Focus+Context Intuition
- move part of surface closer to eye
- stretchable rubber sheet
- borders tacked down
- merge overview and detail into combined view

Graph Layout Criteria
- minimize crossings, area, bends/curves
- maximize angular resolution, symmetry

Polyfocal: Continuous Magnification
- transformation magnification
  - 1D 2D rect polar norm polar

Bifocal Display
- transformation magnification
  - 1D 2D

Multiple Foci
- same params diff params
- polyfocal magnification function dips allow this

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- most criteria NP-hard
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Expressiveness
- magnification is more intuitive control
  - allow expressiveness, data-driven expansion
Noneuclidean Geometry

- Euclid's 5th Postulate
  - exactly 1 parallel line
- spherical
  - geodesic = great circle
  - no parallels
- hyperbolic
  - infinite parallels

Models, 2D

- Klein/projective
- Poincare/conformal
- Upper Half Space

1D Klein

- hyperbola projects to line

2D Klein

- hyperbola projects to disk

Klein vs Poincare

- Klein
  - straight lines stay straight
  - angles are distorted
- Poincare
  - angles are correct
  - straight lines curved

Upper Half Space

- cut and unroll Poincare
  - one point on circle goes to infinity

Minkowski

- 3-hyperbola projects to solid ball
  - Upper Half Space
  - Minkowski

Models, 3D
3D vs. 2D Hyperbolic Scalability

- Information density: 10x better

H3 PARC Tree

<table>
<thead>
<tr>
<th>3D</th>
<th>2D</th>
</tr>
</thead>
<tbody>
<tr>
<td>dozens</td>
<td>dozens</td>
</tr>
<tr>
<td>thousands</td>
<td>hundreds</td>
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</tbody>
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Scalability

- Success: large local neighborhood visible, 5-9 hops
- Limit: if graph diameter >> visible area
- TreeJuxtaposer: global vs. local F+C