

# How Do Scientists Think?

The Process of Science



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Playing With Protons  
CERN 2019

# Perimeter Institute for Theoretical Physics



# How Do Scientists Think?

Scientists are  
Curious



# How Do Scientists Think?

Scientists Build  
and Revise  
Models



# How Do Scientists Think?

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.

## Inference:

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

## Συμπέρασμα:

Βγάζοντας αποτελέσματα βασιζόμενοι σε παρατηρήσεις και πληροφορίες.

### **OBSERVATION:**

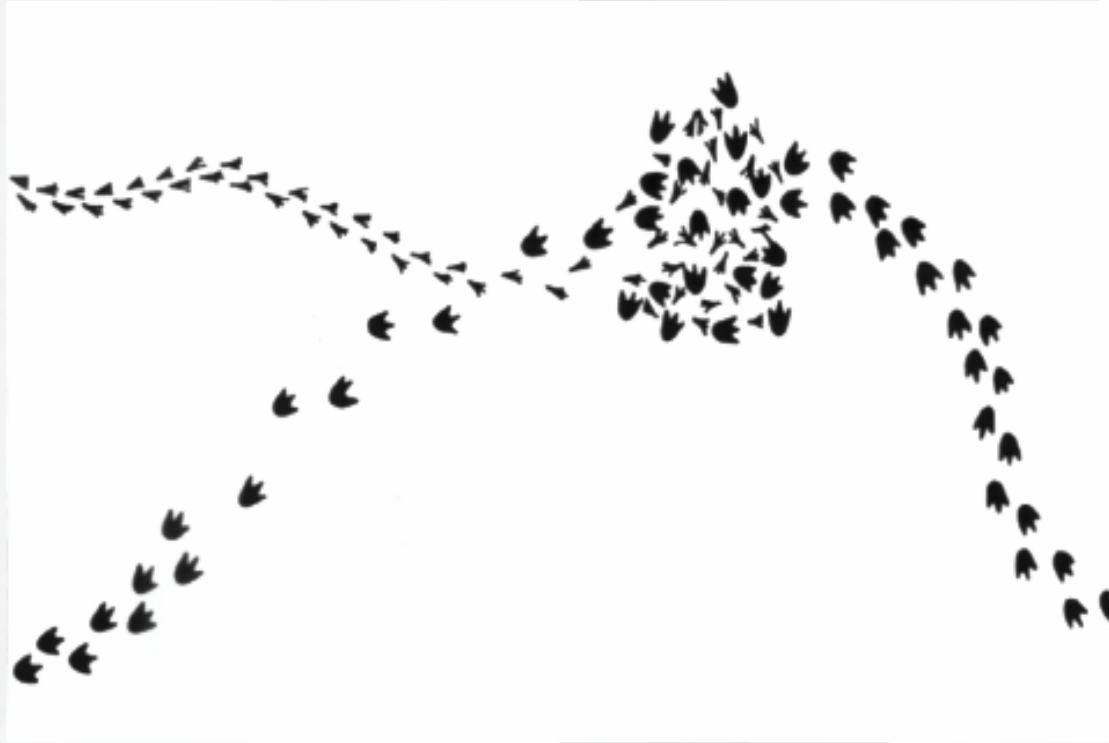
Based on the five senses: sight, smell, touch, taste, hearing.

VS

### **INFERENCE:**

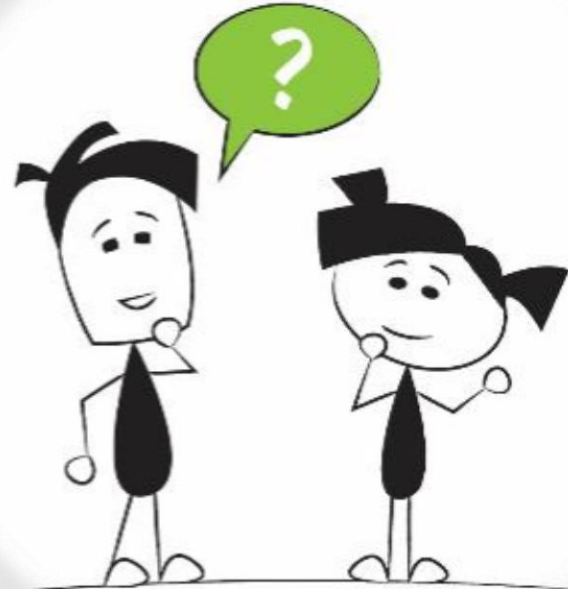
Based on prior knowledge or opinion.

# What happened?



# How Do Scientists Think?

Scientists Ask  
Questions







# 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?



# How Do Scientists Think?

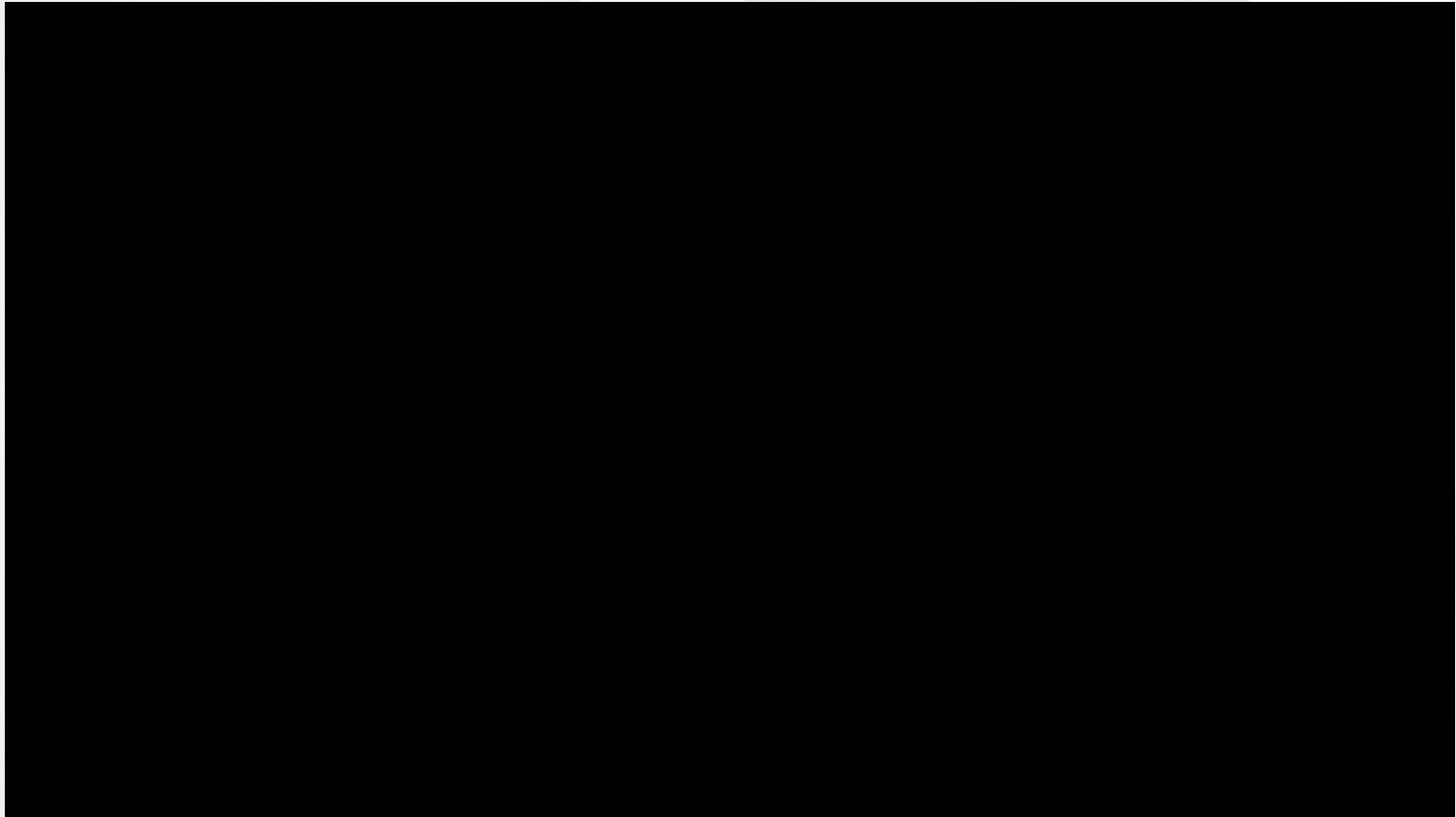
Scientists  
Collaborate



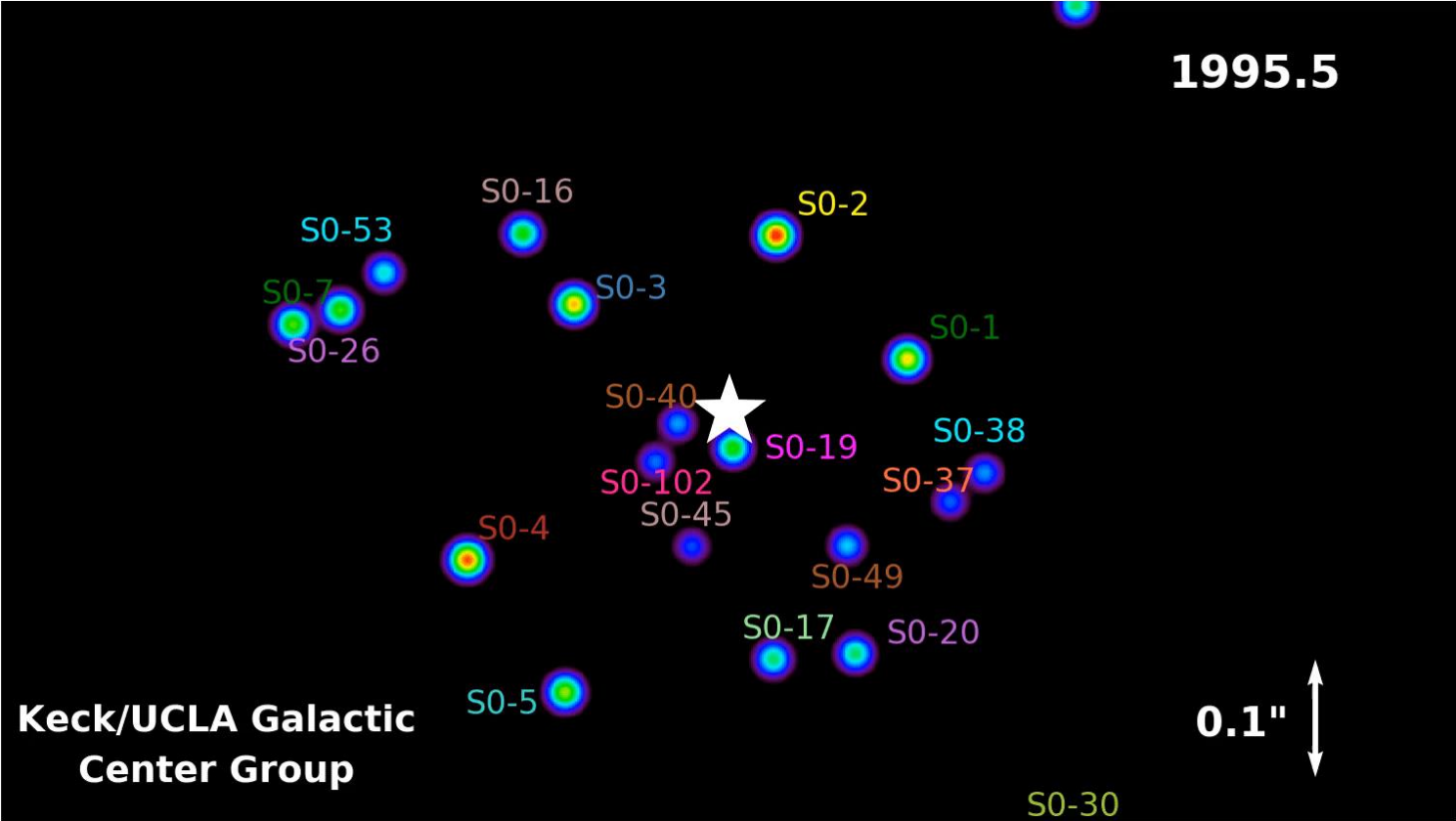
Climate Change Demos - Results

# PI's Climate Change Video:

**Which Gases Are Transparent to Infrared Radiation?**

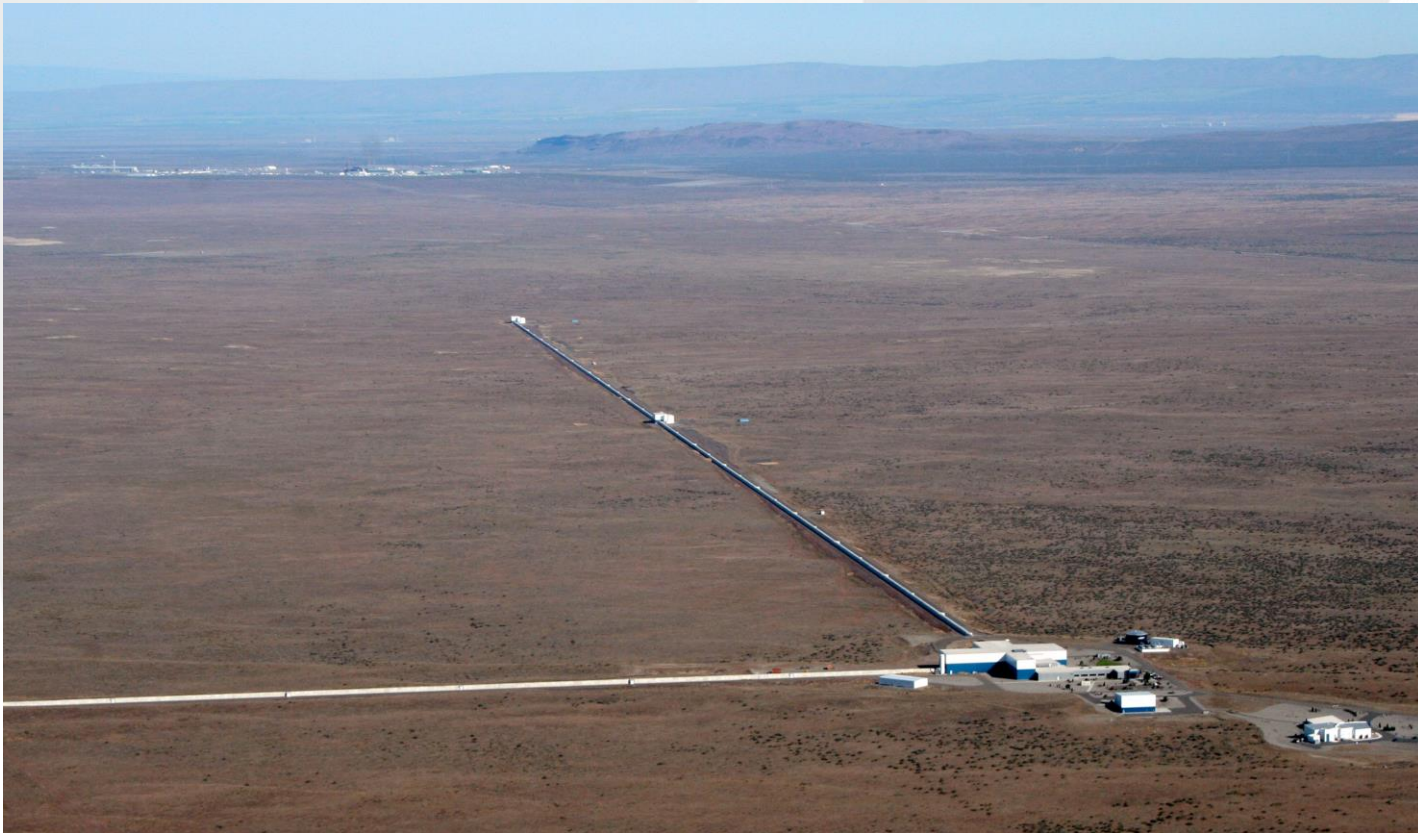
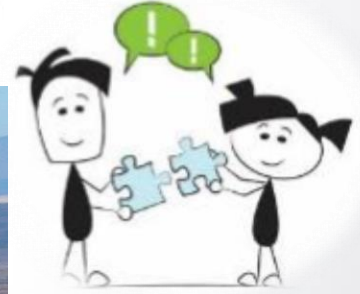


# Black Hole - Centre of the Milky Way



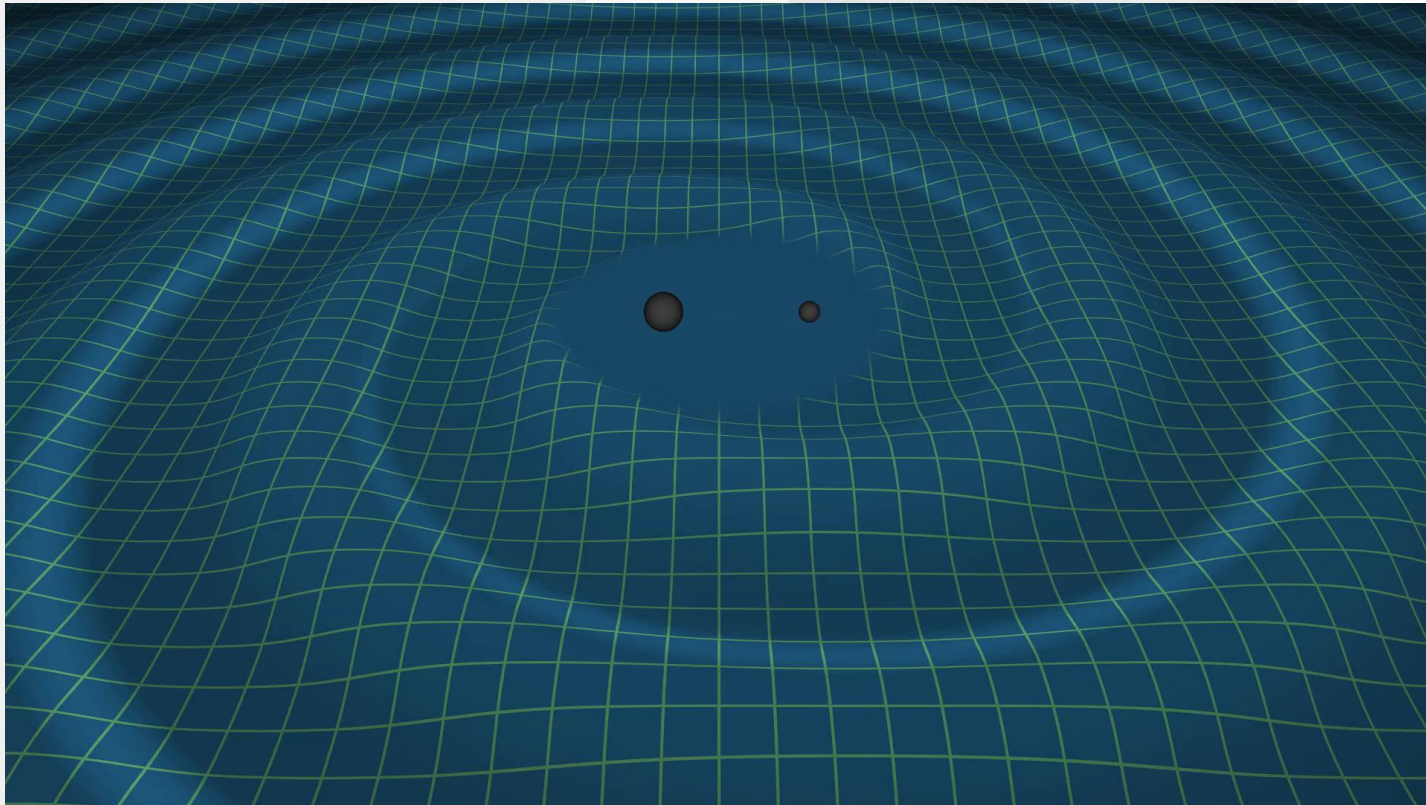
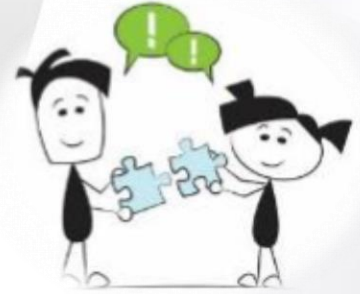


# Scientists Collaborate

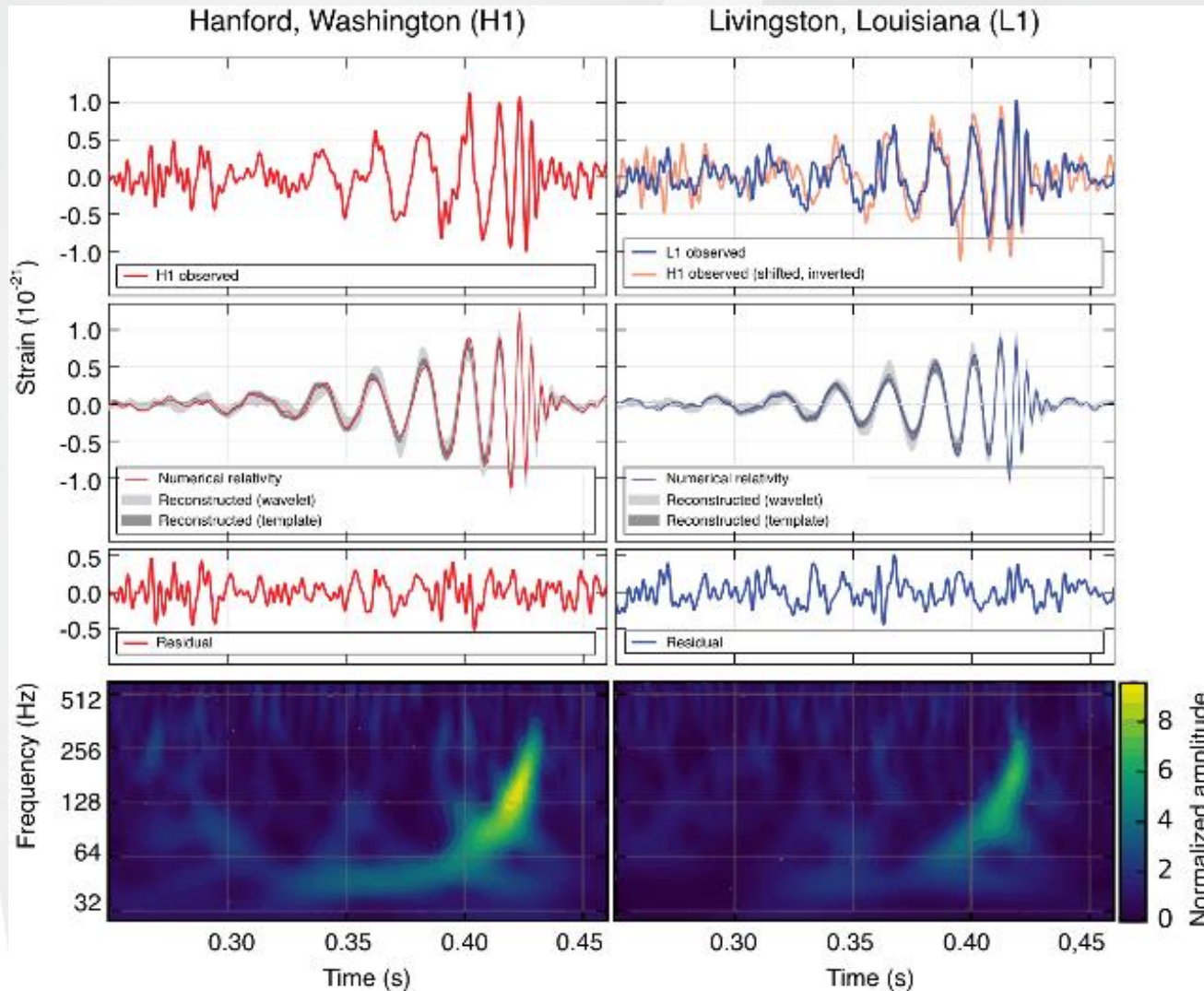
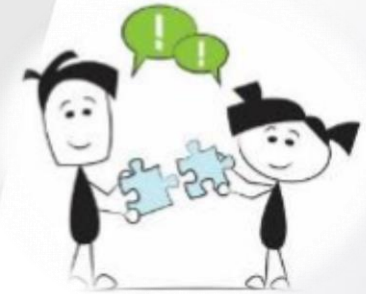


aLIGO = Advanced Light Interferometric Gravitational-wave Observatory

# Scientists Collaborate



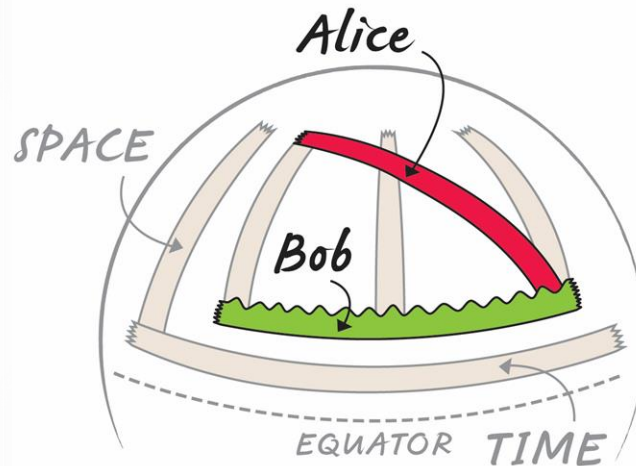
# Scientists Collaborate



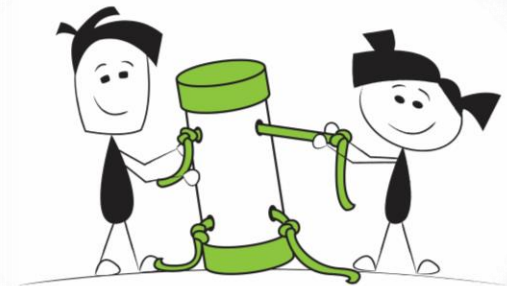
# Science is a powerful way of thinking...



Curiosity

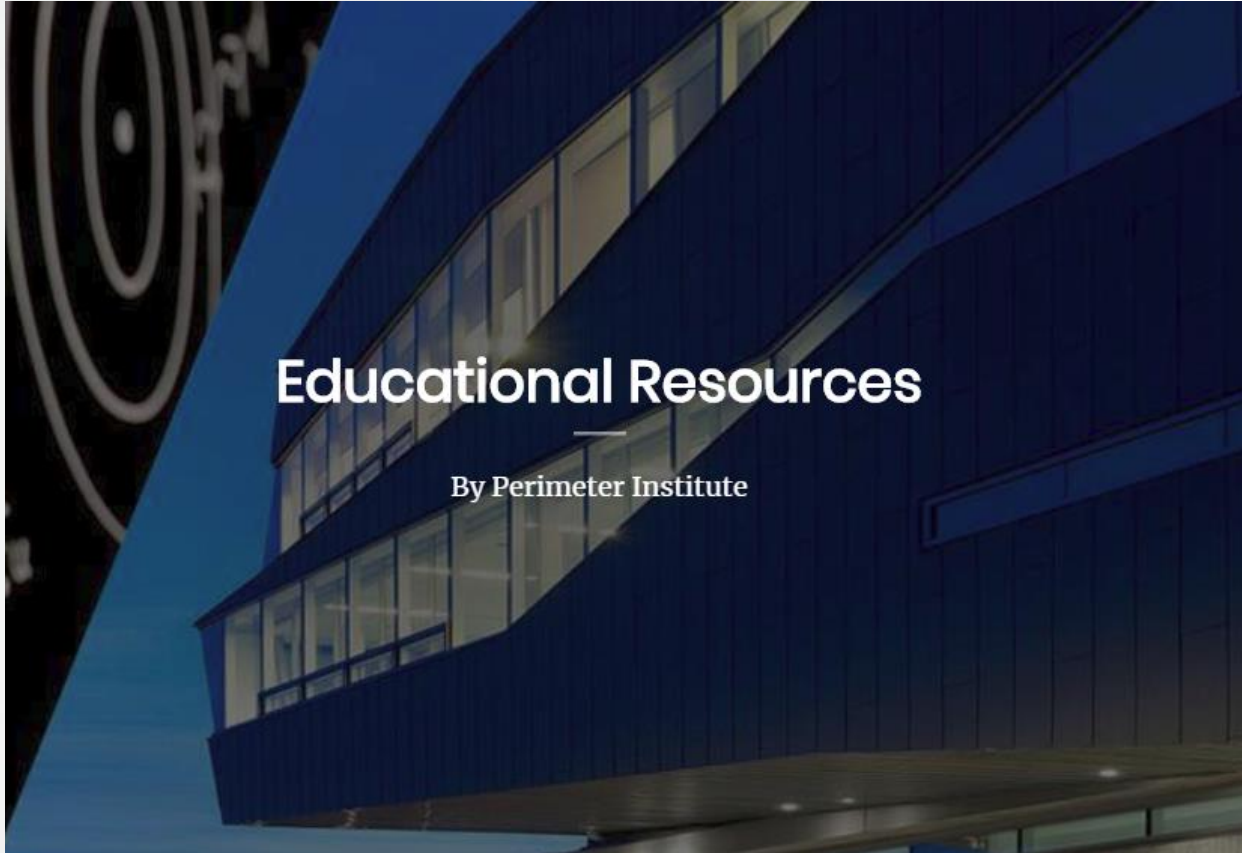


Creativity



Collaboration

# PI Resource Centre



<https://resources.perimeterinstitute.ca/>

# PI Resource Centre

EDUCATIONAL  
RESOURCES



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"*

*Patrick Kossman, Regina*



# 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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