Research projects

Influenza (with Ian, Gilles, Bard, Frank Toapanta, Ted Ross)

- Modeling systemic immune response to IAV attack
- Model development & data calibration
- Extensive mouse data available
- Systemic response analysis (with Saishuai)

Wound healing (with Qi, Beatrice Riviere, David Hackam, Yoram)

- Cell migration during gut injury
- Elastic layer model (published)
- Extension to 2D
- Development of cell tracking algorithms

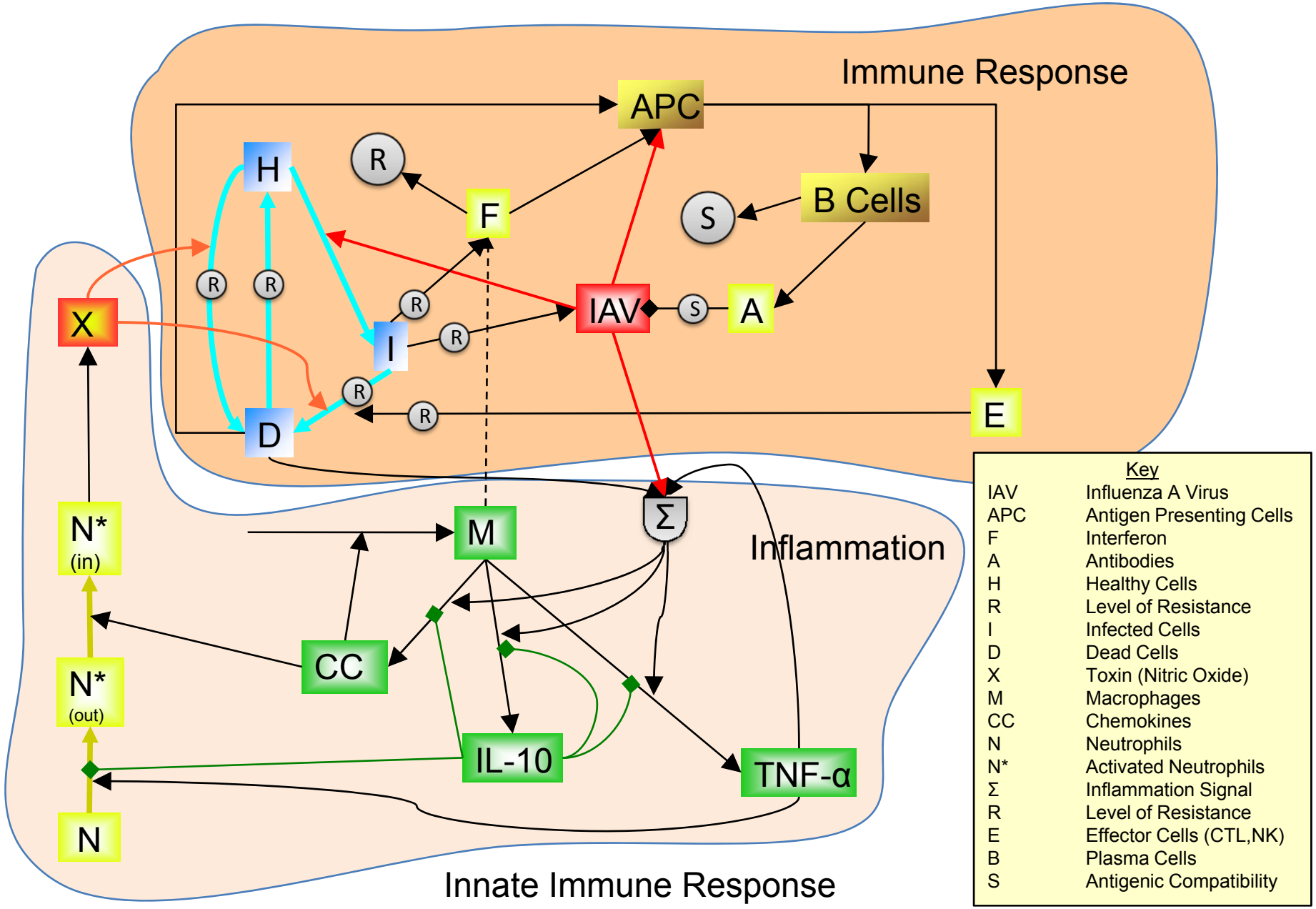
DNA elasticity (with Wilma Olson)

- Elastic model of macromolecular behavior – effect on gene regulation
- Effect of randomly binding bending proteins on elastic properties

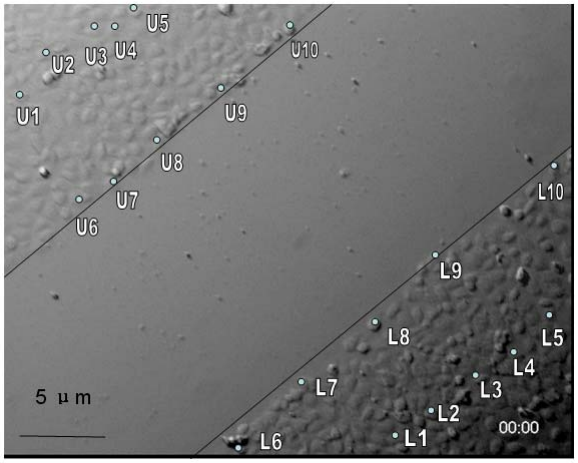
Dynamical properties of biochemical networks

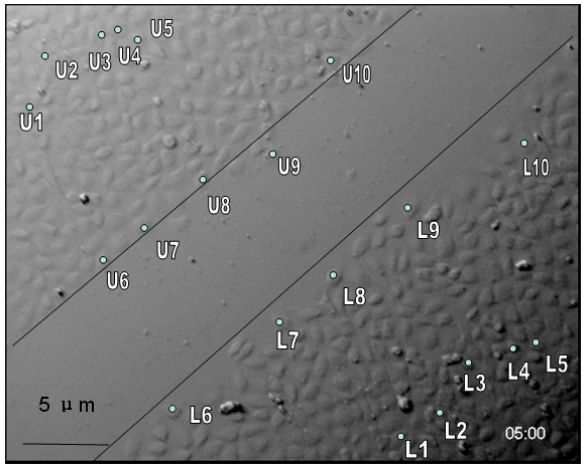
- Bistability, oscillations, influence of stochasticity, graph properties

Mammalian Response to the Influenza A Virus



t = 0 *t* = 5h *t* = 10h


U5
U2 U3 U4
U10
U1
U9
U8
L10
U7
U6
L9
L8
L5
L4
5 µm
L7
L3
L2
00:00
L6
L1


U5
U2 U3 U4
U10
U1
U9
L10
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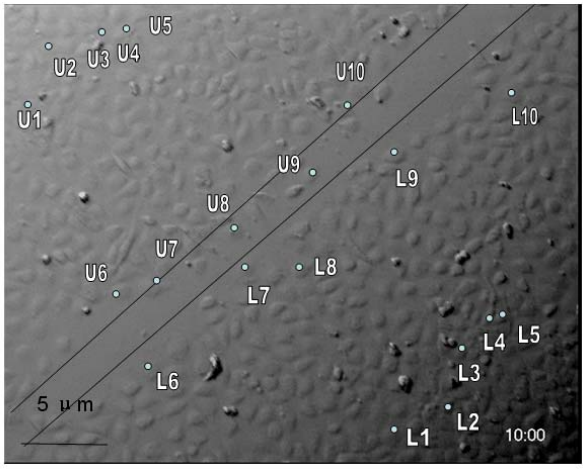
U7
U6
L8
L7
L4 L5
L3
5 µm
L6
L2
05:00
L1


U5
U2 U3 U4
U10
U1
L10
U9
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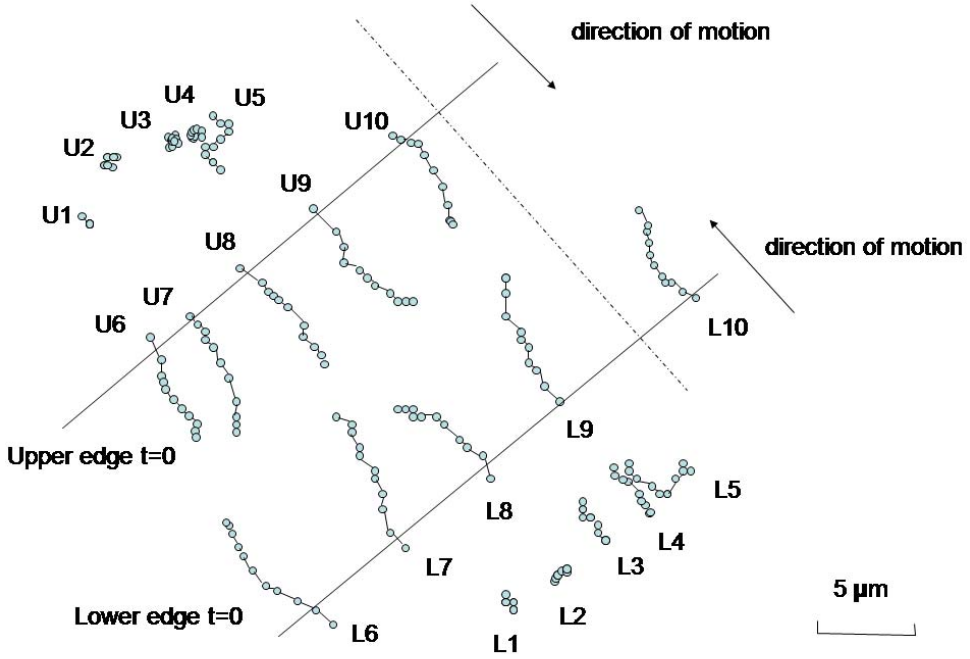
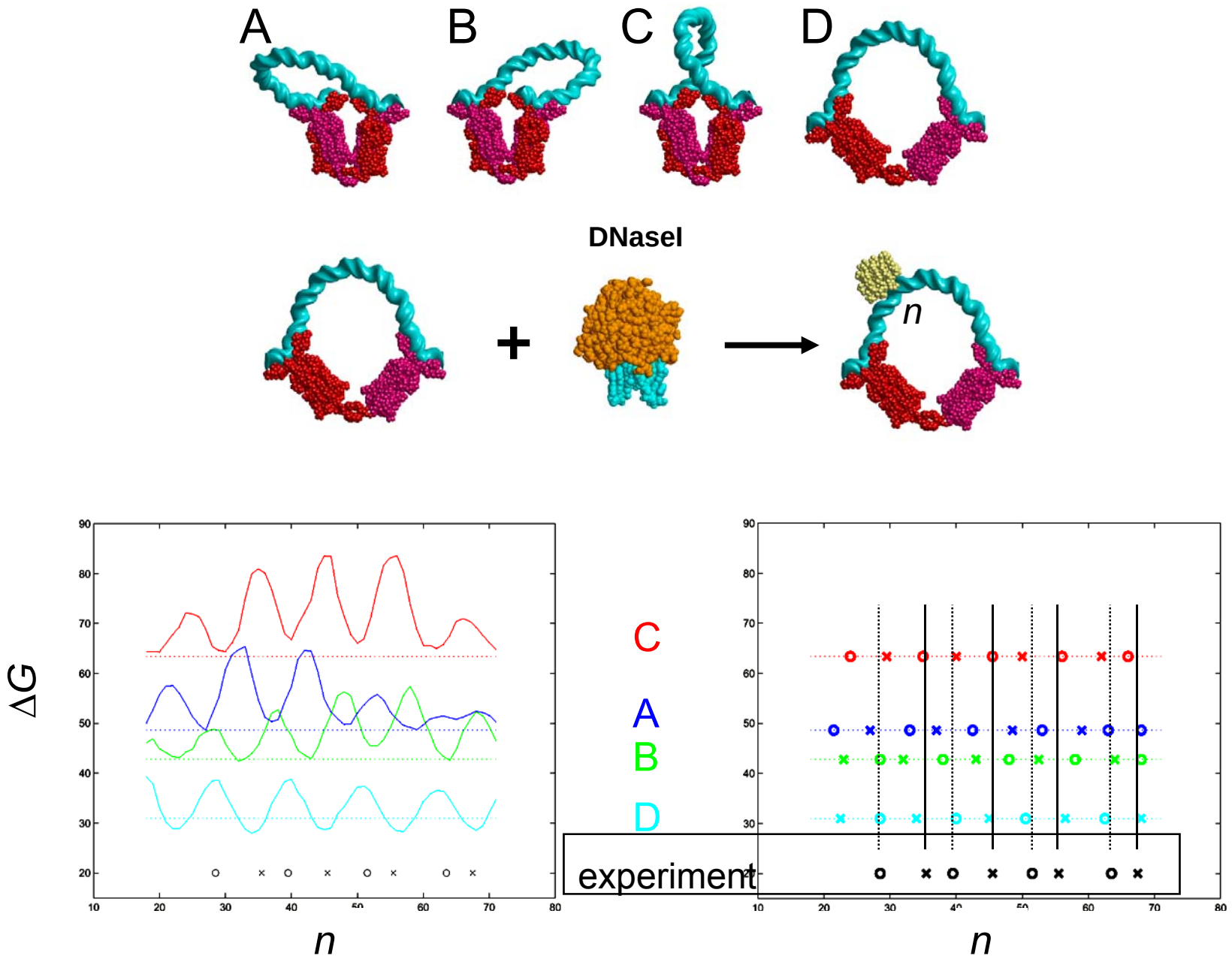
U8
U7
L8
U6
L7
L4 L5
L6
L3
5 µm
L2
10:00
L1


direction of motion
U4
U5
U3
U10
U2
U9
U1
U8
direction of motion
U7
U6
L10
L9
Upper edge t=0
L5
L8
L4
L7
L3
5 µm
Lower edge t=0
L6
L2
L1


A
B
C
D
DNaseI
n
ΔG
n
C
A
B
D
experiment
n

DNA with randomly bound bending proteins (HU)

• 126-bp DNA in the presence of HU
• HU placed randomly at each base pair with probability w = 0.0115
(~ 1 HU per 100 bp)