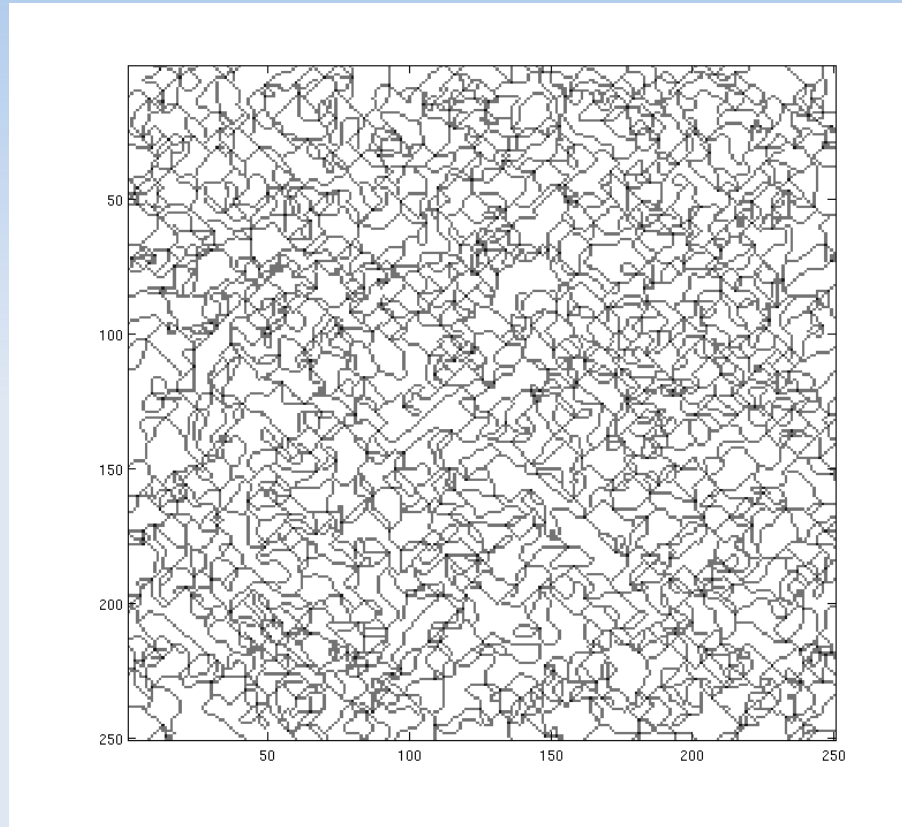
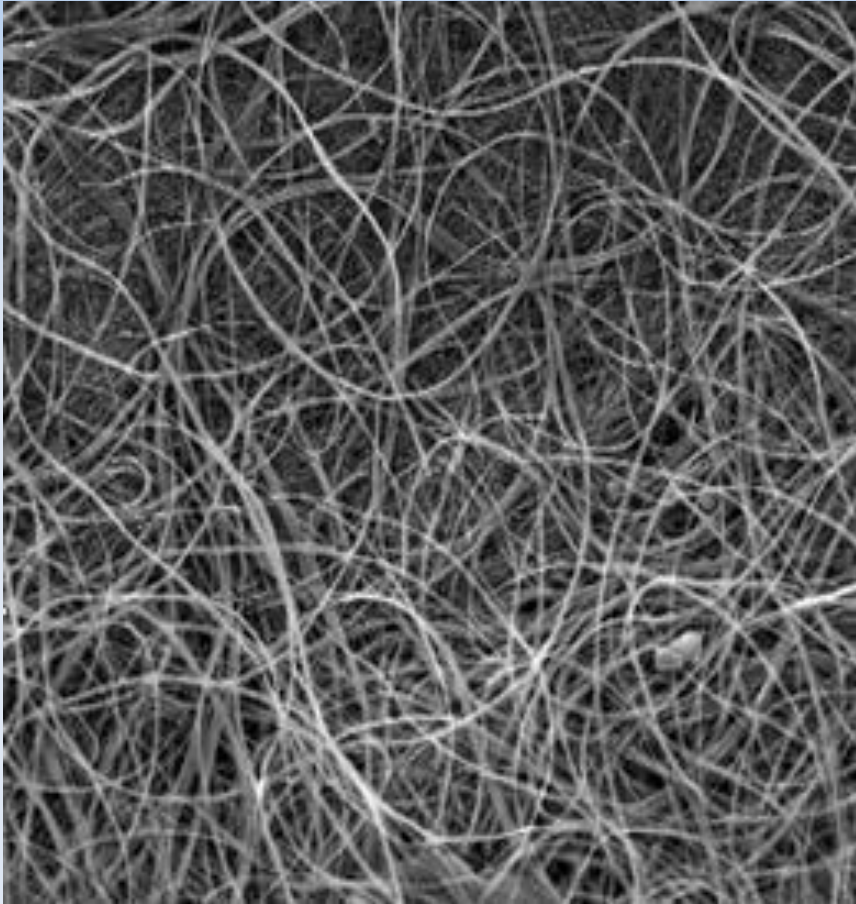


Building 2D and 3D Networks Using Stochastic Nanowire Growth Models

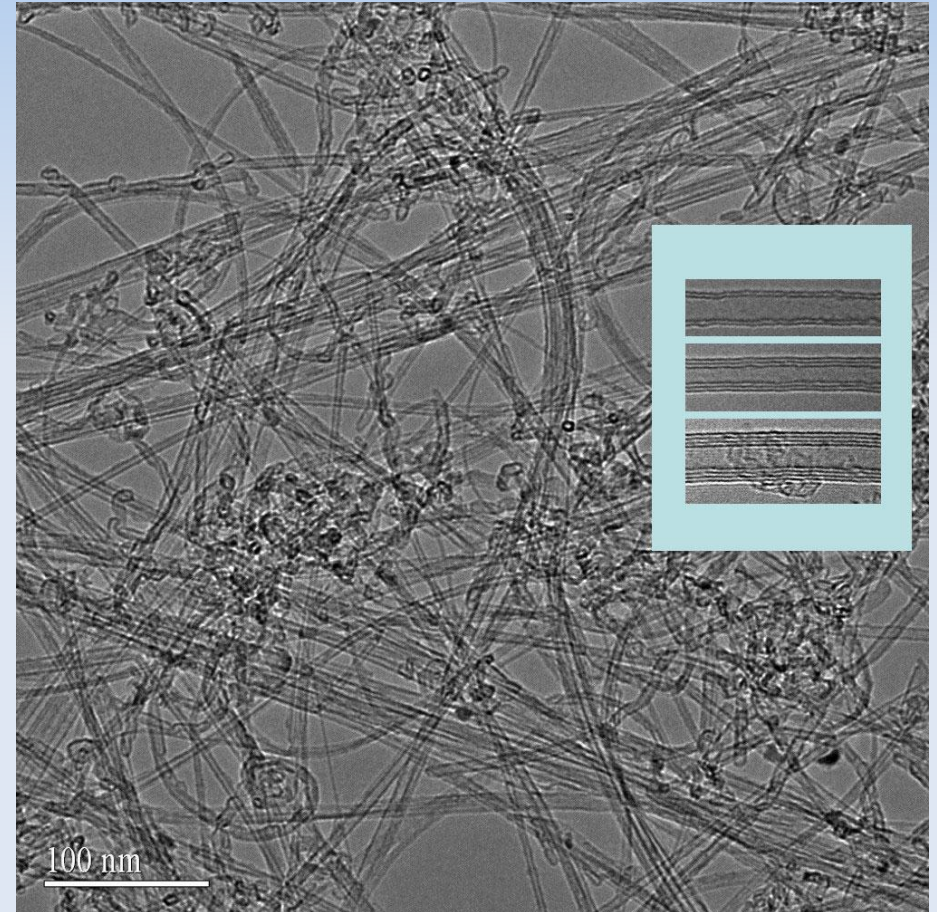


By: Nolan Hergert
Teuscher.:Lab Summer 2009

Nanowire Networks



MIT Hydrophobic Nanowire Mesh
(Potassium Magnesium Oxide)



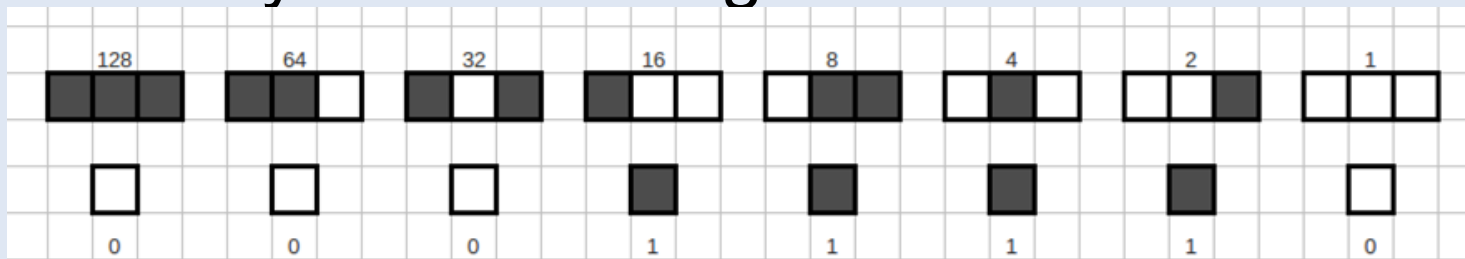
PSU Carbon Nanotube Growth

Design Goals

- Change direction ($< 45^\circ$ at a time)
- Stop completely (at random)
- Connect with other wires/nodes

Cellular Automata: An Overview

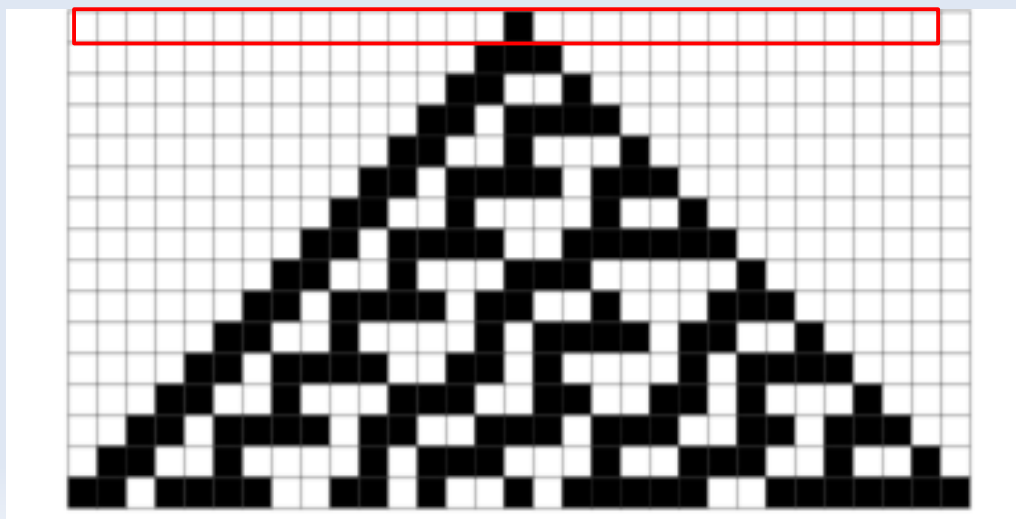
- Features
 - Simple rules that don't change
 - Highly parallel and optimized
 - Cell only looks at "neighborhood"



Input

Output (for center cell)

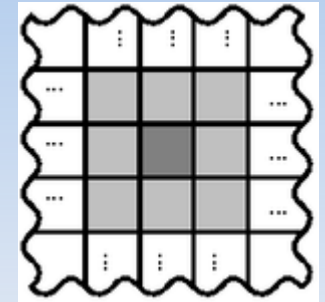
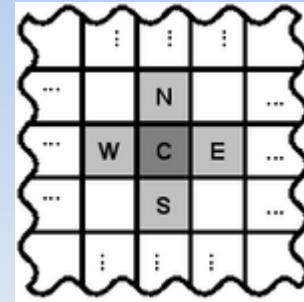
Rule 30



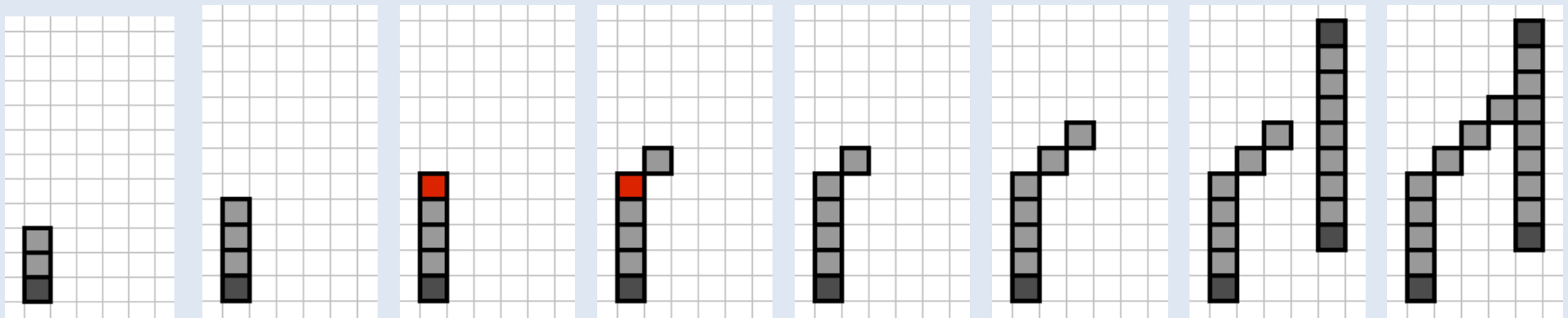
Generation

More on CA's

- Neighborhood Types
 - Von Neumann (diamond)
 - Moore (square)

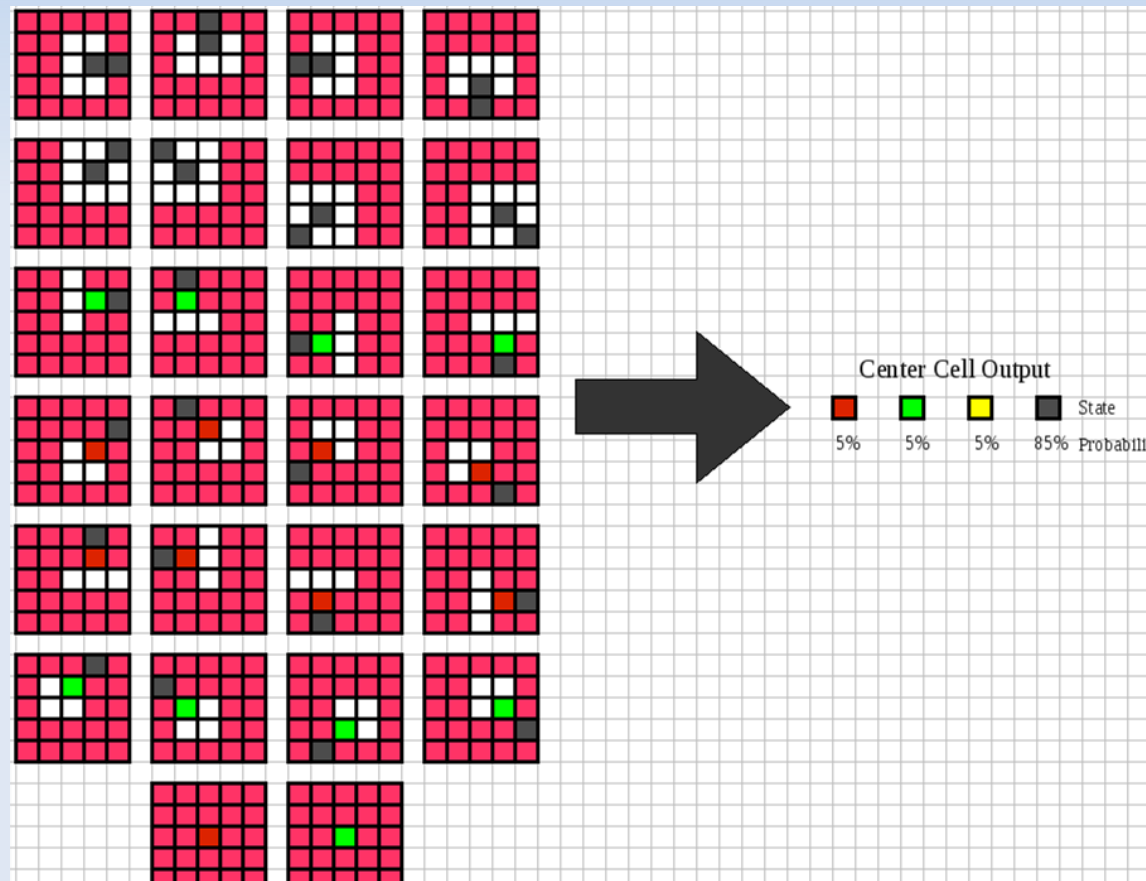


Wire Growth Process Example

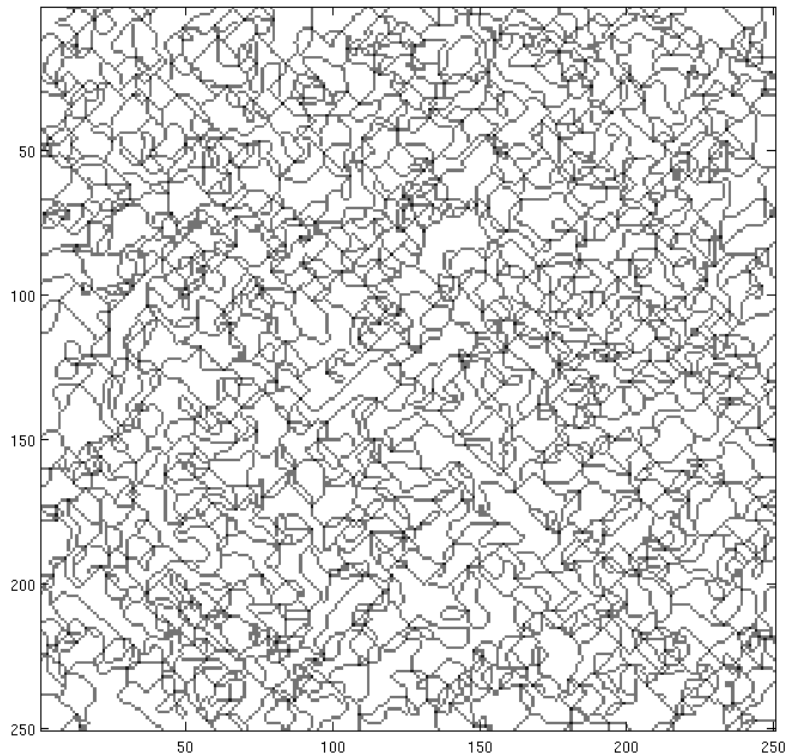


Stochastic CA Design

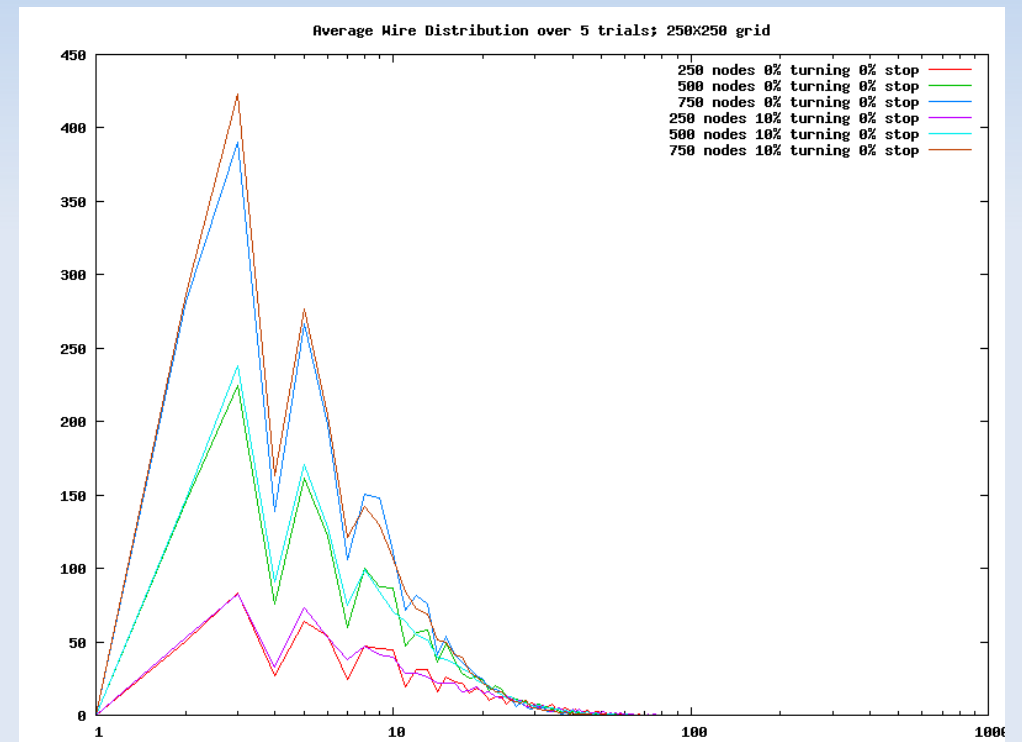
- 5X5 Moore Neighborhood (over 6^{25} rules!)



Wire Growth Results



Typical Growth Run with 750 nodes
on a 250X250 grid



Wire Distribution

3D Wire Growth Simulation

- Agent-Based Modeling
- Wires have width

