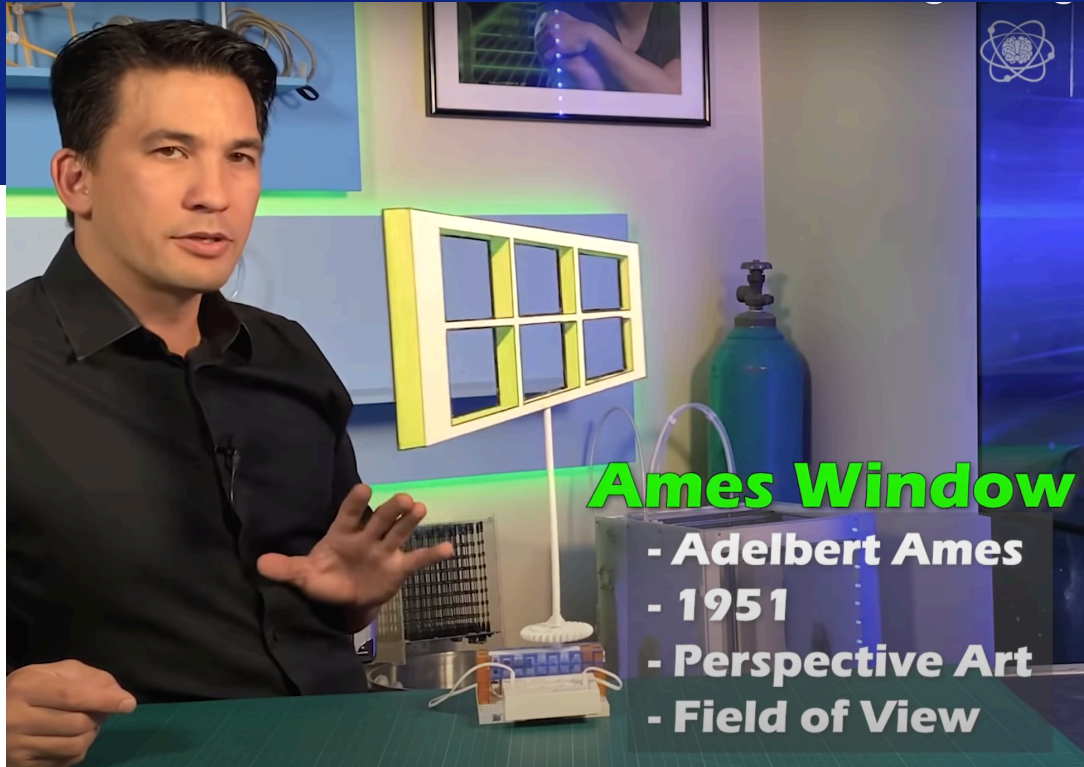


Solid Passing through Solid with the Ames Window



**IMPOSSIBLE
SCIENCE**

Objective: Students will be able to demonstrate and explain how perspective can create an illusion through building an Ames window.



Materials:

- White foam core boards (enough for pairs of two or three students to each work with)
- Rulers (or any straight object that would balance in the window)
- Sony Koov (optional)
- Two strings per foam core board
- Hole punch to attach strings
- Printed jpeg for students to trace onto board (one per group)
- Black markers for each group
- A light and dark shade of the same color marker for each group
- Exacto knives (or you can precut the windows for students)

Background Information

American scientist, Adelbert Ames, jr. (1880-1955), noticed that the human mind has been conditioned to actually see right angles. He designed the Ames window in 1951 using perspective art and field of view to create an optical illusion.

Field of View

How much you can see without turning or tilting your head. How big an object appears has to do with how much of our field of view is taken up by that object. Vertically, our field of view is about 150 degrees.

Perspective in Art

Making objects look three dimensional on a two dimensional (flat) surface.

Prep

Print out [jpeg provided in the link](#) here and below the video.

Procedure

1. Show students [Impossible Science video](#) to 1:25.
2. Ask students to discuss in small groups, and choose one or two responses to share: Why might the window appear to be moving back and forth, when it is actually rotating all the way around? What other optical illusions have you seen? How did they work?
3. Ask: What is perspective art? Have a volunteer draw a sketch of perspective art on the board. If students are not sure, sketch an example on the board (a road or railroad track with a diminishing point works well), or show a few examples and explain the background information above.
4. Ask: Why do certain parts of the examples above appear closer? Why do some parts appear farther away? Students should conclude that when objects are drawn smaller, they appear farther away, and when objects are drawn larger, they appear to be closer.
5. Display the background information above, and hand out copies to students who might need them, and give students a few minutes to add to their notebooks.
6. Explain to students that today they are going to work with partners to create their own Ames window illusions. Show Impossible Science video, pausing as

needed while students follow along.

7. Trace window design onto a piece of foam core. Trace out the lines in black for contrast, and cut it out (or adults can precut).
8. Choose two different shades of the same color (a light and a dark) to shade.
9. Attach a string to the two upper corners of the long side of the cut out, and tie them together. When you hold them up, the window should rotate. Alternatively, if you have access to the Sony KOOV, it will create an automatic rotating stand for the window.
10. Balance a ruler in the center of the top square, and begin rotating the window. Watch closely, slowing down and speeding up the rotation, to see how the ruler looks as though it is passing through one of the solid frames of the window.

Assessment:

Ask: Would this work if the window were cut in the shape of a rectangle instead of a trapezoid with one longer side? Why? Why not? Have students try it with a rectangle shape and record their observations. Students should write an explanation of why the Ames window works. They should explain that larger objects (the longer side of the window) always appear closer, making the window appear to move back and forth rather than all the way around.

Safety Note:

Adult Supervision Recommended

Watch the companion video here:



Lesson Plan by Whitney Gallagher based on the "Impossible Science" series.

Find more at impossiblescience.com

