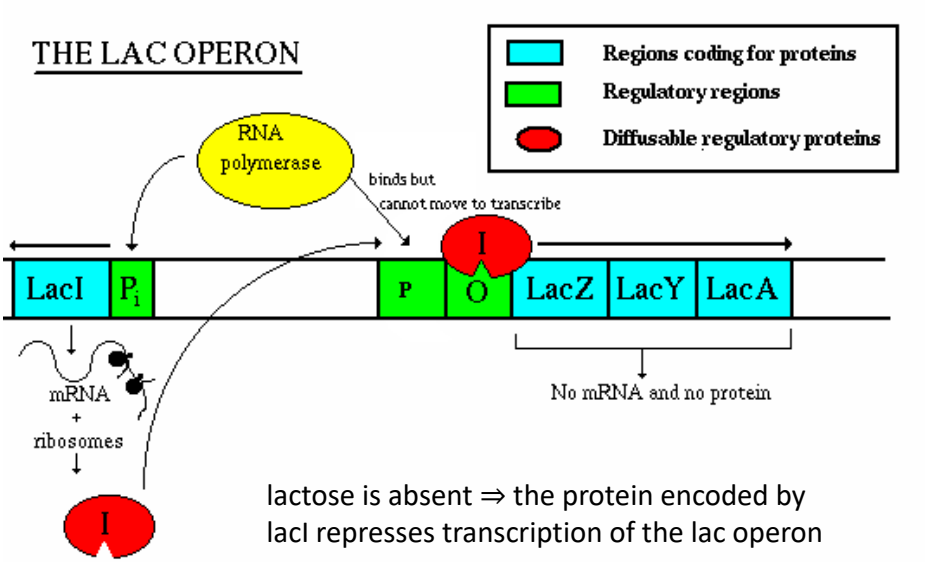
BMI/CS 576 – Day 2

- Today
  - Biological networks and data
  - More details of Python
- Next week
  - Sequence assembly – sequencing technology, fragment assembly, and graphs
- Day 1 & 2 notebooks due Sunday
- Pre-class material for next week available by Saturday
- Waitlisted students
  - Please see me today if you are still waitlisted
  - Should be able to get you in

Quiz



Consider the Lac operon gene regulatory network described in the video lecture. Suppose a mutant bacterium arose that had the LacI gene deleted (i.e., missing from the genome). In an environment where lactose is absent, compared to the non-mutant (which has the LacI gene), the rate at which the Lac operon is transcribed in the mutant will be

Higher!

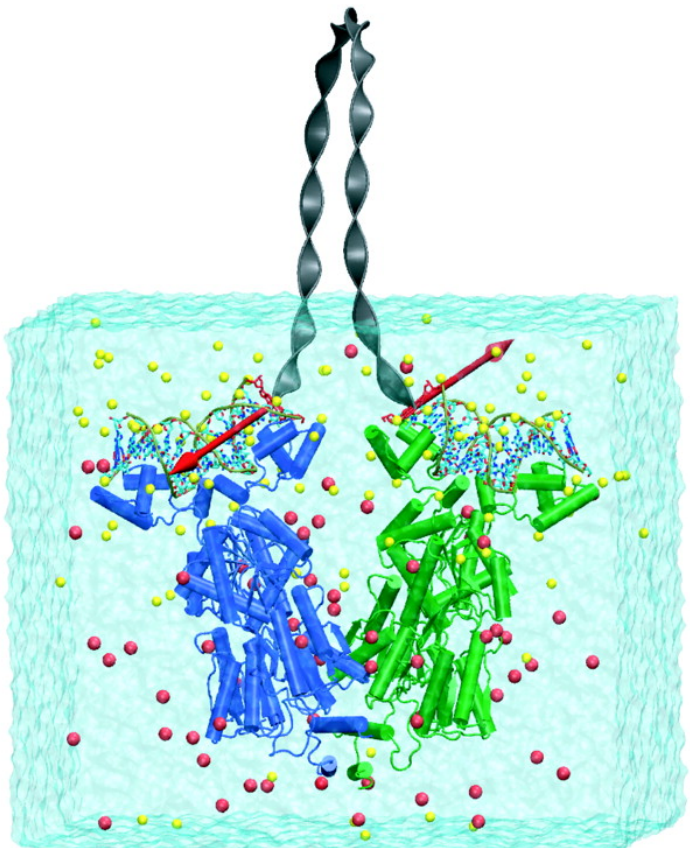
Muddiest points

- Again, great questions (and answers)
- Continued to be required for next week
- If your question was not answered
  - Feel free to pull an instructor aside during the class
  - Ask your neighbors!

Common questions

- More on networks
  - Will get to more examples in the network module
  - Algorithms for constructing networks from high throughput gene expression measurements
- Lambda expressions and keyword arguments
  - Don’t worry about these for now, we’ll practice in later weeks
- Do I need to remember the details of these networks?
  - NO!
  - But you need to understand the general principles of biological networks – regulatory networks in particular

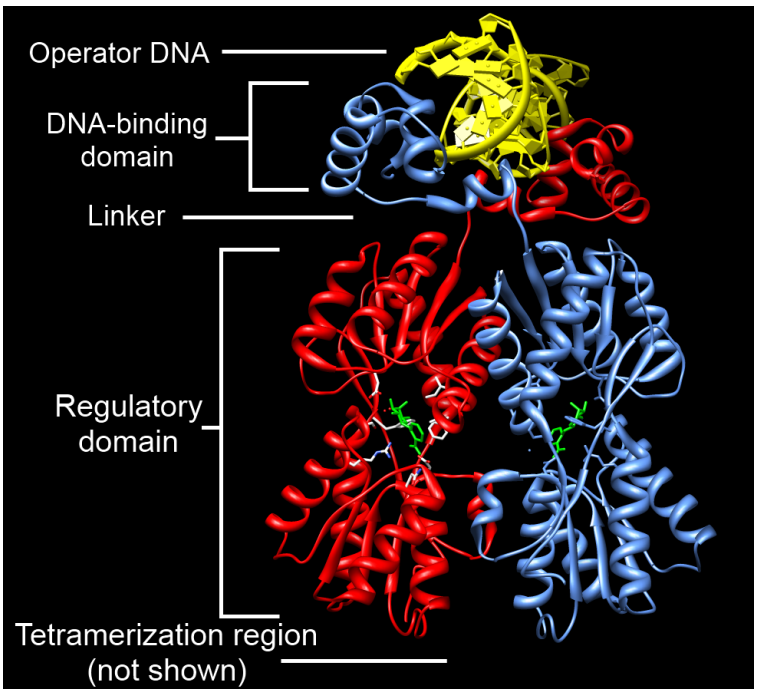
Binding of lacI protein to lac operon



- Four copies (two groups of two) of the lacI protein bind upstream of the lac operon
- Causes DNA to fold into a loop in that region
- Makes it difficult for RNA polymerase to start transcription in this region

Villa et al. 2005, PNAS

lacI (dimer) structure



- Binds an ”operator” sequence of the lac operon:

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5′ TGGAATTGTGAGCGGATAACAATT 3′
3′ ACCTTAACACTCGCCTATTGTTAA 5′
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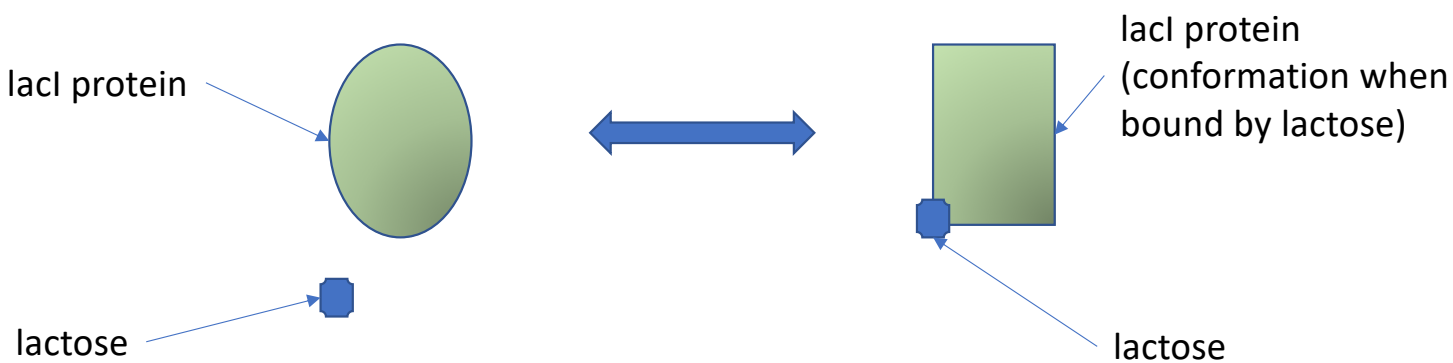
https://en.wikipedia.org/wiki/Lac_repressor

More on lacI



- rate of forming lacI bound to lactose depends on concentrations of lacI and lactose
  - More lactose -> more lacI bound by lactose
- Why is this advantageous to the organism?
  - Energy is not wasted on producing proteins (lactose-related) that are not needed
  - More energy can be spent on replicating
- Lac operon produces one mRNA via transcription which is then translated into three proteins (Z, Y, A)
  - All are related to lactose