Considering the Characterization of Complex Properties of Objects

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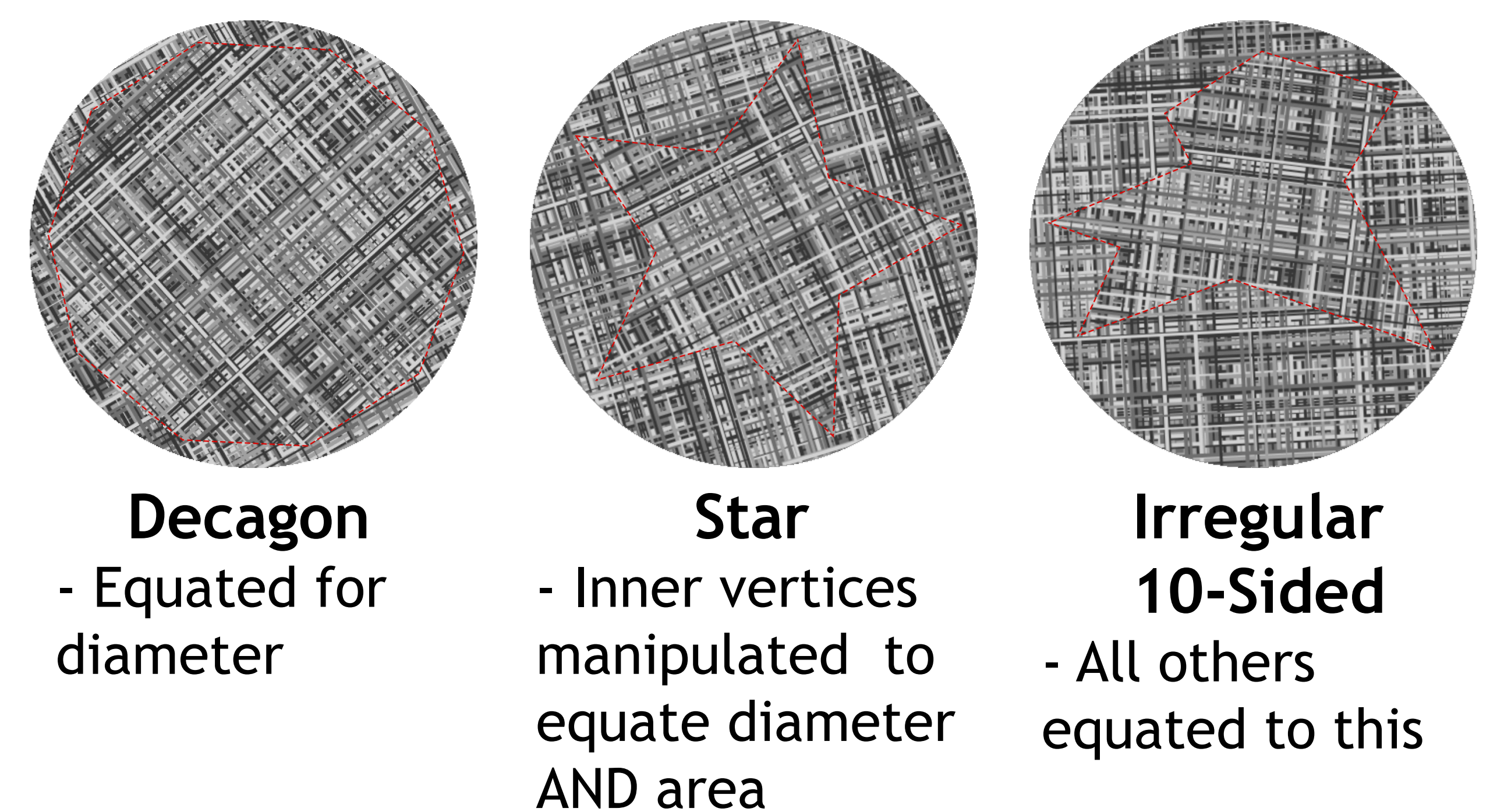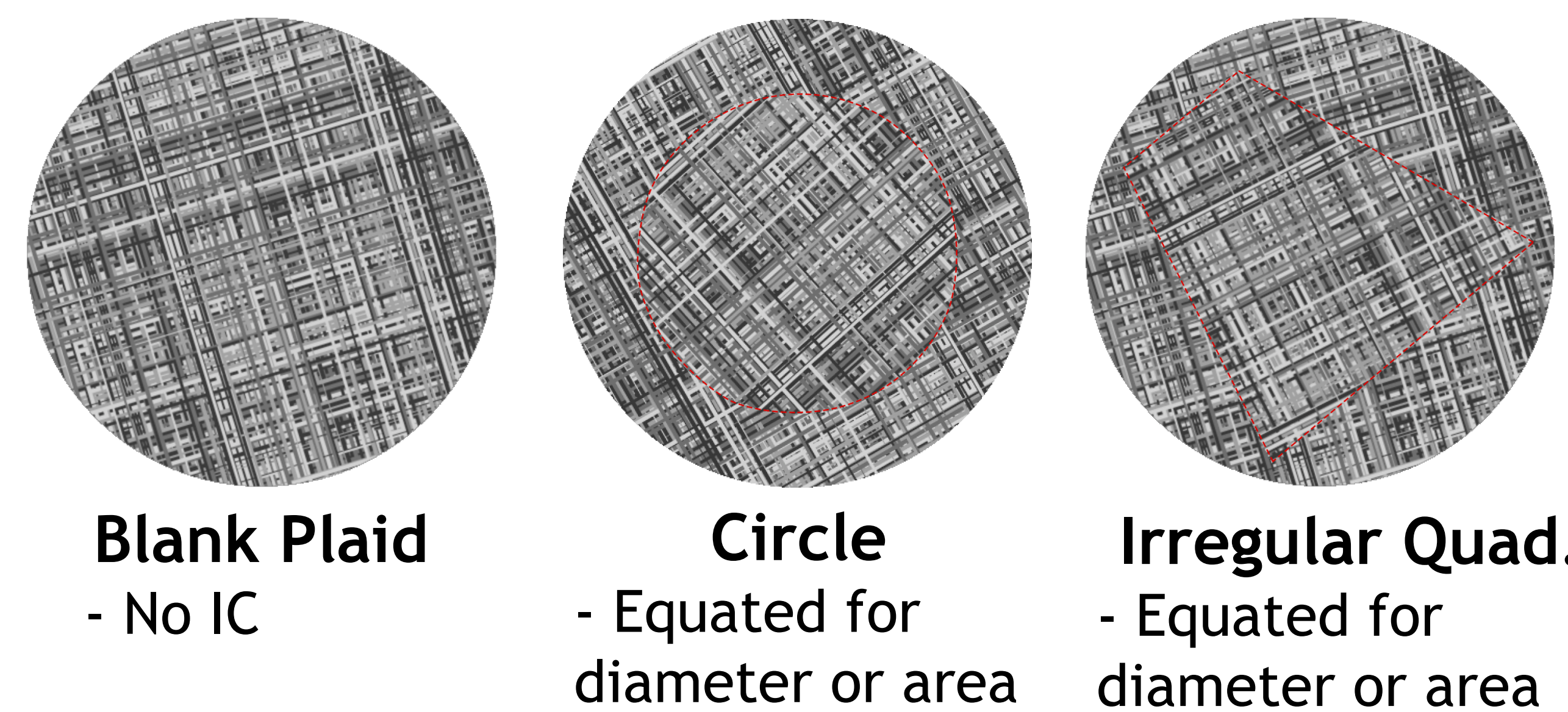
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RESEARCH QUESTIONS

- What is object complexity? Is it a function of size, area, number of edges/corners, asymmetry/irregularity, or projections?

- Is object complexity processed abstractly, separate from low-level object properties?

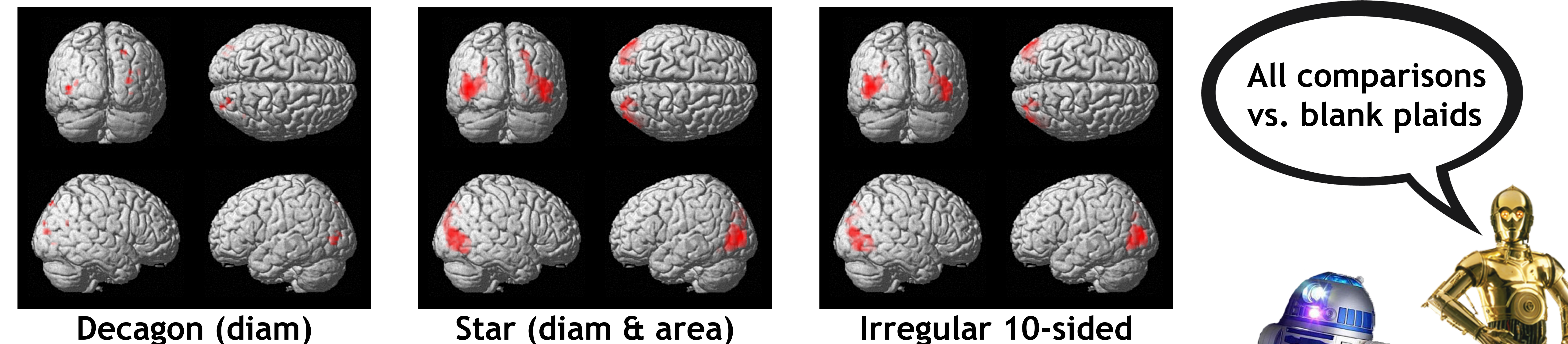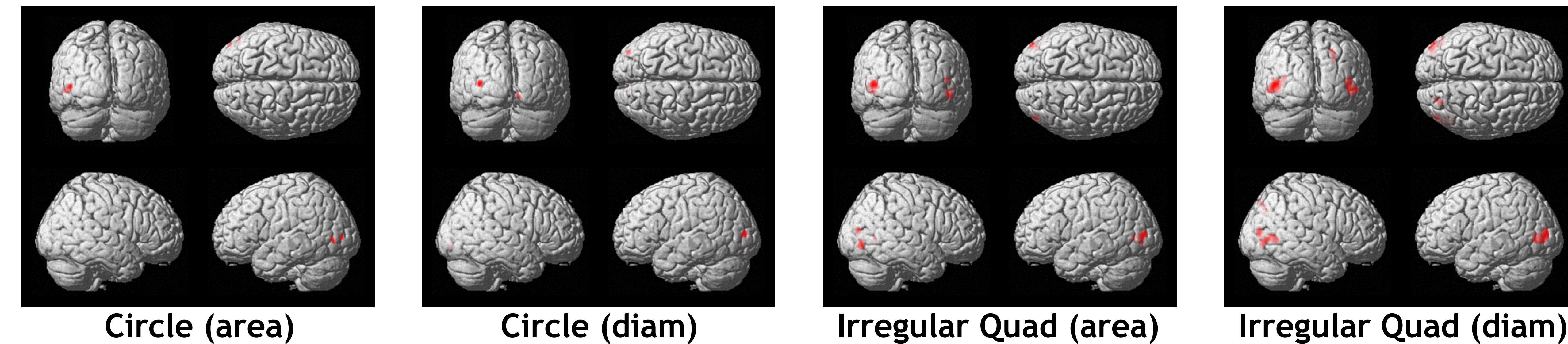- Might increasing object complexity recruit additional cortical space to aid in processing?

STIMULI

- Shapes defined by Illusory Contours (IC).

- ICs were created by rotating a randomly generated plaid in one direction, while a mask of the shape contained the same plaid rotating in the opposite direction.

- Plaids were designed to saturate the BOLD signal and control for low-level visual confounds. Comparison condition shapes were equated for size, area, and/or number of edges/corners. Thus, differences between conditions must be due to varying degrees of increasing complexity.
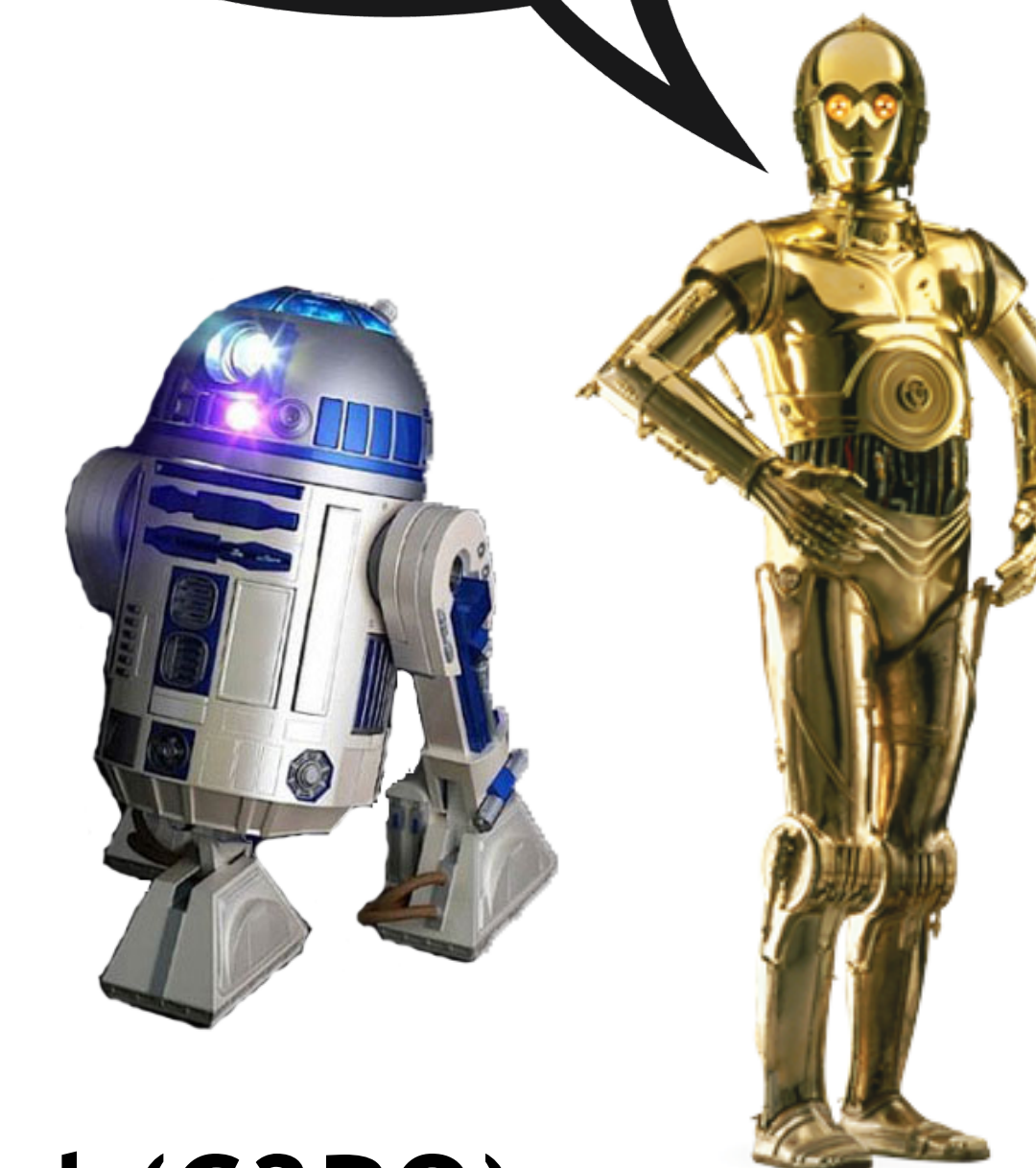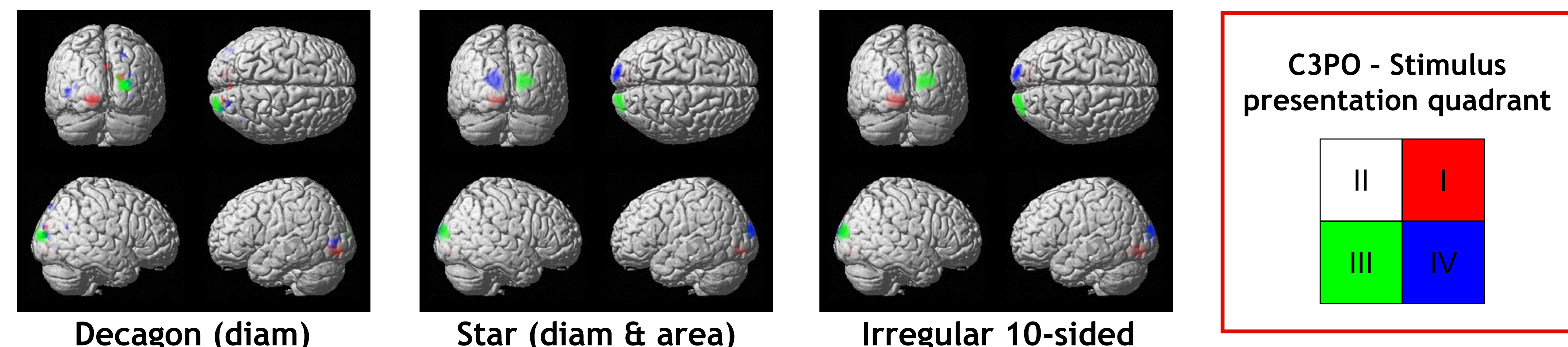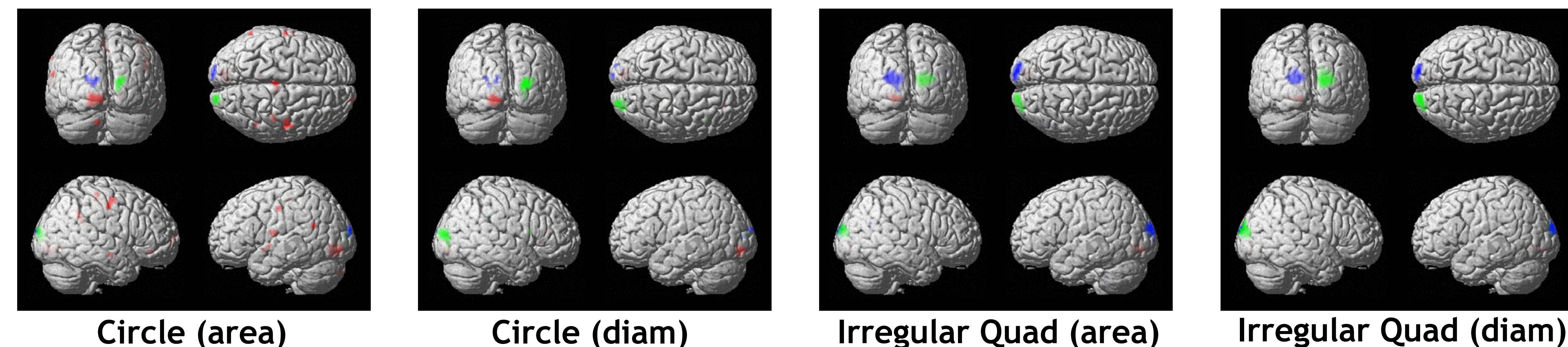

Blank Plaid
- No IC

Circle
- Equated for diameter or area

Irregular Quad.
- Equated for diameter or area

Decagon
- Equated for diameter

Star
- Inner vertices manipulated to equate diameter AND area

Irregular 10-Sided
- All others equated to this

RESULTS

Pilot: Research Recon, Direct Display (R2D2)

Circle (area) ● | Circle (diam) ● | Irregular Quad (area) ◣ | Irregular Quad (diam) ◢

Decagon (diam) ● | Star (diam & area) ★ | Irregular 10-sided ◄

All comparisons vs. blank plaids

Exp. 1: Complex Polygon Presentation Paradigm: Occipital (C3PO)

Circle (area) ● | Circle (diam) ● | Irregular Quad (area) ◣ | Irregular Quad (diam) ◢

Decagon (diam) ● | Star (diam & area) ★ | Irregular 10-sided ◄

C3PO – Stimulus presentation quadrant

II	I
III	IV

SHAPE MASKS

Decagon (diam) ●
- Matched for edges
- Regular
- Matched to base for diameter

Circle (diam) ●
- 0 edges
- Regular
- Matched to base for diameter

Circle (area) ●
- 0 edges
- Regular
- Matched to base for area

Base Shape ◄
- 10 edges
- Irregular

Quad (area) ◣
- 4 edges
- Irregular
- Matched to base for area

Quad. (diam) ◢
- 4 edges
- Irregular
- Matched to base for diameter

Star ★
- Matched for edges
- Regular
- Matched to base for diameter AND area

TASKS

Pilot: Research Recon, Direct Display (R2D2)
- Single IC presented centrally. 9 runs @ 3.6 min.
- Cover task – respond to fixation dot darkening.

Exp. 1: Complex Polygon Presentation Paradigm: Occipital (C3PO)
- 4 IC conditions presented simultaneously, 1 in each screen quadrant.

- Localizer: 4 runs @ 6.3 min. each.

- Cover task – respond to RSVP letters centrally.

- Refresh: 3 runs @ 7.5 min.

- During ISI, refresh (visualize) IC previously in quadrant indicated.

FUTURE DIRECTIONS

- FreeSurfer surface mapping and exploration of cortical area engaged. Expansion of V1 surface area activation?

- Refresh task analysis and combine quadrants to increase statistical power.