

# ROBERSON MUSEUM AND SCIENCE CENTER

## Post-Visit DNA Extraction: Making DNA Jewelry

**Grade Level:** 6 through Adult

**New York State Standards:** M S & T 2, 4, 5, and 7

**Pennsylvania State Standards:** S & T 3.1, 3.2, 3.3, and 3.7

**Objective:** Students will use their knowledge of DNA to construct models of DNA in the form of either key chains, earrings, bracelets, or a necklace. Students from 6th grade through adults can do this activity.

### Materials:

- Large Pony beads (crafts can be purchased cheaply through Bolek’s Craft Supply. Your class will need at least 6 different colors. You will also need about 60 beads per child.
- Petri dish (to hold beads)
- Seed beads size E (3mm) or smaller (1.5mm) sparkle or plain. Your class will need at least 6 different colors. You will also need about 60 beads per child
- Jewelry wire (You will need about 20” per child)
- Silk Cord (for necklaces, bracelets), amount depends on class size and what each child is making
- Key rings, earring wires, jewelry clasps. Amount and type depends on class size.
- Fishing line (for single threading)
- Needle nose pliers. (can be passed around)
- Scissors (can be passed around)
- One demonstration model made by teacher

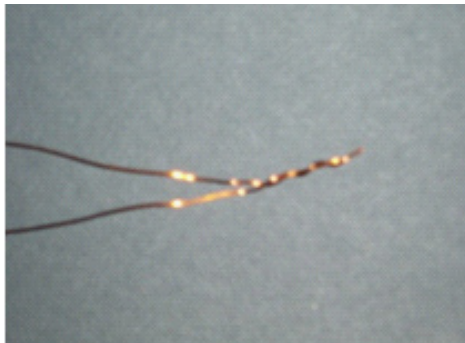
### Procedure:

1. This procedure takes about two class periods.

2. Begin by reading a quote to students from scientist Rosalind Franklin a contemporary of Watson and Crick whose work helped in the creation of the model of DNA. When Franklin first saw the DNA model made by Watson and Crick she exclaimed, “All that matters is the beauty.” By creating jewelry models of DNA in class today we are going to see the beauty that Rosalind Franklin experienced in the molecule of life as well as reinforce our knowledge of its structure. Make sure students also know that Rosalind Franklin contributed greatly to the ideas that Watson and Crick came up with. Her work in X-Ray Crystallography is what lead Watson and Crick to the discovery that DNA is the shape of a double helix. Tell students that are interested that they may do extra-credit by watching a movie or reading an interesting book on the topic (see reference section).

### 3. Part I: Creating a DNA Jewelry Model

- a) Hints to keep in mind while creating your jewelry:
- i. Your teacher's demonstration model is there to serve as a guide. Refer to it if you need to.
  - ii. Remember that the "uprights" (helixes) in the model will be double threaded. Be sure to pick up beads with large enough holes to accommodate both wires.
  - iii. Using needle nose pliers to tie-off or twist the ends of each of the wires will save your fingertips.
  - iv. Also remember it is easier to thread the wire while the beads are directly in the dish rather than picking them up one at a time with your fingers
  - v. Note that the procedure is the same for making key chains, earrings, bracelets etc. To make earrings you may prefer the small seed beads. To make key chains you may choose the larger pony beads.
- b) Step 1: Decide which color beads you want to use for your model. You will need to select six different colors. Two colors for the sugars and phosphates, and four different colors for the bases.
- c) Step 2: To make a key chain, earrings, pendant or central molecule for a silk cord necklace, bracelet, or ankle bracelet, cut two 15cm (6") strands of wire. Twist two wires together at one end to prevent beads from slipping off as you string them. These two strands will be the helixes, or "uprights" of your DNA model.



d) Step 3: String an equal and even number of beads of alternating colors onto each of the wires, to represent alternating sugars and phosphates. Make sure to start with the same color bead on each wire.



When you have strung the beads on each of the wires, twist a loop at the top of the “uprights” separately to prevent the beads from falling off.



f) Use a minimum of 26 beads for the basic 2 inch molecule (when twisted...leave one inch of slack at the top, if you beaded right to the top, it will be very difficult to add the bases).

g) Step 4: Cut 30cm (12”) of wire and fold in half to make an elongated “U.”

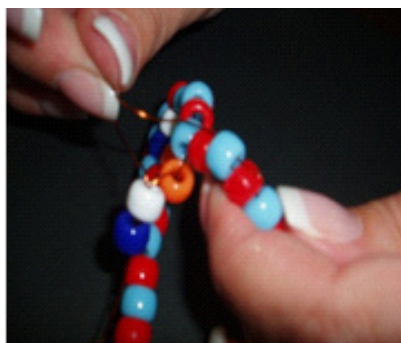


h) Next string and center two colored beads on the wire (or each wire, for earrings), to form the first rungs of the ladder or pairs of nitrogenous bases.



i) Step 5: Thread each end of the wire with the “bases” beads through the third and fourth beads from the bottom of each of the sugar-phosphate “uprights” and pull tight. You have made the first rung.

First Rung:



j) Be sure that the “U-wire’s” ends are even.

k) Step 6: Pull the ends of the base’s wire into the center of the ladder and thread two more base’s onto one side of the base’s wire and take the other base’s wire and thread through the two just threaded base’s to make rung at a right angle to the “uprights”. Note: the base wires go through each other in opposite directions. Also remember, these additional bases can be either the same color pattern or a different color pattern. However, you may only have two color patterns. Remember your base pairing rules! (A-T and G-C)



l) Step 7: Continue threading the bases wire up through the next sugar and phosphates on each “upright”. Now add two additional complimentary base’s to the base’s wire as you did in Step 6. Thread the base’s wire up through the next sugar and phosphate set, and add another base pair.

m) Steps 5-7 Repeat!!

Basic pattern is:

Add two in the middle

Cross through the two in the middle

Up the next two on both sides

n) Step 8: Repeat steps 6 and 7 until you have attached alternating bases to each sugar and phosphate set of “uprights”. You should do at least thirteen base pairs to have a large enough molecule to twist.

o) Step 9: Twist all of the wires at the top of the ladder together. You can twist and cut closely or finish with one last pony bead or E-bead around the point where the wires form the model and the key chain or earring holder connect. If the molecule is loose, untwist the bottom two wires and gently pull on each. This will tighten the sides and make the bases perpendicular to the sides. Re-twist together and trim after tightening. Remember not to twist them too tight because you still have to twist into a double helix!

a. Step 10: Twist your model into a double helix, and attach on to your desired piece of jewelry.



p) Step 11: For class credit

Show your completed item to your teacher along with the following:

Color Key:

A=

T=

G=

C=

Sugar=

Phosphate=

**Developed by:** Barbara Betza & [www. Accessexcellence.org](http://www.Accessexcellence.org) (Activities Exchange)

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References:

Made for TV Movie: “The Race for the Double Helix.” Produced by Mick Jackson.

Sayre, A. (1975). Rosalind Franklin and DNA. New York: W. W. Norton Publishers.

Crick, F. (1988). What Mad Pursuit: A Personal View of Scientific Discovery. New York: Basic Books.

Watson, J. (1968). The Double Helix. New York: Touchstone.