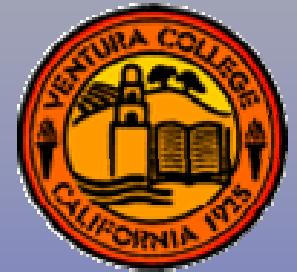


# Effects of pH on DNA Synthesis During Development of Sea Urchin Embryos



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# Why study the effects of pH on DNA Synthesis?

- $\text{CO}_2 + \text{H}_2\text{O} \rightarrow \text{Carbonic Acid}$
- Industrial Revolution  $\rightarrow$  Levels of  $\text{CO}_2 \uparrow$
- Oceanic pH changed from 8.16 to 8.05 in the last 200 years
- Conservative models predict ocean pH could drop as much as 0.4 units globally by 2100

# Research Goals

- Look at early life stages of sea urchin embryos.
- Observe the cell cycle and cleavage rates
- Search for any effects that pH may have on DNA synthesis.

Better understanding on cell cycle progression and embryogenesis

# Research Outline

- Part 1:
  - In-vitro Fertilization of sea urchin eggs
  - Change of pH in sea water to observe any stop in cleavage
- Part 2:
  - Tag DNA and test for DNA synthesis

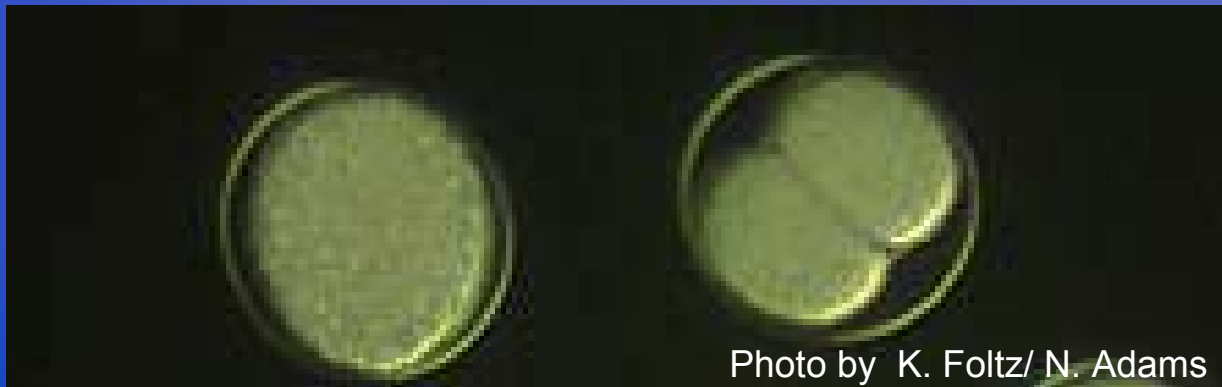
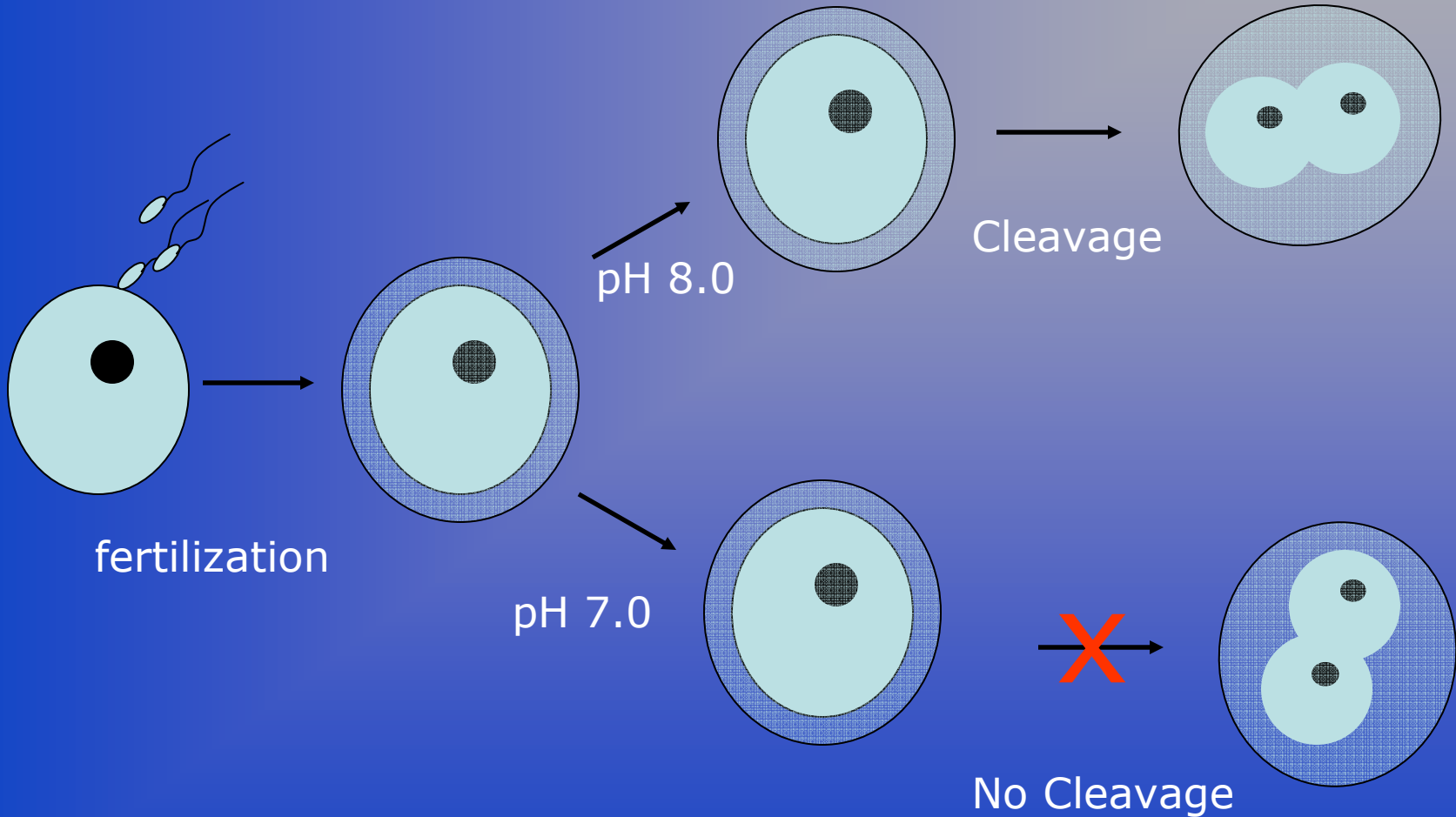


Photo by K. Foltz/ N. Adams

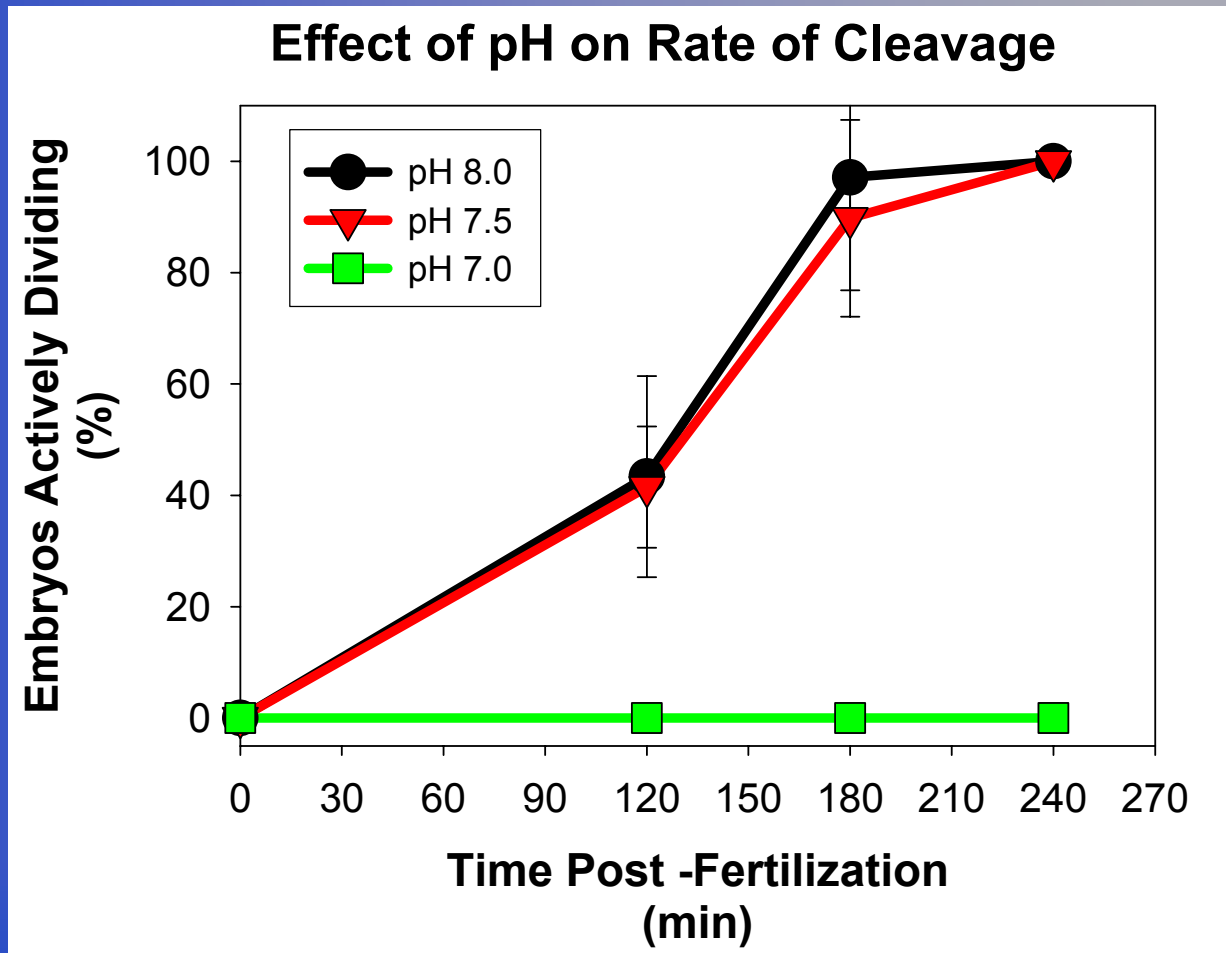
# Experimental Design



# Cleavage



# Experimental Results



# Research Outline

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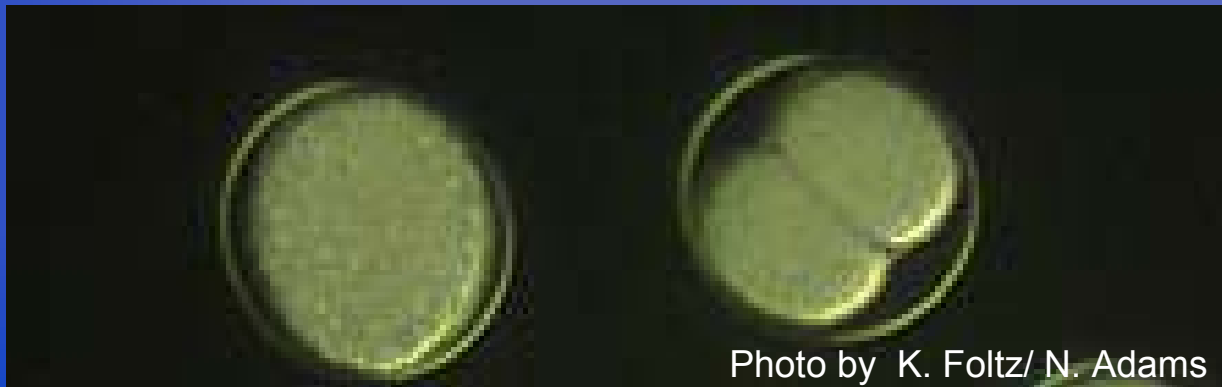
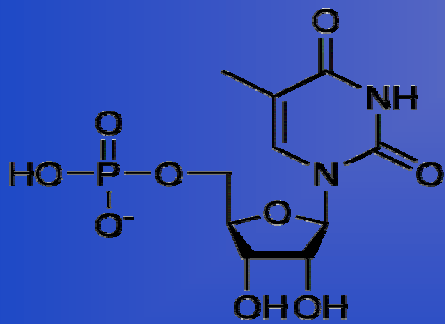
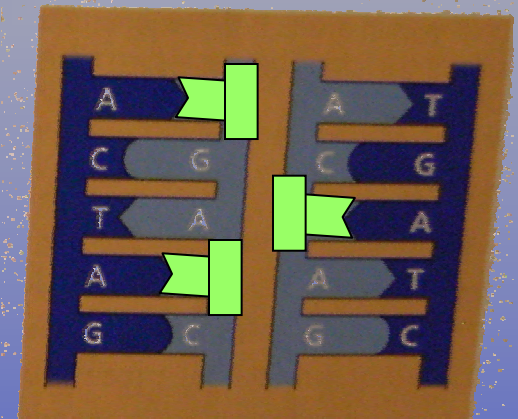
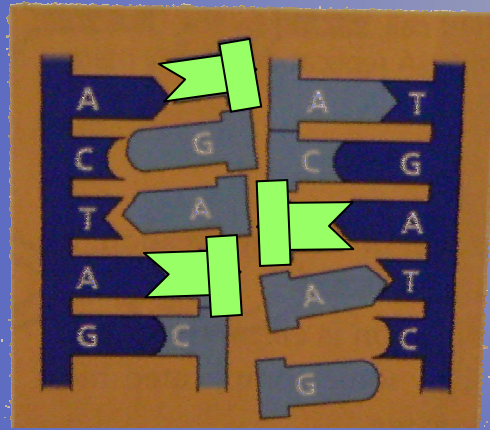
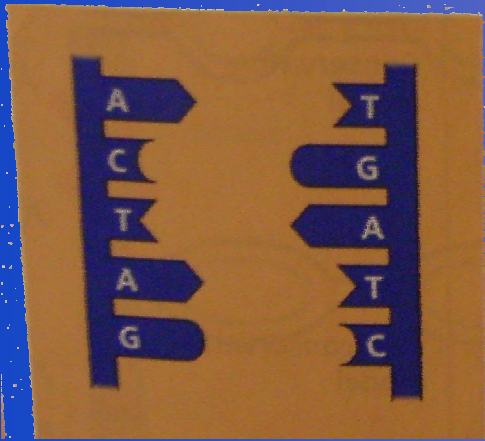


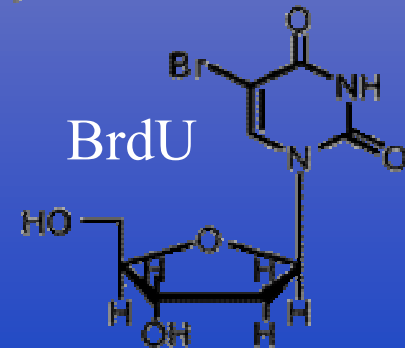
Photo by K. Foltz/ N. Adams



# How does the tagging work?

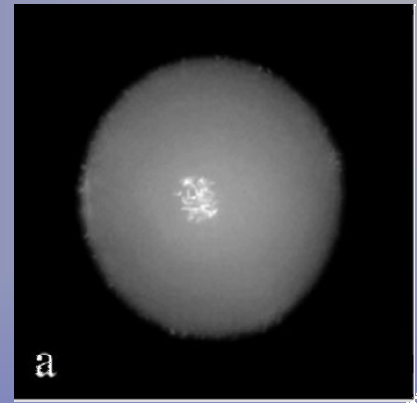
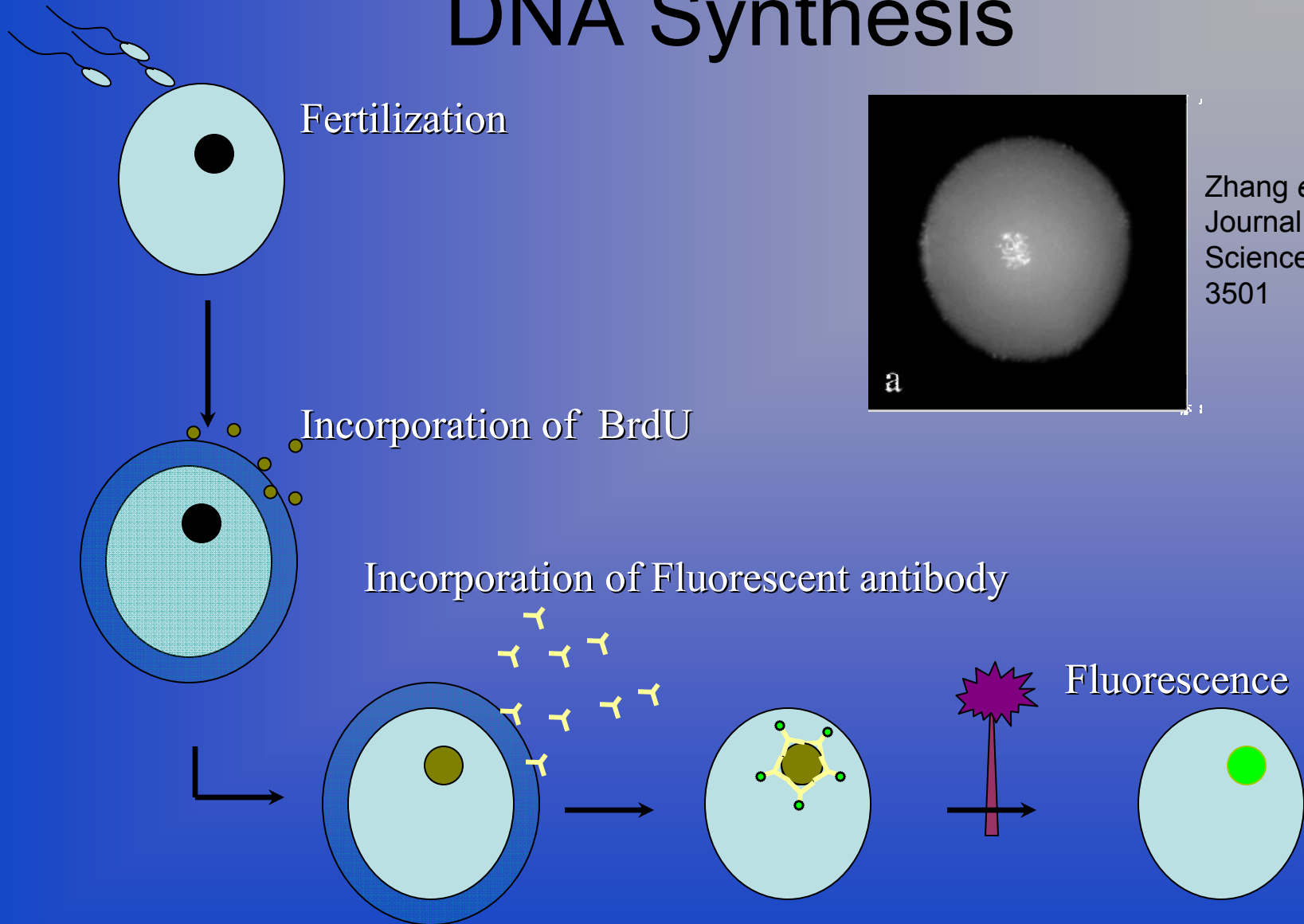


Thymidine



BrdU

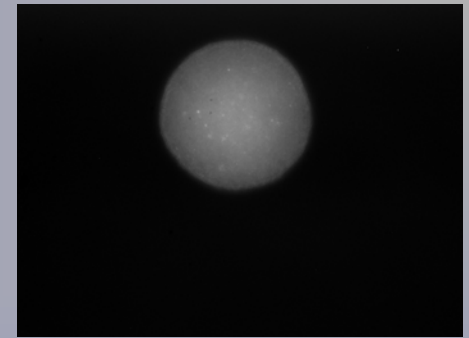
# Incorporation of BrdU to Detect DNA Synthesis



Zhang *et al.*, 2006  
Journal of Cell  
Science 119, 3491-  
3501

# Results for DNA Synthesis

- Preliminary results show that a pH of 7.5 does not inhibit DNA synthesis
- Experiments are currently underway to assess the inhibition of DNA synthesis at pH 7.0



Unfertilized



pH 8.0



pH 7.5

# Conclusion

- pH has a significant effect on development of sea urchin embryos.
- pH 7.5 no statistically significant effect on development
- Appears to slow down cleavage rate with no effect on DNA synthesis
- pH 7.0 completely blocks cleavage
- Possibility of multiple cellular pathways are being affected

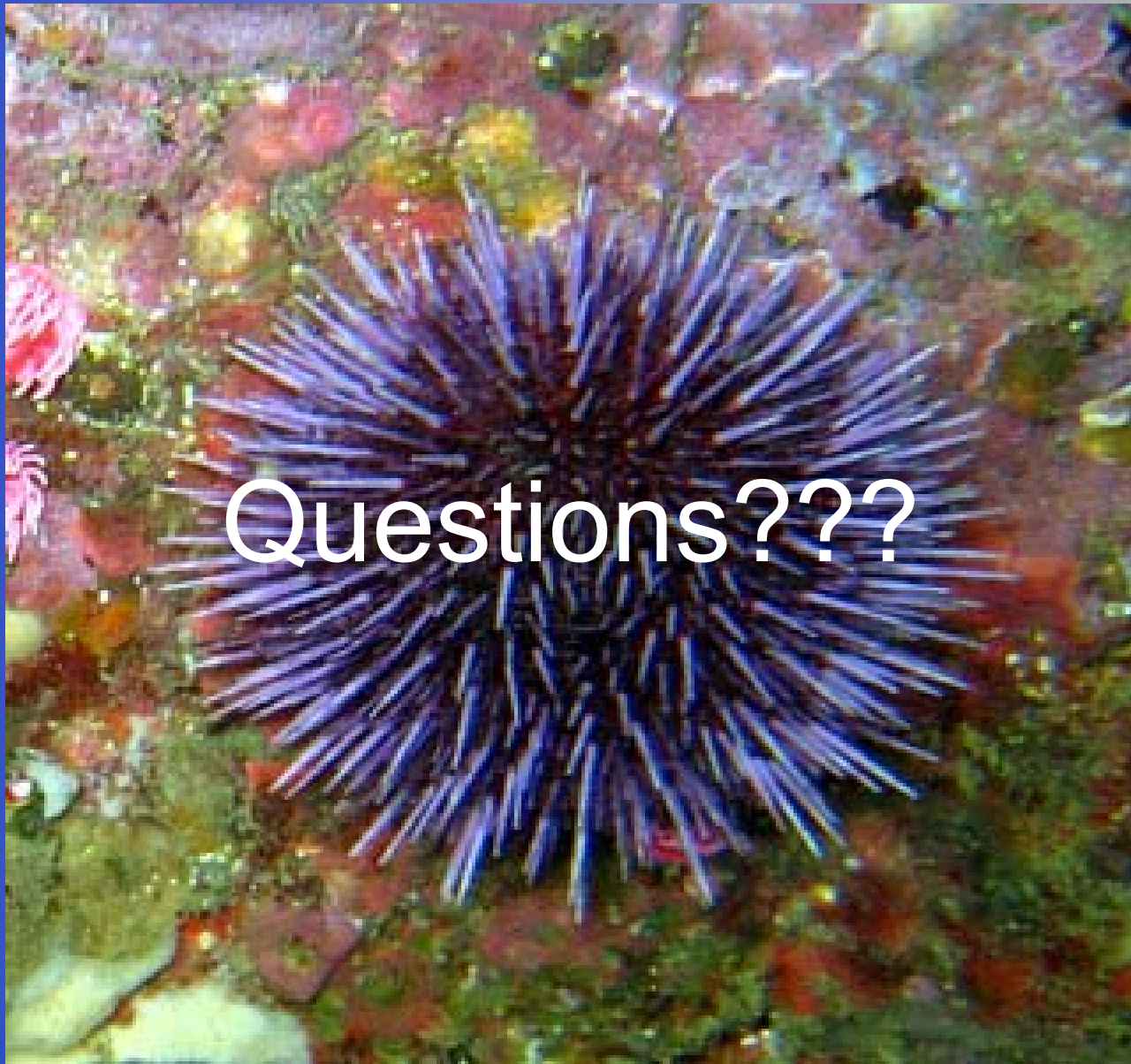
# Future Work

- Assess urchin development on a more narrow range of pHs
- To investigate what other effects a low pH has on the cell cycle.

# Acknowledgements

- Dr. Sean P. Place
- Dr. Kathy Foltz
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- Dr. Nick Arnold
- Special thanks to Samantha Freeman
- All the INSET Group





[www.smbaykeeper.org/.../Purple-sea-urchin.jpg](http://www.smbaykeeper.org/.../Purple-sea-urchin.jpg)

