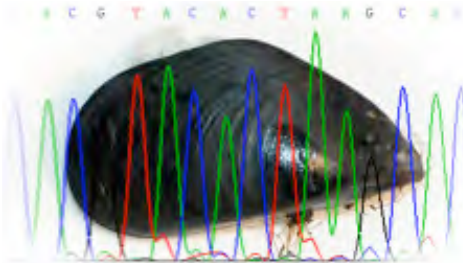


# Marine Biotechnology and Bioinformatics



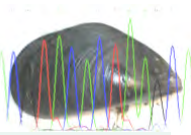
A program of ITEST (Information Technology Experiences for Students and Teachers) funded by the National Science Foundation



## Recovering the Romanovs: Science Solves the Mystery

Life Science  
Seventh Grade

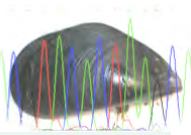
Lorena Rolland  
Blach Intermediate, Los Altos, CA



# Background Context

- ▶ This WebQuest occurred at the end of the genetics unit.
- ▶ Used for review of genetics concepts and real life applications.
- ▶ To help solve the mystery, I provided laptops, worksheets, and enthusiasm!

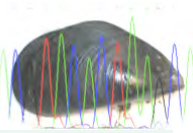
**What happened to Anastasia Romanov?**



# Instructional Goals

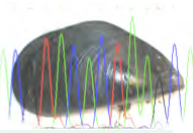
- ▶ Recovering the Romanovs WebQuest
  - ▶▶ Study the family's tragic history of hemophilia — a sex linked disorder
  
  - ▶▶ Analyze bones from a virtual grave and use DNA technology for identification to solve the mystery





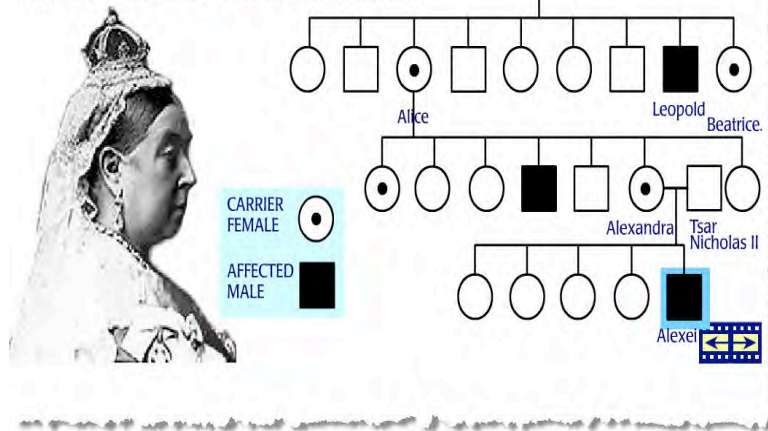
# State Standards

- ▶ California State Standards this lesson addresses
  - ▶▶ Grade 7
    - Genetics 2.b,c,e
    - Investigation & Experimentation: 7.a,b,c
  - ▶▶ Online standards
    - <http://www.cde.ca.gov/be/st/ss/scgrade7.asp>



# Instructional Objectives

'Twas most unfortunate, my granddaughter, Alexandra, was a carrier. She married Nicholas Romanov II, Tsar of Russia. They had five children. My great grandson, the heir Alexei, had hemophilia.

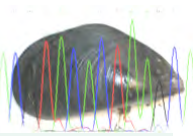


## ► Inheritance of Sex Linked Disorders

►► Going beyond Mendel's peas

## ► Murdered Romanov family's background and tragic history of hemophilia

<http://www.dnai.org/d/index.html>



# Instructional Objectives

DNA HOME Applications

Recovering the Romanovs the Romanov family the mystery of Anna Anderson [evidence solves a mystery](#)

**Analyze the Skeletons**  
Eleven people were reportedly shot but only nine are in the grave. So:  
**Who is missing?**  
Click on a skeleton in order to analyze it!

Analyze the Skeletons

**Skeleton1** Rollover each box, and choose (click) the right answer for each skeleton.

22 or older  
 21 or younger

18 or older  
 17 or younger

Rings on vertebrae (18 or Older) Rings on vertebrae (17 or younger)

Male  
 Female

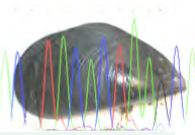
Skeleton 1 2 3 4 5 6 7 8 9

III. 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22

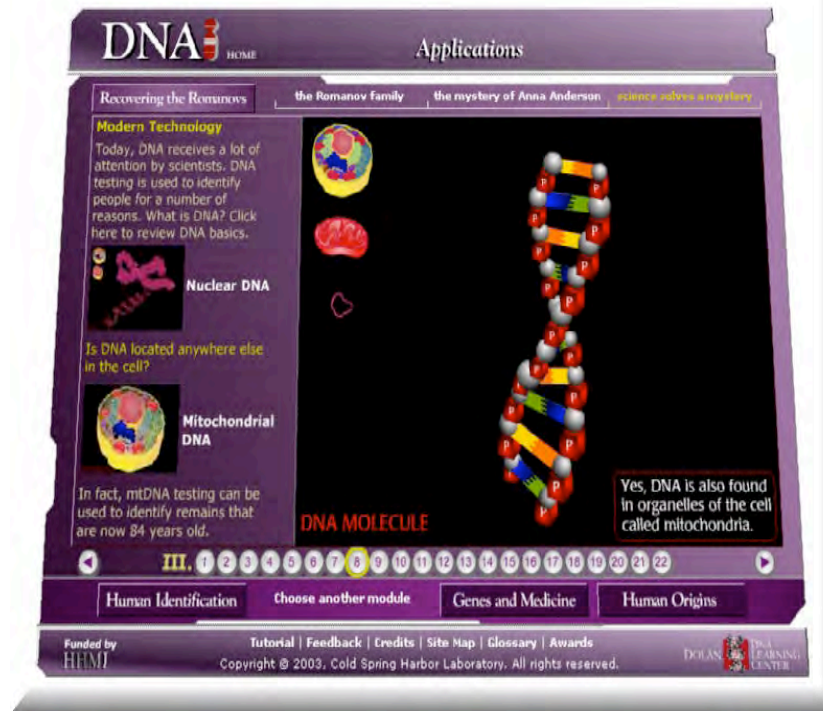
Human Identification choose another module Genes and Medicine Human Origins

Funded by HHMI Tutorial | Feedback | Credits | Site Map | Glossary | Awards  
Copyright © 2003, Cold Spring Harbor Laboratory. All rights reserved. DUTAN DNA LEARNING CENTER

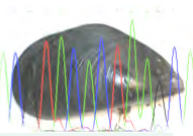
- ▶ Gather evidence about age and gender of skeletons at Siberian grave
- ▶ Is Anastasia there??



# Instructional Objectives



- ▶ Learn about mitochondrial DNA
- ▶ Compare the sequence of mtDNA from skeletons and tissue to the mtDNA of a relative
- ▶ Is it Anastasia?

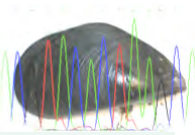


# Materials and Resources



- ▶ I used a cart full of laptops with internet access, one with a projector and screen
- ▶ Worksheets can be downloaded from the teacher section of the same web site

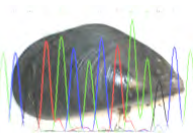
<http://www.dnai.org>



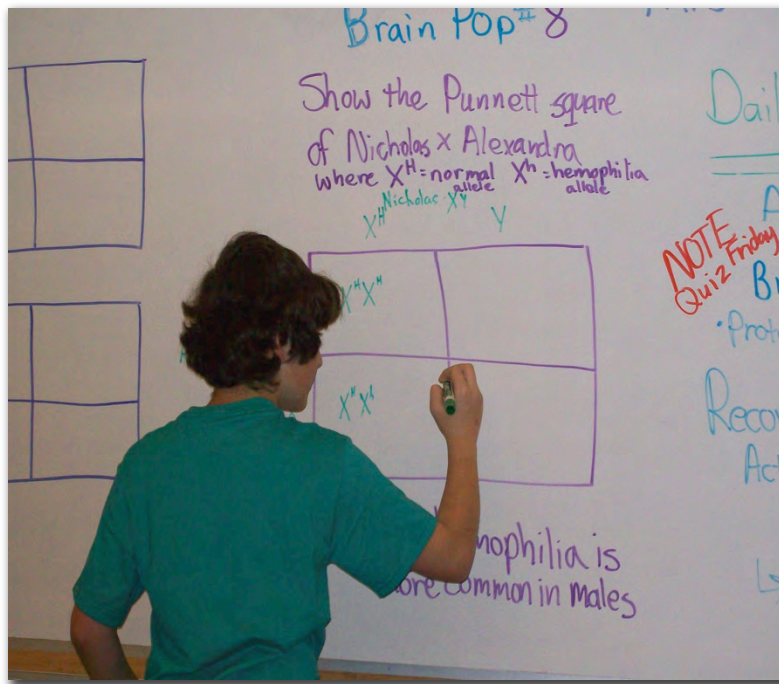
# Instructional Strategies



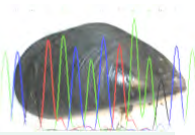
- ▶ Use your laptop and projector to show web site navigation and overview
- ▶ Worksheets and dry erase board for review and practice



# Assessment



- ▶ Dry erase board review
- ▶ Questions during the Quest
- ▶ Worksheets
- ▶ Was Anna Anderson really Anastasia?  
**PROVE IT!!!**



# Learning Outcomes

**Date:** April 4, 2008 3:23:42 PM PDT  
**To:** "Rolland" <[rolland@blachschoo.org](mailto:rolland@blachschoo.org)>  
**Subject:** Anastasia

Mrs. Rolland,  
I thought it was really interesting how we just learned about the Romanov Family and it has an article on them on the front page of the yahoo website!  
here is the link!  
[http://news.yahoo.com/s/ap/20080403/ap\\_on\\_re\\_us/czar\\_s\\_family](http://news.yahoo.com/s/ap/20080403/ap_on_re_us/czar_s_family)

have a great weekend.

**Date:** April 4, 2008 5:12:10 PM PDT  
**To:** "Mrs. Lorena Rolland" <[rolland@blachschoo.org](mailto:rolland@blachschoo.org)>  
**Subject:** website

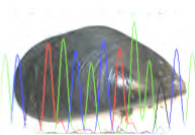
Hi Mrs. Rolland,

I was just on Yahoo! and I just happened to find this article about Anastasia which I thought was kind of interesting.... You might have already seen it.. It's today's article.

Just to let you know-Here's the link: [http://news.yahoo.com/s/ap/20080403/ap\\_on\\_re\\_us/czar\\_s\\_family](http://news.yahoo.com/s/ap/20080403/ap_on_re_us/czar_s_family)

Thanks again and enjoy your weekend,

- ▶ Enthusiasm!
- ▶ Review



# Lessons Learned

**CLUSTAL W ALIGNMENT** SEQUENCE SERVER ?

Skeleton #3 (female, 18-21 years old)  
Skeleton #5 (female, over 21 years old)  
Skeleton #6 (female, 18-21 years old)  
Skeleton #7 (female, over 21 years old)  
Skeleton #9 (female, over 21 years old)  
Prince Philip, Duke of Edinburgh (great-nephew of the Tsarina)

Start at position  of 380 base pairs (show  per page)   
[Print this alignment...](#)

Showing 380, starting from 0 and ending at 380

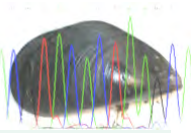
Skeleton #3; female, 18-21 years	CTGTTCTTTTCATGGGAAGCAGATT
Skeleton #5; female, over 21 years	CTGTTCTTTTCATGGGAAGCAGATT
Skeleton #6; female, 18-21 years	CTGTTCTTTTCATGGGAAGCAGATT
Skeleton #7; female, over 21 years	CTGTTCTTTTCATGGGAAGCAGATT
Skeleton #9; female, over 21 years	CTGTTCTTTTCATGGGAAGCAGATT
Prince Philip, Duke of Edinburgh	CTGTTCTTTTCATGGGAAGCAGATT
25	
Skeleton #3; female, 18-21 years	TGGGTACCACCCAAGTATTGACTCA
Skeleton #5; female, over 21 years	TGGGTACCACCCAAGTATTGACTCA
Skeleton #6; female, 18-21 years	TGGGTACCACCCAAGTATTGACTCA
Skeleton #7; female, over 21 years	TGGGTACCACCCAAGTATTGACTCA
Skeleton #9; female, over 21 years	TGGGTACCACCCAAGTATTGACTCA
Prince Philip, Duke of Edinburgh	TGGGTACCACCCAAGTATTGACTCA
50	
Skeleton #3; female, 18-21 years	CCCATCAACAACCGCTATGTATTTC
Skeleton #5; female, over 21 years	CCCATCAACAACCGCTATGTATTTC
Skeleton #6; female, 18-21 years	CCCATCAACAACCGCTATGTATTTC
Skeleton #7; female, over 21 years	CCCATCAACAACCGCTATGTATTTC
Skeleton #9; female, over 21 years	CCCATCAACAACCGCTATGTATTTC
Prince Philip, Duke of Edinburgh	CCCATCAACAACCGCTATGTATTTC
75	
Skeleton #3; female, 18-21 years	GTACATTACTGCCAGCACCATGAA
Skeleton #5; female, over 21 years	GTACATTACTGCCAGCACCATGAA
Skeleton #6; female, 18-21 years	GTACATTACTGCCAGCACCATGAA
Skeleton #7; female, over 21 years	GTACATTACTGCCAGCACCATGAA
Skeleton #9; female, over 21 years	GTACATTACTGCCAGCACCATGAA
Prince Philip, Duke of Edinburgh	GTACATTACTGCCAGCACCATGAA
100	

- ▶ Watch out!
  - ▶ Scaffold for Clustal W
  - ▶ Small pieces of module

## Fun Review



science careers?



## Contact

- ▶ For more information about this lesson, contact:
  - ▶▶ Lorena Rolland
  - ▶▶ Science Teacher, 7th Grade
  - ▶▶ Blach Intermediate, Los Altos, CA
  - ▶▶ [Lrolland@blachschool.org](mailto:Lrolland@blachschool.org)

The End!