

# *Recovering the Romanovs*



*Student Workbook*



## An introduction to Recovering the Romanovs

Anastasia Romanov was the youngest daughter of Tsar Nicholas of Russia and his wife Tsarina Alexandra. Anastasia had three older sisters, Olga, Maria, and Tatiana, and a younger brother Alexei. In 1917, the Bolsheviks led by Vladimir Lenin overthrew the Romanovs and imprisoned the family in the Impatiev House in Yekaterinburg, Siberia. In July of 1918, they were brutally murdered by the Bolshevik soldiers. To prevent those remaining loyal to the Tsar from finding their remains, the bodies were buried in a secret location.

Rumors persisted at the end of World War I that some members of the imperial family may have survived the massacre. In the 1920's an unknown woman in a mental hospital in Germany claimed to be Anastasia Romanov. While in the hospital she adopted the name Anna Anderson. Could this unknown woman be Anastasia Romanov, the youngest daughter of Tsar Nicholas? Anna Anderson had the same hair color, eye color, height, and distinctive body markings (including a deformed foot) as the Romanov princess. She had uncanny personal knowledge of the royal family, and several Romanov relatives believed her story. Her identity was never resolved, and Anna Anderson went to her death in 1984 still claiming to be Anastasia.

In 1991, the presumed remains of the royal Romanov family were exhumed in Yekaterinburg, Siberia. Portions of nine skeletons were found. Using anatomical and DNA methods, scientists identified the bodies of the Tsar and Tsarina, as well as three of their children. Two skeletons were missing – those of Anastasia and the youngest son Alexei.

Was Anna Anderson the sole survivor of the massacre of the Romanov family? For most of the 20<sup>th</sup> century, this question persisted without a conclusive answer. Then, in 1994, scientists used modern DNA technology to finally solve the mystery of Anastasia.



PART I: The Romanov Family

Screen ④

### Inheritance of a Sex-linked Disorder

*Directions*

- Click on the *Links* tab and follow the link for *Sex-linked Disorders*.
- Read through each screen of the animation. Move from one screen to the next by clicking the arrows at the bottom right.

*Questions*

1. Use a Punnett square to show the cross between Tsar Nicholas and Alexandra.  
Key: **H** = normal allele    **h** = hemophilia allele    **X** = X chromosome    **Y** = Y chromosome


- a. What is the percent chance that one of their children would have the disorder? \_\_\_\_\_
- b. What is the percent chance that a son would have the disorder? \_\_\_\_\_
- c. What is the percent chance that a daughter would be a carrier of the disorder? \_\_\_\_\_
- d. Is it possible for a family with the same genotypes as the Tsar and Tsarina to have a child without the hemophilia allele? Explain your answer.

\_\_\_\_\_

\_\_\_\_\_

2. Use two different Punnett squares to show how a female can become a carrier from hemophilia alleles inherited from either her father or her mother.



PART II: The Mystery of Anna Anderson

Screen ③

The Proof?

**Handwriting Analysis**

1. Follow the directions on the computer screen. Carefully examine both handwriting samples.



- a. Do you think the same person wrote both samples? \_\_\_\_\_
- b. Why? \_\_\_\_\_

**The Ear Test**

2. After the age of four months, no two people – including identical twins – have the same pattern of folds in their outer ear..

- a. Do the ears match? \_\_\_\_\_
- b. In your opinion, could they be the same person? \_\_\_\_\_
- c. Explain your answer using evidence from the ear test.

\_\_\_\_\_

\_\_\_\_\_



**PART II: The Mystery of Anna Anderson**

Screen ③ continued

*Face Comparison*

3. Compare the photographs of these five different people with a photograph of the true Anastasia by rolling over each unknown face.

a. Complete the chart by circling *Yes* or *No* for each face.

Face	Does this face resemble Anastasia?	
#1	Yes	No
#2	Yes	No
#3	Yes	No
#4	Yes	No
#5	Yes	No

b. Write the name or names of those who most closely resemble Anastasia.

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c. Do you think that everyone making this comparison will have the same list of names that you have? Explain your answer.

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d. Can an individual's identity be determined by physical likeness alone? \_\_\_\_\_

4. Is the handwriting, ear, and facial evidence you analyzed strong enough for you to say with certainty that Anna Anderson is Anastasia? Explain your answer.

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PART III: Science Solves a Mystery

Screen 3

### The Bones

When the Soviet Union collapsed in 1989, many long held secrets were finally revealed. Among them was the location of the mass grave of Tzar Nicholas and his family. In 1992, a group of scientists uncovered remains from this grave and made some startling discoveries. Were these indeed the remains of the Romanov family, and could they solve, once and for all, the mystery of Anastasia?

The royal family was imprisoned at the Impatiev House along with two male servants, the family doctor, and a nurse. The following chart lists the sex and age of the 11 people who were presumed to be buried in the mass grave.

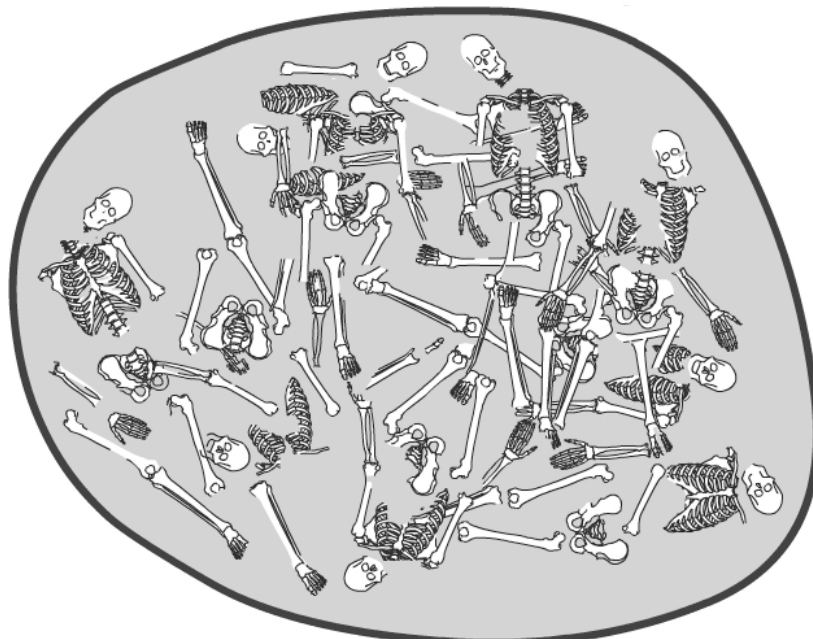
**Females**

- Tsarina Alexandra, adult
- Princess Olga, 22 years old
- Princess Tatiana, 21 years old
- Princess Maria, 19 years old
- Princess Anastasia, 17 years old
- Nurse, adult

**Males**

- Tsar Nicholas, adult
- Prince Alexei, almost 14 years old
- Family doctor, adult
- Servant, adult
- Servant, adult

1. How many skeletons do you expect to find in the grave? \_\_\_\_\_
  
2. Click on the *Count the Skeletons* box.  
Click on any bone in the grave to remove a skeleton. Continue until no bones remain in the grave.
  - a. How many skeletons were found in the grave? \_\_\_\_\_
  - b. What could that mean? \_\_\_\_\_



**PART III: Science Solves a Mystery**

Screen 5

**Skeletal Analysis**

1. Click on the "Analyze the Skeletons" box and then on skeleton #1.

Analyze the bones by rolling over the boxes. Use the key on the right to determine if wisdom teeth are present, if rings on the vertebrae are present, and if the pelvis is that of a male or of a female. Then circle the correct choices in the chart below.

Do the same for the other eight skeletons. Use this information and the list of persons presumed to have been murdered (from the previous activity) to determine whose skeletons were present or missing from the grave.

Skeletons	#1	#2	#3	#4	#5	#6	#7	#8	#9
Wisdom teeth present?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Yes = 22 years and older	No	No	No	No	No	No	No	No	No
Rings on vertebrae?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Yes = 18 years and older	No	No	No	No	No	No	No	No	No
Pelvis- male or female?	Male	Male	Male	Male	Male	Male	Male	Male	Male
	Female	Female	Female	Female	Female	Female	Female	Female	Female
Give a possible identity for each skeleton.									

2. Who is missing from the grave?

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3. How do you know?

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PART III: Science Solves a Mystery

Screens 8 - 11

## The DNA

1. a. Although historical evidence suggests that the bones found in the Siberian grave are the remains of the murdered royal family, how can the identity of these bones be proven?

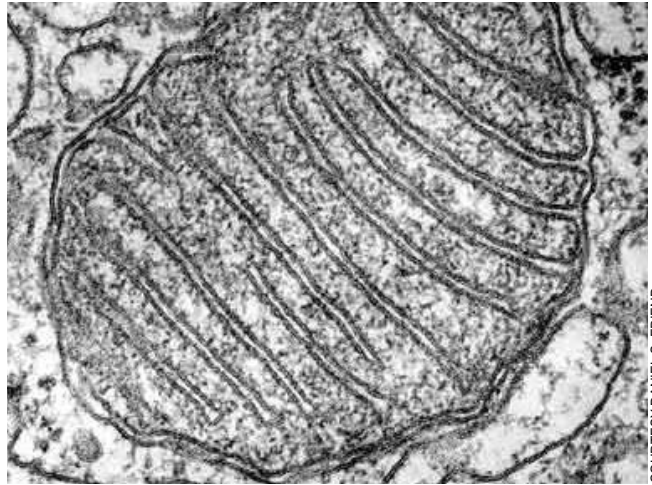
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Because there are no direct descendents of the Romanov family and the only surviving relatives are distant, the best way to determine the identity of the skeletons is to use DNA from the mitochondria. (Refer to screen #8 for background information.)

Mitochondria are organelles that contain a small circular chromosome. Only the mother passes on her mitochondrial DNA (mtDNA) to the children in a family (both her sons and daughters). Mitochondrial DNA remains relatively unchanged for many generations.



b. From whom did you inherit your mtDNA? \_\_\_\_\_

c. Who else in your family has the same mtDNA? \_\_\_\_\_

2. Go to screen #11 to *Test Yourself on Mitochondrial DNA*.

a. From whom did the Romanov children inherit their mtDNA?

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b. Does Tsar Nicholas II have the same mtDNA as his children? \_\_\_\_\_

c. Support your answer with an explanation of what you know about mtDNA.

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3. How can we use mtDNA to prove the identity of the skeletal remains?

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PART III: Science Solves a Mystery

Screens 12 - 14

### The Tsarina's Pedigree – Analyzing the DNA

1. Go to screen #12 and click on the Tsarina's pedigree.
  - a. What do the small red objects represent? \_\_\_\_\_
  - b. After examining the Tsarina's pedigree, record the name of the most recent *living* Romanov maternal relative:  
\_\_\_\_\_
  - c. How can scientists use this individual's mtDNA to confirm that the skeletal remains belong to the Romanov family?  
\_\_\_\_\_  
\_\_\_\_\_

#### *The Tsarina's Relatives*

2. Confirm the identity of the skeletons found in the grave starting with the females.
  - a. How many of the females in the grave should be related to each other? \_\_\_\_\_
  - b. Should those female relatives have the same mtDNA? Explain your answer.  
\_\_\_\_\_  
\_\_\_\_\_
3. Go to Screen #13, and click on the *Bioservers Sequence Server* link. Look at the positions of the mtDNA sequence that are highlighted to determine which skeletons are related and which are not. Then go to Screen #14 to answer the following questions:
  - a. What can we conclude about the skeletons?  
\_\_\_\_\_
  - b. What can we conclude about skeleton #9?  
\_\_\_\_\_

PART III: Science Solves a Mystery

Screens 15 - 17

### The Tsar's Pedigree – Analyzing the DNA

1. Go to screen #15, and click on the Tsar's Pedigree. Is there a maternal relative alive who could be used for a mitochondrial DNA comparison?
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#### The Tsar

2. Go to Screen #16, and click the *Bioservers Sequence Server* link. Differences in mtDNA sequence will again be highlighted in yellow.
    - a. Is there a skeleton that matches the Duke of Fife? \_\_\_\_\_
    - b. What conclusion can you make about the male skeletons?
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Princess Alexandra of Hesse  
and Tsarevitch Nicholas II.  
Library of Congress, Prints &  
Photographs Division, LC-B2-792-1  
and LC-B2-1371-8.



**PART III: Science Solves a Mystery**

Screens 18 - 22

**What about Anna Anderson?**

- 1. How could mtDNA technology be used to reveal Anna Anderson's true identity?

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- 2. Whose mtDNA sequences should Anna Anderson's match, if she is really Anastasia?

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Franziska Schankowska

- 3. Many royal relatives denounced Anna Anderson as a fraud. A private investigator, hired by the royal family, claimed she was really Franziska Schankowska, a Polish factory worker. If she was Franziska, how can it be proven?

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**Identifying Anna**

- 4. Go to the *Sequence Server*, and compare Anna Anderson's mtDNA with that of Prince Philip (a maternal relative of Anastasia) and Carl Maucher (a maternal relative of Franziska Schankowska). What can you conclude?

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**Your Conclusion**

- 5. Was Anna Anderson really Anastasia?

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