

# Introduction to Simulation Modeling

Highlights and Discussion

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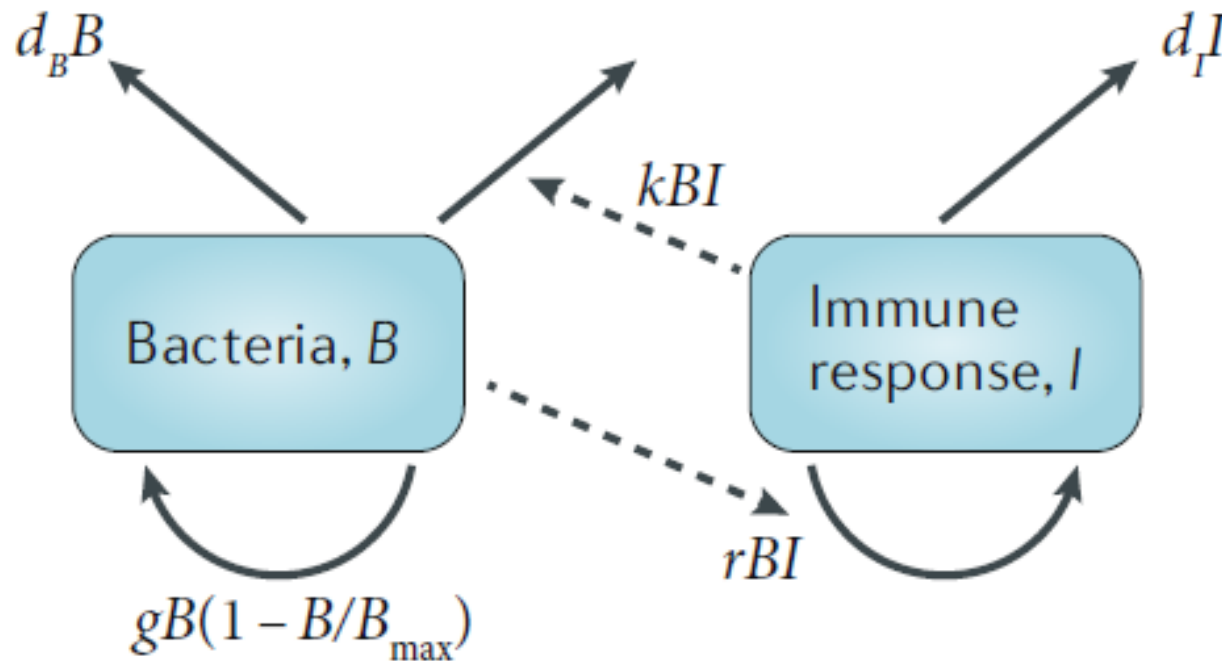
# Introduction

- I assume you watched the 2 lectures, here I'm giving a brief summary and touching on some of the highlights.
- I allocated most of the time for discussion/Q&A.

# Simulation models

- Are widely used in all areas of science.
- Are implementations of specific processes/mechanisms as a computer model.

Bacteria	$\dot{B} = gB\left(1 - \frac{B}{B_{max}}\right) - d_B B - kBI$
Immune Response	$\dot{I} = rBI - d_I I$



# Model type comparison

- Phenomenological/non-mechanistic/(statistical) models

- Look for patterns in data
- Do not describe mechanisms leading to the observed outcomes (data)

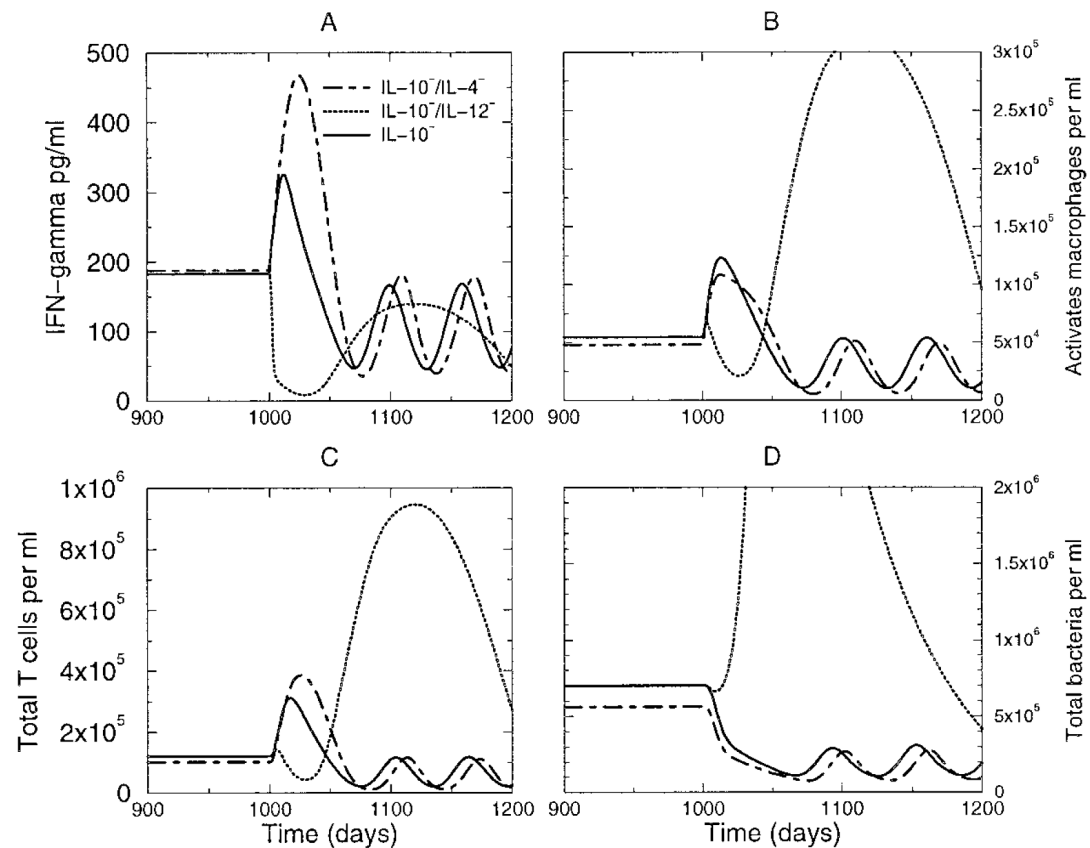
$$y = b_0 + b_1x_1 + b_2x_2 + \dots$$

- Mechanistic/process/simulation models

- Try to represent simplified versions of mechanisms
- Can be used without and with data (and then also become *statistical*)

# Simulation model uses

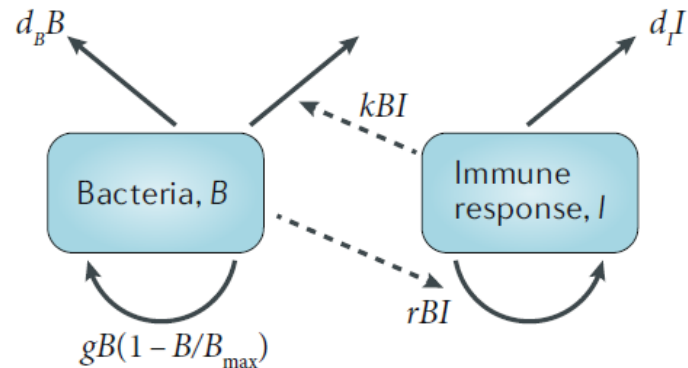
- Exploring the behavior of a system.
- Making predictions about the behavior of a system.
- (With data) Performing inference, testing hypotheses.



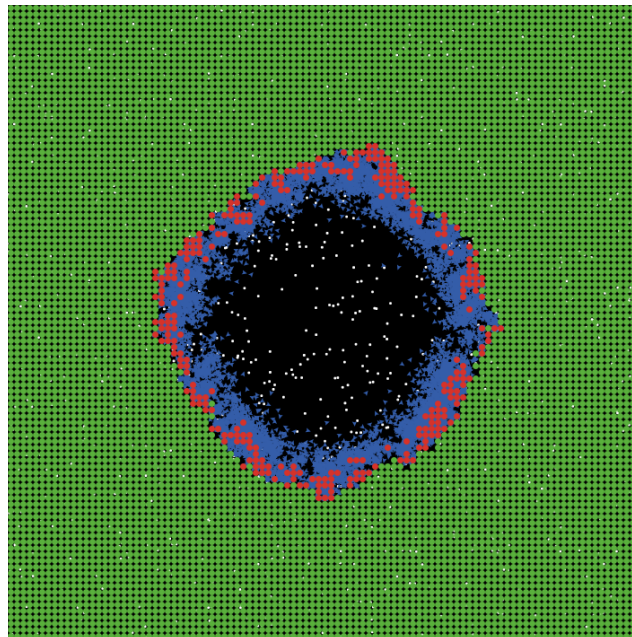
Exploring/predicting cytokine-based interventions for TB (Wigginton and Kirschner, 2001 J Imm)

# Simulation model types

- Compartmental models are the simplest and most widely used.



- Agent-based or network models are more detailed/complex.



Acute virus infection. (Handel et al 2009 J Roy Soc Interface)

# Discussion, Q&A, AMA

- Type in the chat or unmute and ask.