

## To the Teacher

Students can understand genetics and biological change through time only when they understand the chemical basis of the gene. Genes provide the information for sequencing amino acids in the production of proteins. Proteins are the structural and functional portions of our bodies.

In order for students to understand genetics and evolution, they must first understand the structure of the DNA molecule. The function of DNA proceeds from its unique structure, a structure beautifully adapted for information storage, transcription, translation into amino acid sequences, replication, and time travel.

This activity illustrates DNA structure in a simple and colorful way including details of the purine and pyrimidine nitrogen bases and the relative positions of the sugar-phosphate backbone. We find that the hands-on construction of the model creates a strong image of its structure in the student's mind. Building the DNA model will help students understand the structure and function of the basic molecule of life. Middle school students, high school students, and teachers in our workshops have all successfully constructed the mol-

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ecule. They reinvent the process and make other wonderful jewelry, bracelets, necklaces and even tree ornaments. It's an excellent teaching tool, and adornment, as well.

## To the Students

The real family treasures are not jewels at all; they are the DNA molecules that have constructed each member of your family. These immortal coils have carried your family's genetic information through vast reaches of time to the present. The digital information encoded within the molecule constructs and orchestrates perfectly formed protein bodies ... you! Your protein body, if it is successful, lives, grows, matures, and reproduces—you help make a baby. With love, encouragement, education, and hard work, your “family treasures” may have the chance to

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PHOTOS BY JOYCE RODERICK

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leap into the far future! You may see segments of your DNA pass on to your grandchildren and great grandchildren!

DNA stands for Deoxyribo-Nucleic Acid. The structure of DNA was unraveled in 1953 in Cambridge, England, by two researchers, Francis Crick (English) and James Watson (American). These two men will be honored in the future for as many centuries as Aristotle and Plato have been in the past. Their contribution to our understanding of life and ourselves is fundamental.

The molecule itself is elegant in its simplicity, and makes great jewelry!

The DNA molecule is composed of four different nucleotide bases. They are adenine, guanine, thymine, and cytosine. The adenine and thymine are molecular mates as are the guanine and cytosine. These are held in a long helix shaped molecule by a backbone of phosphate and deoxyribose sugar. The data contained within the DNA molecule is digital and is reproduced and passed on from generation to generation with very few errors or changes. The DNA you inherited from your ancestors resides in almost every one of the cells of your body. A “half set” resides in each of your reproductive cells, waiting for a complement, so they may “jump” into the future!

## Materials

wire cutter

pliers

28 gauge wire

gold 28ga wire

silver 28ga wire

copper 28ga wire

black 28ga wire

green 28ga wire

red 28ga wire

ear hook

gold earring/pierced

silver earring/pierced

steel earring/pierced

gold earring/clip

silver earring/clip

beads

#3 Bugle Blue

#2 Bugle Green

#3 Bugle Gold

#2 Bugle Red

6/0 S/L Crystal AB

or 6/0 S/L Crystal

or 6/0 Crystal AB

6/0 S/L Gold

or 6/0 S/L Gold AB

or 6/0 Topaz AB

Optional

gold keyring

silver keyring

All beads and wire can be purchased in gram-kilogram bulk for the classroom at reasonable prices. Small quantities can be very expensive. We use General Bead at [www.genbead.com](http://www.genbead.com).

Note: If you have questions or need additional information, feel free to contact either author.

## Procedure



1. Measure out 34 inches/86 centimeters of 28 gauge wire. Find the mid-point and place the beads in the following manner at the halfway point.



2. Run the end of the wire on the right, in the previous frame, through the green and silver beads on the left. Run the end of the wire on the left through the blue and silver beads on the right.

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# Procedure

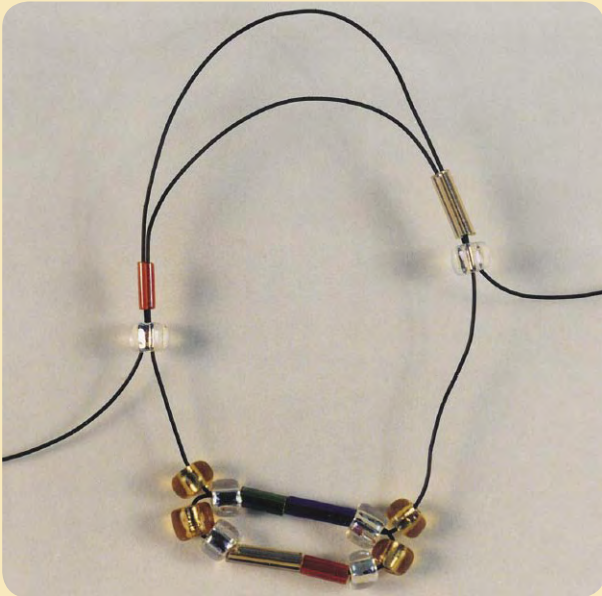
*continuation*



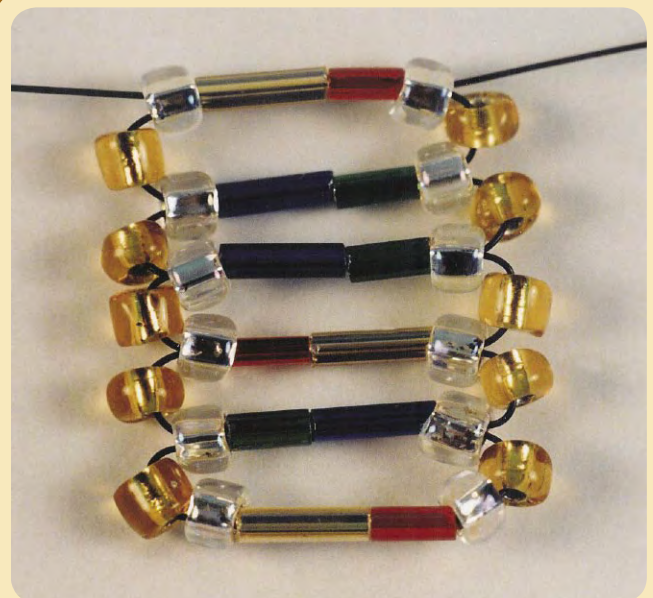
3. Double check that the beads are in the center of the wire. Pull the wires gently to snug up the beads against each other. They should look like the photo above.



5. Repeat the previous steps as many times as you wish. The sequences are up to you!



4. Add a gold (phosphate) and a silver (deoxyribose) to the right and left wires. Add your choice of one of the matching nitrogen bases to each wire. Remember that adenine pairs with thymine, and guanine pairs with cytosine. Cross the wires, and gently remove the slack in the wire as you did before.

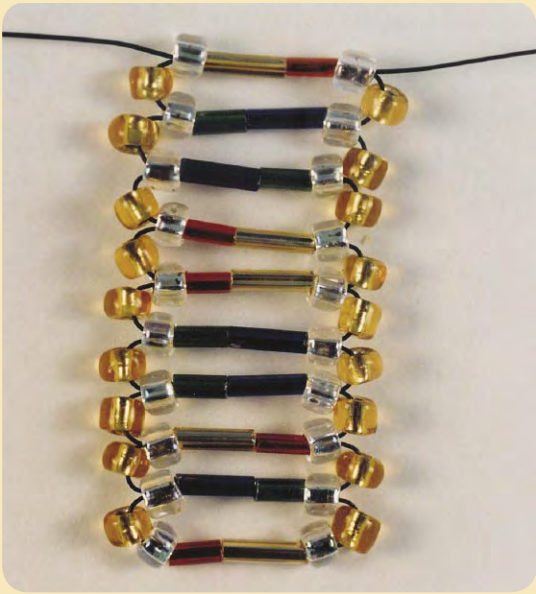


6. Keep the wire rather taut when you pull the gold colored phosphate seed beads out to the sides of the molecule. This is shown in the photo above.

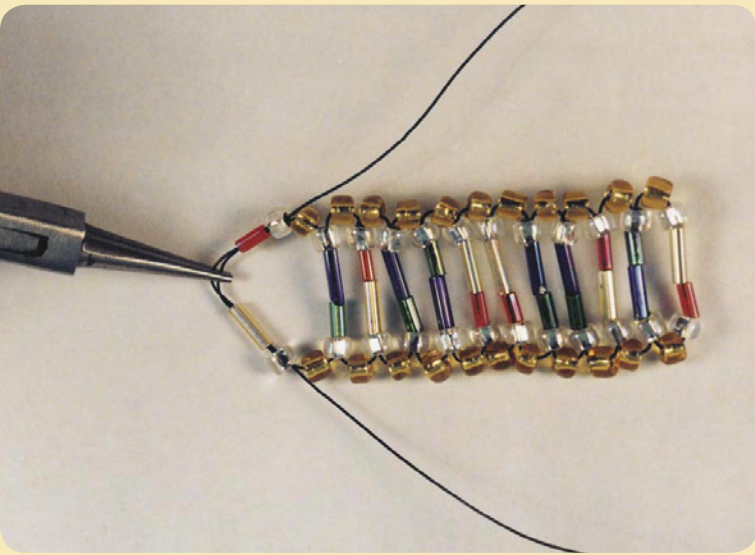
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## Procedure

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7. Earring can be made any length—twelve base pairs make a nice single twist of the double helix.

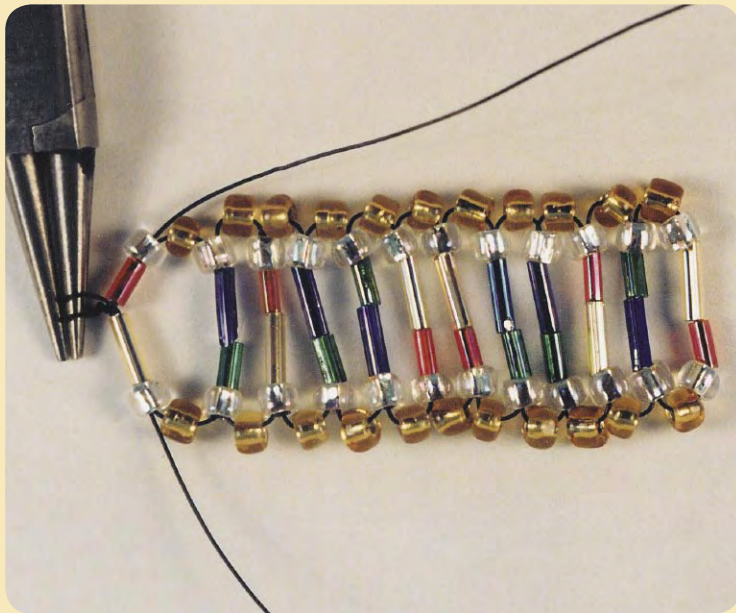


8. When you place your last base pair onto your DNA molecule, allow a bit of wire to extend from between the last two base pairs.

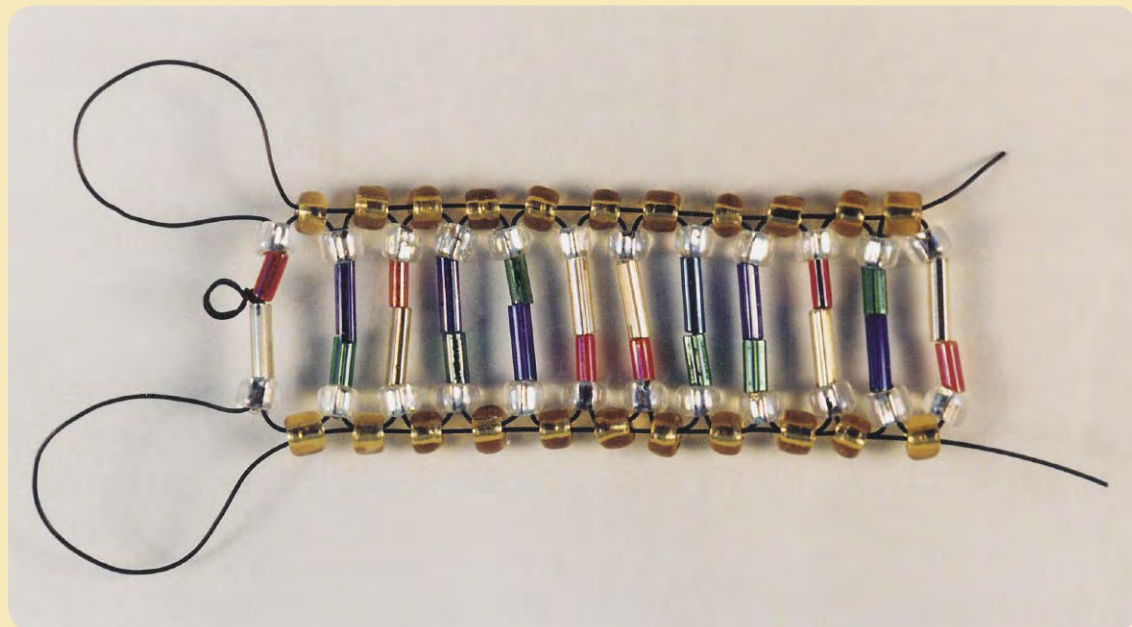
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## Procedure

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9. With a pair of pliers, or even a paperclip, form a small loop so you can later attach the ear hook. Give the wire a little twist.



10. The remaining wire should be threaded down through the gold phosphate seed beads; this greatly improves the stability and strength of the jewelry.

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## Procedure

*continuation*



11. Cut the excess wire from the bottom. Spend a few moments adjusting all of the beads in your helix. When all seem in their proper positions, give the "ladder" a little counter-clockwise twist. Finally ... add an ear hook to the loop at the top.

Remember to understand what each glass bead represents!