

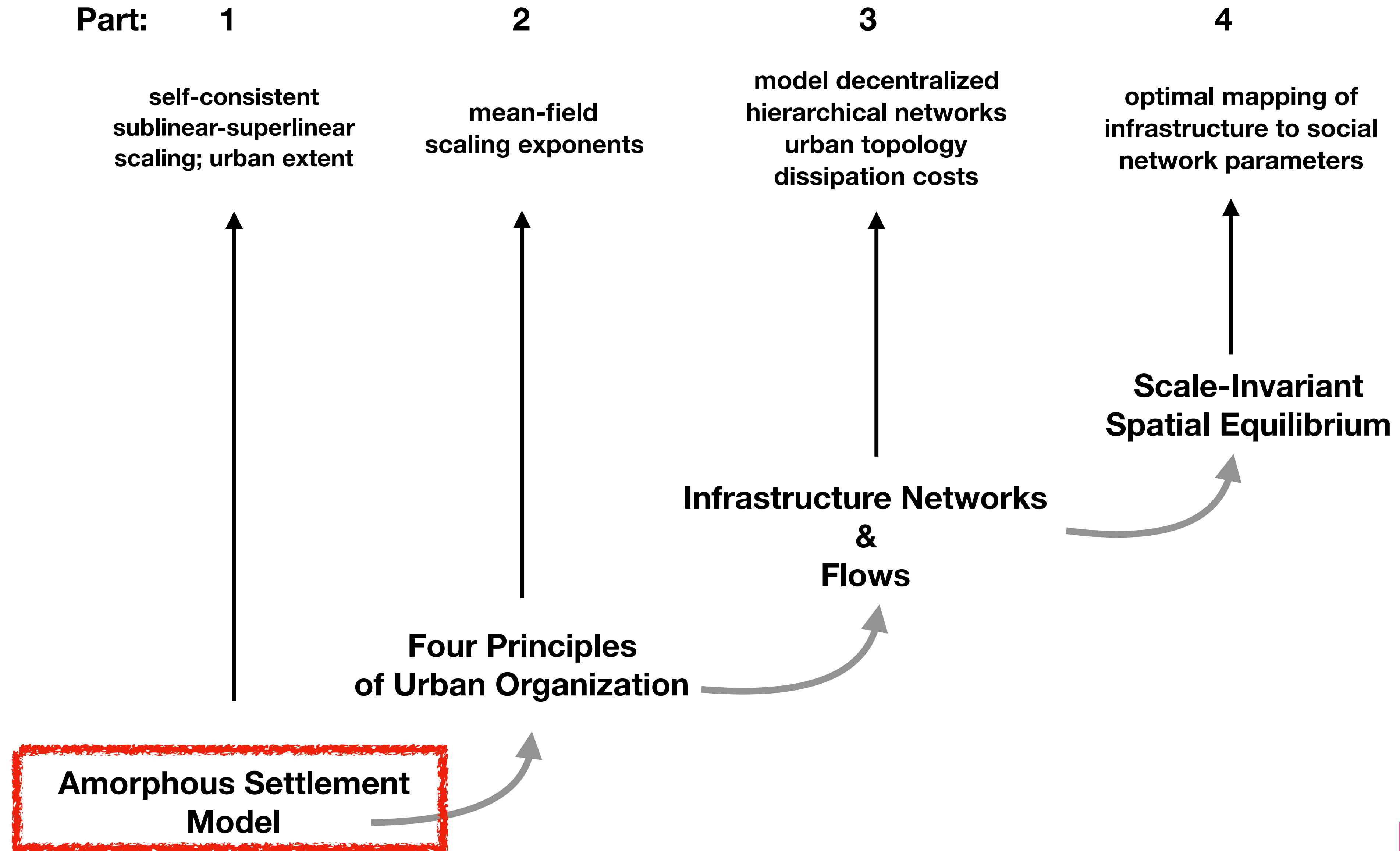
# **Lecture 6**

## **Network Models of Cities**

### **6.2 A First Model: The Amorphous Settlement Model and Urban Scaling**

IUS 3.2.2

# Urban Scaling Theory



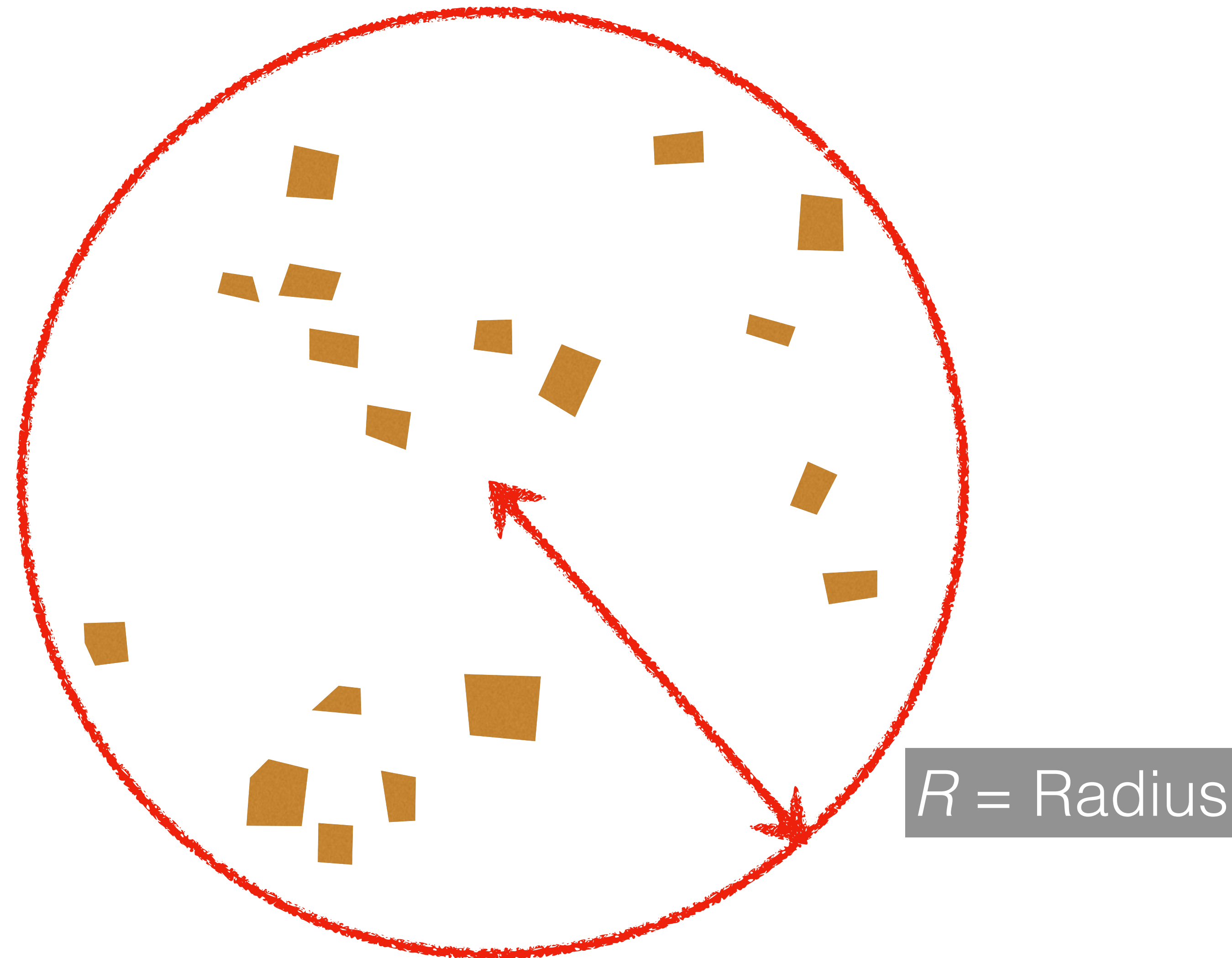


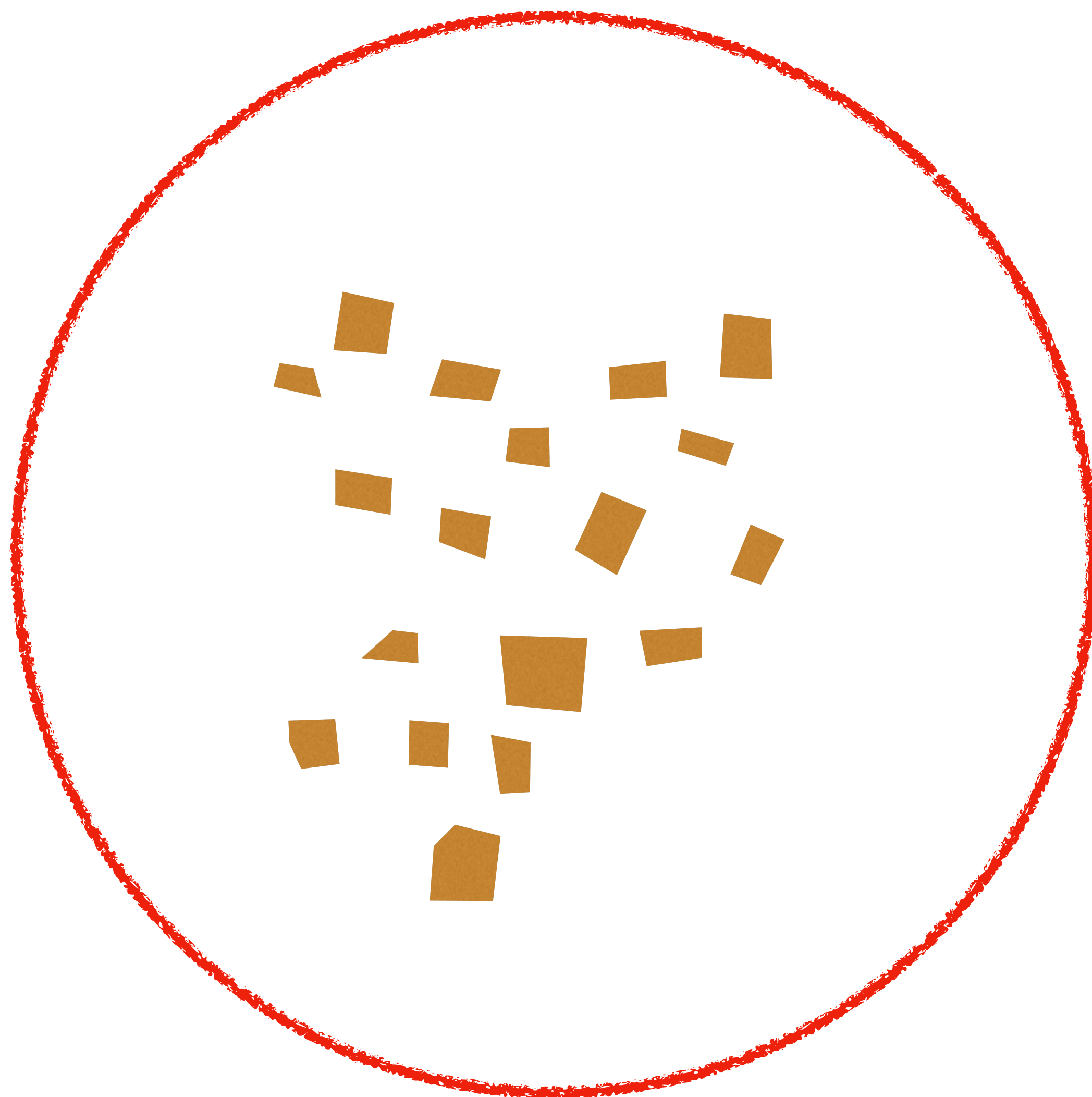


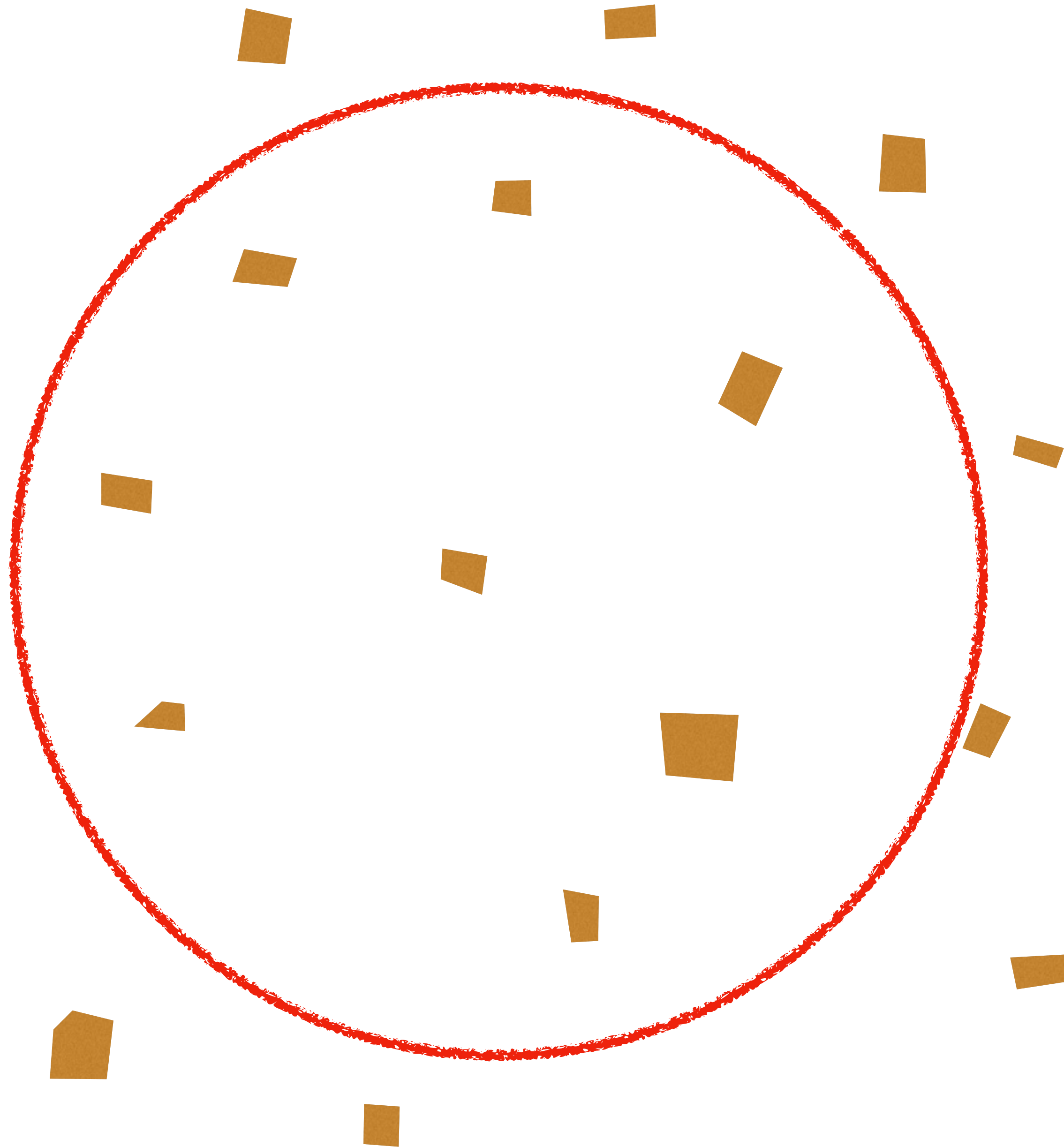
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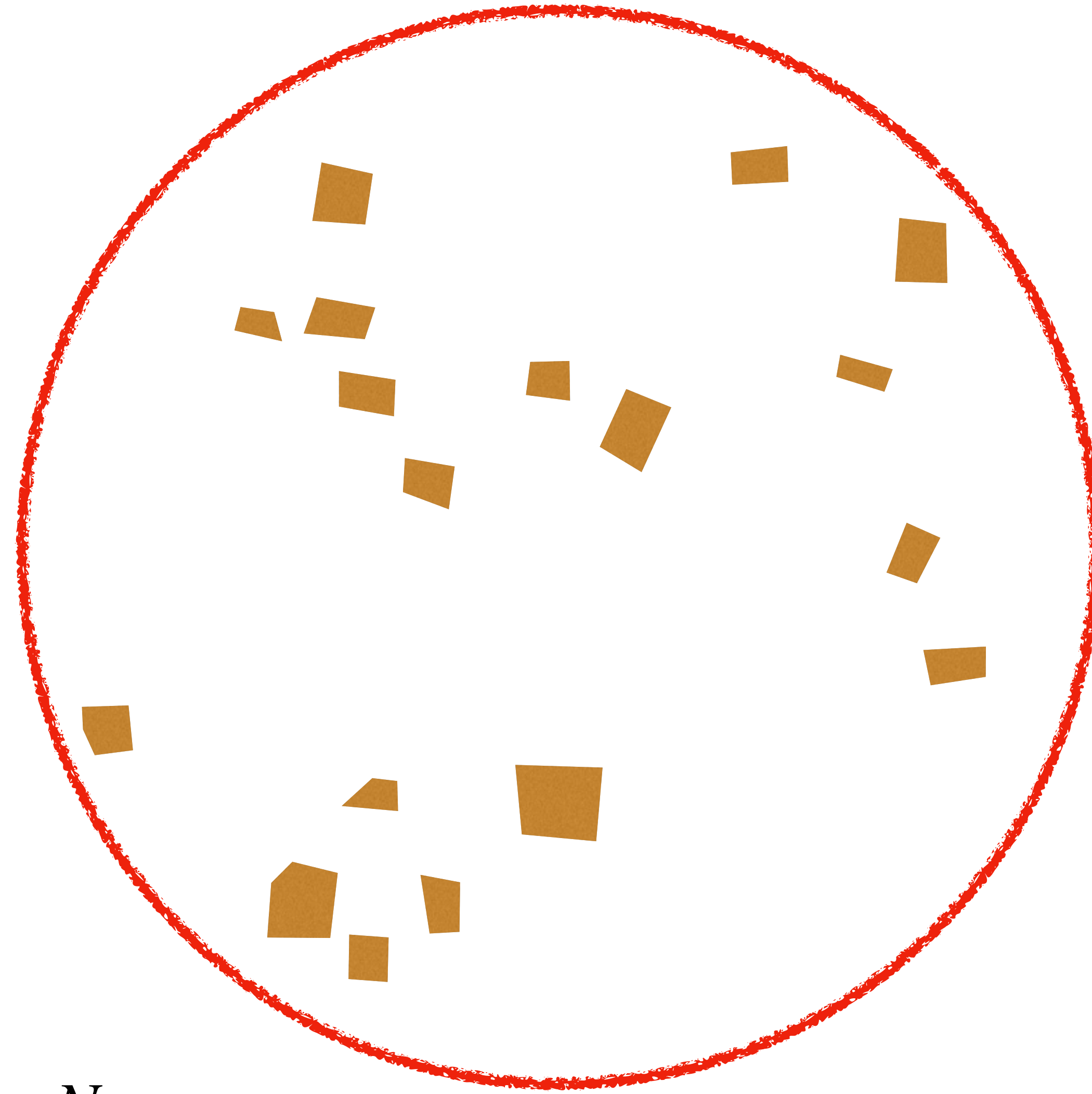
- 1. Biserica de lemn, Vechiul Mănăstireț
- 2. Biserica de lemn, Die Wachstube
- 3. Lăzariu de lemn, Leichenhaus
- 4. Biserica de lemn, Die Wohnung im Burggarten, Gärtnerei
- 5. Capela, 1625-1640, Die Kapelle
- 6. Capela, 1640, Die Kapelle
- 7. Biserica de lemn, Die peragonale Kirche
- 8. Biserica de lemn, Die alte Kirche
- 9. Capela, 1640, Die alte Kapelle
- 10. Biserica de lemn, Die alte Kirche











$$A^{3/2} = \frac{\sqrt{\pi}G}{c_{T_0}}N$$

$$G\frac{N}{A} = c_{T_0}\left(\frac{A}{\pi}\right)^{1/2}$$

For Circle:

$$A = \pi R^2$$

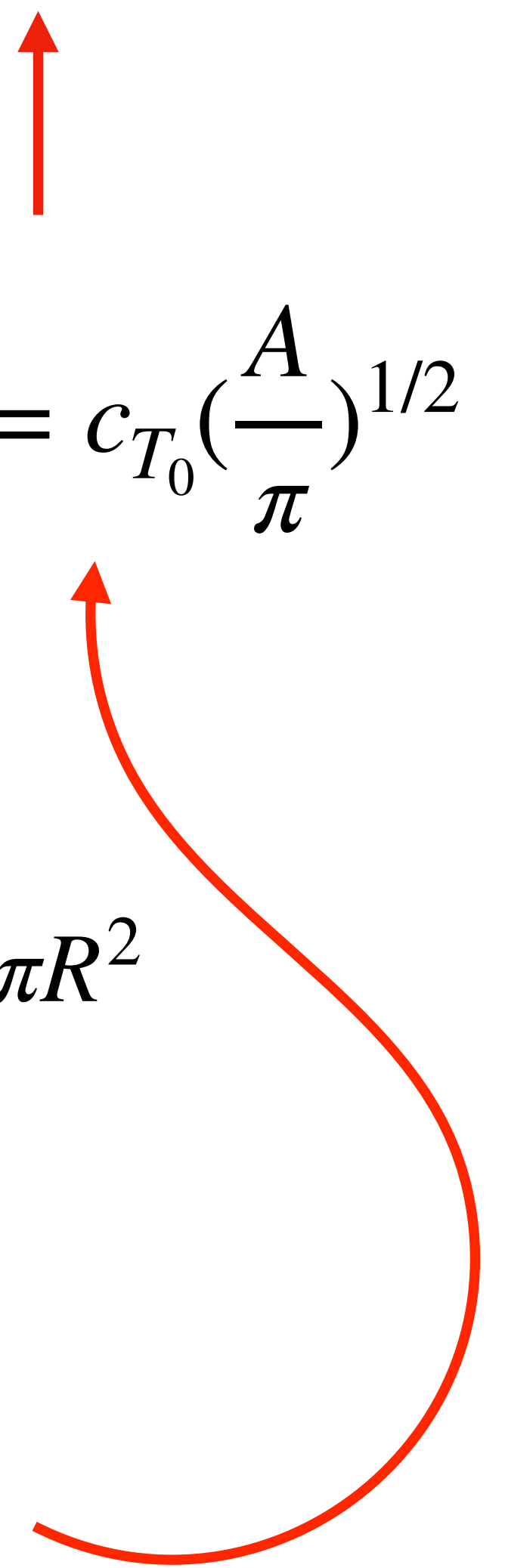
$$G\frac{N}{A} = \text{benefit}$$

social interactions

~

$$\text{cost} = c_{T_0}R = \frac{c_{T_0}}{\sqrt{\pi}}A^{1/2}$$

movement



This gets us two good things:

“City” Area:

$$A(N) = \left( \frac{\sqrt{\pi} G}{c_{T_0}} \right)^{\frac{2}{3}} N^{\frac{2}{3}}$$

sublinear

$$1 - \delta = \frac{2}{3}$$

Total  
Socioeconomic  
Outputs:

$$Y(N) = G \frac{N^2}{A} = \left( \frac{G^{\frac{1}{2}} c_{T_0}}{\sqrt{\pi}} \right)^{\frac{2}{3}} N^{\frac{4}{3}}$$

superlinear

$$1 + \delta = \frac{4}{3}$$

Note also different  $G$ ,  $c_{T_0}$  dependences

quality of interactions

transportation costs

Results in:

$$\delta = \frac{1}{3}$$

too big !



**To get closer to the right answer need:**

**A better model of social interactions over built space**

**To understand the general characteristics of urban built spaces**

**To better compute costs of transportation and land rents (better than in economics)**

**To understand fundamental constraints on human interactions**