

Shadow Box

Demo instructions

This demo really only needs one volunteer unless you have a large flux of visitors.

Thanks for volunteering! This demo (inspired by the original at Impression 5 Science Center) is a pretty simple way to show people how we can “see” invisible nuclei and how you might use nuclear theory to understand the results of your measurement. You’ll need some or all of the following equipment (provided by Zach Constan, outreach coordinator):

- Shadow Box Demo bin, containing:
- 5 flashlights
- 10 “shadow boxes” with a small object inside a paper cube
- 2 boxes of “theoretical models,” examples of objects that could be inside a box



Figure 1. “Seeing” the invisible.

Before the demo

Set out the shadow boxes on a table with flashlights nearby. Put the “theoretical models” out of the way (in the tub?) so they’re not obvious when visitors start the demo.



Figure 2. Initial setup.

During the demo

When visitors approach your table, pick up one of the shadow boxes (preferably Easy or Very Easy) and say: *At our laboratory, we study the nucleus - it’s a particle so small that it’s invisible to the best microscopes. But we can still measure what it looks like!*

In this box is a common object, but it’s invisible to you - if I gave you this flashlight, how could you tell what’s in there?

It may take them some time to realize they should shine the flashlight from the top and look at the bottom! They will likely identify the object in the box right away.

How did you “see” the invisible object? When it casts a shadow, what is it doing to the light? Could you guess how we “see” an invisible nucleus?

Point out the other boxes, especially those of higher difficulty. Ask them to try to identify those objects. There should be some they cannot readily name - have them set those boxes aside.

Pull out the “theoretical models” boxes. *Guessing what an invisible nucleus looks like is very difficult! Thankfully, we have theorists who create models that suggest what shapes may exist. With these models of what might be in the boxes, could you figure out the ones that weren’t obvious?*



Visitors may try to peek into the boxes - remind them that it’s not that easy with real nuclei!

If there are lots of visitors, you can let them explore the boxes on their own - the information that relates to nuclear science is printed on their sides!

It’s OK if people figure out to use the “theoretical models” right away.

If they stick around, you could ask whether they used anything other than the shadow to identify the invisible object (weight, sound, how it moved in the box by rolling or sliding, other?)

