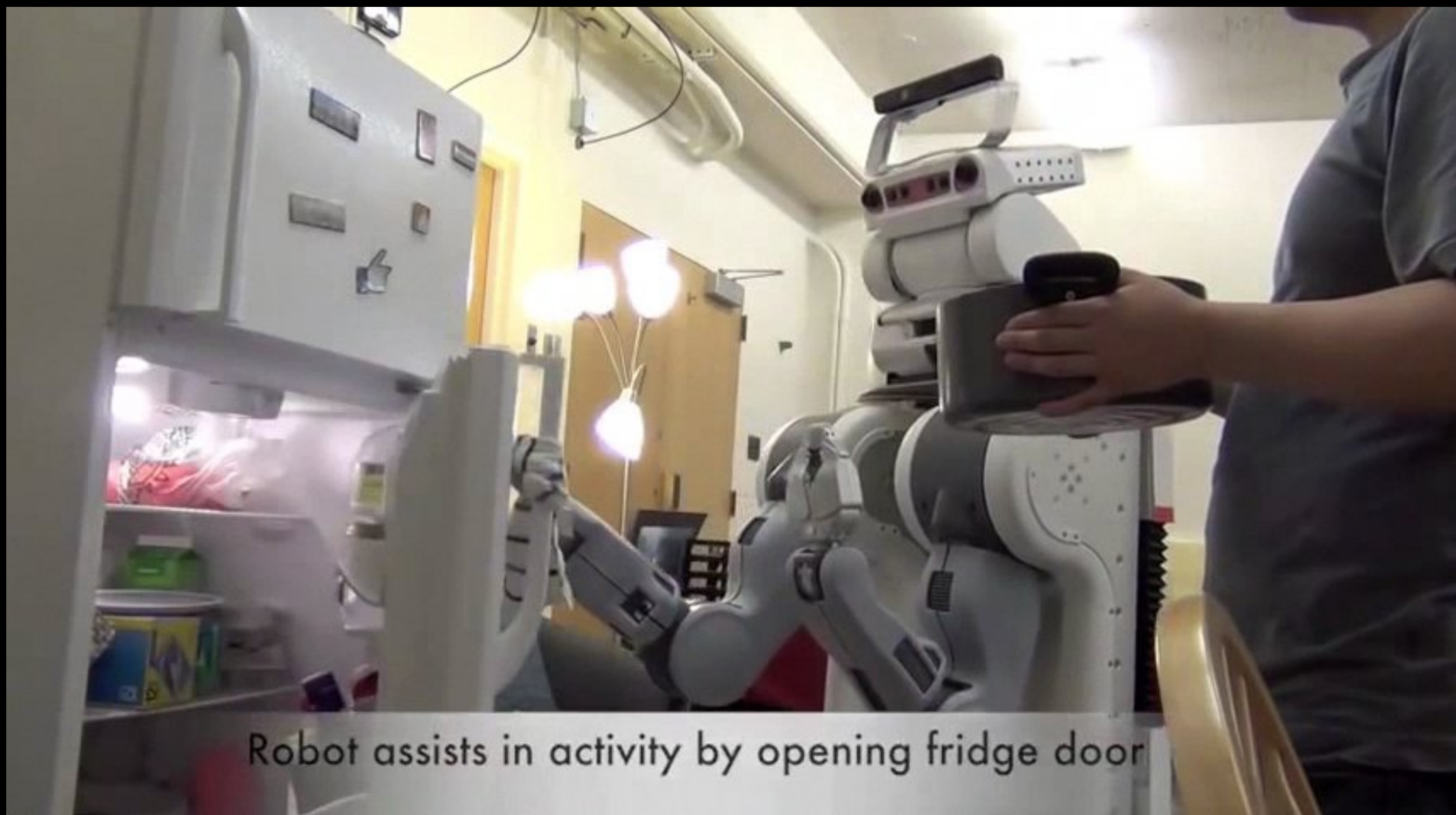




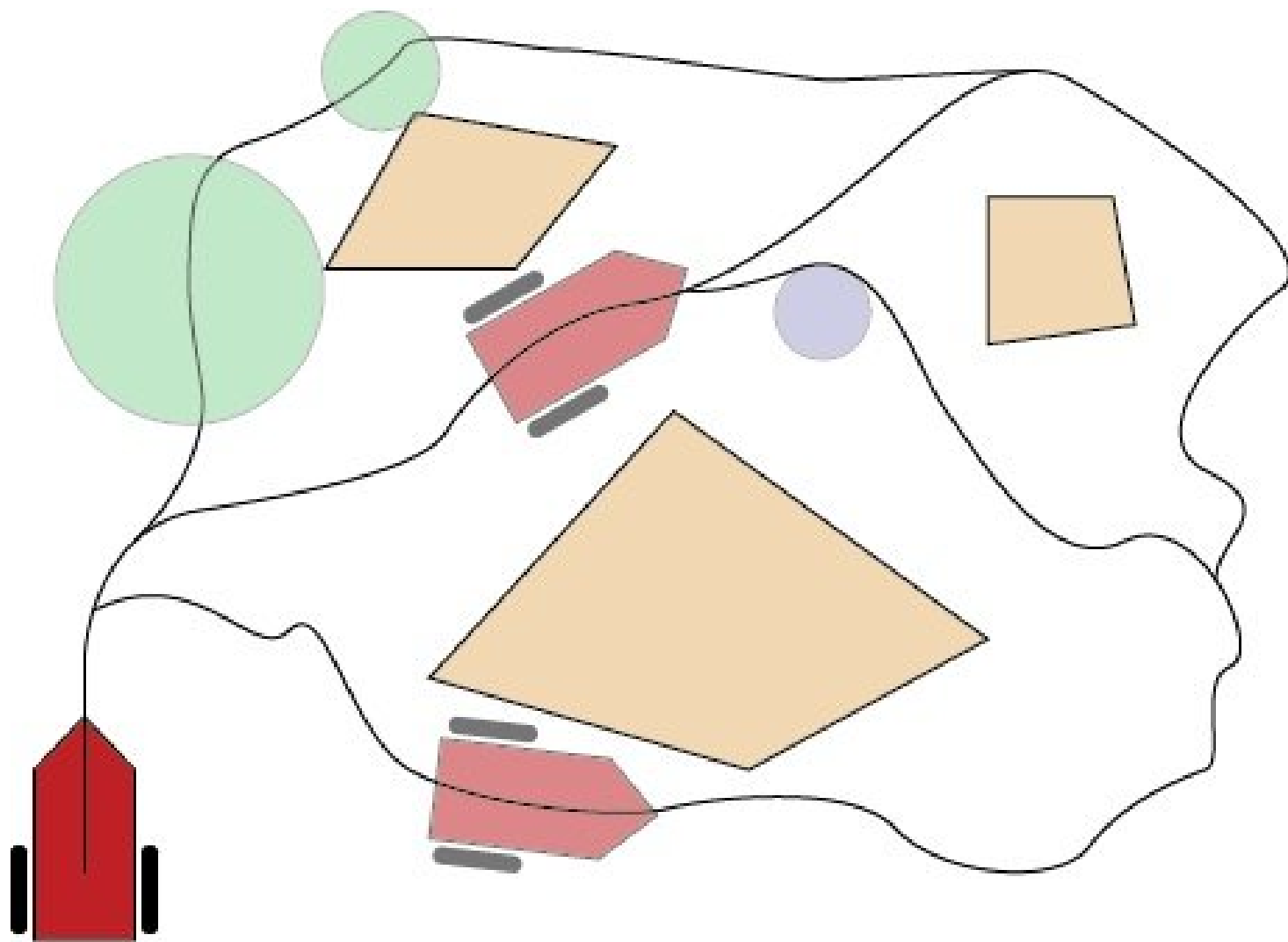








Robot assists in activity by opening fridge door



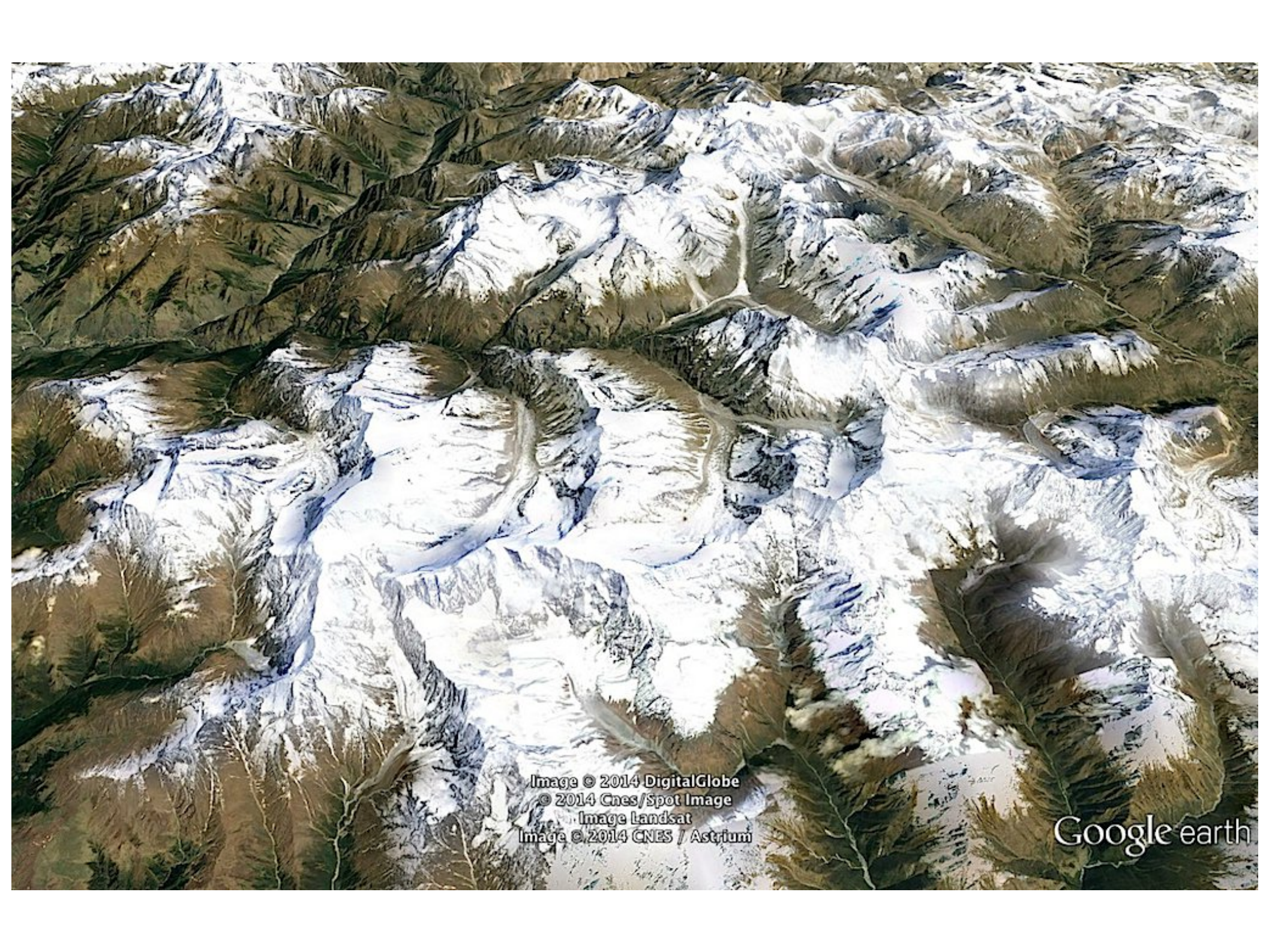
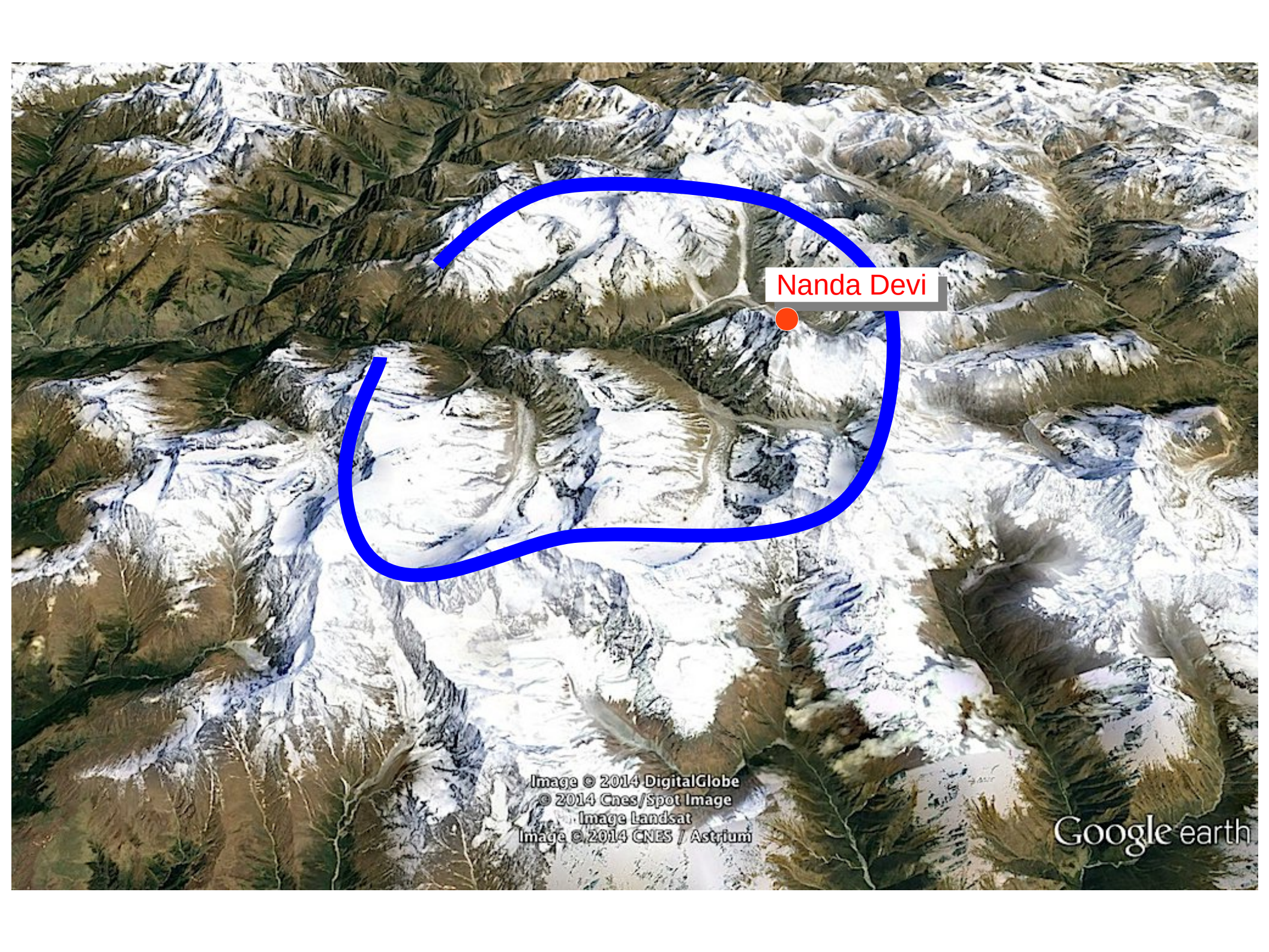


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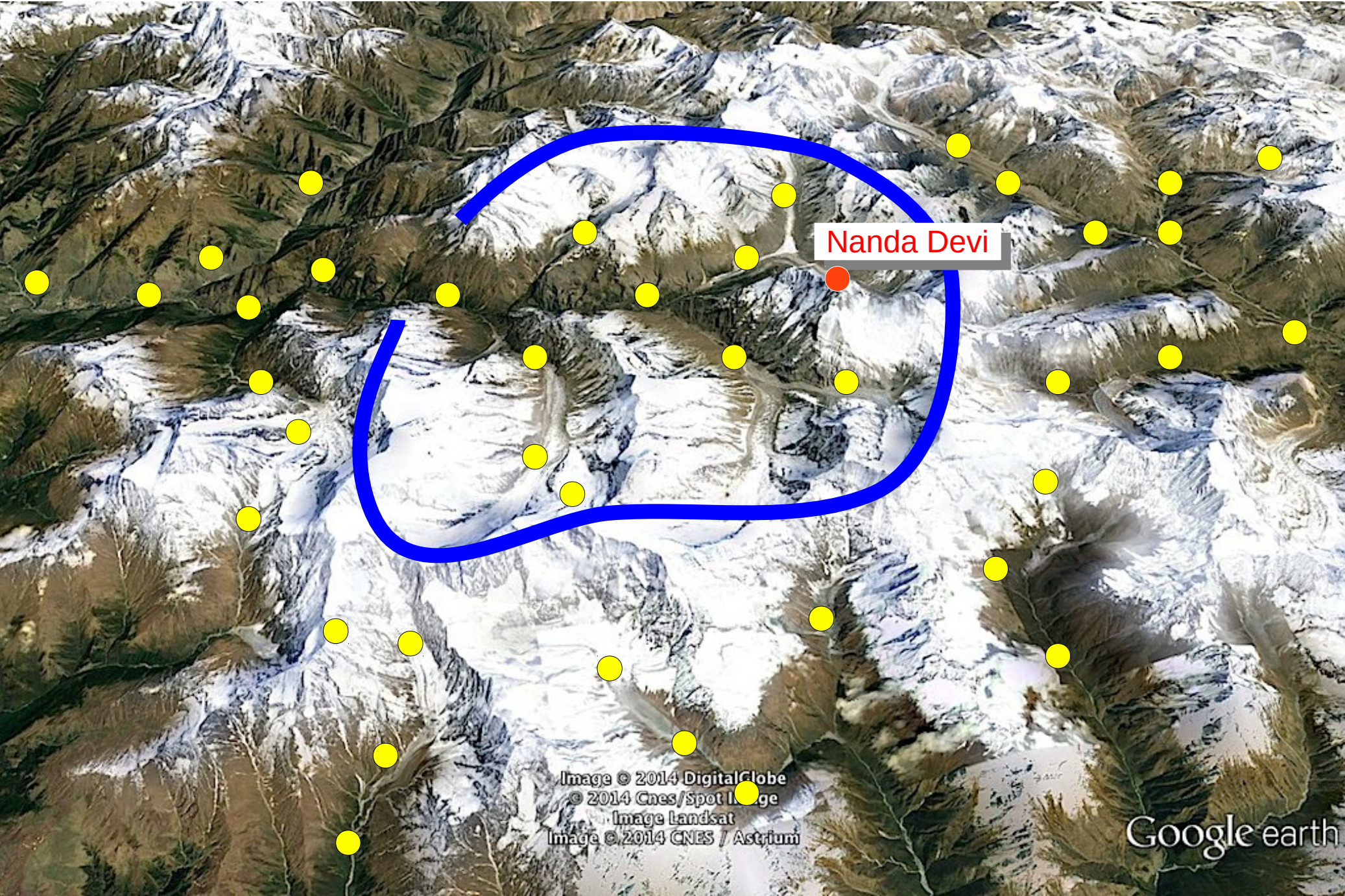
Google earth



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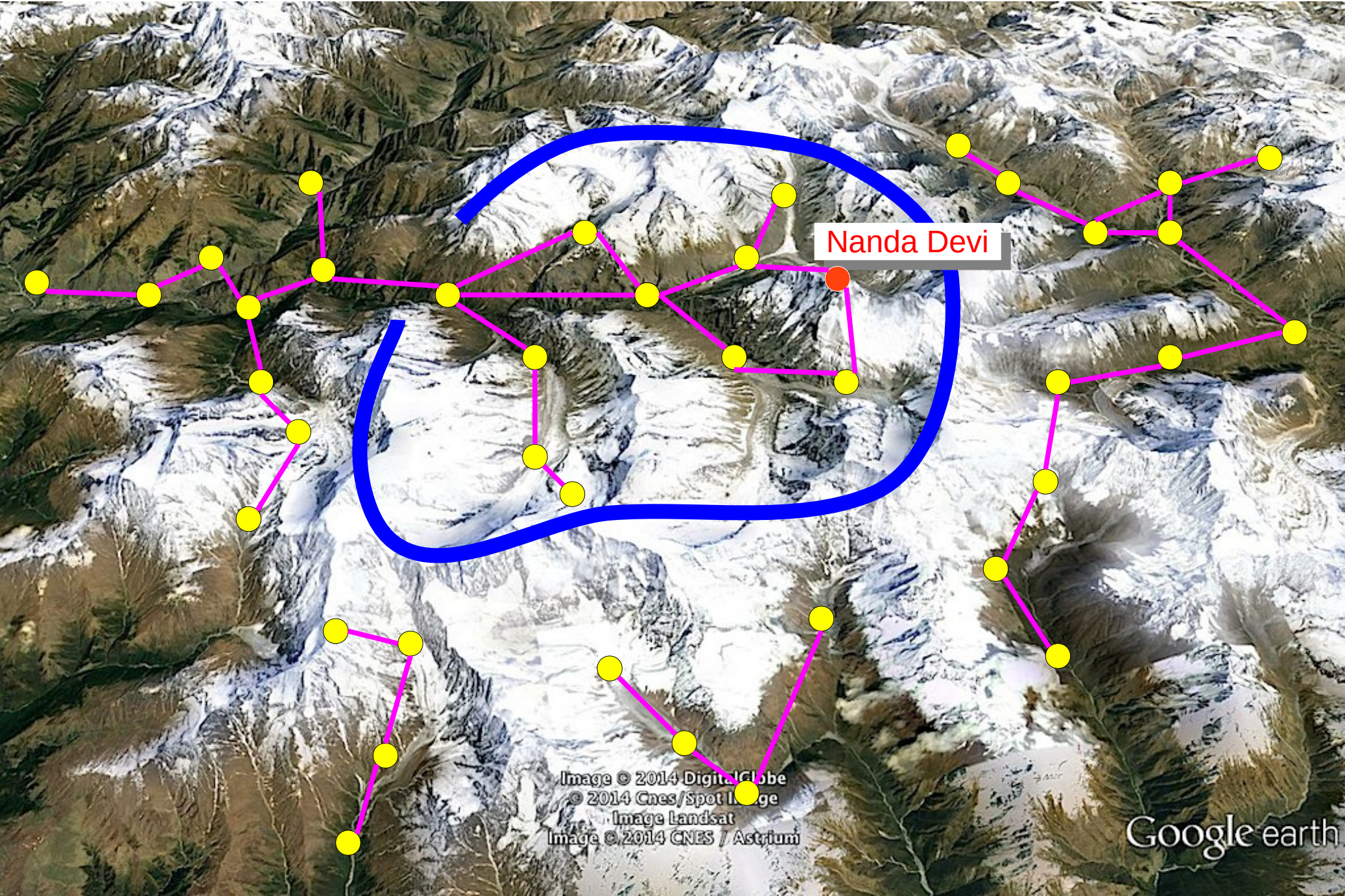
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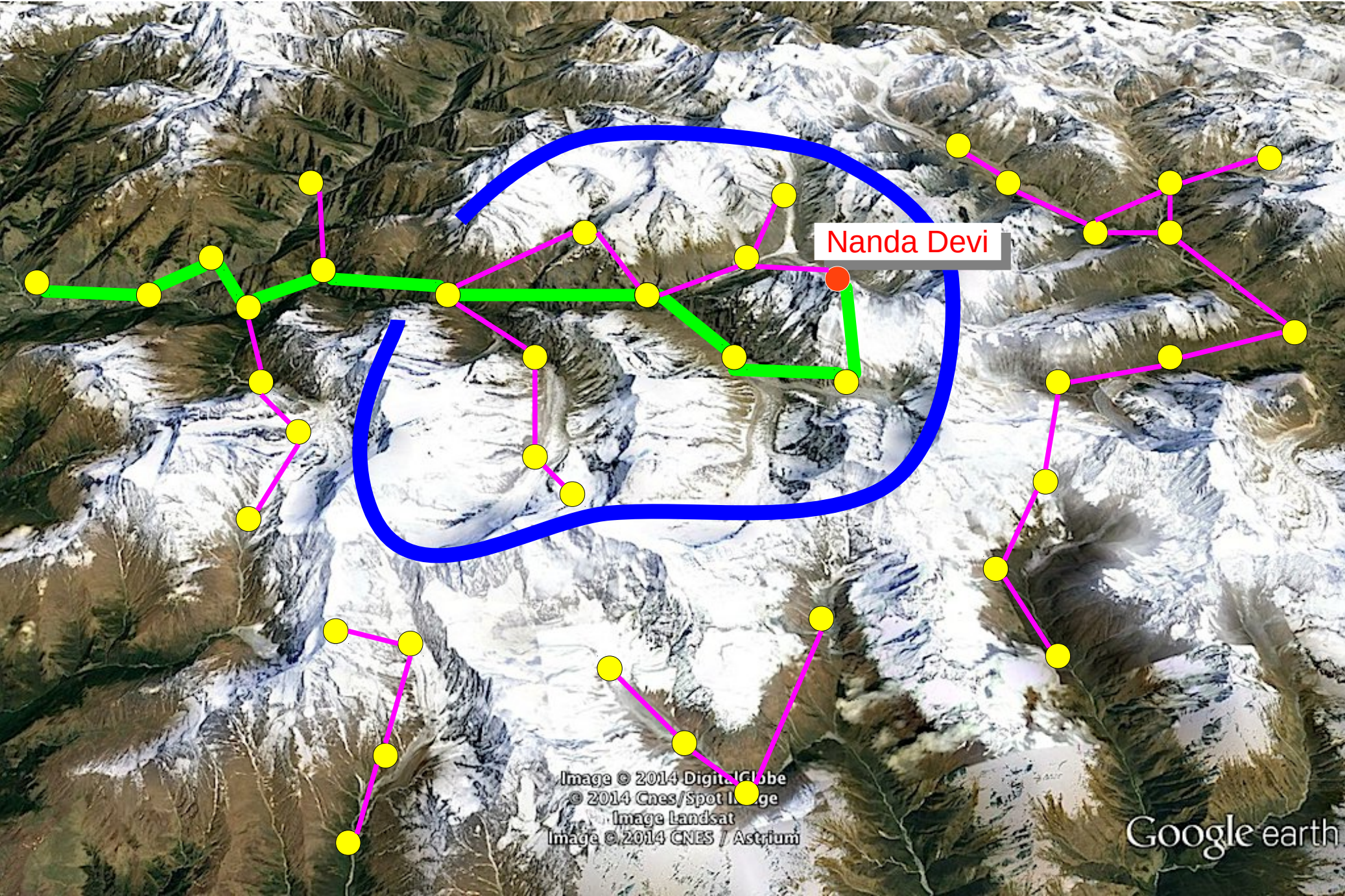
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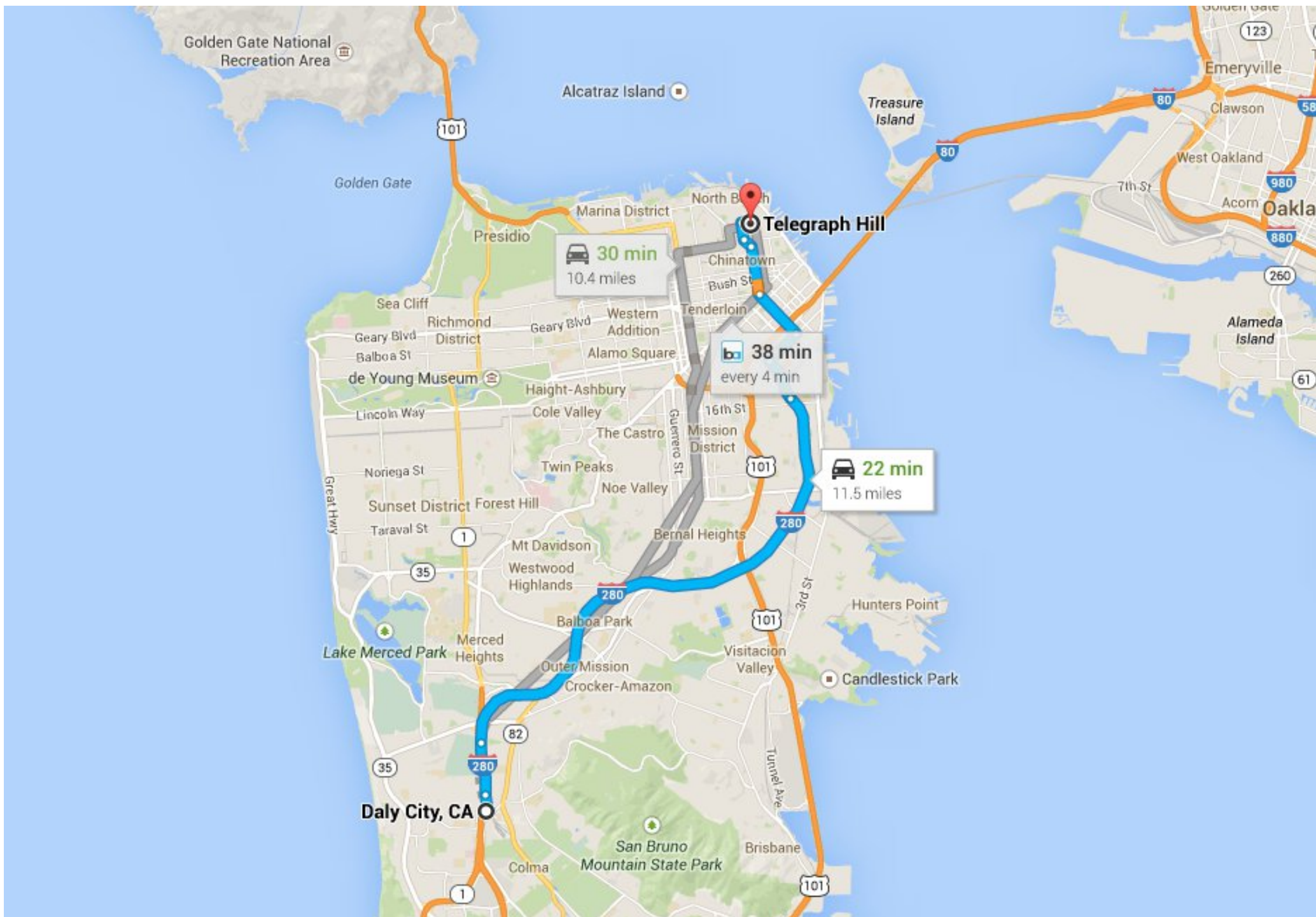
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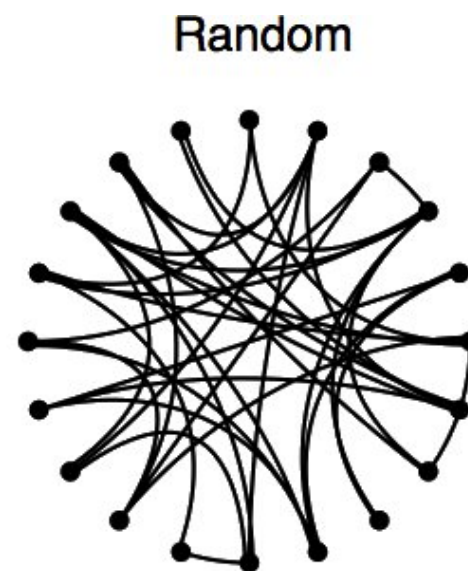
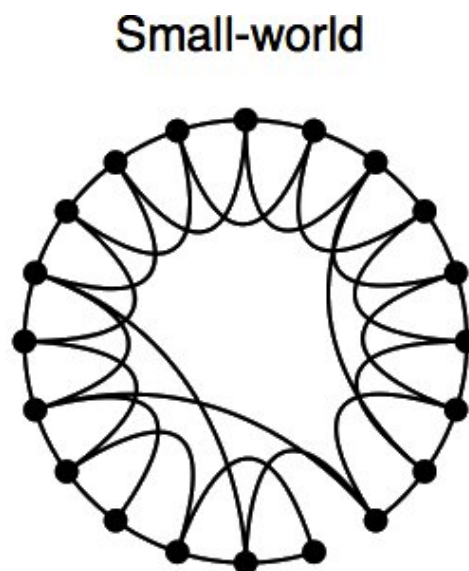
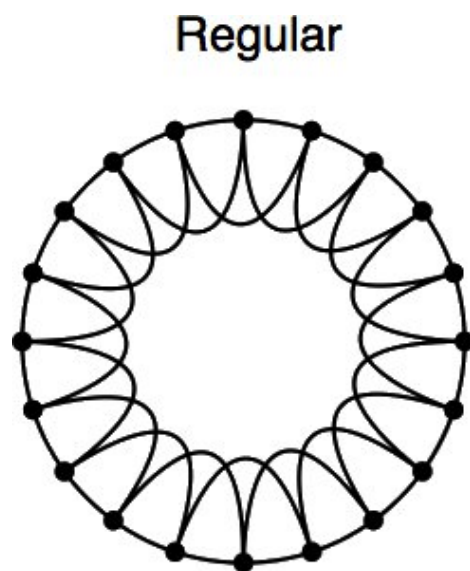


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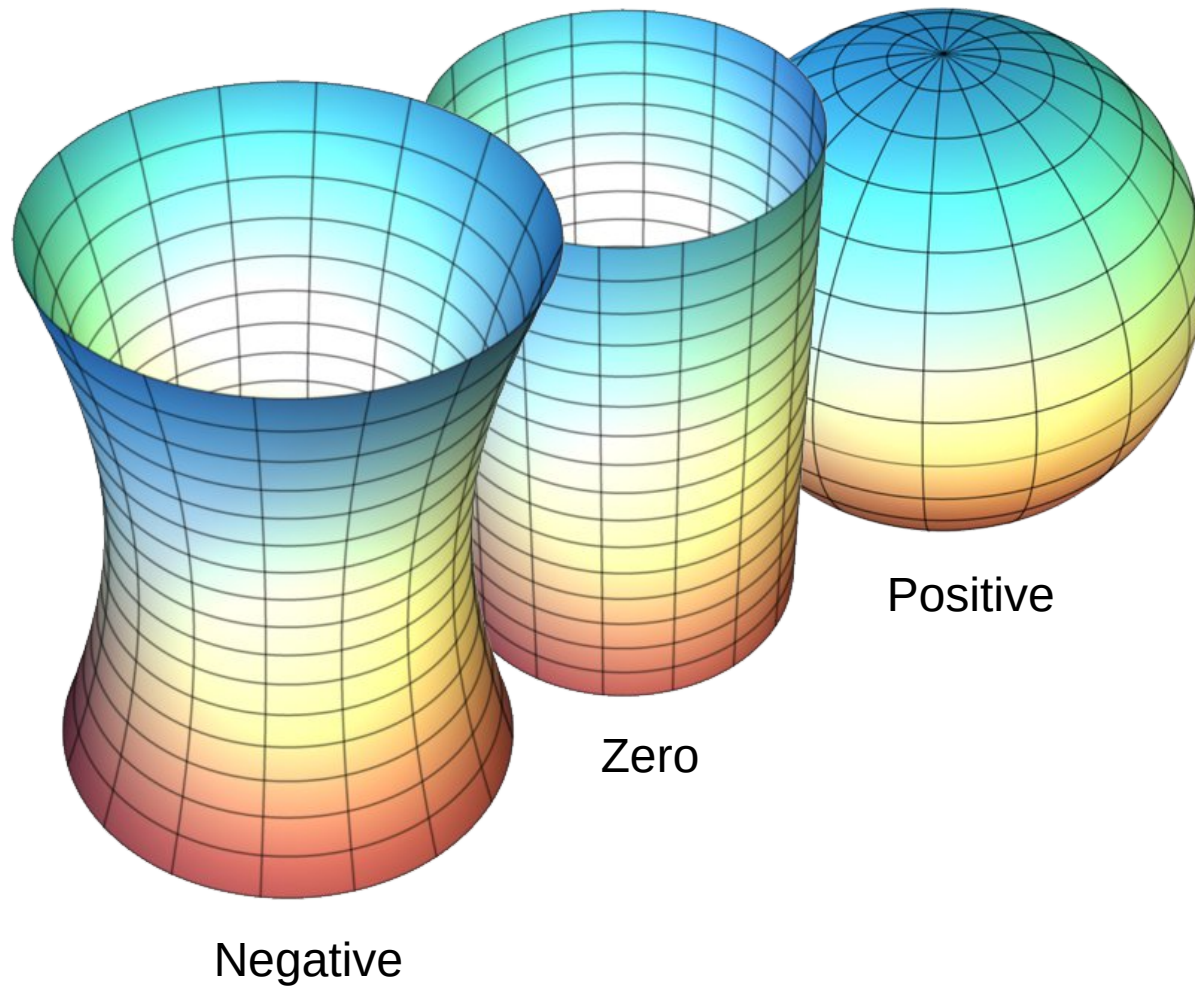
$p = 0$  $p = 1$

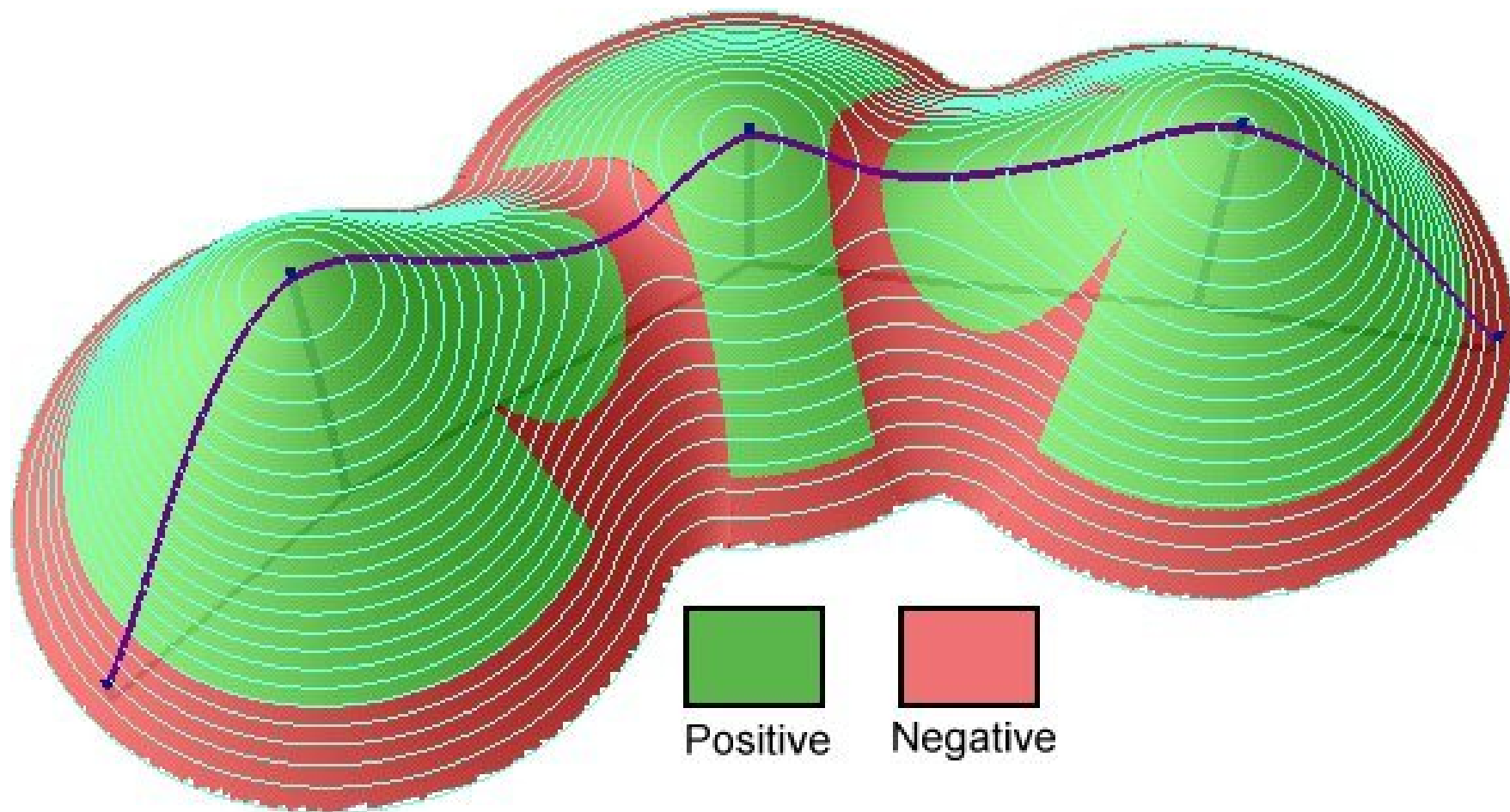
Increasing randomness

Average path lengths

- 225k Film actors: 3.65
- 5k nodes on US power grid: 18.7
- 282 neurons of *C. elegans*: 2.65
- 721m Facebook users: 4.74

If geometry tells us about distances, what
do distances tell us about geometry?





Can a 2D ant on a 2D surface tell if it lives in a space of positive, negative or zero curvature?

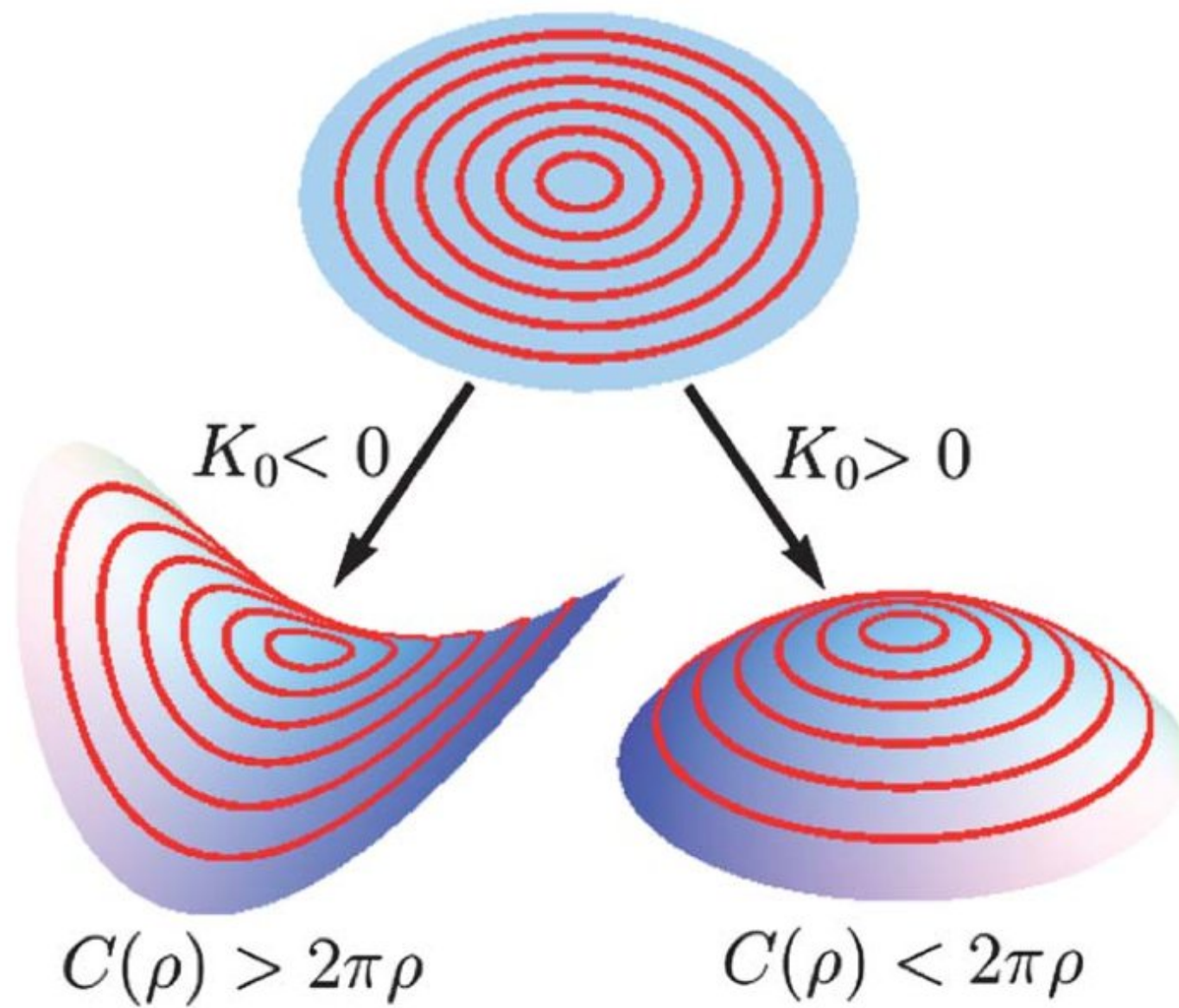
Can a 2D ant on a 2D surface tell if it lives in a space of positive, negative or zero curvature?

Can a person, in 3D?

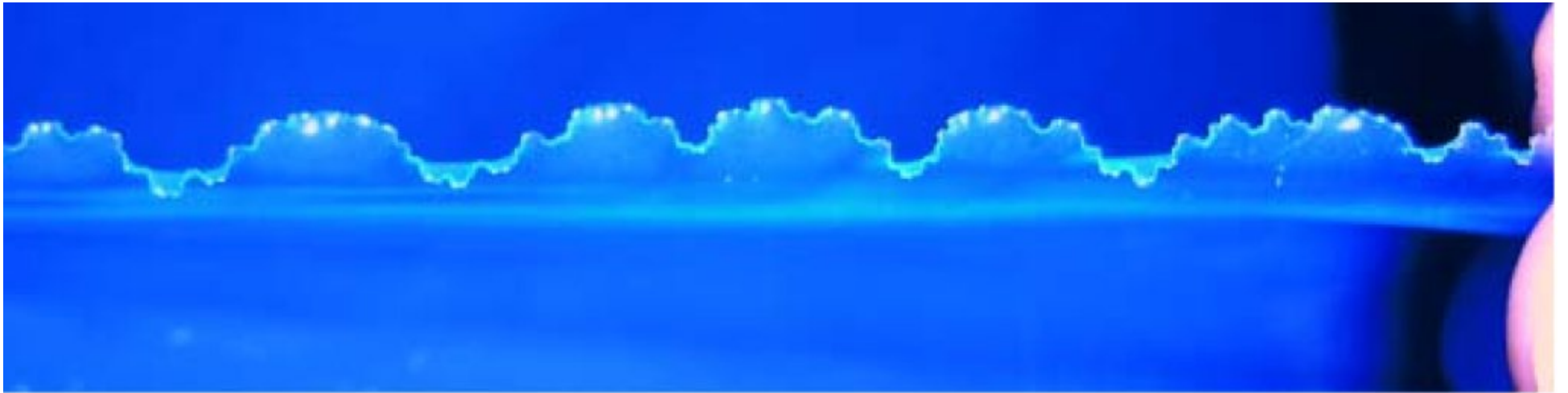
Can a 2D ant on a 2D surface tell if it lives in a space of positive, negative or zero curvature?

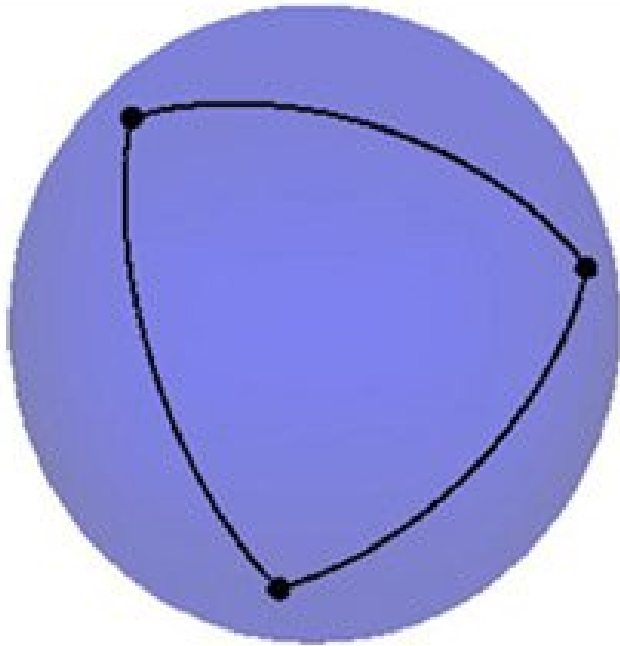
Can a person, in 3D?

Yes, by measuring distances!

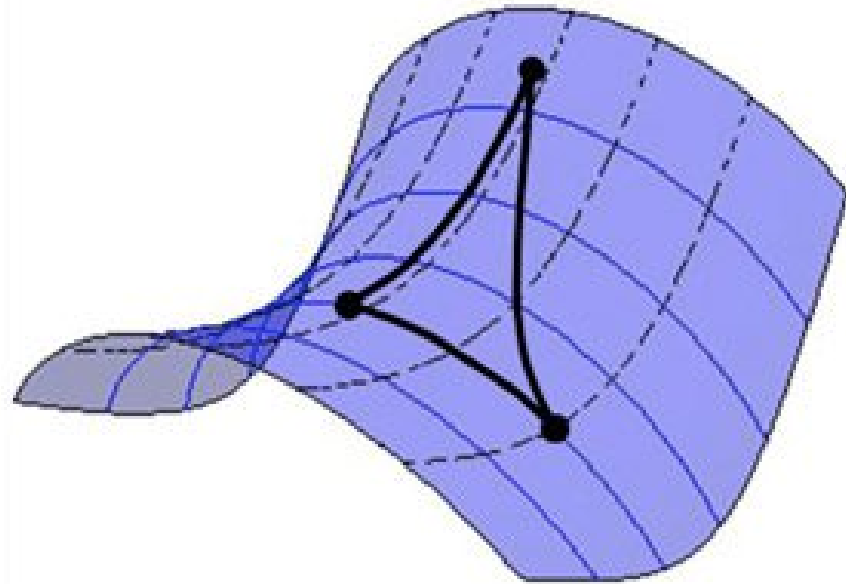




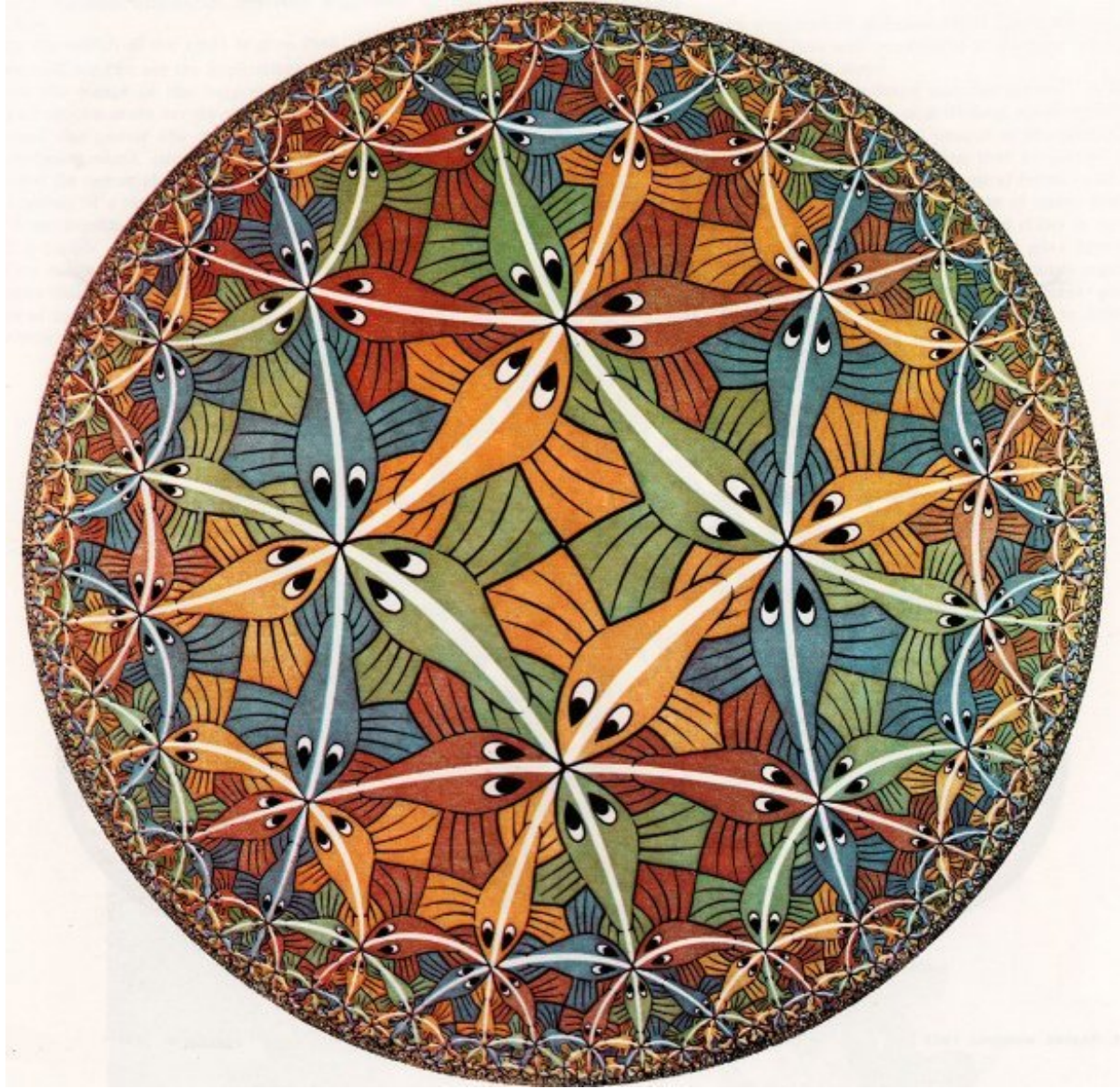




Sum of angles $> 180^\circ$



Sum of angles $< 180^\circ$



M. C. Escher, *Circle Limit III*

How long is the coastline?



2400km



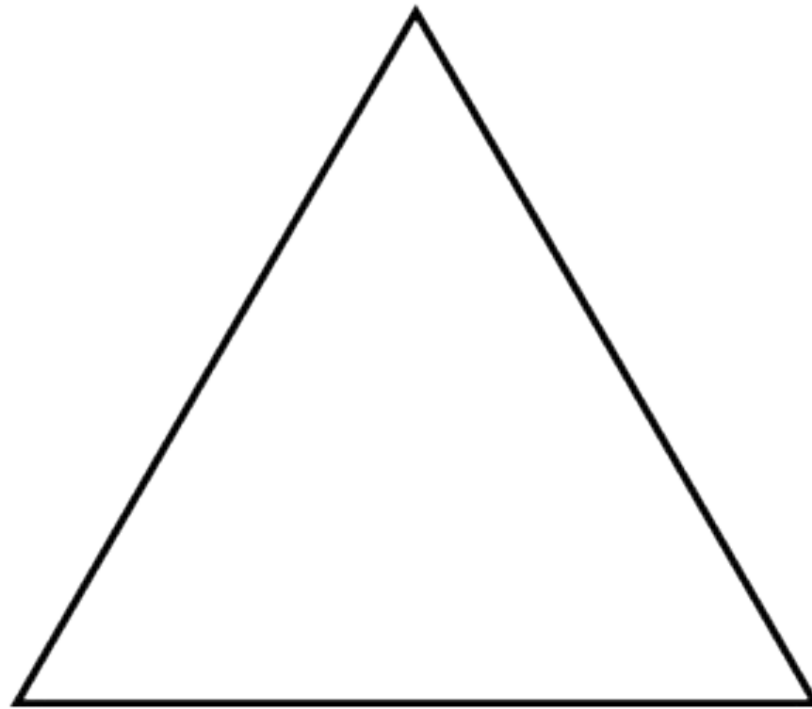
2800km



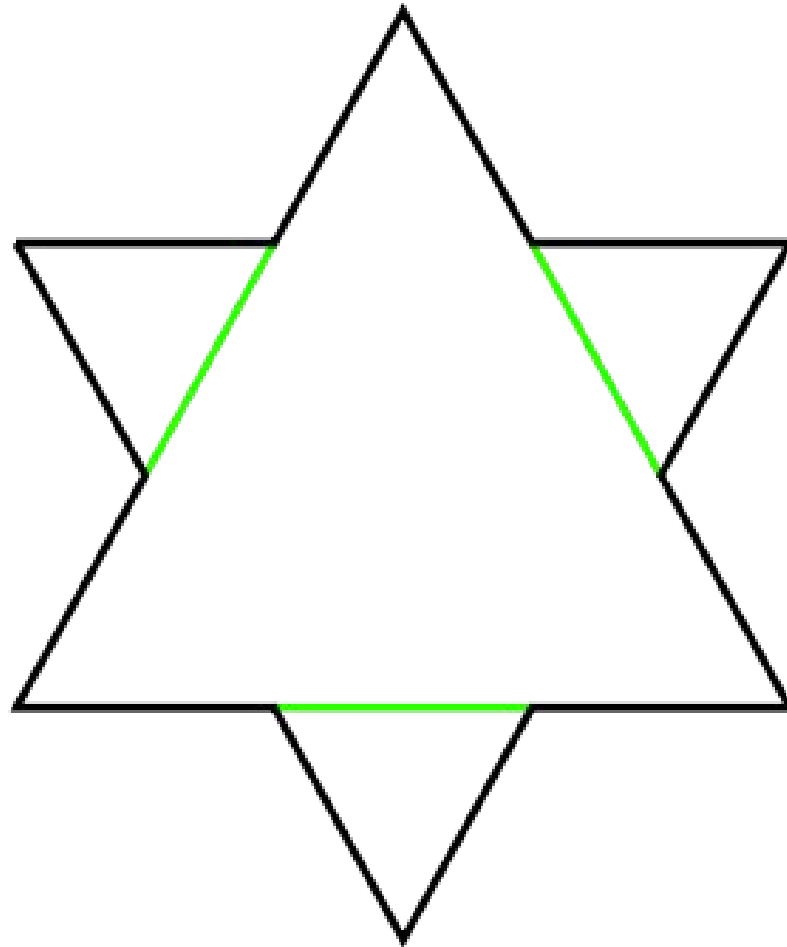
3450km



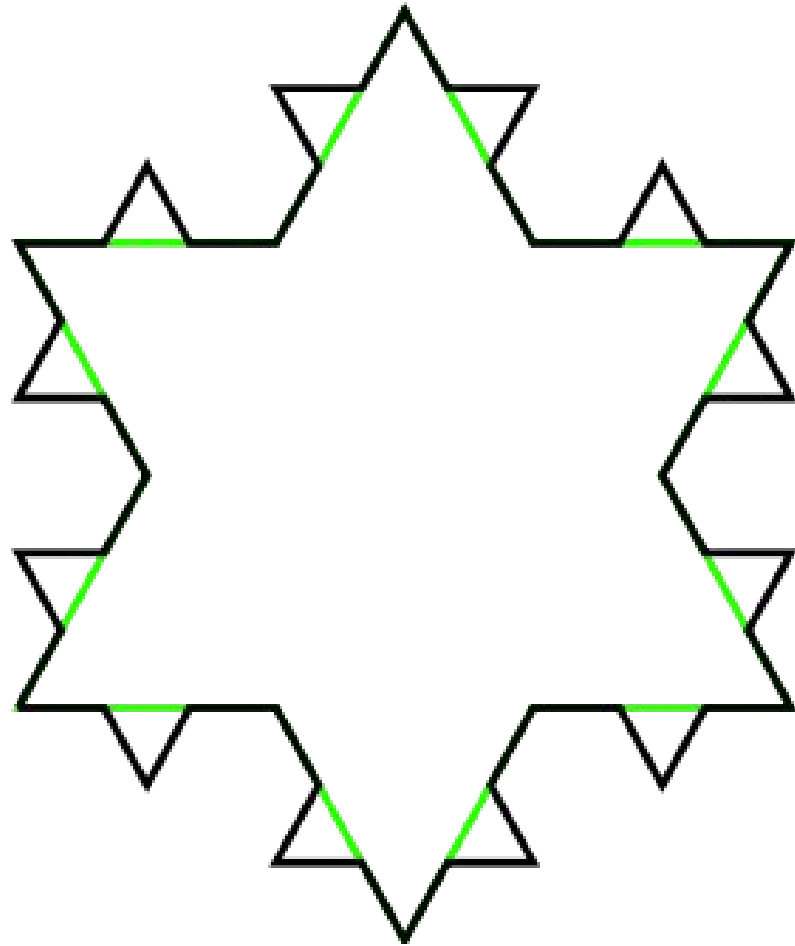
The Koch snowflake



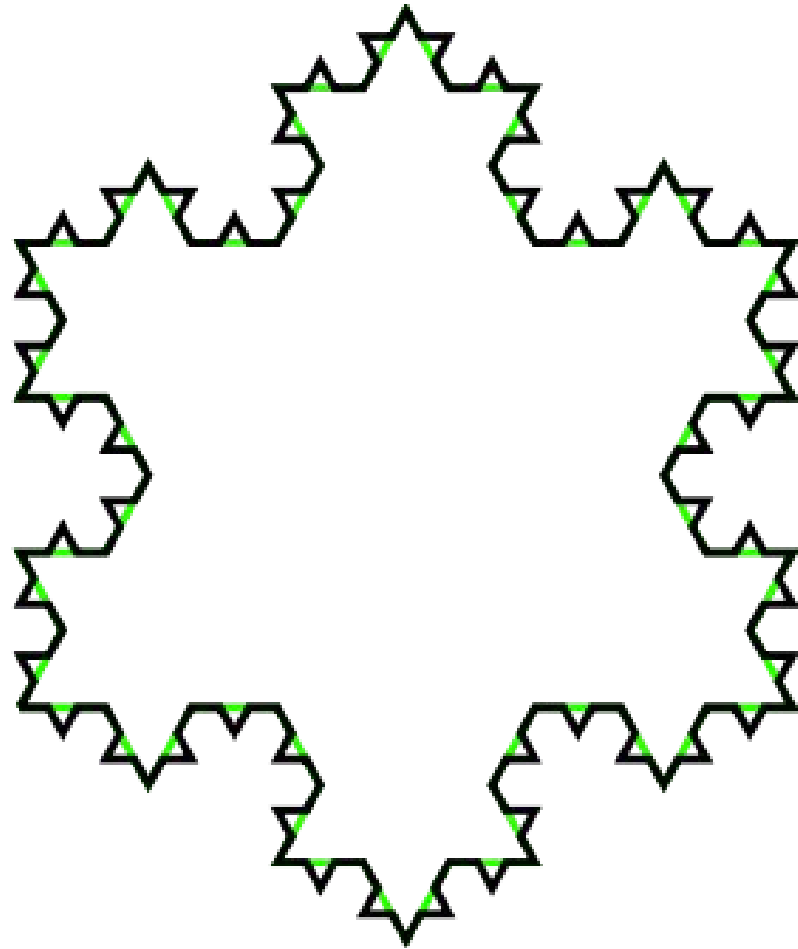
The Koch snowflake



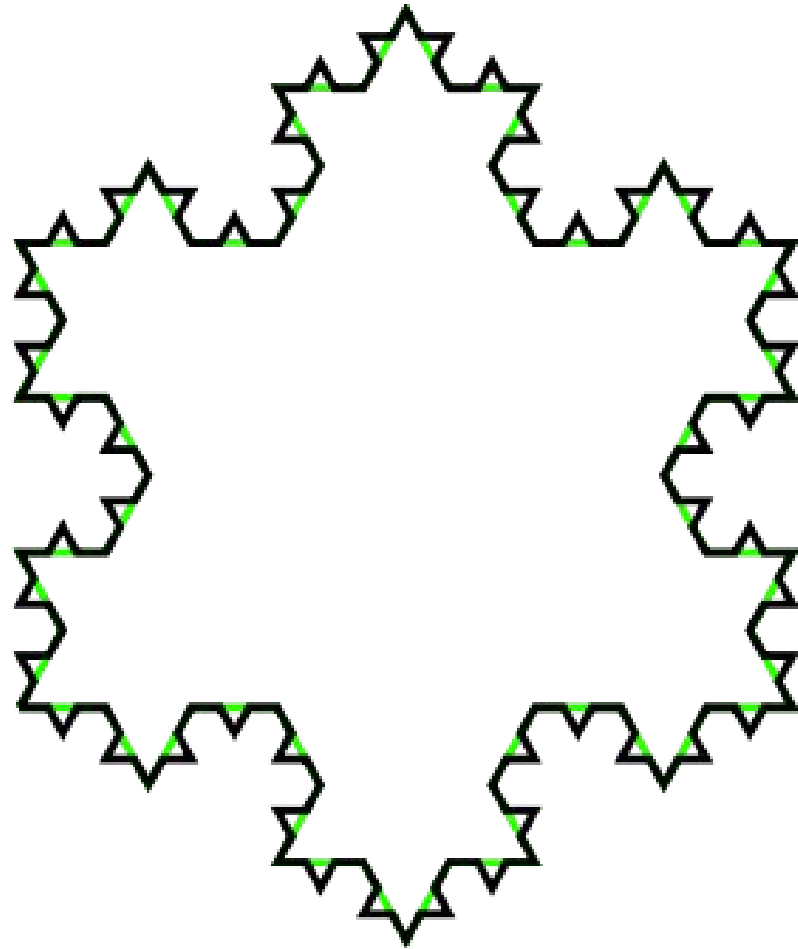
The Koch snowflake



The Koch snowflake



The Koch snowflake



In the limit: bounded area, unbounded perimeter