

# Probing the Mechanical Properties of Single Copolymers of DNA

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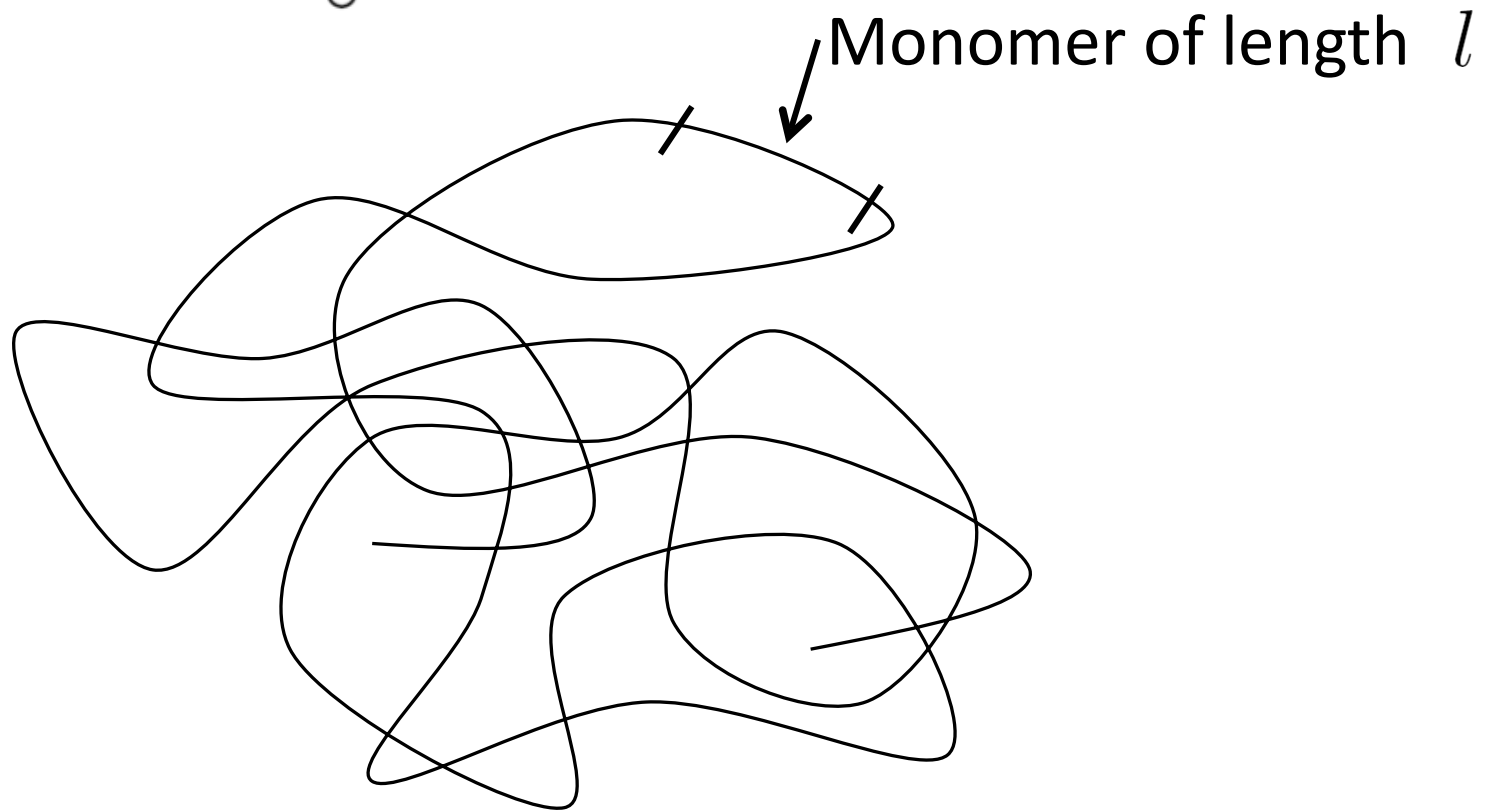
Professor Omar Saleh

How does a charged polymer of controllable stiffness respond to salt concentrations?

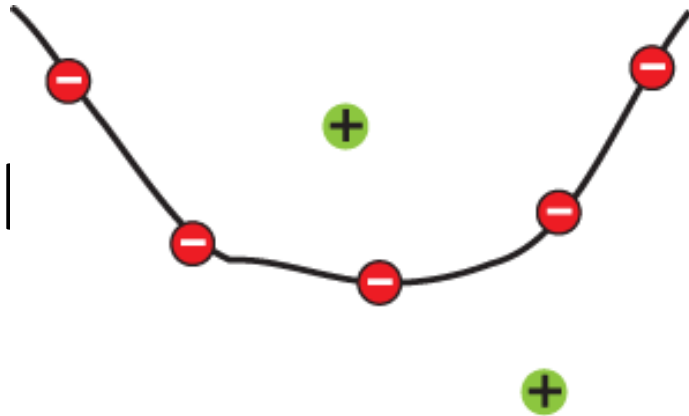
# Characterization of stiffness for a polymer

Polymers in solution follow a Random Walk with step size  $l$

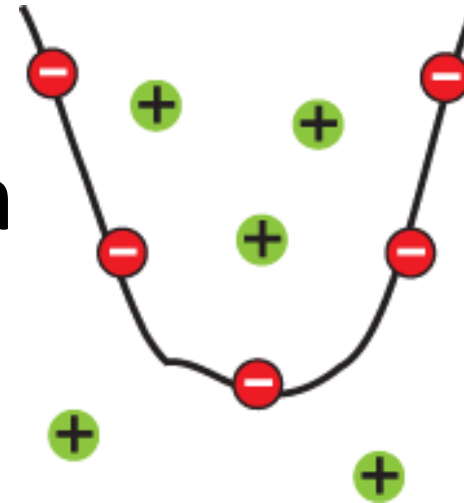
$$R_o \sim N^{1/2}l$$



Less Salt:



More Salt:



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ner?

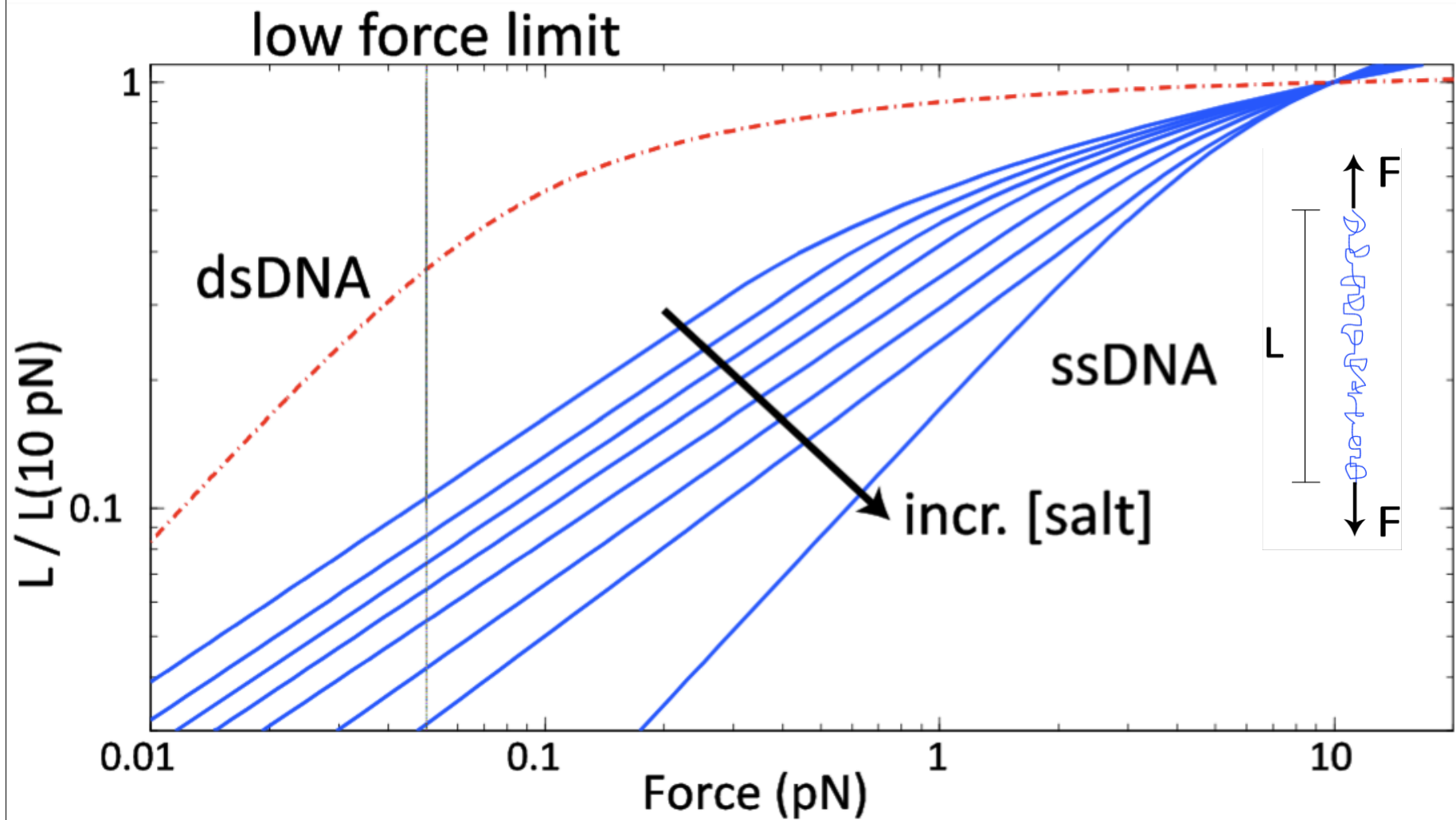


DNA is a charged polymer

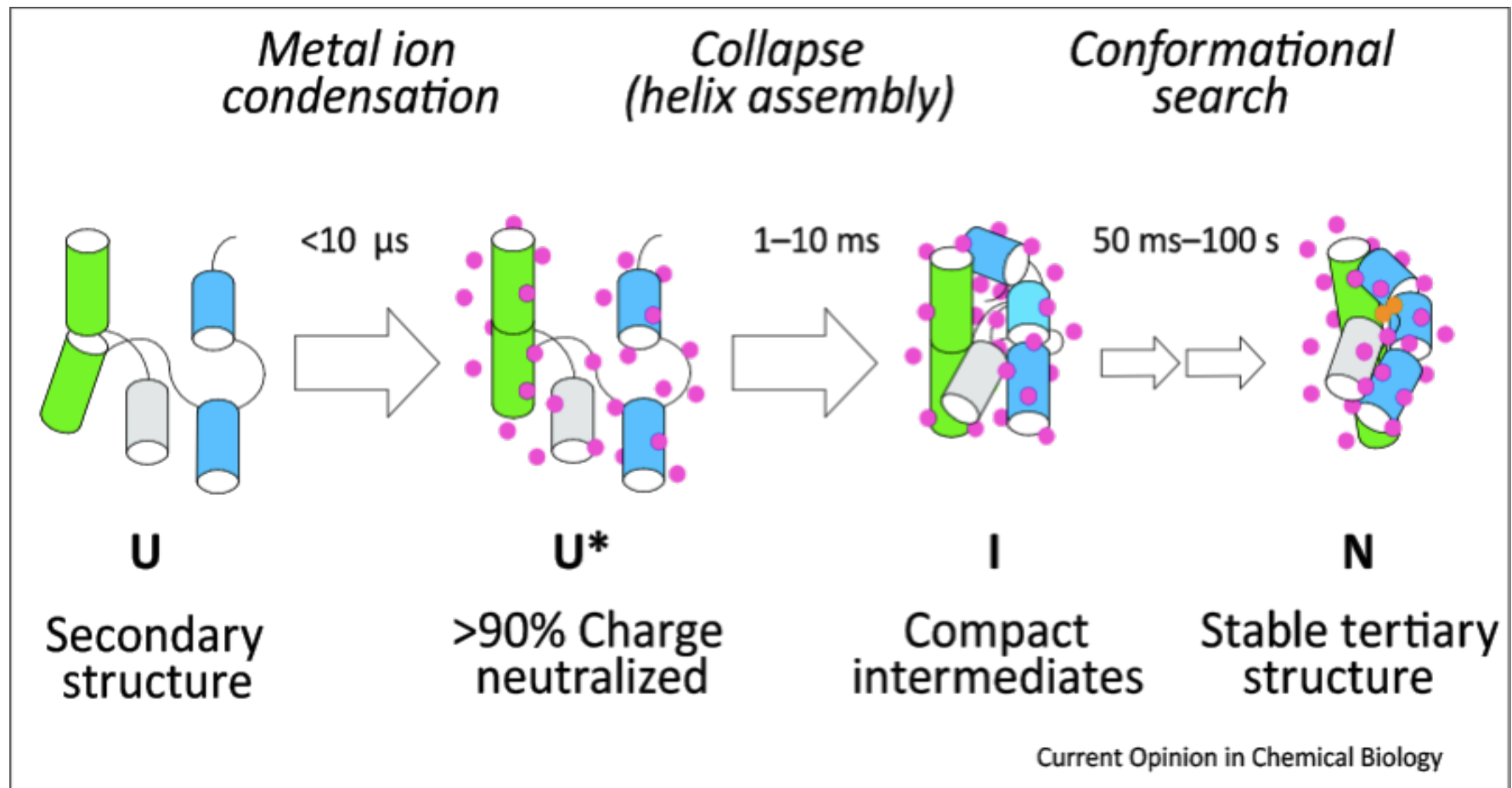
Physiological conditions:

150 mM KCl and 5 mM MgCl

How does a polymer of intermediate stiffness

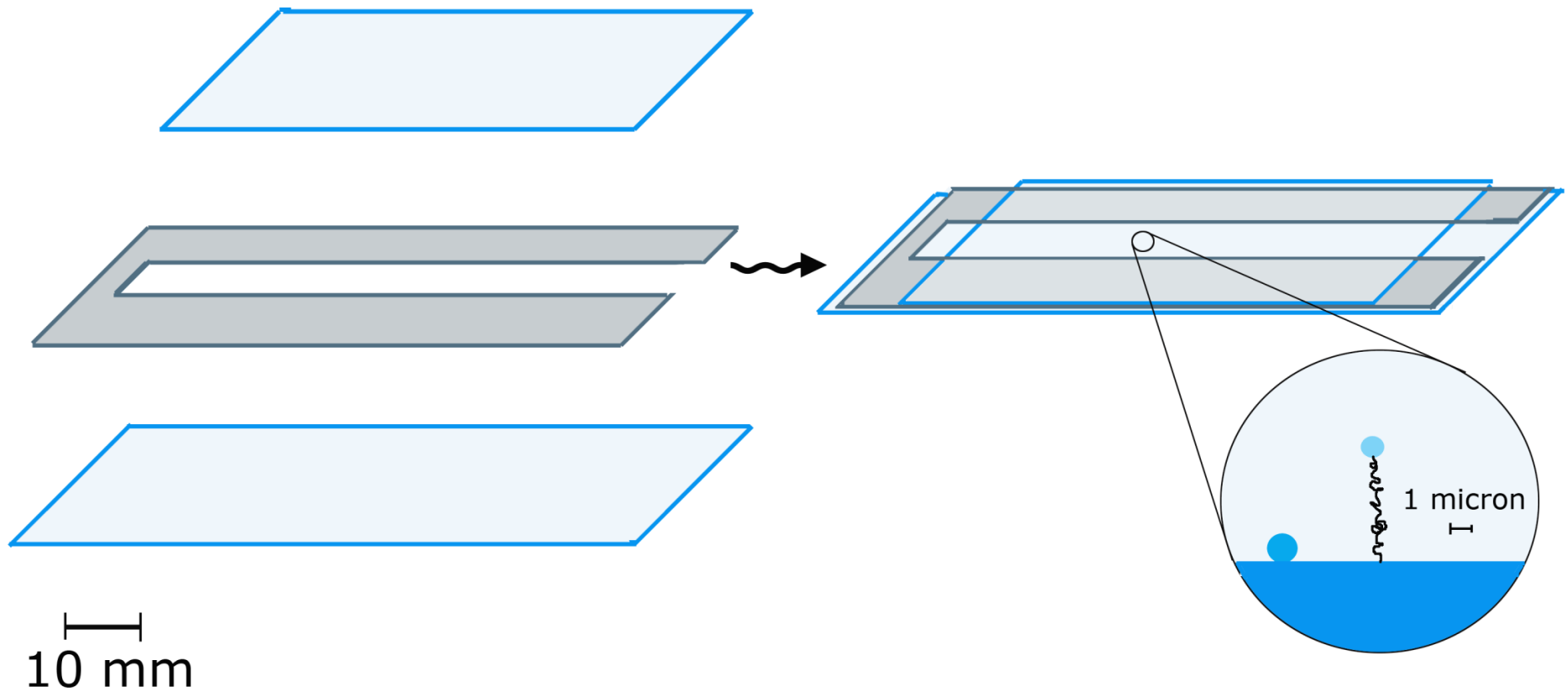


# RNA folding relies on polymer-salt ion

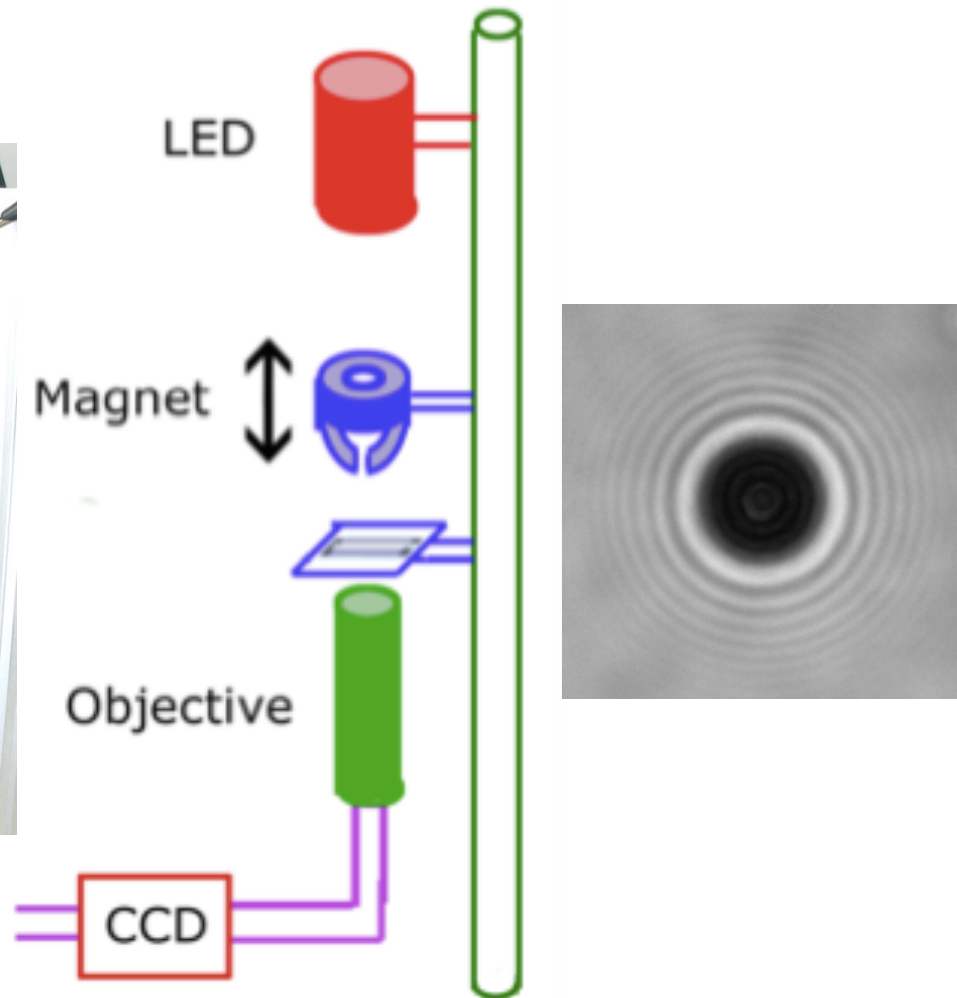
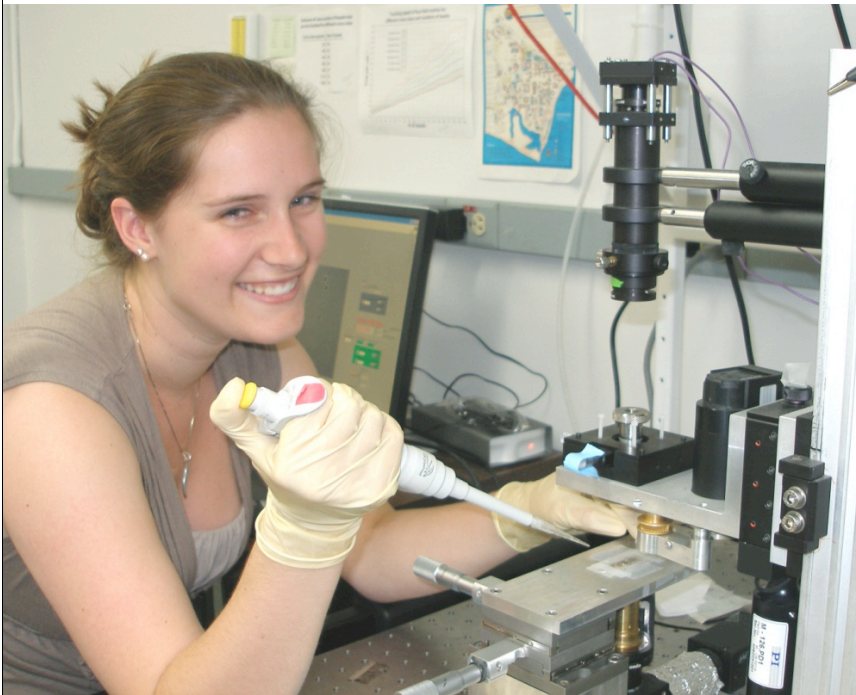


S. A. Woodson, Current Opinion in Chemical Biology (2005)

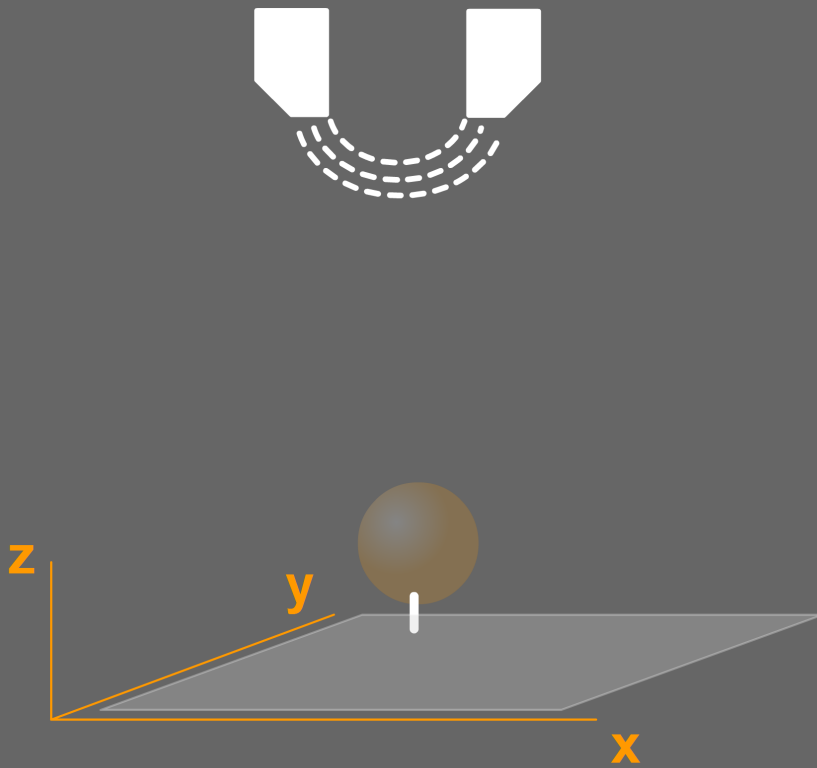
# Flow Cell protects DNA and enables



# Magnetic Tweezers apply force and

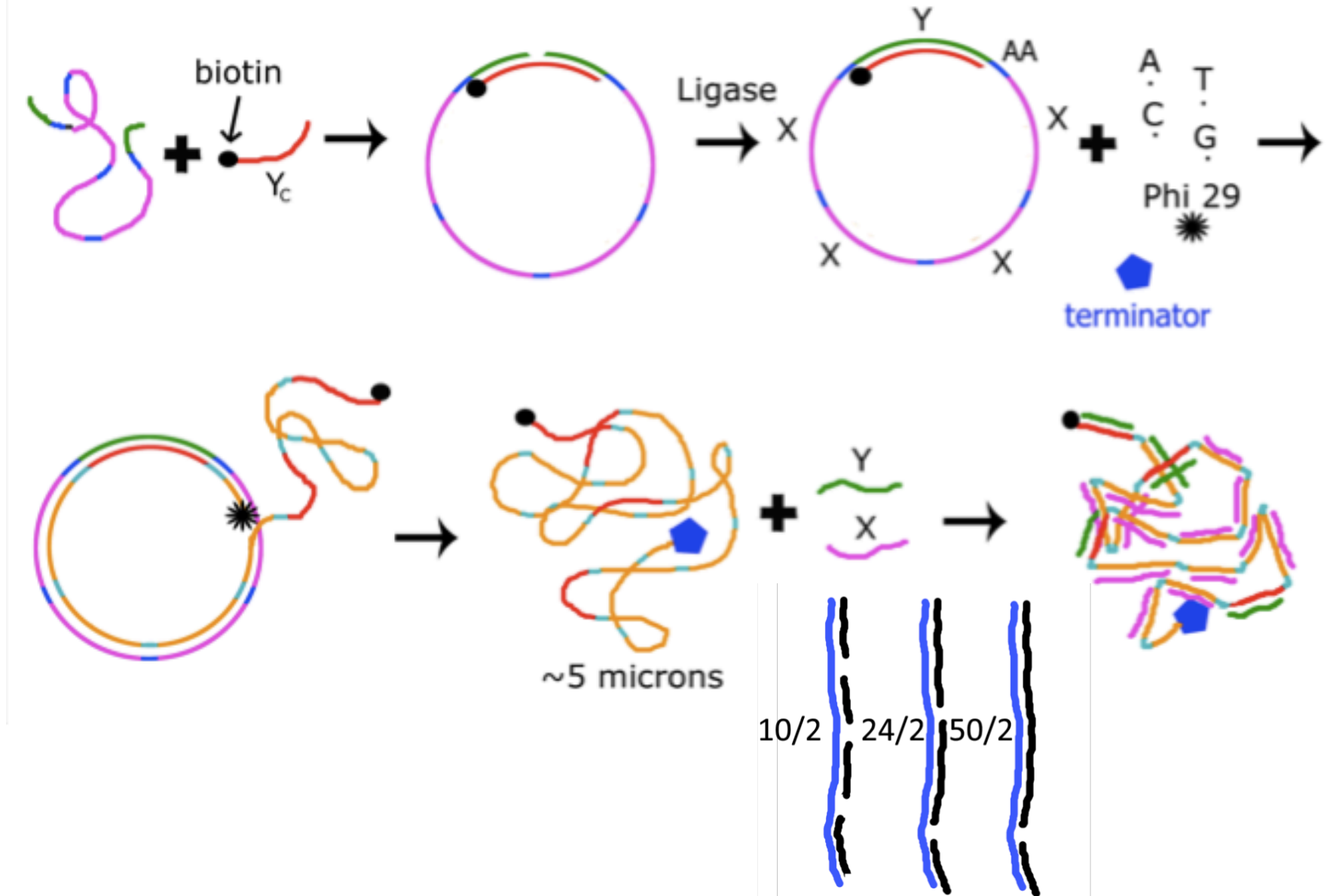




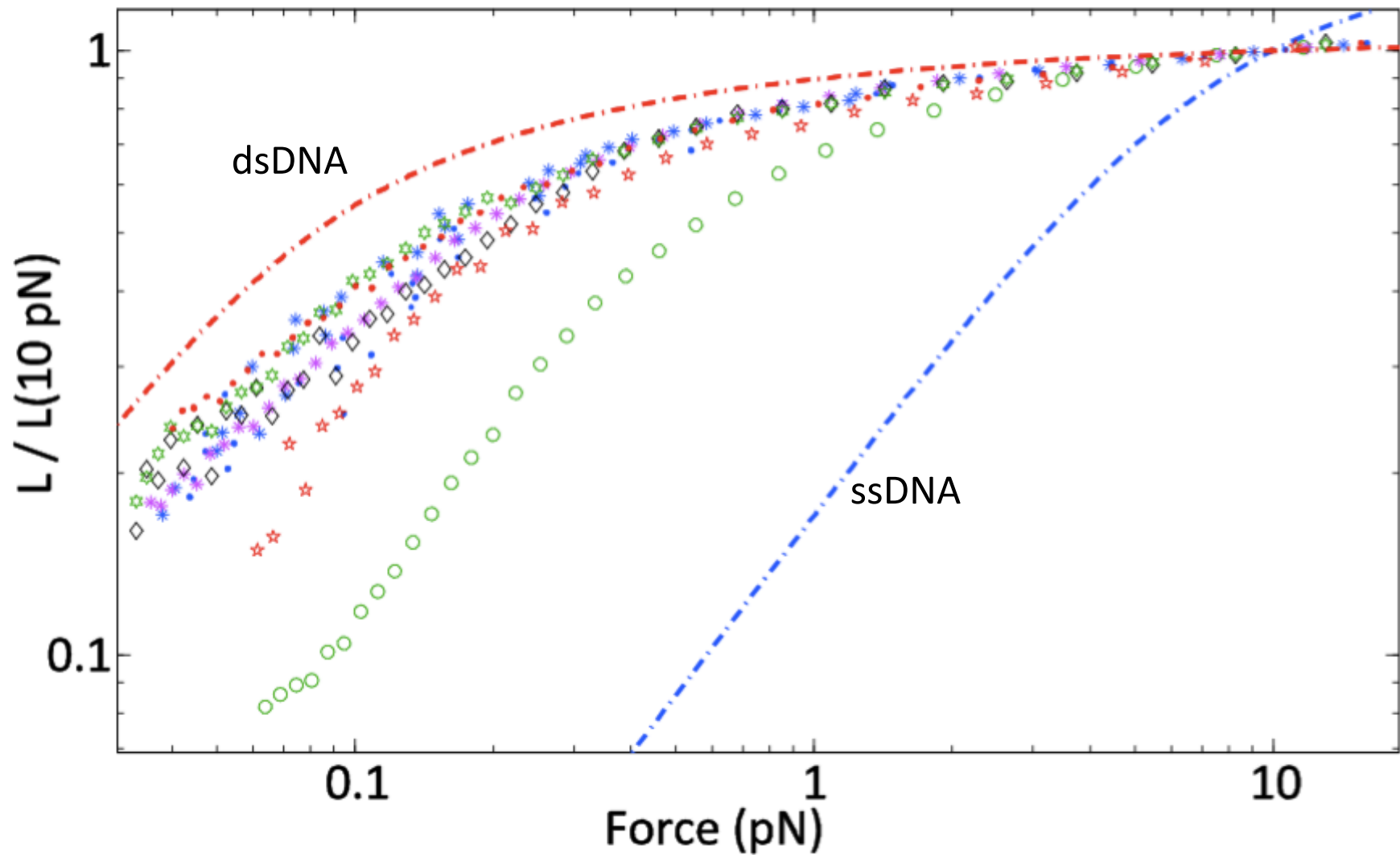


press "space"

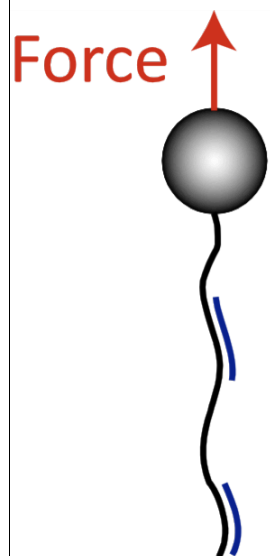
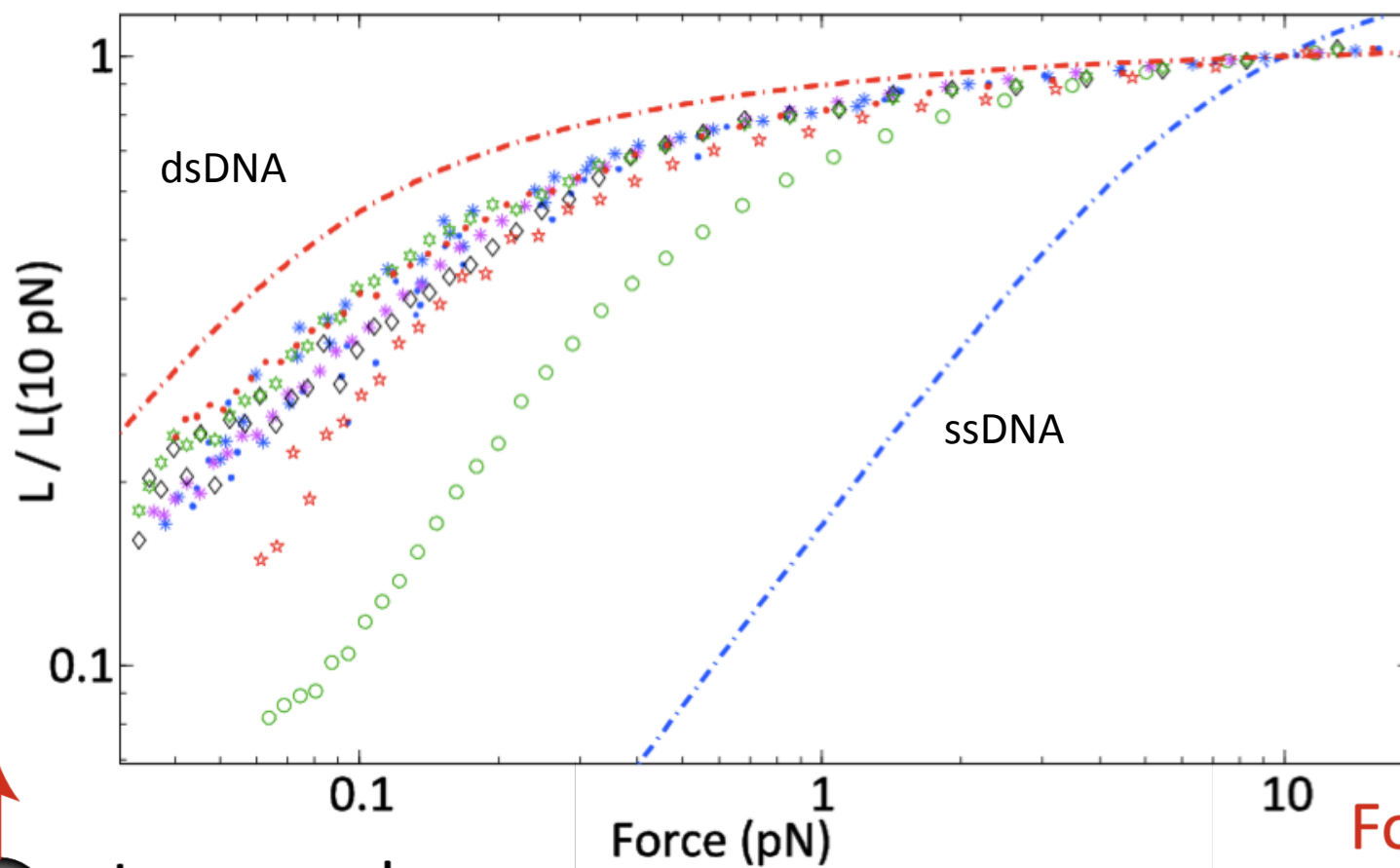
# Creation of Copolymer of DNA



# 50/2 copolymer displays intermediate

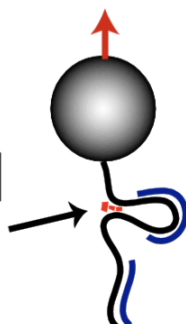


50/2 3M NaCl



Improperly  
Annealed

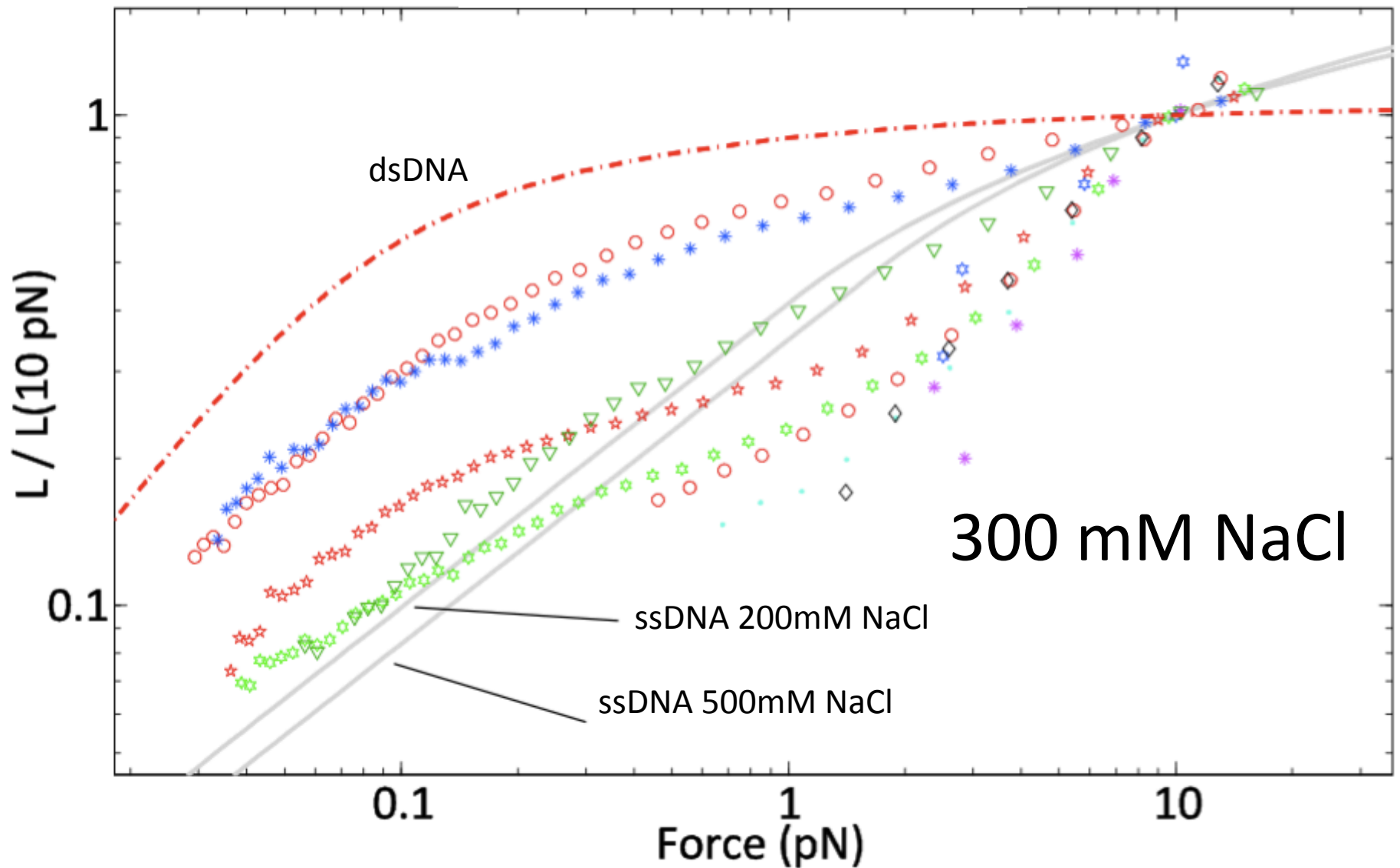
Bound  
Bases



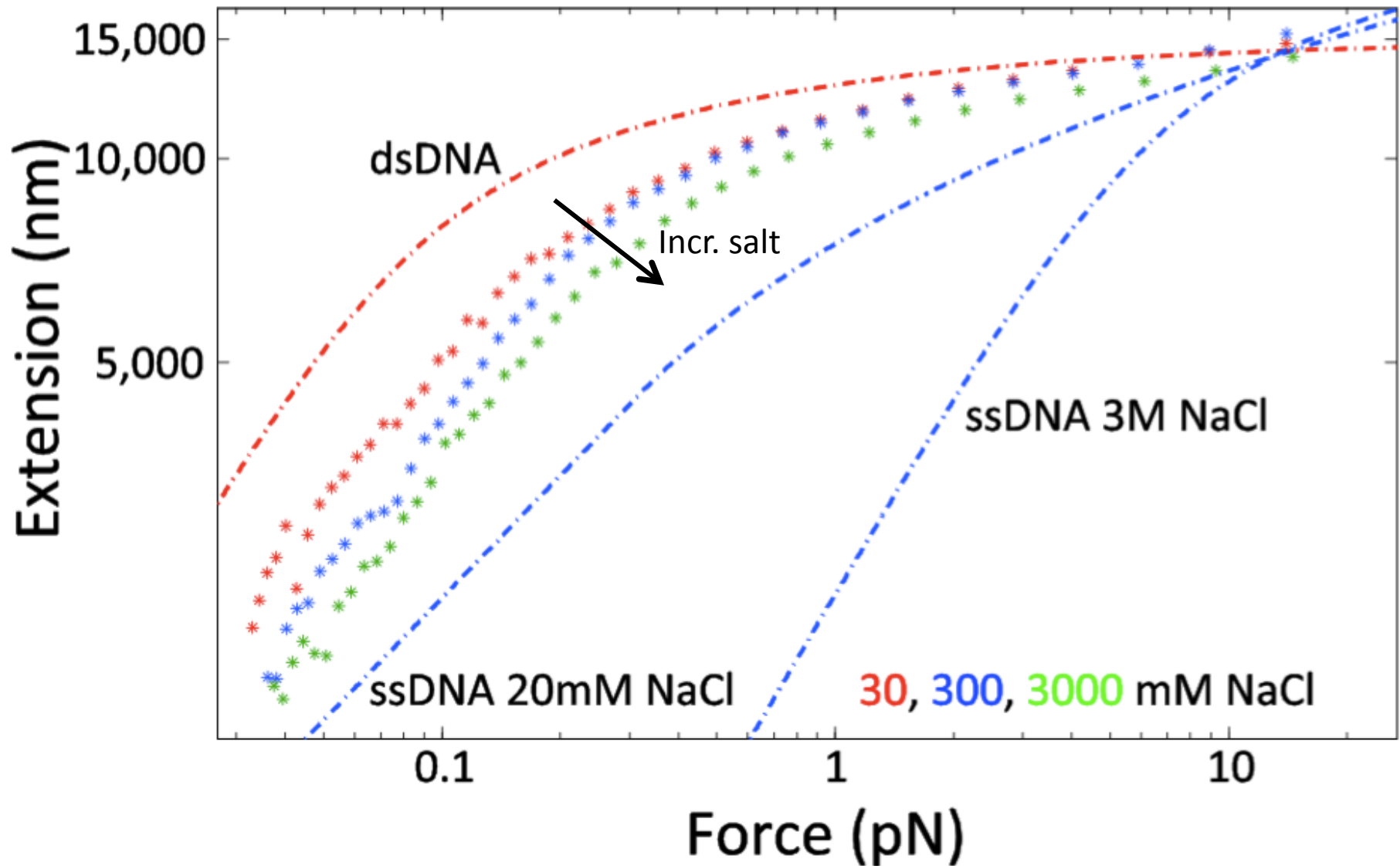
Fully  
Annealed



# Annealing proves to be more difficult



# 24/2 copolymer exhibits moderate salt



# Conclusion

- We successfully synthesized block copolymers of DNA.
- Tests show that our polymer has intermediate stiffness between ssDNA and dsDNA.
- Copolymer flexibility increases with salt.

# Future Work

- Vary ssDNA section while holding dsDNA section constant
- Find better annealing conditions
- Develop a system to quantify a polymer's salt dependence

# Acknowledgments

- Saleh Group
- Worster Fellowship