

Challenges in Satisfying the Need and Promotion of Modeling & Simulation Workforce

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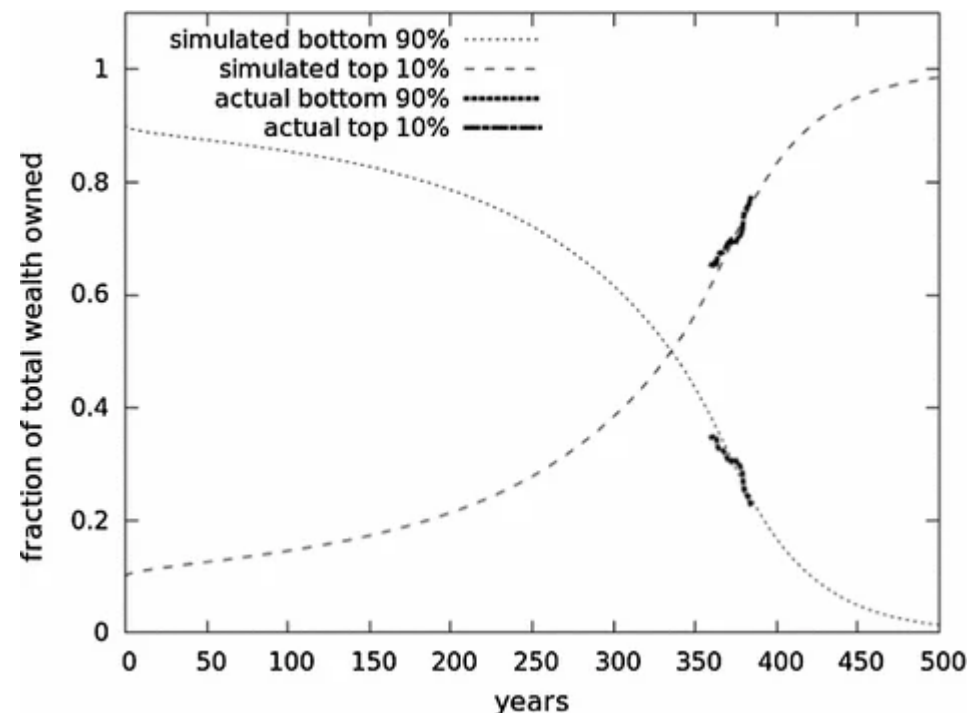
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About myself

- Engaged in M&S research and applications for the Department of Energy and Department of Defense
 - ~5 years total in industry at Raytheon Missile Systems and Northrop Grumman
 - 16 years at Oak Ridge National Laboratory
- Have taught a handful of graduate M&S courses at University of Arizona, University of Tennessee – Knoxville, and University of Memphis

Broadening interest in the past decade or so

- Interest in M&S is growing in fields where it was rarely considered before
 - Social sciences, particularly in economics
 - Health care and health care effectiveness in large populations (population health)
 - Material science, enabled by increasingly powerful computers
 - Climate!
 - Just to name a few
 - New and interesting discoveries are coming out of this work



Several, independent simulation studies have reproduced historical trends of wealth inequality with precisely stated models of the adage “the rich get richer”, made possible by ubiquitous access to powerful computers

Vallejos, H.A., Nataro, J.J. & Perumalla, K.S. An agent-based model of the observed distribution of wealth in the United States. *J Econ Interact Coord* 13, 641–656 (2018)

Simulation is used everywhere in some industries, and almost nowhere in others

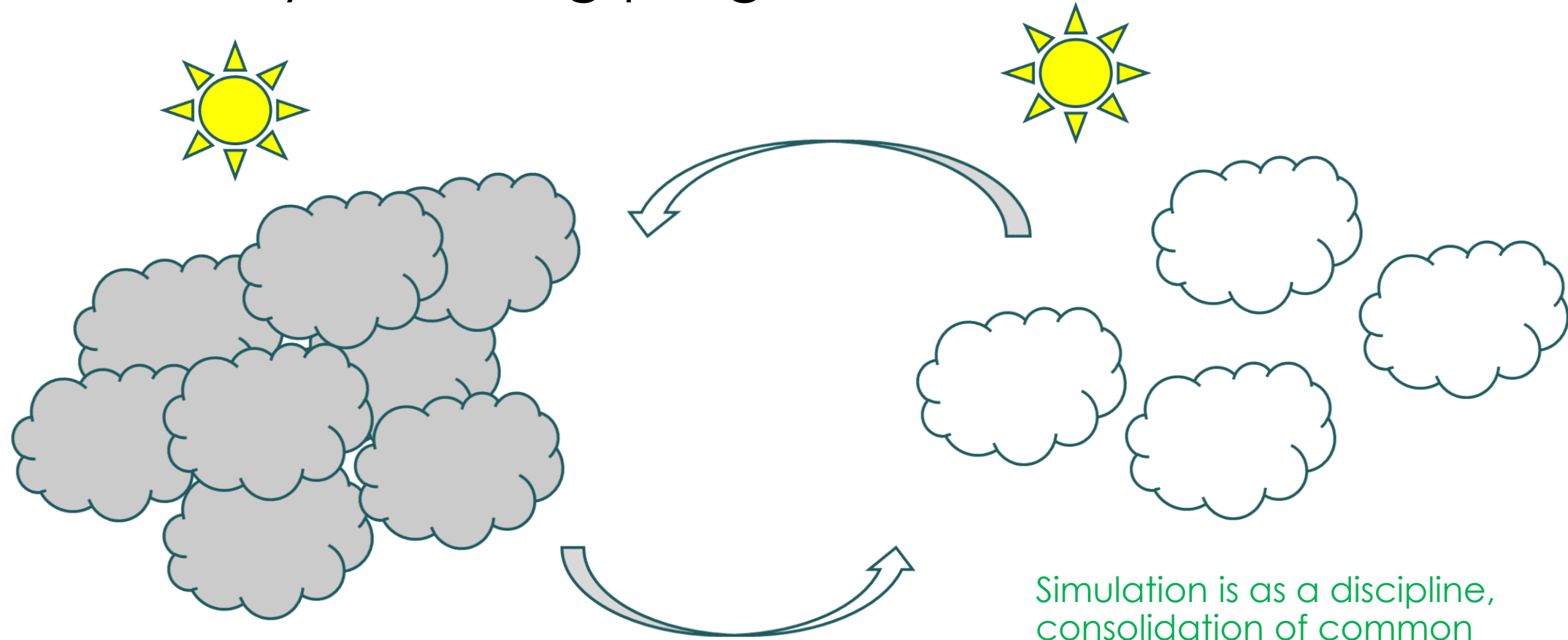
- Aerospace and defense are the #1 users of M&S
 - Driven by the high cost of real world failures
 - Tremendous appetite for new M&S technologies that can reduce costs and risks
- M&S is an afterthought when proto-types are perceived to be affordable and the cost of experimental failures is perceived to be low
 - *Perception* of cost & risk matter a lot!
 - In a proto-type oriented engineering culture, M&S is met with suspicion



A disintegrating field

- Modeling and simulation was strong as a discipline for a little while
 - Common methods and techniques distilled from discipline specific specializations
 - We could and did build on this to improve the state of the art in M&S everywhere
 - But it requires new talent with an interest in M&S foundations
- As the usefulness of M&S expanded, fewer practitioners had a broad view
 - Retreat to domain specific techniques
 - Increased rediscovery in isolated domains
 - Progress in M&S slows, and some knowledge may be lost

Broadening interest leads to loss of common ground, rediscovery is slowing progress



Simulation is specific to every domain, everything “co-discovered”, nothing shared

Simulation is as a discipline, consolidation of common techniques, new methods and techniques shared across disciplines

An increasingly common exchange

So, what do you do?

But ... modeling of what?



Modeling and simulation. You know, modeling methods, simulation algorithms, that sort of stuff.

