

# Case Studies in Teaching Science

The use of a story to deliver an educational message.

# Why bother?

- Another form of active learning & class flipping.
- Case studies are well-established as effective.
- Integrates 'real world' problem-solving/critical thinking.
- Facilitates 'soft skill' building.

## Types of case studies

Interrupted Case - progressive information & discussion

Content Case - center on important concept

Trigger Case - beginning of module/course section

Capstone Case - end of module/course section

Journal Case - take paper and turn into case study

Analysis Case - look at historical example

Decision Case - decide what to do to solve dilemma

Directed Case - closed-ended questions

Clicker Cases – student answer/voting using clickers in class

## Content available online:

Enduring Legacies Native American Case Studies: <http://www.evergreen.edu/tribal/cases/>

Science Case Studies U Buffalo. Has about 600 cases in math and sci:

[sciencecases.lib.buffalo.edu/cs/](http://sciencecases.lib.buffalo.edu/cs/)

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Biotech Simulation Cases (chem, biol): [www.caseitproject.org](http://www.caseitproject.org)

General Science (Investigative Case Studies in Bio, Phys, Chem): [bioquest.org/icbl/cases.php](http://bioquest.org/icbl/cases.php)

Links to many different websites: [sciencecasenet.org/](http://sciencecasenet.org/)

Emory University (mostly K-12 and not peer reviewed): <http://www.cse.emory.edu/cases/>

UCLA Statistics: <http://www.stat.ucla.edu/cases/>

SHiPs Science Teacher Resources <http://www.shipseducation.net/>

# Useful references

Prud'homme-Généreux, A. 2016. Writing a Journal Case Study. *Journal of College Science Teaching* 45.6: 65-70.

Herreid, C.F., Schiller, N.A. and Herreid, K.F., 2014. *Science stories you can count on: 51 case studies with quantitative reasoning in biology*. NSTA Press.

# Journal Case Study – Miller's Amino Acids from Inorganic Molecules

NATIONAL CENTER FOR CASE STUDY TEACHING IN SCIENCE

## The Spark of Life: *Where Did Organic Molecules Come From?*

by

Annie Prud'homme-Généreux, Nicole F. Magill, and Tatiana N. Bliss

Life Sciences

Quest University Canada

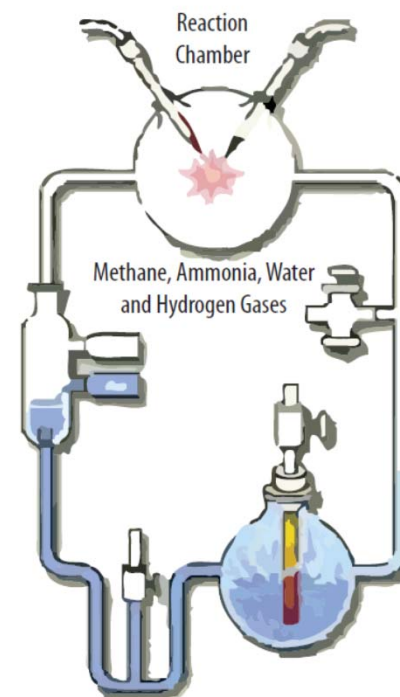


Figure 1. Stanley Miller's experimental set-up.

# Case of the Mystery Salmon – BIOL 105

Mary Koyuk is a UAS student who often trades food she harvests with her neighbors, family, and friends. .... She grew a bit concerned that Jim might have mistakenly given her fillets that were not the king salmon she anticipated.

What steps should Mary take to determine whether she received king salmon filets from Jim?



- Describe the relationship of cells, chromosomes, and DNA
- Understand DNA replication and mutation.
- Design experiments to isolate and compare filet DNA to control(s).
- Predict and interpret results of DNA experiments.

# Case of the Mystery Salmon – BIOL 105

What steps should Mary take to determine whether the filets she received are kings?

Where is DNA located?

How would you isolate and extract it?

--Students extract salmon DNA.

How would you determine whether Mary's filets contain king salmon DNA?

--Students set up experiment w/ positive and negative controls.

--Students cut and visualize filet DNA and compare to known salmon DNA.

Did Mary get the filets she was promised?

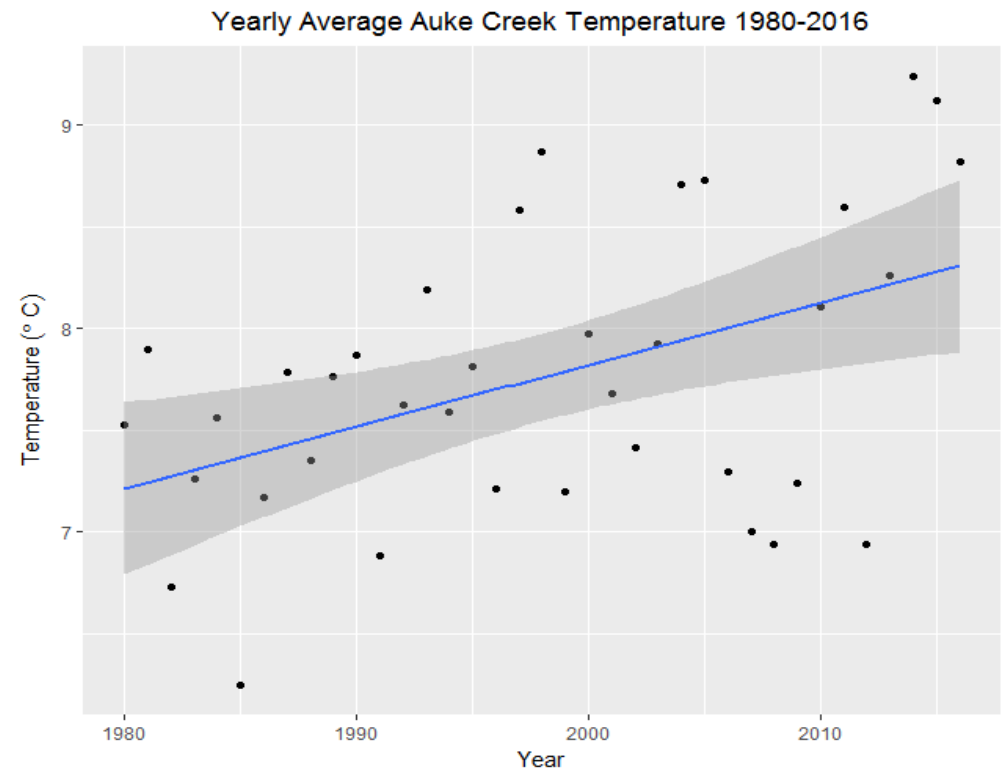
--Students discuss DNA applications and biotechnology strengths/limitations.



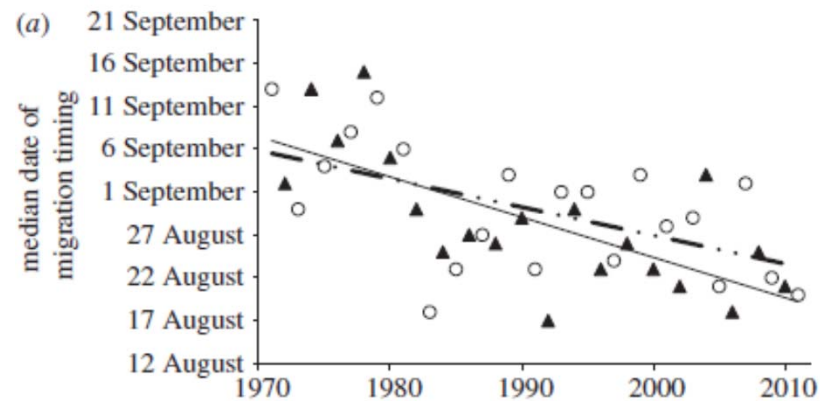
# Interrupted Case Study – The Shifty Salmon and Trout of Auke Creek



Alaska Department of Fish and Game (ADFG) Biologist Esther Aproblem is charged with ensuring that salmon in Southeast Alaska are harvested at a rate that maximizes harvest by commercial, sport, and subsistence users without compromising the long term health of these species and populations.



# Is change in run timing genetic or plastic? Which evolutionary forces might be responsible?



Interpret figs.  
Design experiments.  
Identify and tease-apart  
evolutionary forces.

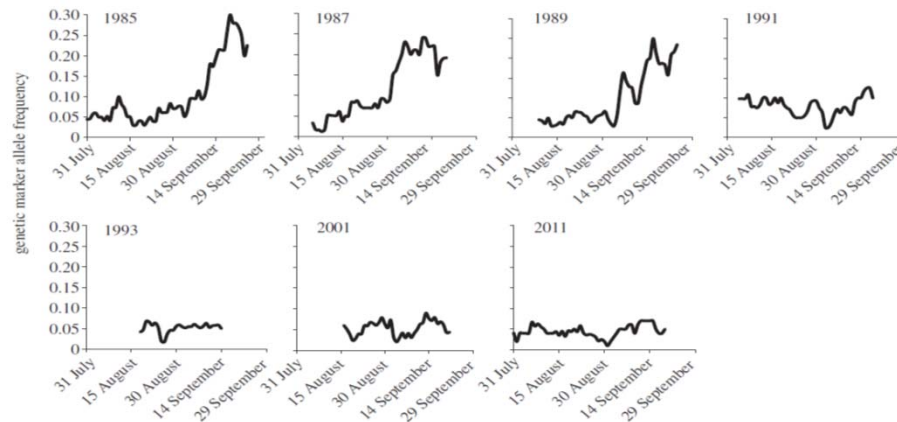
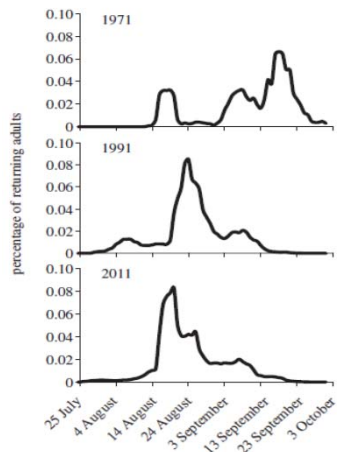


Figure 4. Five-day running averages of the frequency of the late-migration marker allele (LMMA). 1983 is not included

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