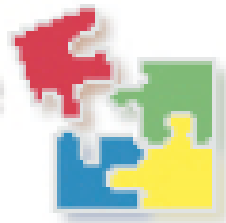




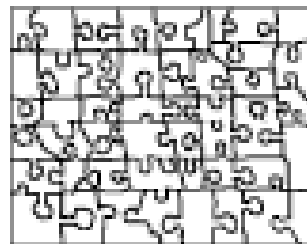
Finding a Gene on the Chromosome Map



As a scientist, you've noticed that a genetic disorder runs in families, and you want to find the gene responsible for it. First, you identify a large family, in which some individuals have the disorder, and others don't. After enlisting the family's support and collecting DNA samples from all family members, you're ready to begin looking for the gene. Where do you go from here?

Here's one way to think about genes:

Say the genetic information in each family member were like a jigsaw puzzle. Each puzzle piece would represent a gene organized in a specific



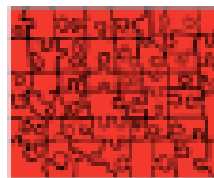
location on the chromosome puzzle. Because all humans have the same set of genes, arranged in the same order, every family member would have the same basic set of puzzle pieces for each chromosome. A generic human jigsaw puzzle for one of our chromosomes might look like this.

But the information carried in genes differs slightly from person to person. This is what makes each of us unique. As a result, the colors of the puzzle pieces would be different between family members.

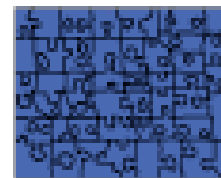
What might a family's puzzles look like?

While some relatives might share puzzle pieces of a certain color, other pieces would be different. Only identical twins share the exact same combination of colors.

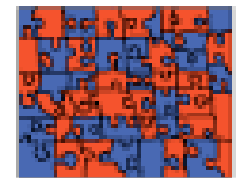
Look at the family of jigsaw puzzles below.



Mother's genes



Father's genes



Child's genes

Can you see how some of the child's genes are derived from one parent and some from the other parent?

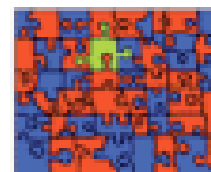
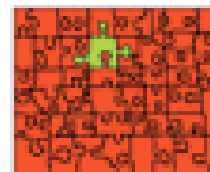
The child receives half of its genetic information from the mother and half from the father.

What can our genes tell us about our chances of inheriting a genetic disorder?

When a mutation (or change in the DNA sequence) occurs in a gene, a medical condition called a genetic disorder may result. Type I neurofibromatosis (NF1) is an example of a genetic disorder. If one parent has the *NF1* disorder gene, indicated by the green puzzle piece, then the child has a 50% chance of inheriting the gene.

Mother's genes

Father's genes



Child's genes

This child has inherited the *NF1* gene from his mother; the child will have the disorder since the inheritance pattern for *NF1* is dominant.

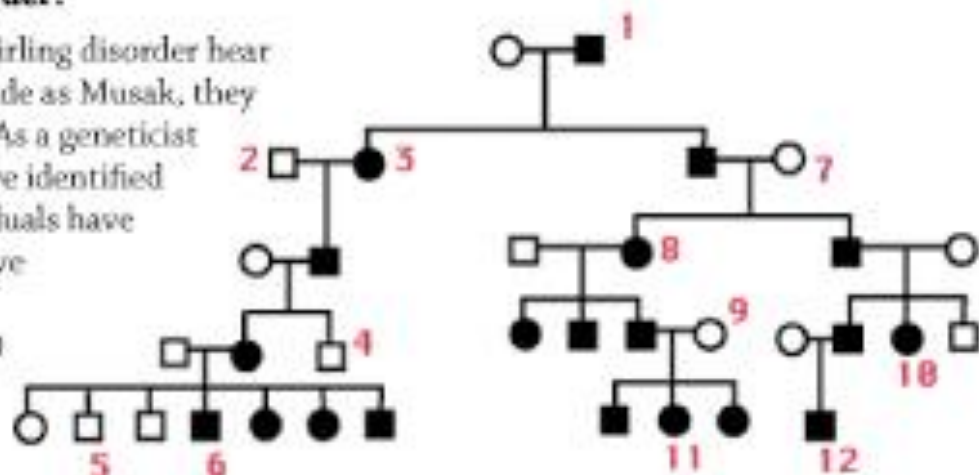


Finding a Gene on the Chromosome Map



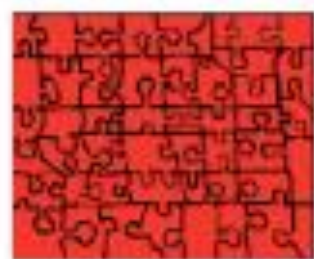
Find the gene for Whirling disorder!

When individuals afflicted with Whirling disorder hear old Rolling Stones tunes, even remade as Musak, they let loose and dance uncontrollably. As a geneticist studying Whirling disorder, you have identified a large family in which some individuals have the disorder, and others don't. You've drawn a pedigree for this family. A pedigree is a diagram that shows (1) how family members are related, and (2) which individuals have Whirling disorder, indicated by black circles (females) and black squares (males).



Here's your challenge:

Below are genetic jigsaw puzzles for 12 members of your Whirling disorder family. Each puzzle has a number that corresponds to an individual in the pedigree above. Your job is to find the puzzle piece (or gene) that is responsible for Whirling disorder.



1



2



3



4



5



6



7



8



9



10



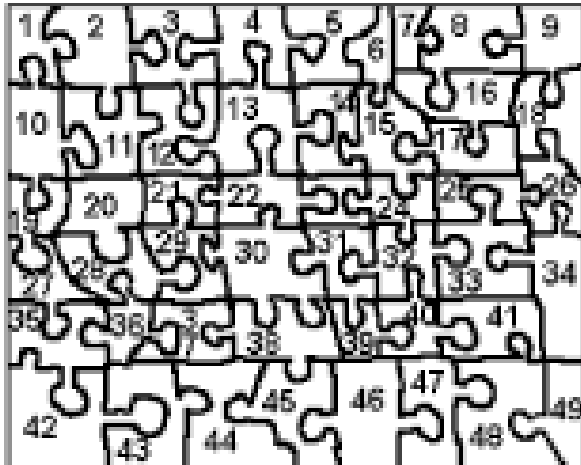
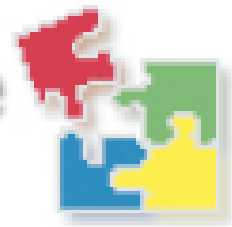
11



12



Finding a Gene on the Chromosome Map



1. Which puzzle piece is responsible for Whirling disorder? Explain your answer.
2. Is the inheritance pattern for Whirling disorder dominant or recessive? autosomal or sex-linked? Explain your answer.

The jigsaw puzzles for individuals A, B, C, and D in the pedigree below were not given. Imagine what their puzzles would look like, and determine what color(s) the puzzle pieces should be. Explain your answers on the back.

3. For person "A", the colors of the puzzle pieces should be:
 - a. dark blue
 - b. 1/2 dark blue, 1/2 red
 - c. 1/2 light green, 1/2 dark blue

4. For person "B", the colors of the puzzle pieces should be:
 - a. red
 - b. dark blue
 - c. pink
 - d. light blue

5. For person "C", the colors of the puzzle pieces should be:
 - a. red
 - b. 1/2 dark green, 1/2 yellow
 - c. dark green
 - d. yellow

6. For person "D", the colors of the puzzle pieces should be:
 - a. 1/2 dark green, 1/4 red, 1/4 dark blue
 - b. 1/2 dark green, 1/2 red
 - c. 1/4 yellow, 1/4 dark green, 1/4 red, 1/4 dark blue
 - d. 1/2 red, 1/2 dark blue

