

# Outline for Lecture 7

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## 1. Standard Structure Theorems

- Constant Alternations
- General Alternation
- Alternation Theorems
  - $\text{ASPACE}$  in  $\text{TIME}(\text{exp})$
  - $\text{ATIME}$  in  $\text{SPACE}(\text{poly})$
  - $\text{SPACE}$  in  $\text{ATIME}(n^2)$
  - $\text{EXP}$  in  $\text{ASPACE}(\text{poly})$

## 2. What about BPP

- Amplification of BPP
- Lautman's Lemma
- BPP in  $\Sigma_2^{\text{poly}}$
- Coins written on a stone
  - BPP probably equal to P

## 3. Complete Problems

- NP
  - Notion of Reducibility
  - Cook-Levin theorem for NP
  - Converting from circuits to shallow circuits
  - Going from k-SAT to 3-SAT
- SPACE
  - TQBF