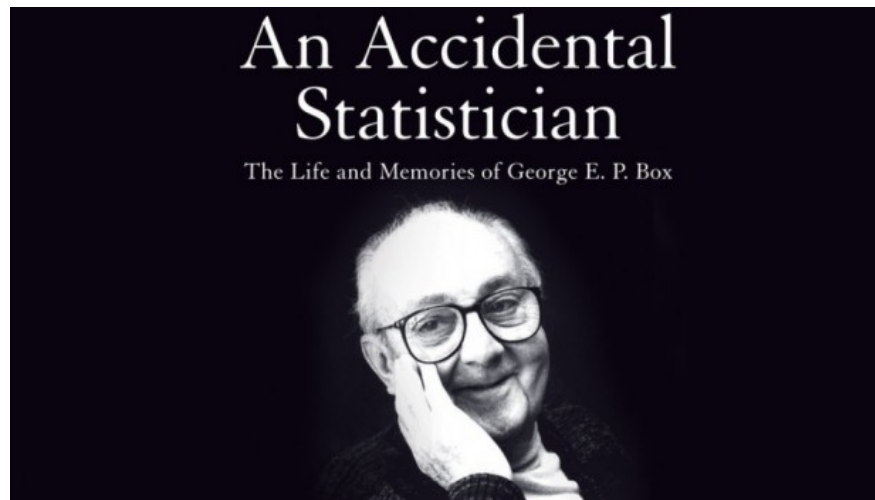# Stochastic Thinking and Random Walks, Segment 3

Simulation Models

- A description of computations that provide useful information about the possible behaviors of the system being modeled

- Descriptive, not prescriptive

- Only an approximation to reality

- "All models are wrong, but some are useful." – George Box
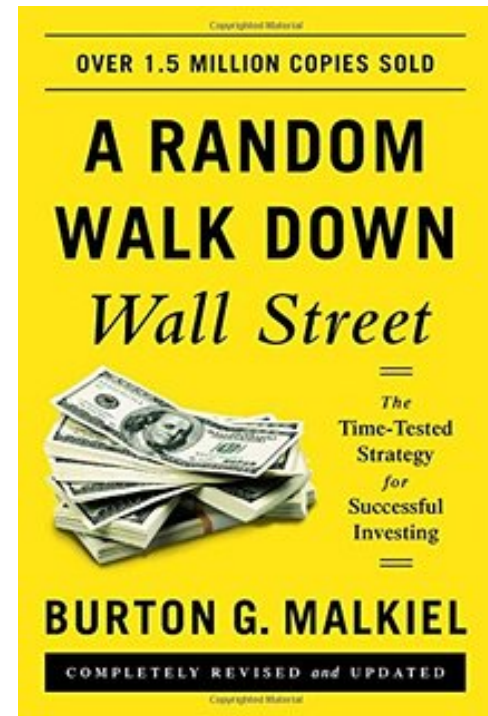
Simulations Are Used a Lot

- To model systems that are mathematically intractable

- To extract useful intermediate results

- Lend themselves to development by successive refinement and "what if" questions

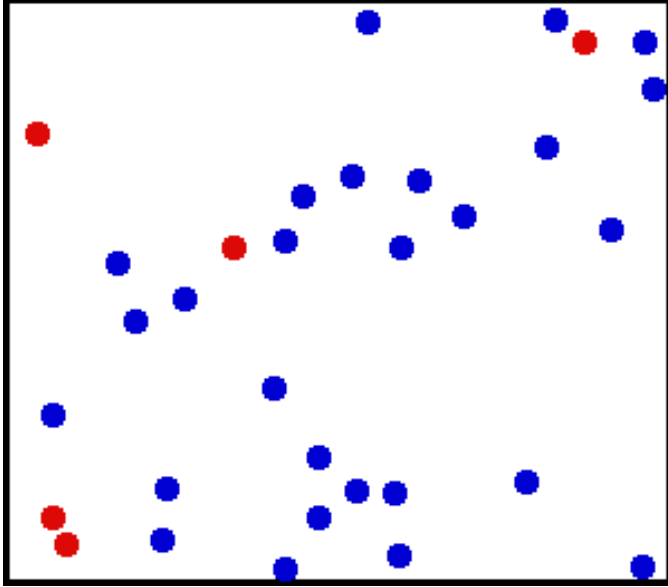- Start by simulating random walks

Why Random Walks?

- Random walks are important in many domains
  - Understanding the stock market
  - Modeling diffusion processes
  - Etc.

- Good illustration of how to use simulations to understand things

- Excuse to cover some important programming topics
  - Using inheritance mechanisms
  - More about plotting

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A RANDOM WALK DOWN *Wall Street*

The Time-Tested Strategy for Successful Investing

BURTON G. MALKIEL

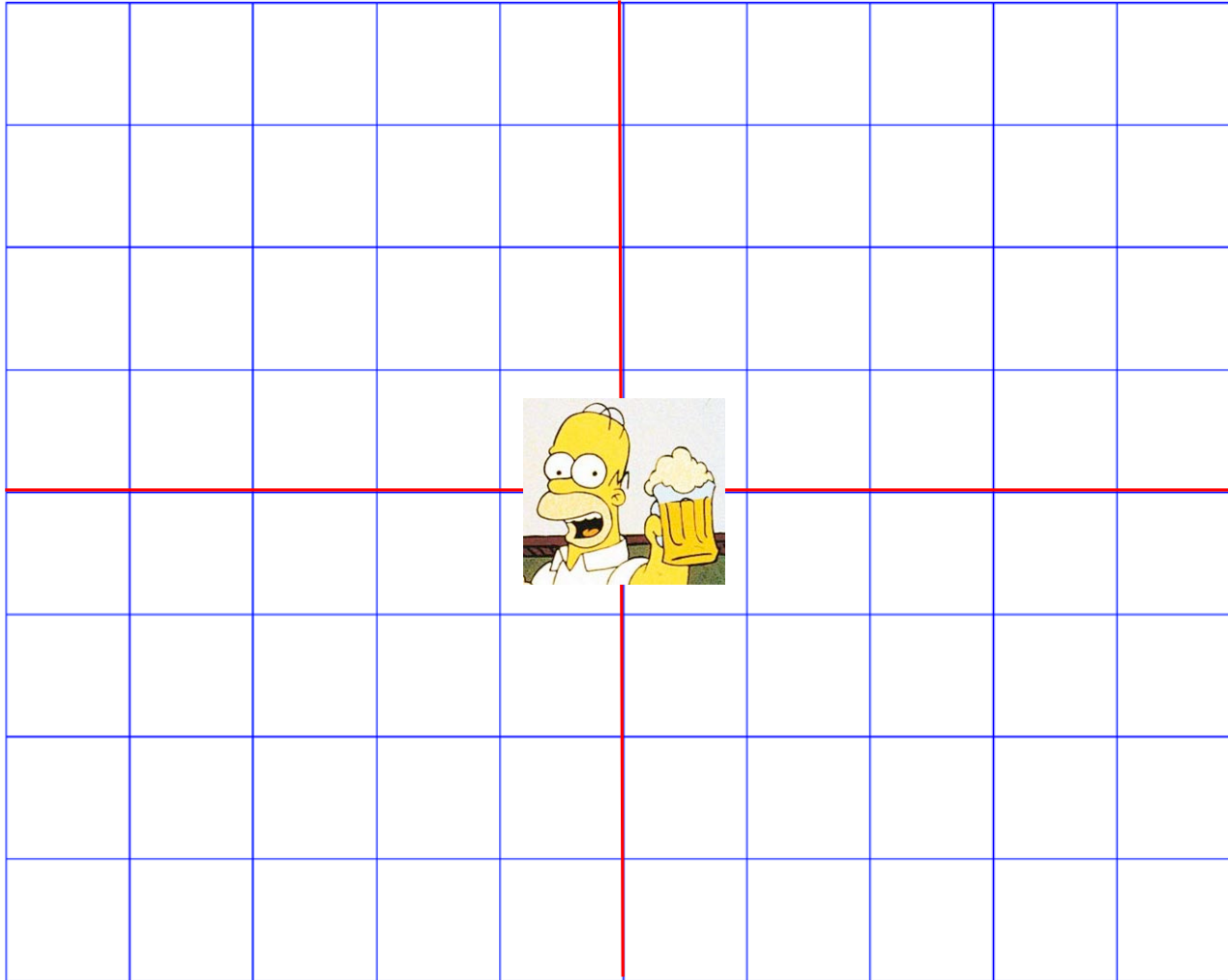COMPLETELY REVISED *and* UPDATED

Brownian Motion Is a Random Walk

Brown

Bachelier

Einstein
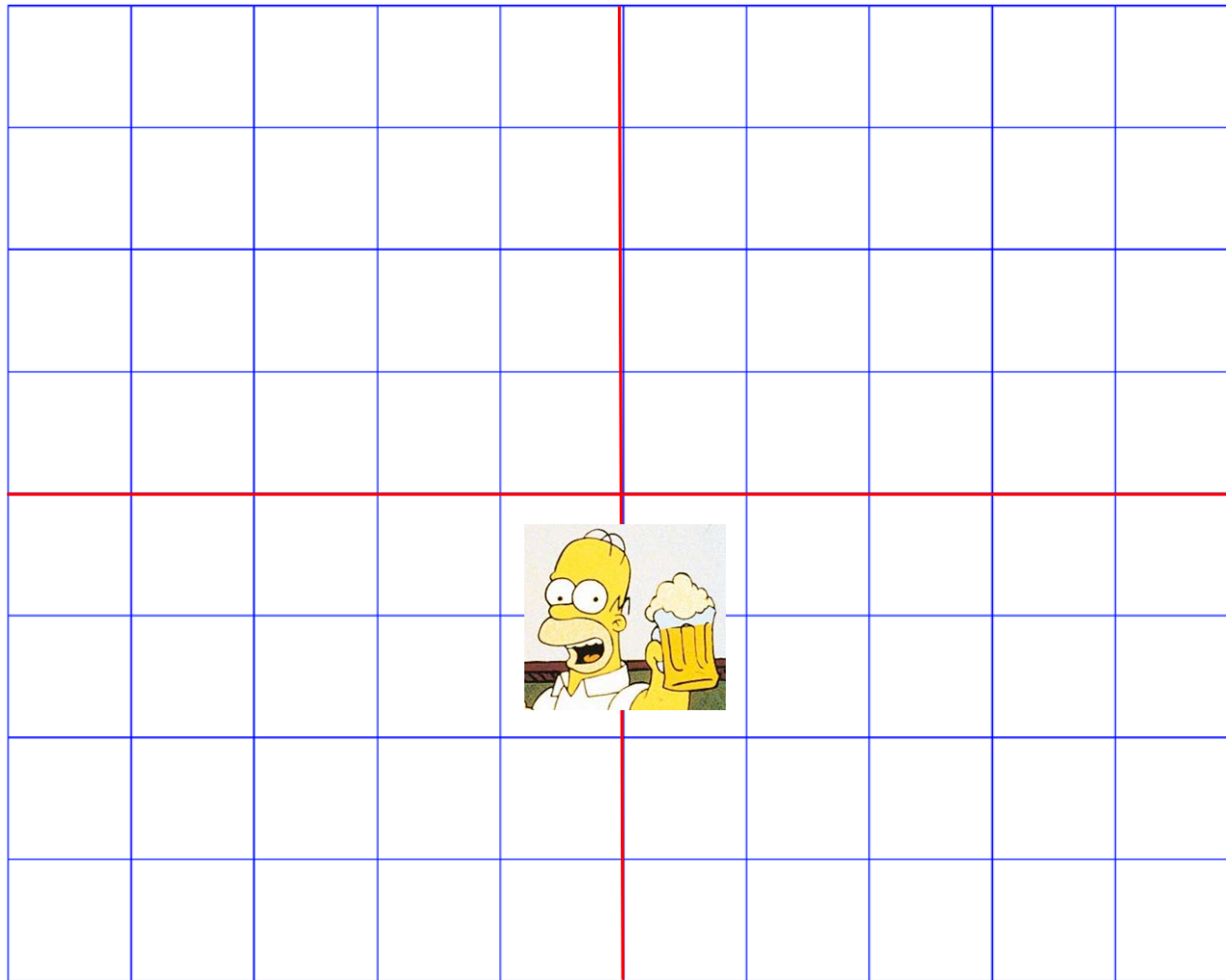
Drunkard's Walk
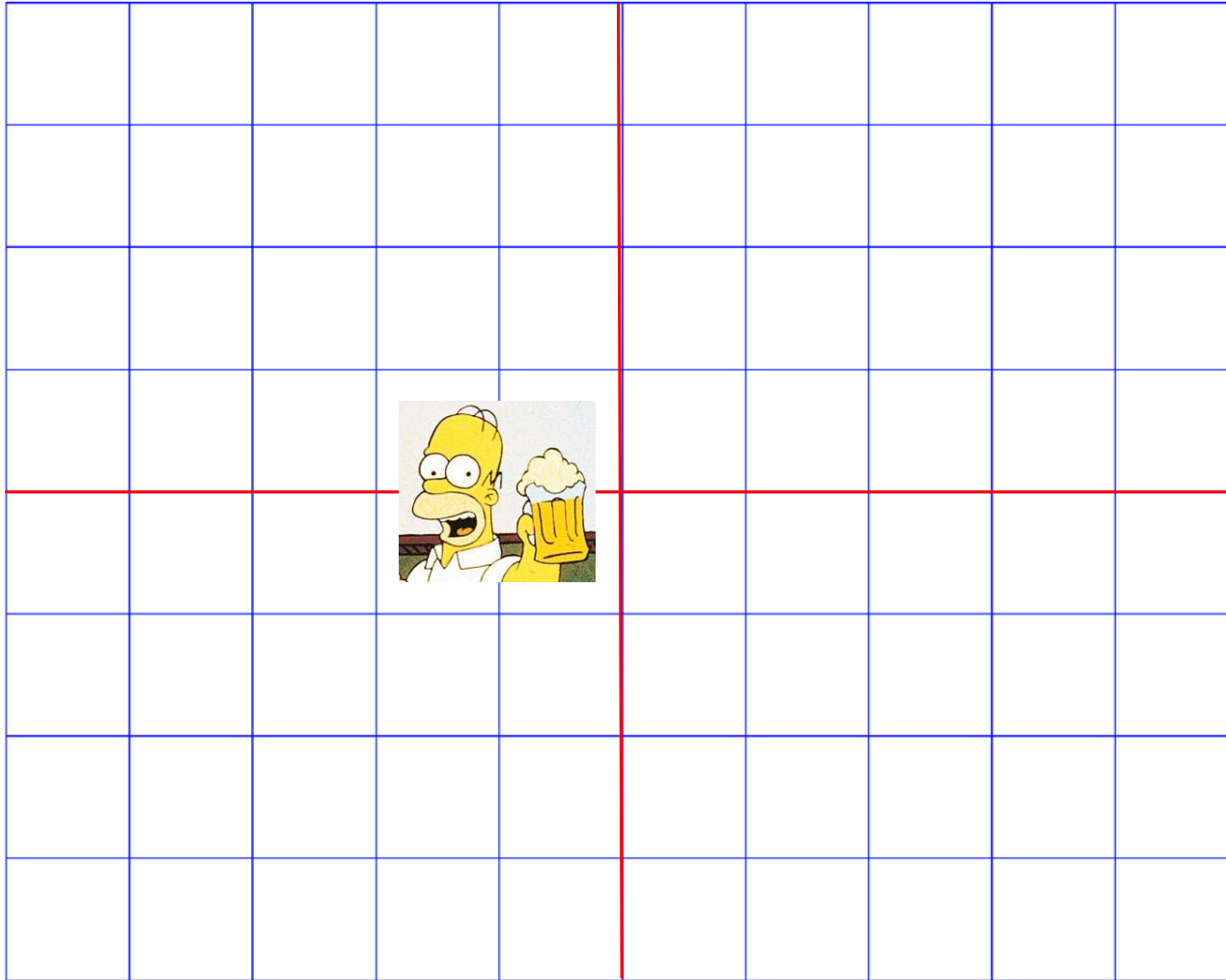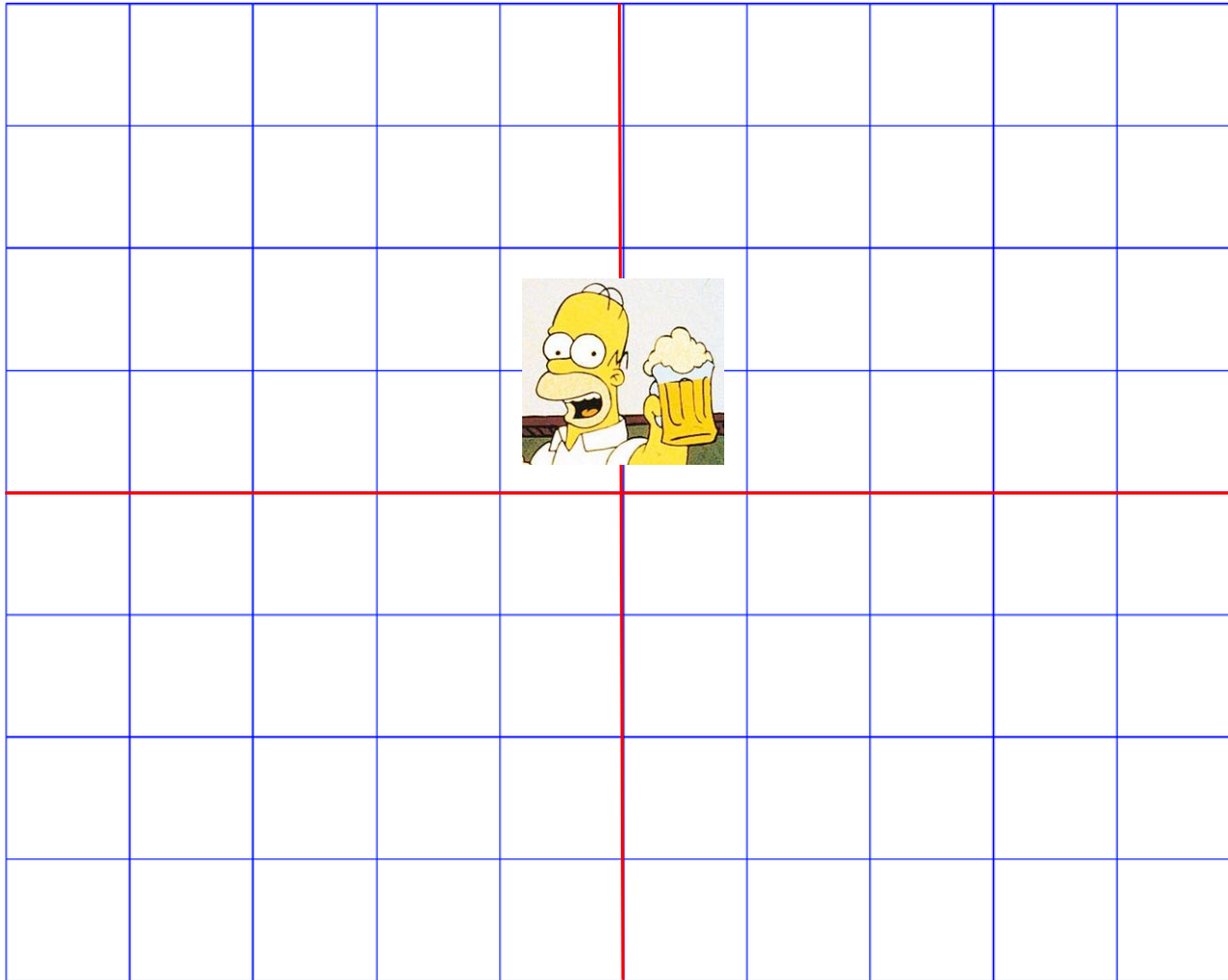
One Possible First Step

Another Possible First Step
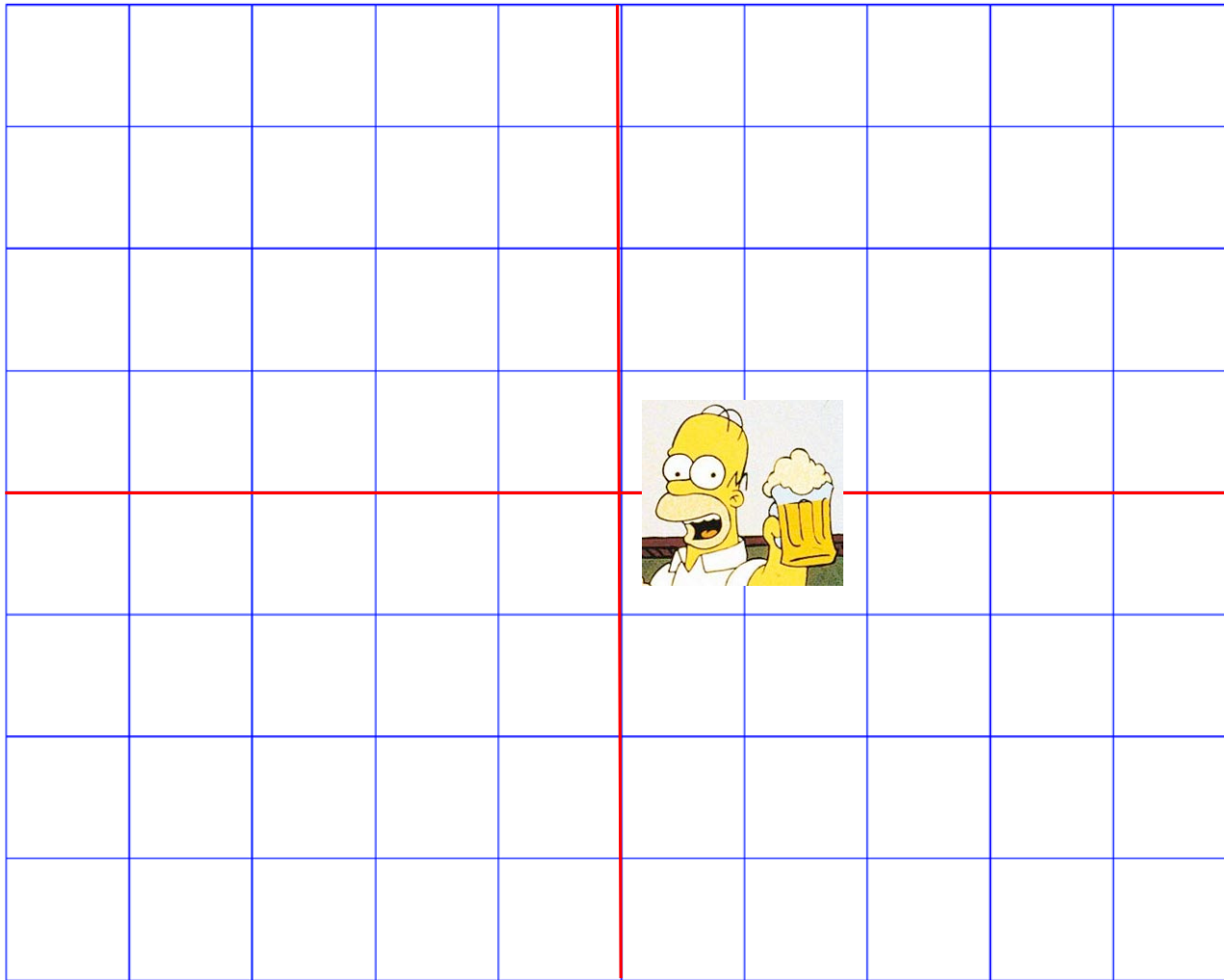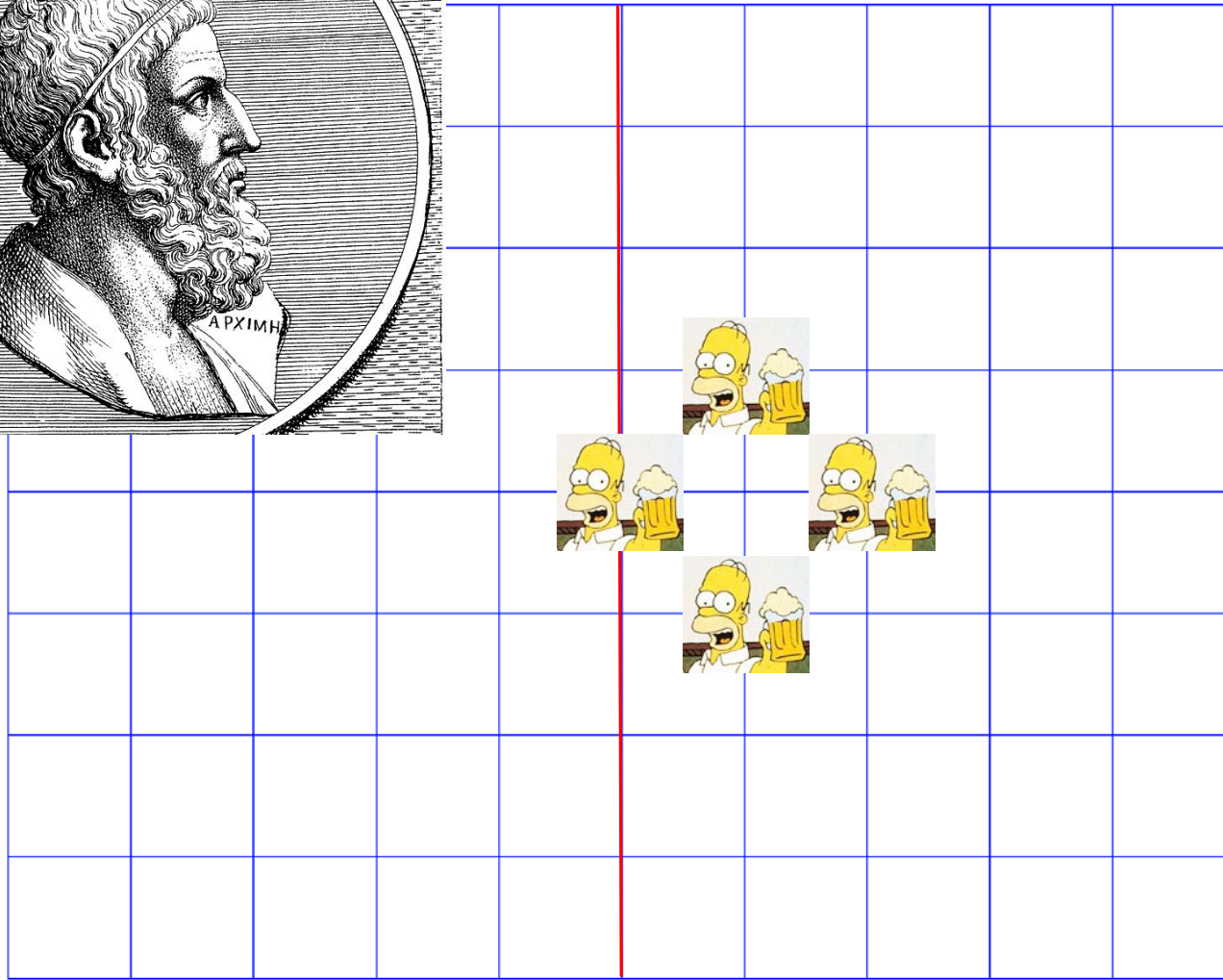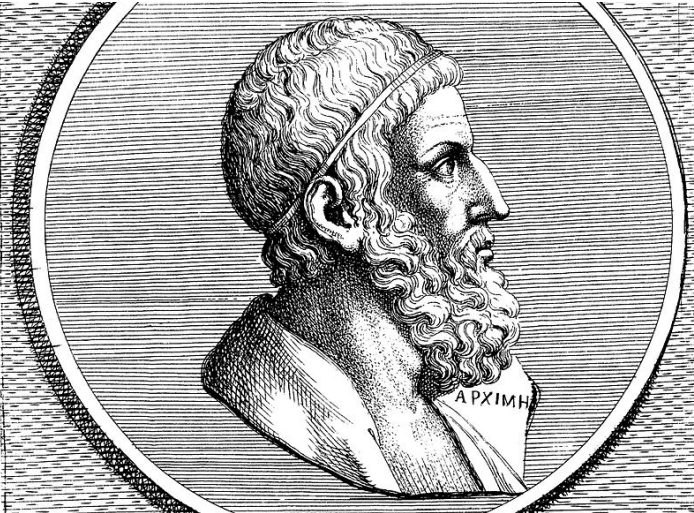
Yet Another Possible First Step

Last Possible First Step

Possible Distances After Two Steps

Expected Distance After 100,000 Steps?

- Need a different approach to problem

- Will use simulation

- But not until the next lecture