

# Creating 3-D Models of Neutrino Detectors

## Overview

Students will learn about the difference between the methods of neutrino detection – optical versus radio. This will then allow them to understand why the relative size of the detectors is so different. Students will also engage in a hands-on activity to understand scale through creating models of the two detectors.

## Objectives

Students can understand the scale size of a neutrino detector and explain why radio detectors can be much larger than an optical detector.

## Lesson Preparation

Students should also know how to create conversions for scale calculations.

## Procedure

- Students will receive an overview of the difference between optical and radio detectors and learn about the importance of the two types of neutrinos these detectors will capture.
  - Students will then create a drawing and a model of the detectors using scale calculations:
1. Sketch out a design of the IceCube neutrino detector in relation to the Askaryan Radio Array detector. Be sure the sketch is to scale. Include units and label all components. Get teacher approval.

### Details

- 📘 Lesson
- 🌐 Antarctic
- ✍️ High school and Up

### Materials

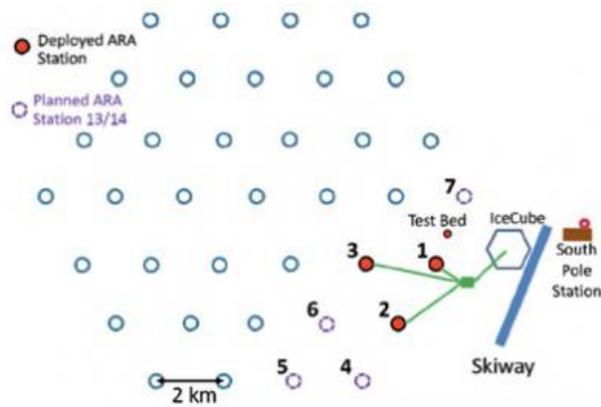
Provide students with materials they can use to create a 3D model. Suggestions include (but are not limited to): dried spaghetti, clay, string, beads, seeds, beans, construction paper, paper clips, tape, glue, etc.

### Standards

#### NGSS Standards

#### HS-PS1-8 Matter and its Interactions

Develop models to illustrate the changes in the composition of the nucleus of the atom and the energy released during the processes of fission, fusion, and radioactive decay.



*Map of IceCube and ARA stations to be used in creating 3D model*

2. Gather supplies for the model.
3. Create a 3-D model of the IceCube and ARA neutrino detectors that is to scale and includes a legend that describes all components of the model.

## **Extension**

Find a way to display these in the classroom. Students can create write-ups that explain the models and be hung in frames on the wall by the models.

## **Assessment**

### **Formative assessment:**

Ask students to write down 3 things that they learned on an exit card to check for understanding.

## **Author/Credits**

Lesley Anderson, PolarTREC Teacher 2017  
 High Tech High School  
 Chula Vista, CA  
 landerson@hightechhigh.org

Map of IceCube and ARA Stations to be used in Creating 3D Model

