What does a single light-ray reveal about a transparent object?

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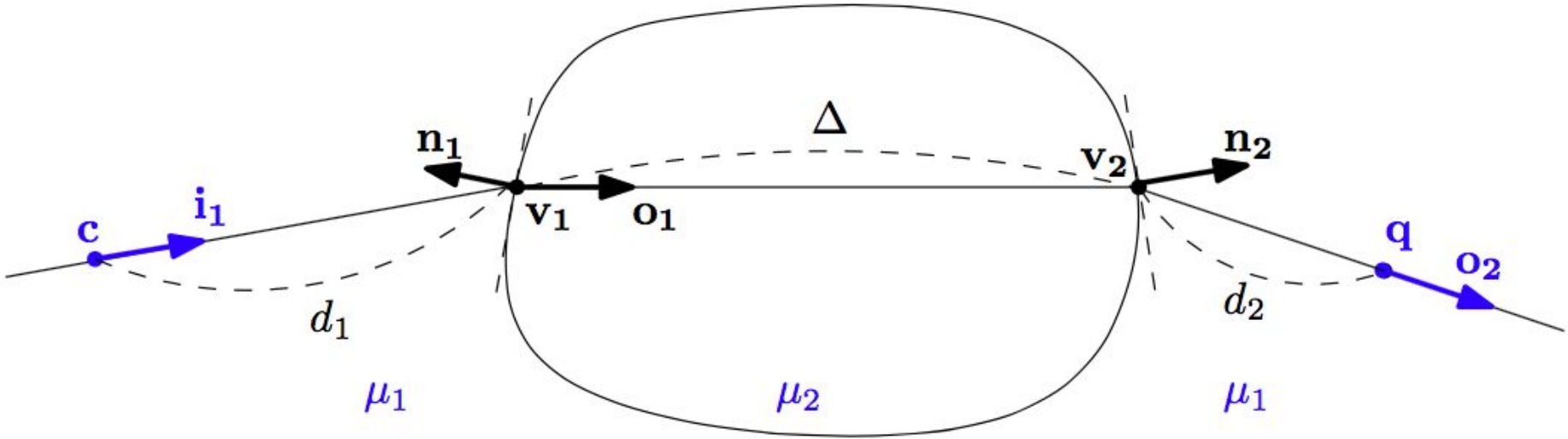
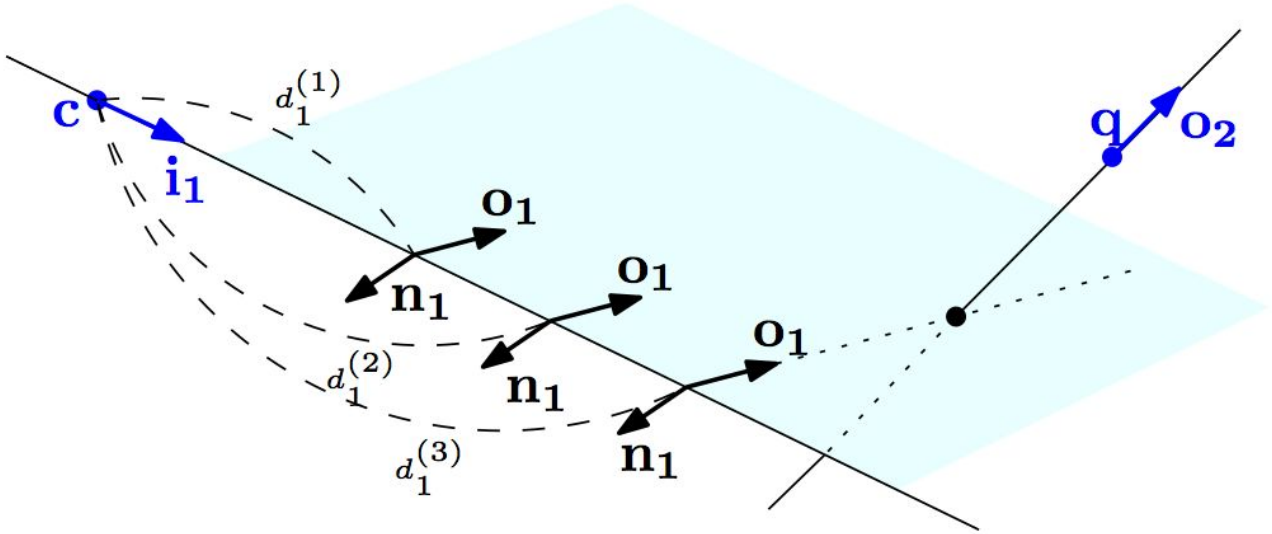
Photo from http://www.telegraph.co.uk/culture/culturepicturegalleries/9025139/Out-of-this-world-planets-captured-within-water-drops-by-Markus-Reugels.html?image=5



Light ray correspondences

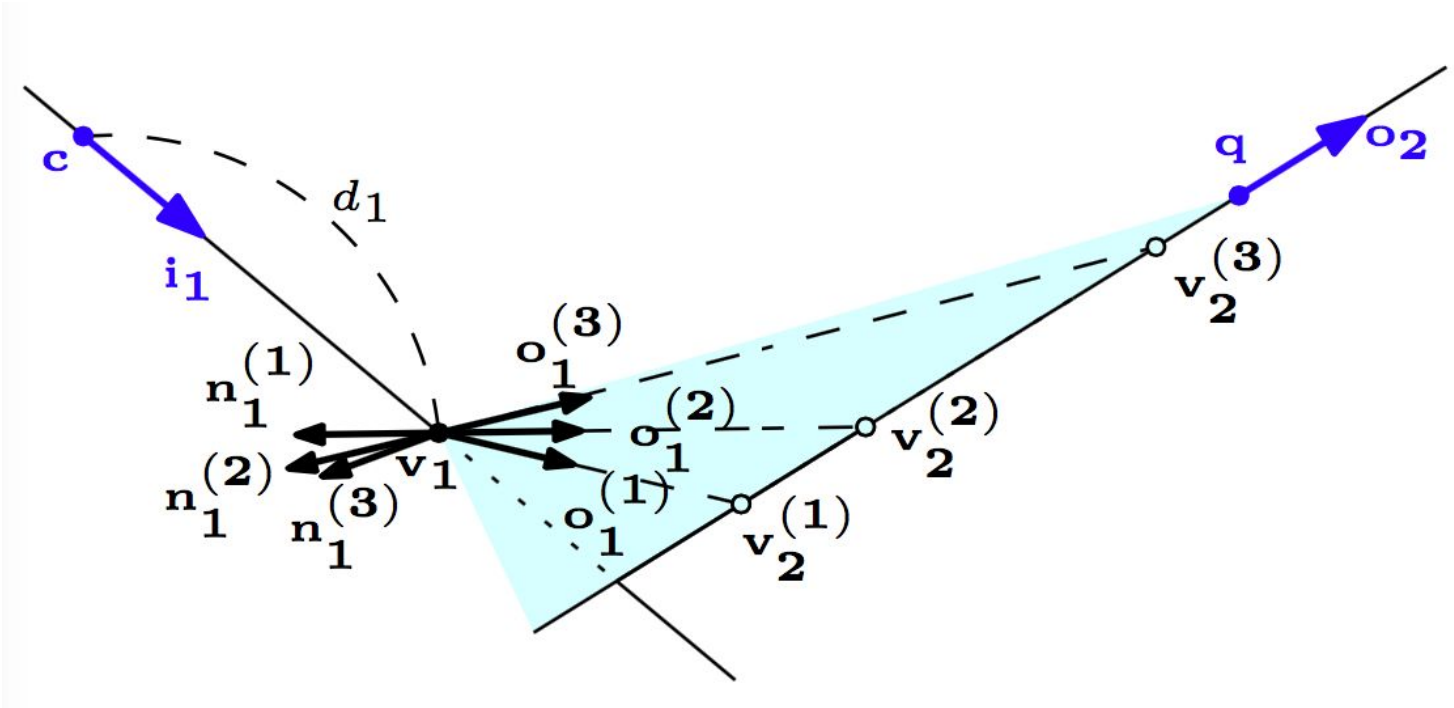
Theorem 1: unique depth given normal

Given the surface normal at the first refraction, the depth is **unique**

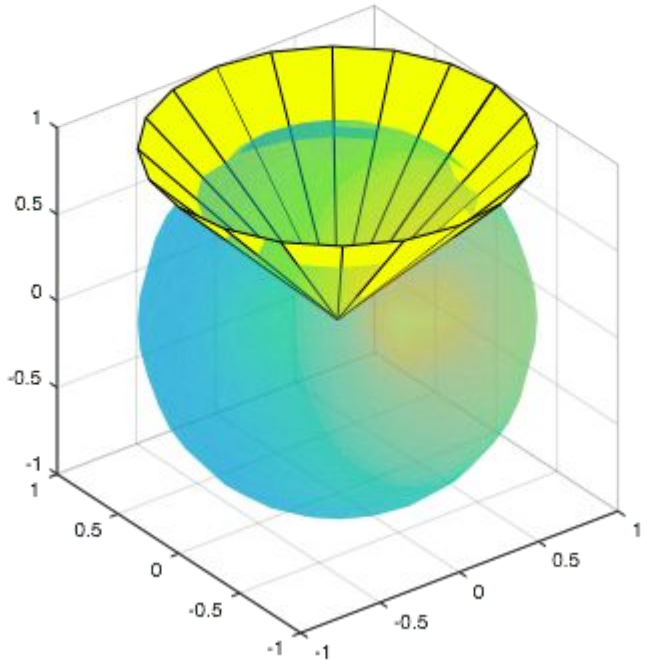


Theorem 2: ambiguous normal given depth

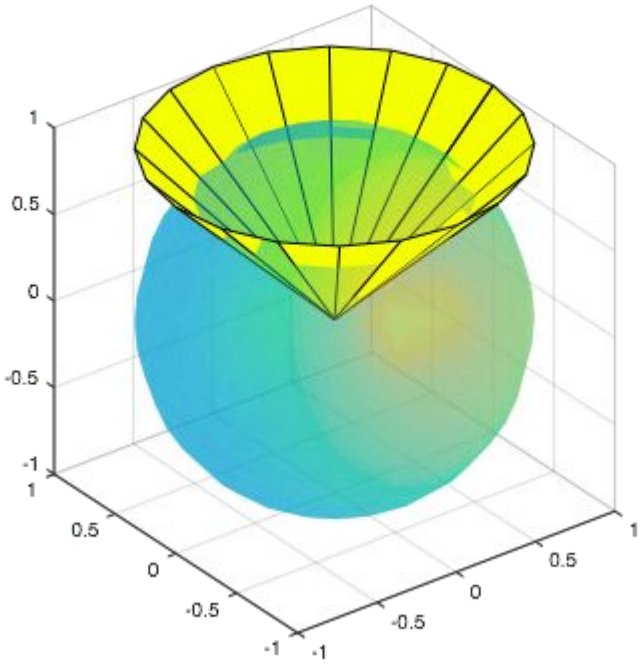
Given the surface depth at the first refraction, the surface normal is lie on a 1D curve

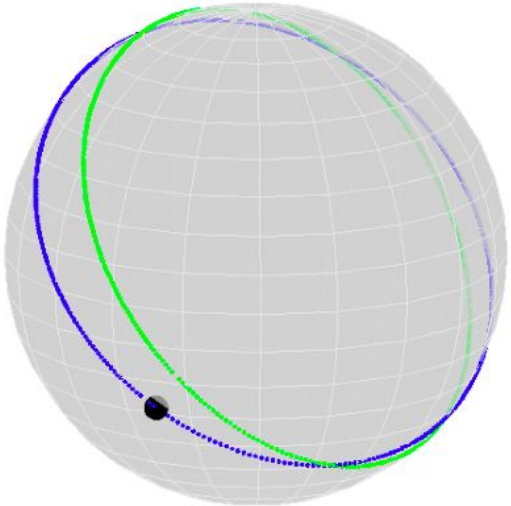


Theorem 2

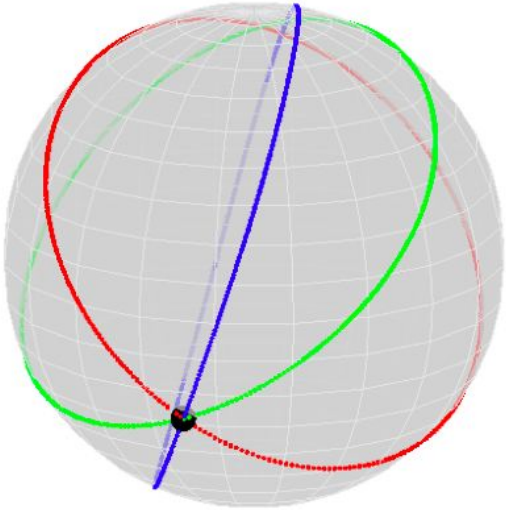


Theorem 2





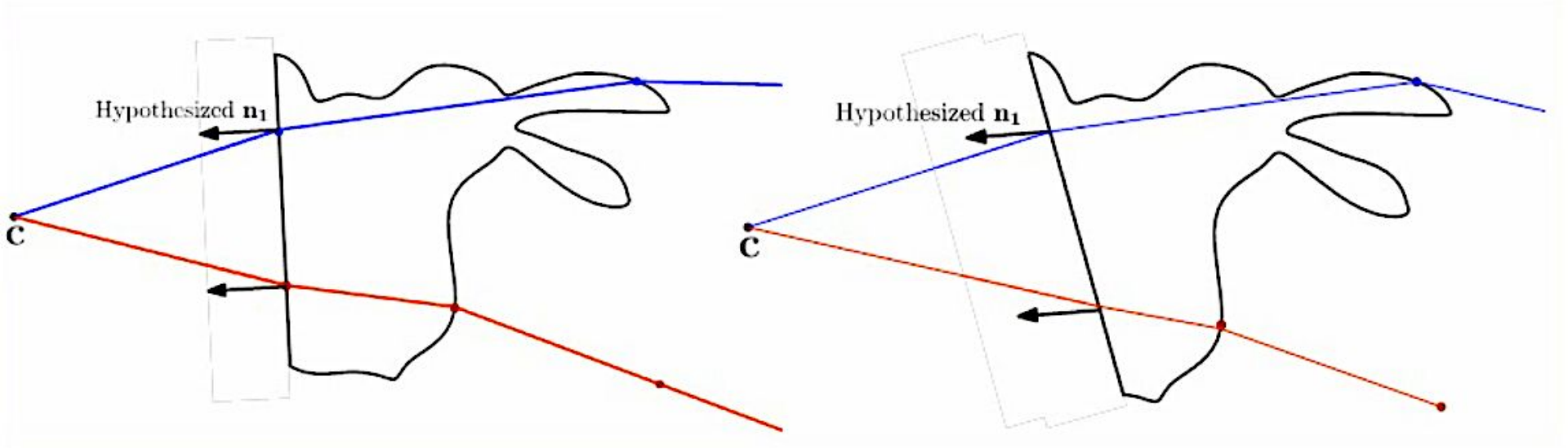
(a)



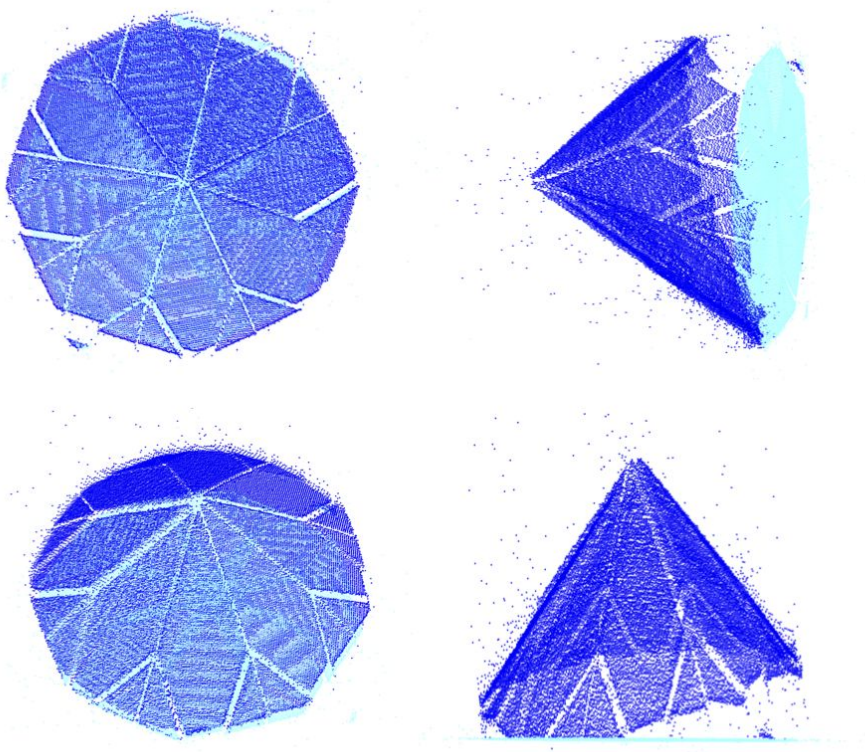
(b)

Experiment result

Planar surface prior: First refraction on happens on a plane.



Experiment result



Summary

Overall Score: 2

- Pros:
  - Solid theory
  - Well constructed and easy to understand

- Cons:
  - Lack of experiment
  - Limited application

Questions?