

Psyching Out the System Teacher Page

Goal:

To illustrate the universal method of analyzing a system in terms of its components and their interactions

General Information

In this activity students assume the role of scientists as they interpret data while playing a "puzzle shape" game that challenges them to evaluate objects that are hypothetically "observed" as well as those that are "not observed" this puzzle applies to all of science, not just particle physics. When scientists study any system they must begin with the same two basic questions:

1. What are the components of this system?
2. How do the components interact?

Through this exercise, students learn that the rules of interaction are as important as the "building blocks" in explaining data. In addition they become aware that what does NOT occur is often as important a clue as what DOES occur.

As students begin working on this activity, give them a hint that the components that they are looking for are two-dimensional shapes. After they find the shapes, point out that both the "observed" and the "not observed" could be built from the same shapes. Point out to the students that the answer to the second question must explain why some shapes are NOT observed.

When the students have completed the activity sheet, suggest that they draw additional objects using the building blocks and basic forces illustrated in the activity. They should indicate whether the shapes they have drawn would belong to the "observed" or "not observed" lists. This is a good opportunity to review that science is a dynamic process and the shapes drawn could be then searched for in future data.

★ — **Answers:** The building blocks are small squares and small equilateral triangles, both with the same side length. The rules for constructing these figures are that every triangle must form a single bond and every square must form two bonds with other constituents.

Some students may suggest that the answer is triangles only; this is acceptable as long as they also see that there are two different types of triangles (the second is an isosceles right triangle with the congruent sides the length of the side of the square.) the rules of interaction for the solution are that the right triangles form two types of bonds: one that is a pairing bond to another right triangle and the other one to the equilateral triangle. As with the other solution the equilateral triangles form a single bond.

