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**Building Evolutionary Trees**:

How did the color patterns in New World Orioles evolve?

**Background**

 The New World Orioles are a large family of birds that live throughout the tropical and temperate habitats of North America. All males are various shades of yellow and orange contrasting with black feathers. Females range from dull yellow to bright yellow-orange. Evolutionary biologists, Hofmann, Cronin, and Omland, wanted to know how female colors evolved in this group. Below we’ll explore this question using 7 species from the New World Oriole family.

**Part 1: Building a tree using physical traits**

**Make a prediction**: Was the female ancestor brightly colored or dull? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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***Instructions***

1. Using the **table of traits** below, the **species cards**, and the **blank tree** work with your group to arrange the species in the order you think they evolved. Your goal is to minimize the number of trait changes on the tree.
2. When you’ve decided on a solution, write the species names at the tips of each branch.
3. Every time a trait changes, draw a dash on the tree where this happens and write the new trait next to the line (i.e. “female-gray back”). If multiple traits change in one spot, draw multiple dashes and write out all traits.

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| --- | --- | --- | --- | --- |
| **Species** | **Male Back** | **Male Color** | **Female Back** | **Female Color** |
| Altimira Oriole | black | yellow-orange | black | yellow-orange |
| Audubon’s Oriole | black | bright yellow | gray | bright yellow |
| Baltimore Oriole | black | orange | gray | medium yellow |
| Black-backed Oriole | black | bright yellow | gray | light yellow  |
| Scott’s Oriole | black | bright yellow | gray | medium yellow |
| Yellow Oriole | black | bright yellow | black | bright yellow |
| Yellow-backed Oriole | black | bright yellow | black  | bright yellow |
| **Totals** | black = 7 | bright yellow = 5yellow orange = 1orange = 1 | black = 3gray = 4 | yellow-orange = 1bright yellow = 3medium yellow = 2light yellow = 1 |

**Questions:**

1. What color was the female ancestor to the group?\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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1. Write a sentence to describe the evolutionary changes, in the order they occurred, to get from the ancestor to the Baltimore Oriole according to your tree. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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