Self Organization and Templates

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OBJECT AFFINITY

Snowball effect

- Organize random objects into clusters

- Desirability of Location is directly proportional to density of objects.
- Random self-organized clusters of similar objects
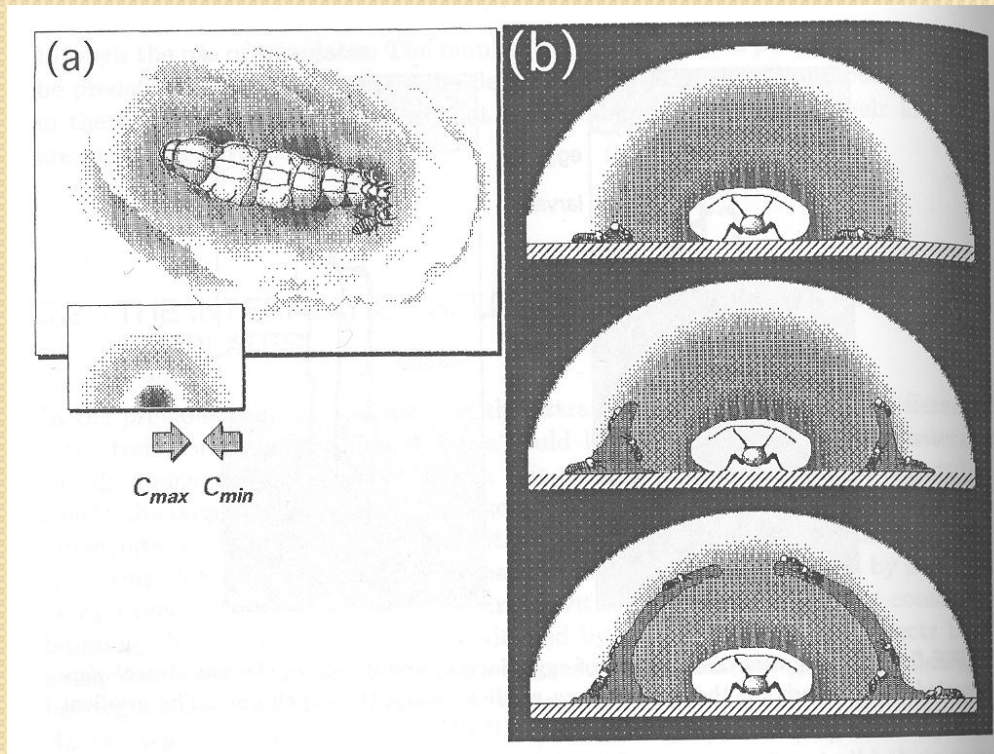
LOCATION AFFINITY

Templates

- Organizing objects into non-random clusters

- Pre-existing environmental factors
  - Temperature
  - Geometry
- Manufactured Chemical Templates
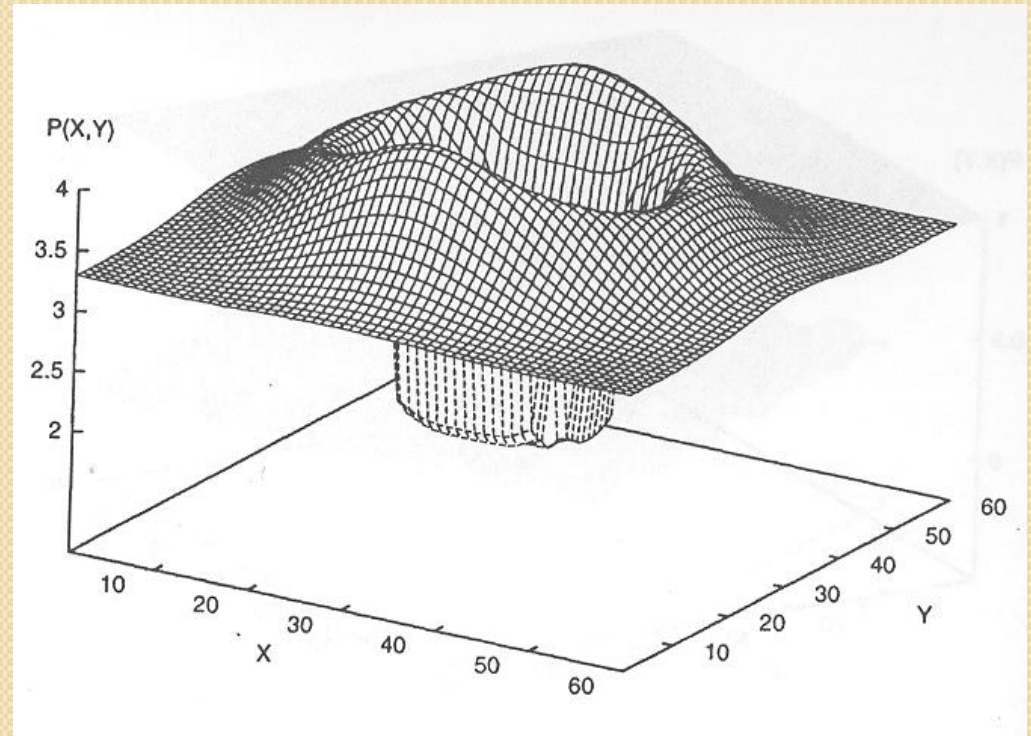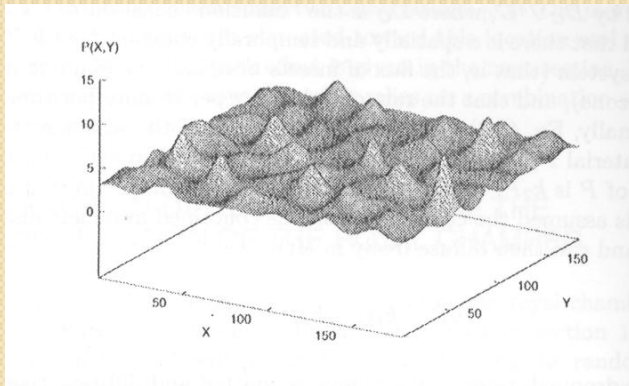 - Pheromones

EXAMPLE: TERMITE QUEEN

Building the Queen's chamber

- Queen emits pheromone, forming template
- Termites obey object affinity
- Termites obey location affinity
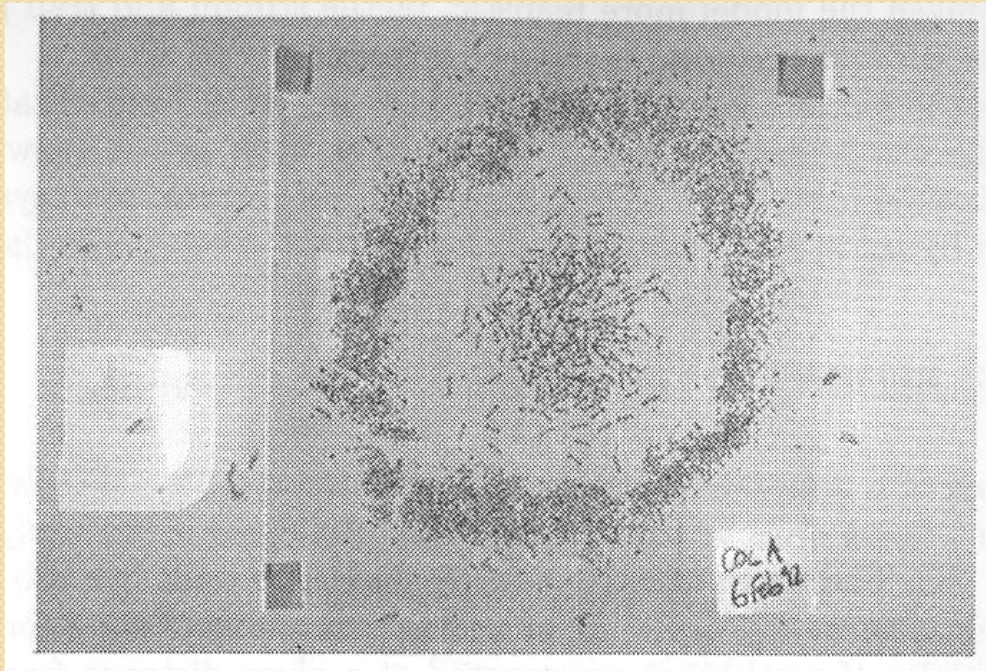
EXAMPLE: TERMITE QUEEN

Building the Queen's chamber

Final Pheromone map after partial wall construction simulation

EXAMPLE: ANT WALLS

Brood wall construction

- Ants created a wall appropriately sized to the brood
- Template similar to termites and queen but produced by brood instead
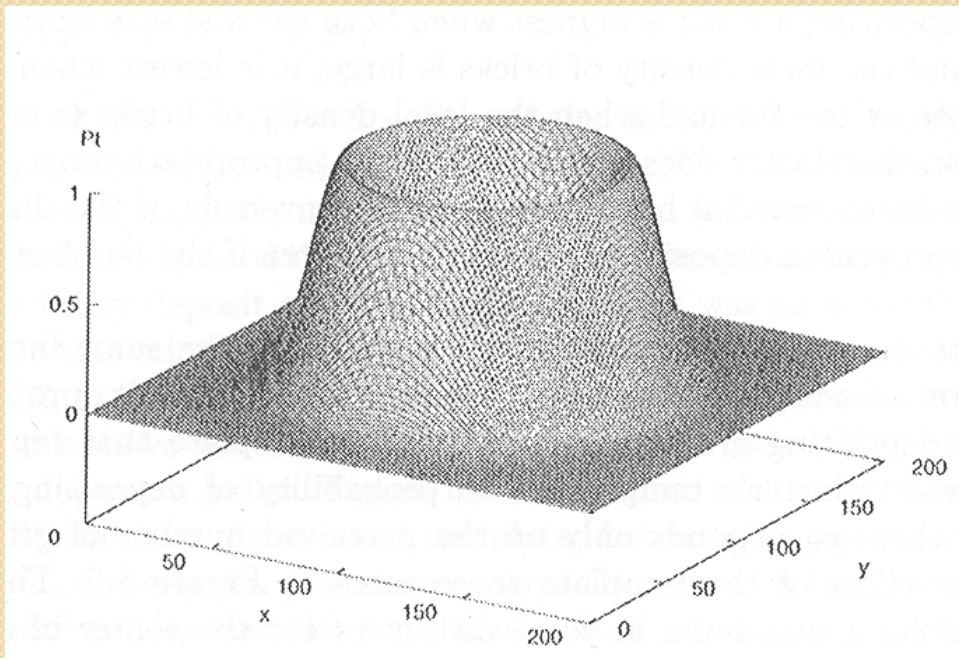
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APPLICATION: GRAPH PARTITIONING

- Placement of nodes is controlled by object affinity, creating clusters.

- Placement of clusters is controlled by location affinity using a template function

- Inverse object affinity (negative feedback) creates clusters of about equal size

SUMMARY AND QUESTIONS

- Object Affinity
- Location Affinity
- Parallel graph partitioning