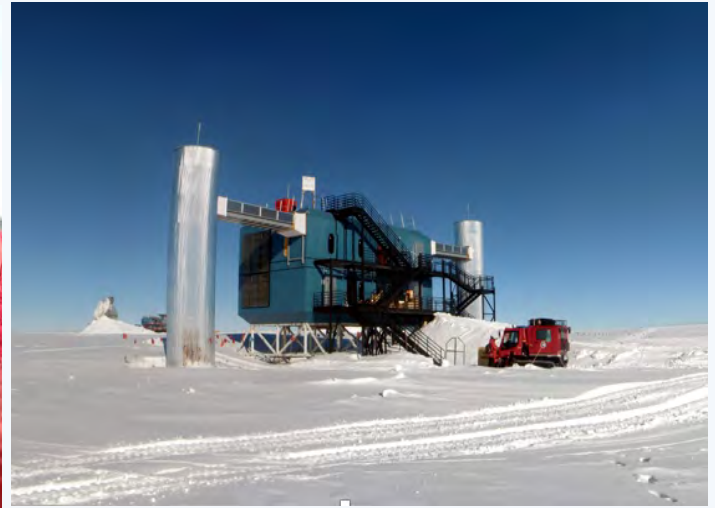


# Antarctica Day Celebration



## IceCube and the Askaryan Radio Array

With PolarTREC Teacher Jocelyn Argueta & Researcher Dr. James Madsen

**13 December 2019**



**OUR SPACES**  
FOUNDATION FOR THE GOOD GOVERNANCE OF INTERNATIONAL SPACES



**ICECUBE**  
SOUTH POLE NEUTRINO OBSERVATORY



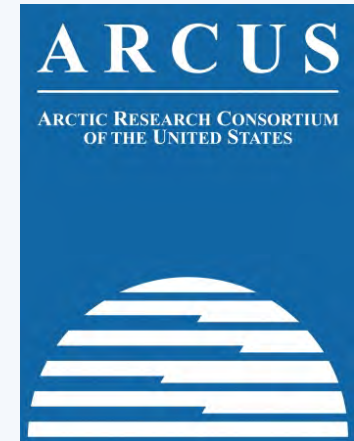
# Participant Introductions

**In the Chat box, please introduce yourself  
by typing in your:**

- ✓ Name
- ✓ School or Institution
- ✓ The number of students and adults participating with you in the same location

# What is PolarTREC?

- Since 2004, the Arctic Research Consortium of the United States (ARCUS), a non-profit organization, has been administering the PolarTREC Program.
- PolarTREC is professional development for K-12 teachers. They are paired with researchers for 2-6 week research experiences in the polar regions.
- Over 150 teachers from around the United States have joined scientists in the Arctic and Antarctica to learn about science, the polar regions, and to share what they have learned with their students and communities.



*25 Years of Connecting Arctic Research*  
[www.arcus.org](http://www.arcus.org)

# Questions

## During the Presentation:

- Type your question in the text chat box

## At the End of the Presentation:

- Raise your hand with the “hand button”.
- PolarTREC staff will call on you and activate your microphone.
- Speak loud and clear, directly into the computer microphone or the phone to ask your question.





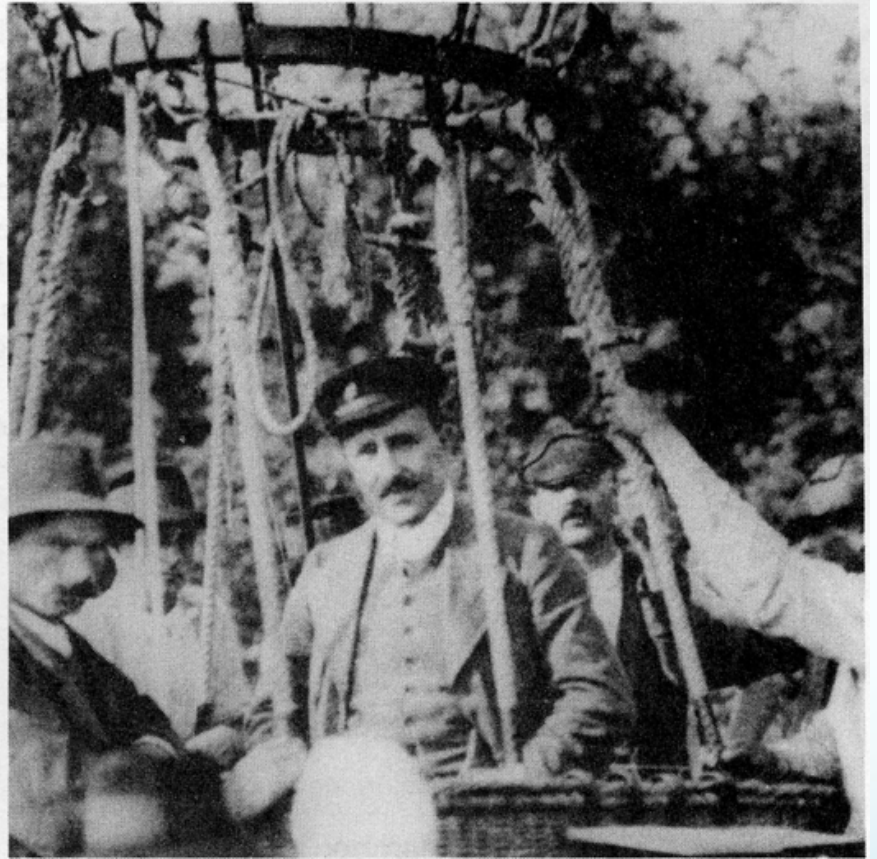
# History of Antarctic Exploration



# One hundred years ago



**December 14, 1911:**  
Roald Amundson  
succeeds in reaching  
the South Pole



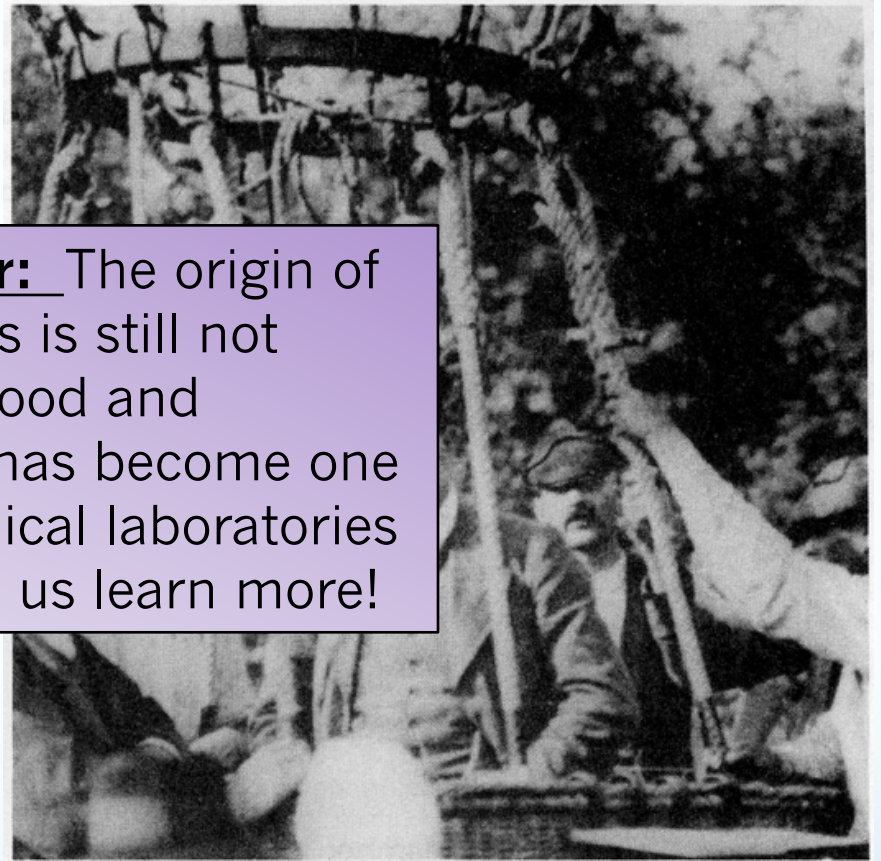
**1911/1912:**  
Victor Hess discovers  
Cosmic Rays



# One hundred years later



**100 years later:** The origin of cosmic rays is still not understood and the South Pole has become one of the astronomical laboratories which can help us learn more!



**December 14, 1911:**  
Roald Amundson  
succeeds in reaching  
the South Pole

**1911/1912:**  
Victor Hess discovers  
Cosmic Rays



# Antarctic Treaty - 1959



# Antarctic Conservation Act



Now almost 100 years after  
Amundsen and Hess' discoveries...





# McMurdo Station



# South Pole Station







# ICECUBE

SOUTH POLE NEUTRINO OBSERVATORY



**Amundsen-Scott South Pole Station, Antarctica**  
A National Science Foundation-managed research facility

50 m

IceTop

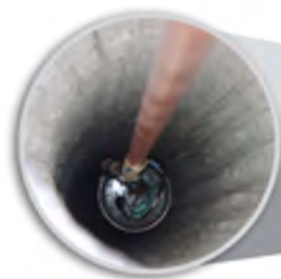


## IceCube Laboratory

Data is collected here and sent by satellite to the data warehouse at UW-Madison

1450 m

86 strings of DOMs,  
set 125 meters apart



## Digital Optical Module (DOM)

5,160 DOMs  
deployed in the ice

2450 m

IceCube  
detector

DeepCore

DOMs  
are 17  
meters  
apart

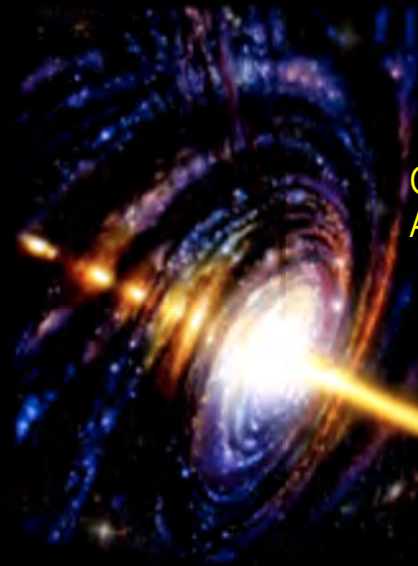
60 DOMs  
on each  
string

Antarctic bedrock



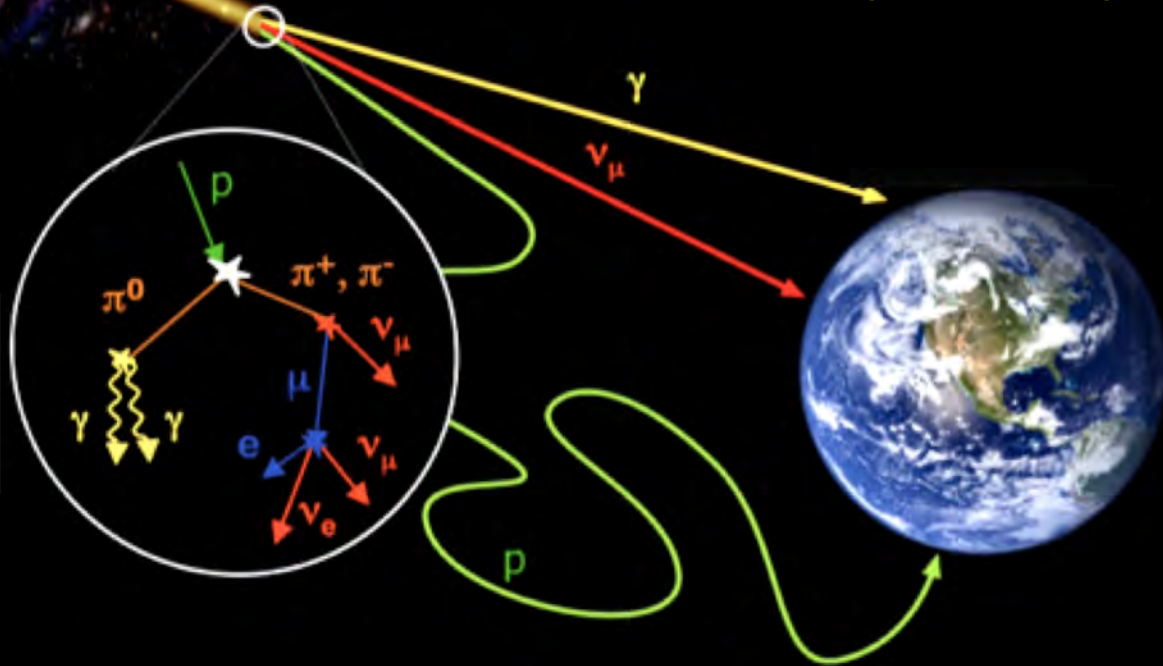


# Cosmic rays, gamma rays, and neutrinos from the cosmos



Cosmic accaerator:  
Active galaxy with supermassive black hole in the center.

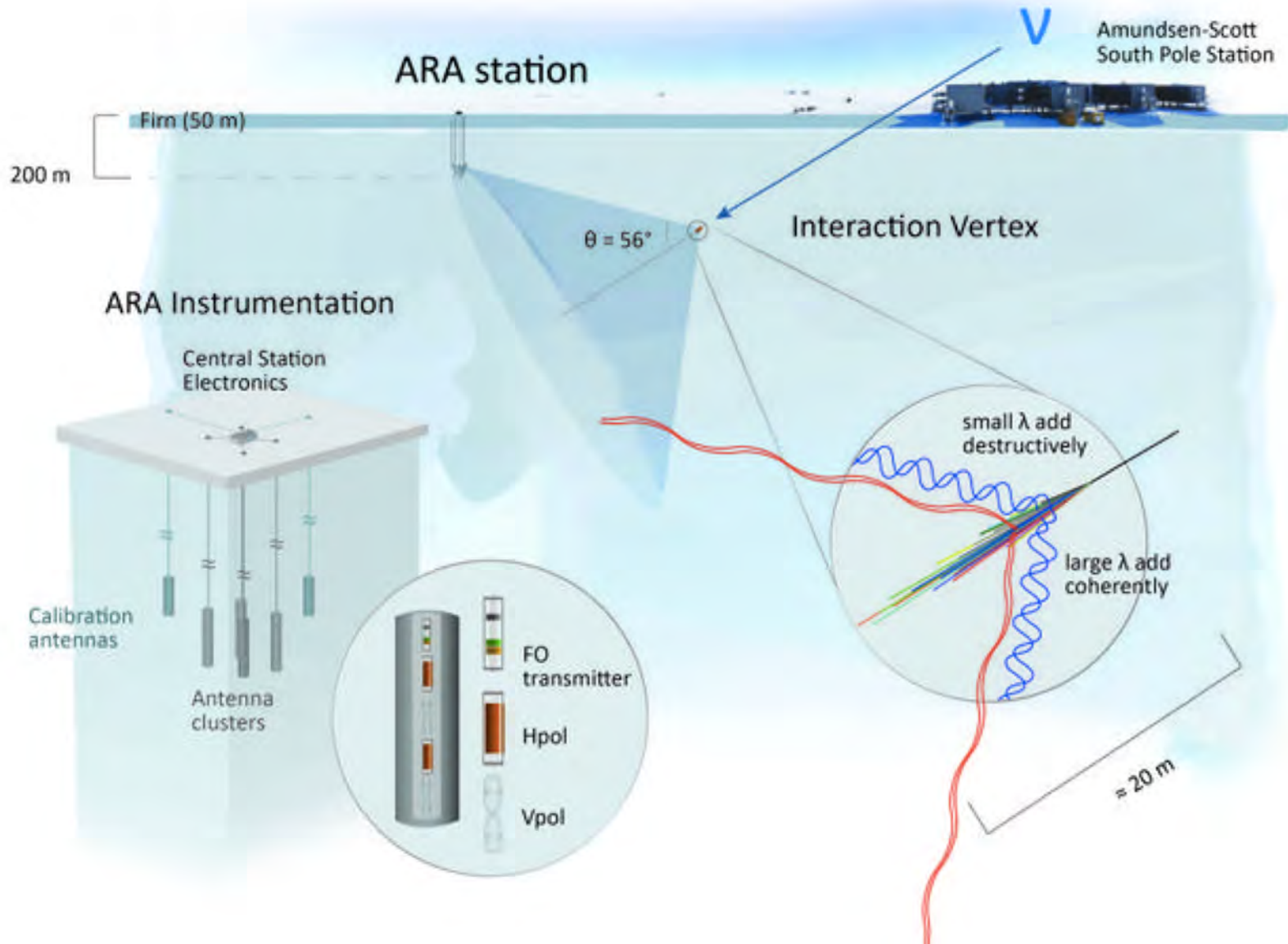
Energetic photons may get absorbed.  
Charged particles will get randomized in magnetic fields  
→ Neutrinos will travel in straight line through the Universe.



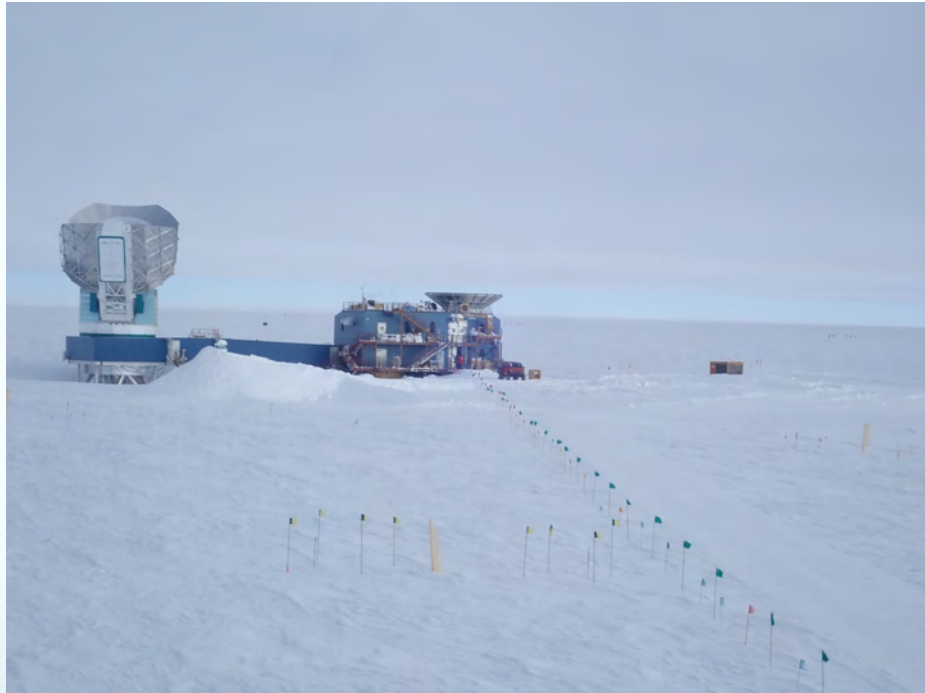
Cosmic protons will create many articles in collision, among them neutrinos



# Detection of ultrahigh-energy neutrinos in ARA



# South Pole Station











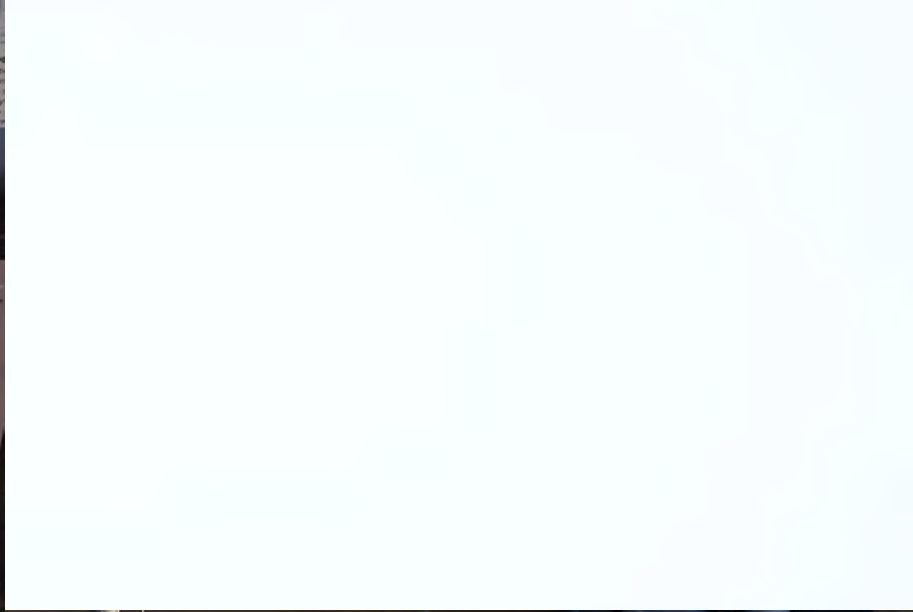
MT865C

8

120v

TRI5304

CAT







TEACHERS AND RESEARCHERS  
EXPLORING AND COLLABORATING

# Join PolarTREC!

[www.polartrec.com/about/join](http://www.polartrec.com/about/join)

Everyone can participate in different ways:

- **Follow Expeditions**
- **Participate in PolarConnect Events**
- **Join the Polar Education Email List**
- **Check out the great resources**
- **Become a PolarTREC Teacher or Researcher**
- **Become a member of ARCUS**

# Thank You!

*An archive of the event will be available shortly.*

<http://www.polar-trec.com/polar-connect/archive>



*25 Years of Connecting Arctic Research*  
[www.arcus.org](http://www.arcus.org)