

Playing With Protons CERN 2019



## Perimeter Institute for Theoretical Physics



Scientists are Curious





Scientists Build and Revise Models





Scientists Are Creative





#### Observation vs

### Inference

#### **Observation:**

We use our 5 senses to gather information about the world around us.

### Παρατήρηση:

Μαθαίνοντας για το περιβάλλον σας διαμέσου των αισθήσεών σας.

#### **OBSERVATION:**

Based on the five senses: sight, smell, touch, taste, hearing.

#### Inference:

A logical interpretation of an event based on observations and prior knowledge.

### Συμπέρασμα:

Βγάζοντας αποτελέσματα βασιζόμενοι σε παρατηρήσεις και πληροφορίες.

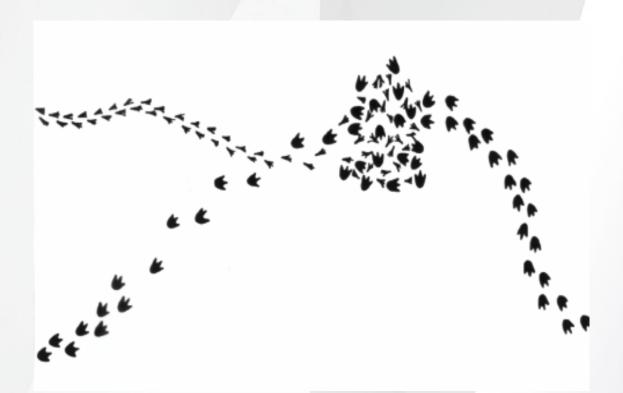
### INFERENCE:

Based on prior knowledge or opinion.



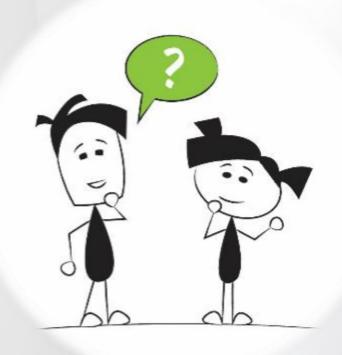
VS

## What happened?





Scientists Ask Questions





## Predict, Observe, Explain, Infer

Table 1

1. Demonstration	2. Predict and Explain	3. Observe and Explain	4. Sketch a Model	5. Infer
Balloon with air and balloon with water  Air  Water	Which balloon will pop first when held over a flame? Why?	Observations:  Explanation:	4. OKS 6.11 G MOGO!	As the planet continues to warm, where will most of the additional heat be stored? In the atmosphere or in the ocean?
Water bottle with heat source  Straw Water line Cap with hole Water bottle	What will happen to the water level in the straw as the water absorbs heat? Why?	Observations:  Explanation:		How will the volume of the ocean change if it absorbs heat?
Container with water and ice and container with water, rocks, and ice	What will happen to the water level in each container over time? Why?	Observations:  Explanation:		How will melting land ice and sea ice affect sea levels?



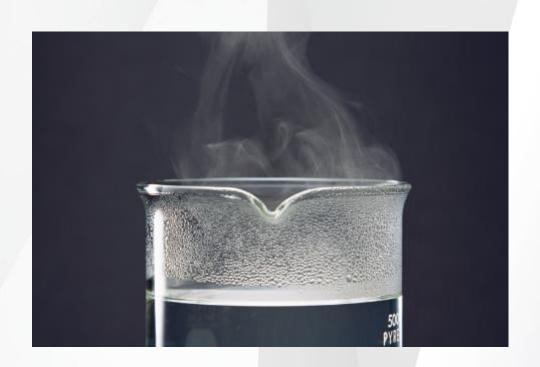
# Predict, Observe and Explain: What happens to the balloons?







# Predict, Observe and Explain: What happens when water heats up?





# Predict, Observe and Explain: What happens when ice heats up?





## Predict and Explain: How will this feel?





Scientists Collaborate



Climate Change Demos - Results



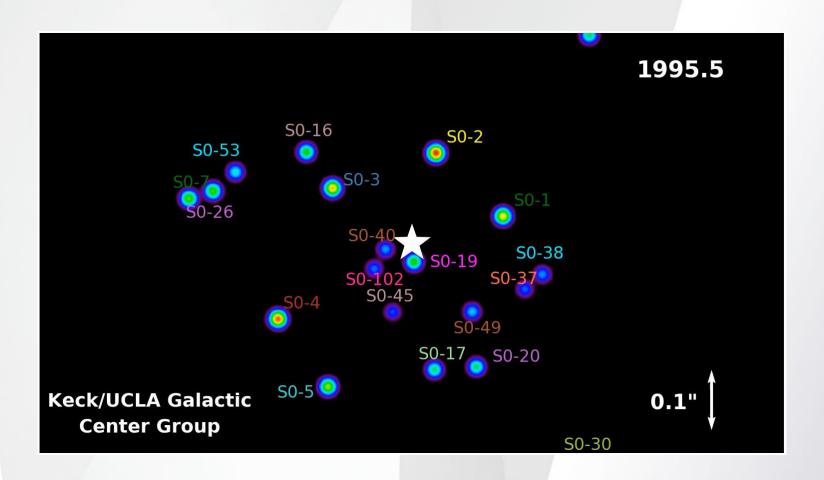
## Pl's Climate Change Video:

Which Gases Are Transparent to Infrared Radiation?





### Black Hole - Centre of the Milky Way





### Scientists Collaborate



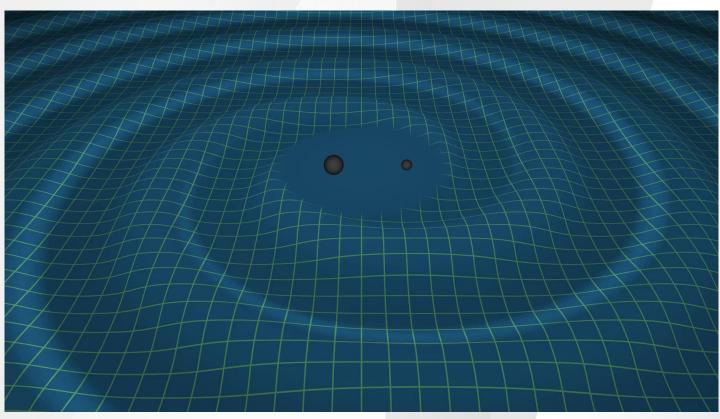


aLIGO = Advanced Light Interferometric Gravitational-wave Observatory



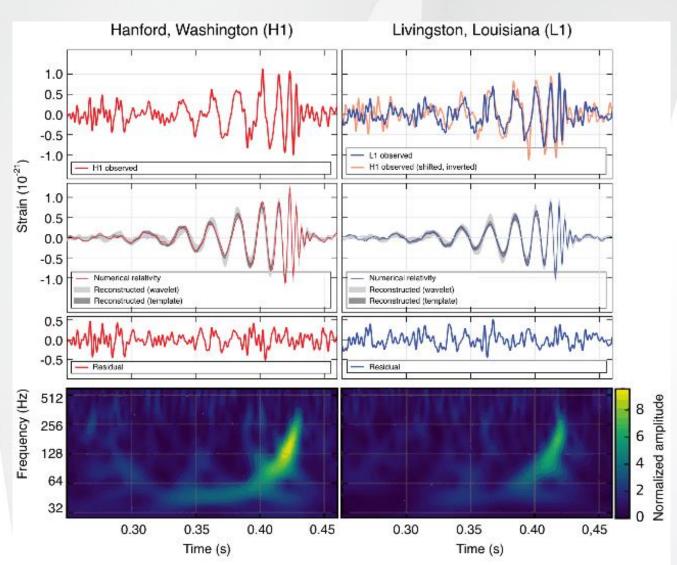
## Scientists Collaborate







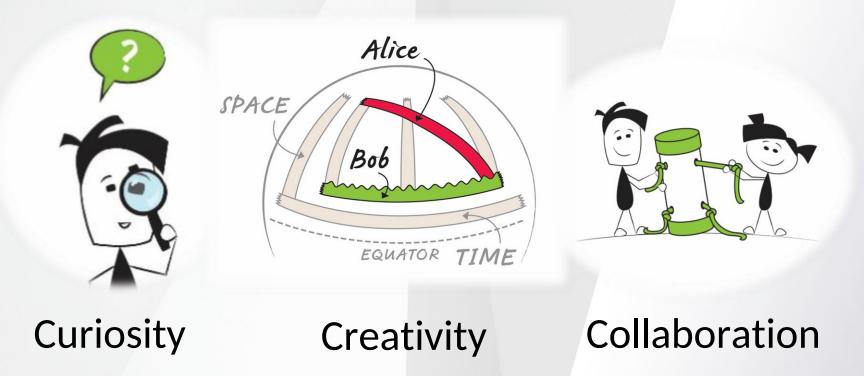
### Scientists Collaborate





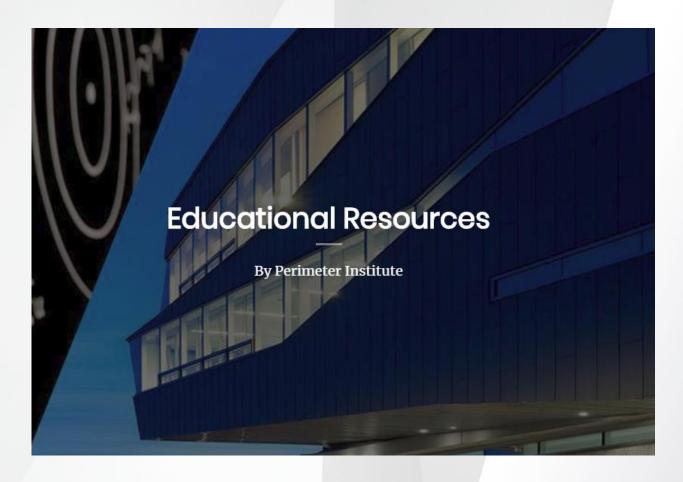


### Science is a powerful way of thinking...





### PI Resource Centre



https://resources.perimeterinstitute.ca/



### PI Resource Centre





**Evidence for Climate Change** 



**Process of Science** 

https://resources.perimeterinstitute.ca/



## **Inspirational Programs**

Einstein Plus Teacher Camp Week long modern physics summer camp

"...one of the most valuable workshops I have ever attended"











### **Inspirational Programs**

### **ISSYP Highlights**

Modern Physics course
Keynote talks
Mentor groups
Visits to cutting-edge experiments
Social Interaction



"I can safely say it was the best two weeks of my life...Because of ISSYP, I'm now absolutely sure that I want to take up a career in physics"



Anna O'Grady, ISSYP 2011



## Thank You! – Ευχαριστώ!!

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