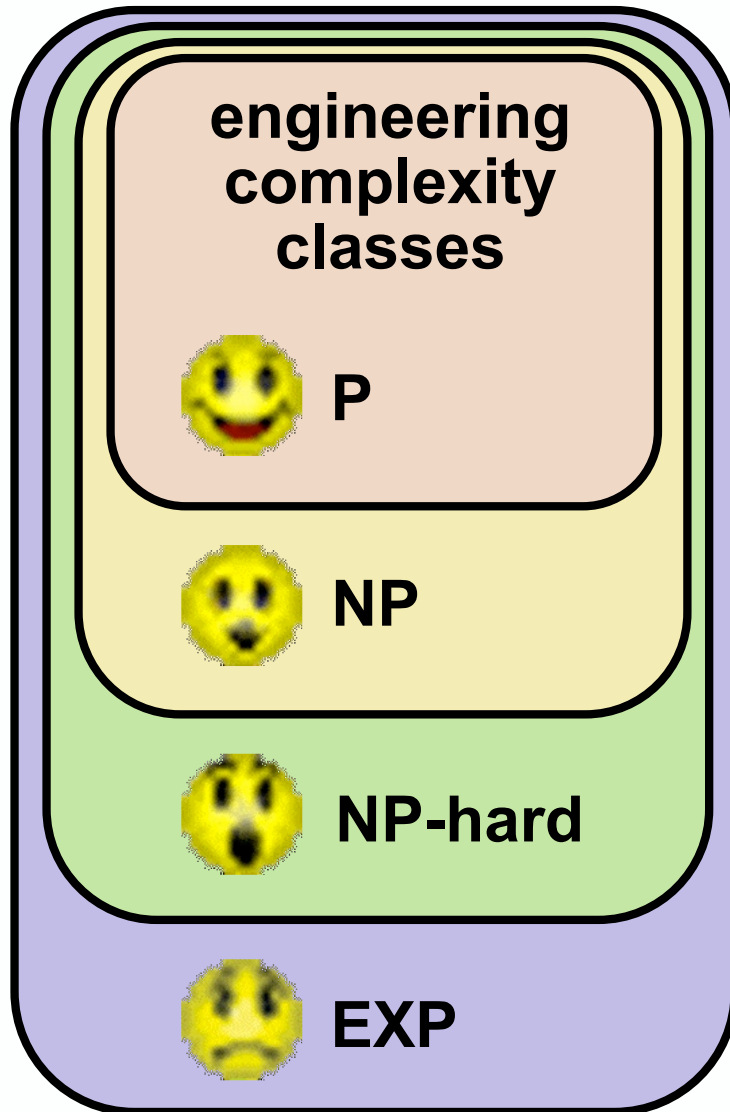


Q5: Are we confident that quantum spin microscopy will work?

A5: Simulation techniques in NP are a mission-critical requirement



- **P**: derive and check using polynomial memory and time resources
 - E.g., compute a transfer function
- **NP**: via a decision “certificate”, verify with polynomial resources
 - E.g, does a stable controller exist?
- **NP-hard**: typically, the optimization or interval version of an NP problem
 - E.g., does a stable controller exist over an interval of model parameters?
 - In practice, “solved” by robust design heuristics, simulations, and virtualization (“virtual rollouts”)
- **EXP**: emulation requires exponential resources, and no certificates known
 - problems in EXP are inaccessible
 - **Quantum system engineering must move from EXP to P**