

IceCube Education and Outreach and Communications

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Associate Director for E&O

IceCube Management and Operations
NSF Site Visit March 16, 2020



Outline

- Education and Outreach Deliverables
- Education and Outreach Activities
- Communications
- Diversity
- Summary



Deliverables

- Reach high school students, teachers, and K-12 classrooms
- Build STEM awareness through undergraduate research and South Pole deployments (PolarTREC)
- Produce captivating web and print resources, graphic designs, and displays
- Enhance education and outreach capacity
- Increase national and international audiences with conventional and new media



IceCube Masterclass

- One-day event for high school students and accompanying teachers to experience IceCube research
- Held annually since spring 2014
- Two activities (HESE analysis and cosmic ray flux) with extensive [web resources](#) in English, French, German, and Spanish
- Goals
 - Increase masterclass participation to 250 students annually
 - Offer masterclass in Spanish at a U.S. site
 - Review and revamp masterclass resources based on user evaluations

ICECUBE
MASTERCLASS
AN AUTHENTIC ASTROPHYSICS RESEARCH EXPERIENCE
MASTERCLASS.ICECUBE.WISC.EDU

Photograph by Keith Vanderlinde, IceCube21F

TUESDAY
APRIL 14, 2020

IceCube Masterclass
An Authentic Astrophysics Research Experience

Join UW-Madison scientists in a collaborative analysis of IceCube data and learn from young researchers why a science career is an interesting, even fun, and most of all real option for you.

Learn about IceCube, a cubic-kilometer detector at the South Pole, and about how tiny, ghostly particles, called neutrinos, can help us explore the extreme Universe.

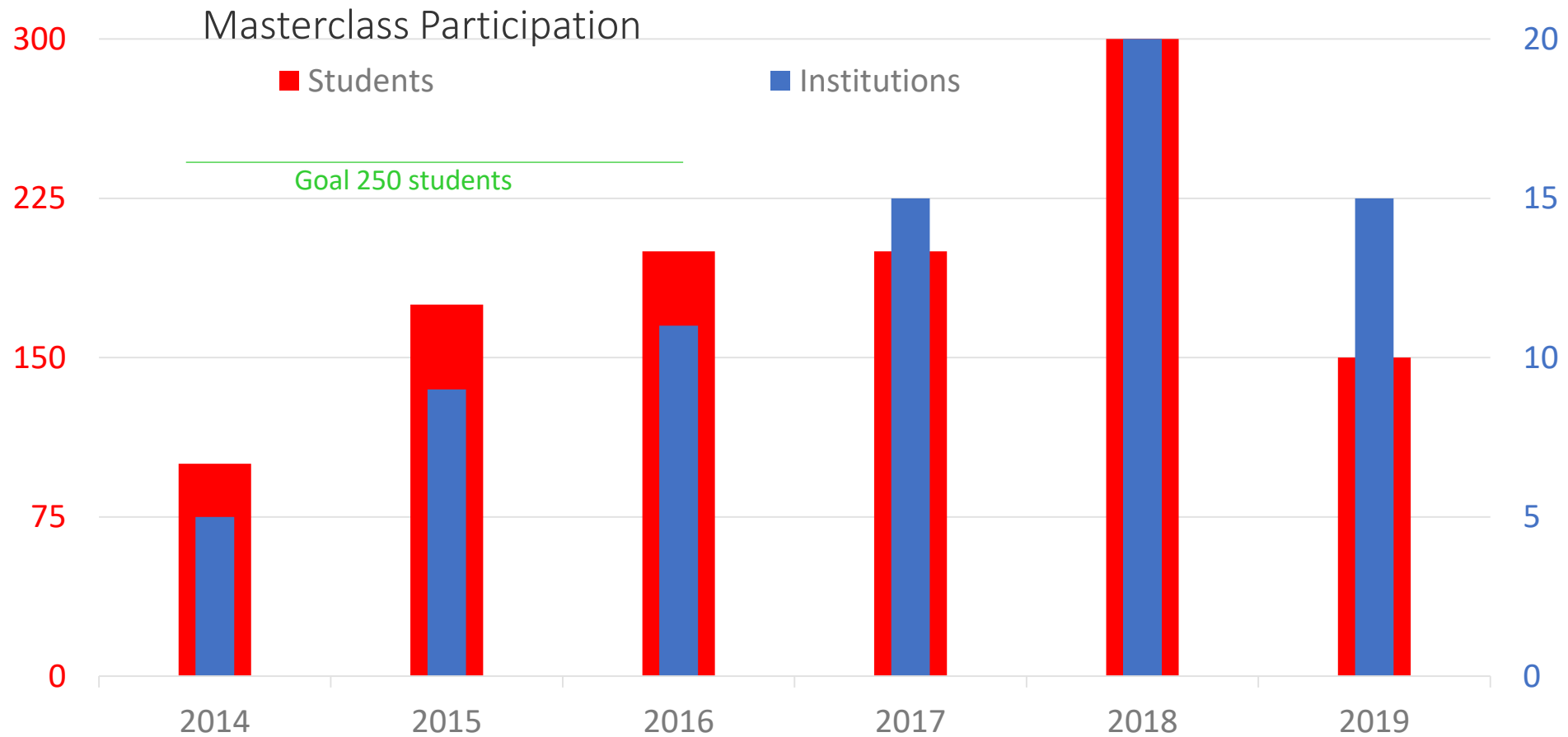
Audience
High school students & teachers, sophomores and above.
Registration is free, but spots are limited.

ICECUBE
SOUTH POLE NEUTRINO OBSERVATORY

WIPAC
WISCONSIN ICECUBE PARTICLE ASTROPHYSICS CENTER

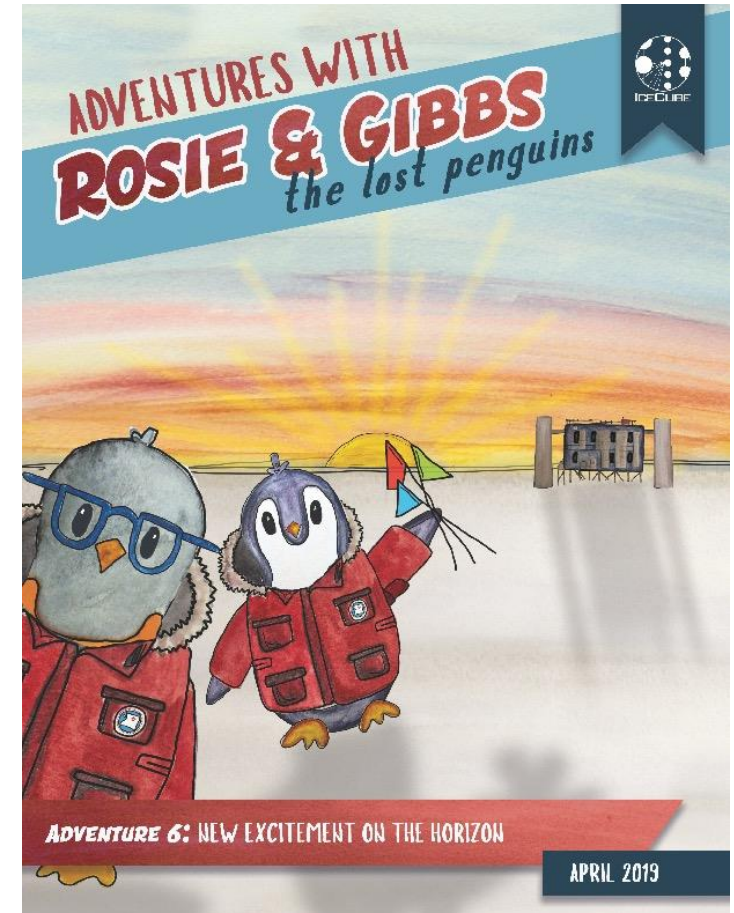


IceCube Masterclass Metrics



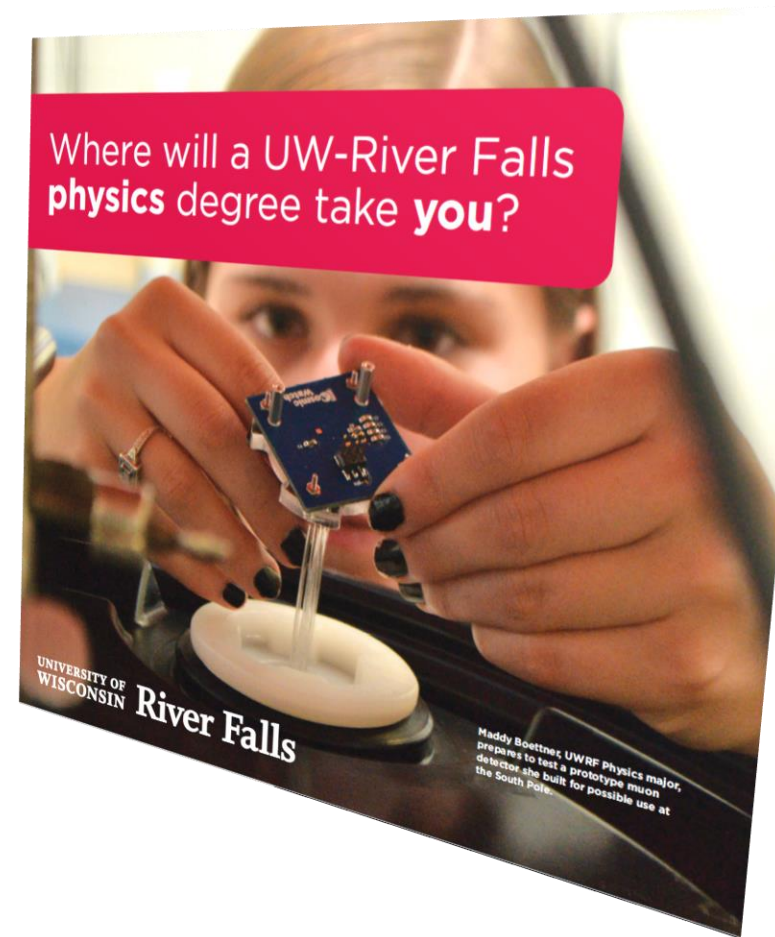
Rosie & Gibbs Comic

- Launched March 2018 for elementary school kids
 - South Pole life and IceCube science
 - Special editions, e.g., *Science* papers
- Translated to 9 languages by awesome collaborators
- Sixth and final issue May 2019 covered IceCube Upgrade
- Compilation of all six issues available



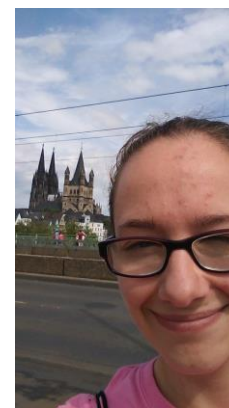
Undergraduate Research

- Many IceCube institutions employ undergraduates
- High-impact practice shown to increase retention
- Engaging students early builds transferable skills
- Goals
 - Dedicated virtual meetings for undergraduate researchers
 - Increase visibility through poster prizes at collaboration meetings
 - Majority of UWRF REU and IRES students from underrepresented groups and/or two-year colleges



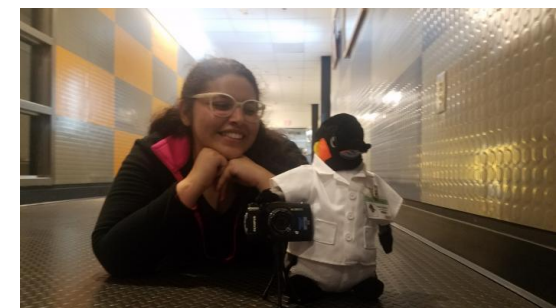
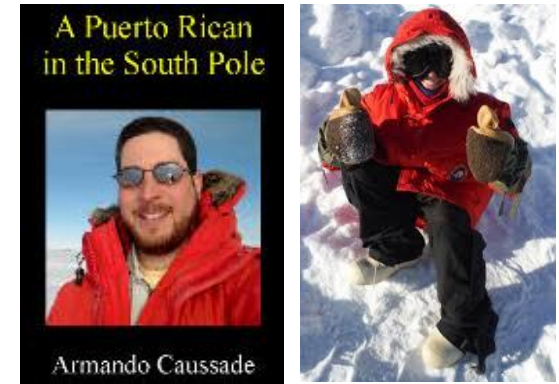
UWRF International Research Experiences & UW, UWRF REU

- UWRF Foundation funds
 - UWRF student Amy Zingheim (prior UWRF REU student)
 - 10 weeks at Aachen University
 - Worked on photomultiplier characterization
- 6th year for UWRF NSF REU (renewed 2018)
 - Recruits 6 students nationally
 - Students eligible after one year of physics
 - 2019 cohort: 5 women, 1 men (+ 3 women on solar physics)
- UW Astronomy and Astrophysics NSF REU



Teacher Deployments (PolarTREC*)

- [Armando Caussade](#) 2014-15
 - Puerto Rican educator and former Puerto Rico Astronomy Society president
 - Extensive media coverage and resources in English and Spanish including his [book](#)
- [Kate Miller](#) 2016-17
 - Arlington, VA, high school physics teacher
 - South Pole station [video](#) (over 1 million views)
- [Lesley Anderson](#) 2017-18
 - Chula Vista, CA, high school biology and environmental science teacher
 - Great videos showing South Pole transportation, living and working environments, and people
- [Jocelyn Argueta](#) 2019-20
 - National touring bilingual science theater program [Jargie the Science Girl](#)
 - Great [videos and bilingual blogs](#) and will incorporate experience into show
- [Elaine Krebs](#) 2020-2021
 - Lead educator at the [California Science Center](#) in Los Angeles, CA



*NSF supported program pairs polar researchers and educators

Upward Bound (UB)* Connections

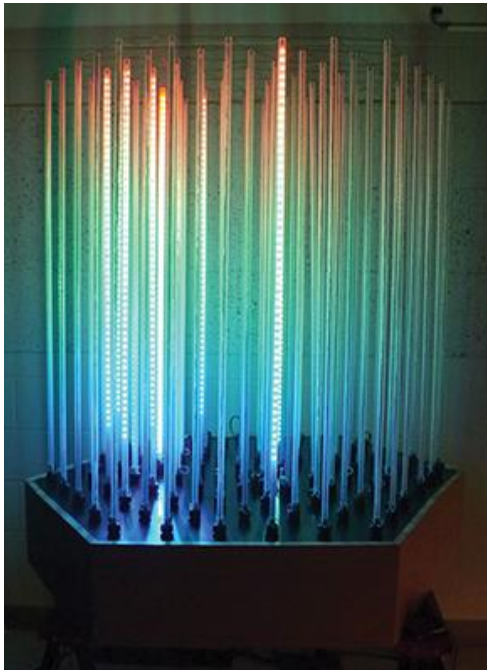
- IceCube PolarTREC teachers design and deliver two-week summer science immersion class for UWRF UB program
 - 11-year effort has served nearly 500 highly diverse 9-12 grade students
 - Will continue for 12th summer led by [Dr. Katey Shirey](#), former IceCube PolarTREC educator
- University of Rochester
 - Masterclass-style IceCube data analysis and event categorization competitions

*Upward Bound is a federally funded program to prepare first generation and/or low-income students for success in postsecondary education



Web Resources and LED Models

- Growing [graphic and video collection](#)
 - Support material for press releases
 - Promotional posters
 - Pictures from the South Pole
- Multiple scale models to display IceCube data
 - WIPAC
 - Aachen
 - Gent
 - Munster
 - Stockholm
 - Toronto



340,000 + Views



Enhancing E&O Capacity

- Communications workshops at IceCube Collaboration meetings
- Leveraging resources
 - Continuing to build on IceCube VR efforts
 - IceCube experience available in Spanish and Portuguese
 - Expanding to new Antarctic topics
 - NSF M&O supplemental award Multimessenger@INCLUDES: Leading a community of change in multimessenger astronomy
- Particle physics outreach
 - [Interactions](#)
 - [Origin](#)



 **INTERACTIONS.ORG**
PARTICLE PHYSICS NEWS AND RESOURCES

Data Sonification

- Collaboration with Jim Madsen, Gwenhael De Wasseige, Martin Rongen, and artists Donald Fortescue and Mark-David Hosale

Synergy between Art and Science Collaboration at the South Pole



Prof. Donald Fortescue,
California College of the Arts,
San Francisco



Dr. Gwenhaël de Wasseige,
IceCube Collaboration.

<https://arxiv.org/abs/1908.08812>

To view *Axis Mundi*
<https://vimeo.com/314347886>

Fortescue's research in Antarctica, in the austral summer of 2016/2017, was supported by the United States National Science Foundation (NSF) through an Antarctic Artists and Writers Fellowship and by the Australian National University through an Australian Government Research Training Program Scholarship.

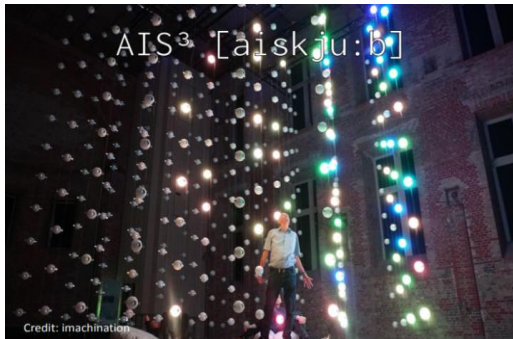


Australian
National
University



National and International Events

- World Science Festival, NYC June 2015–2019
- [AIS³](#) (Astrophysics Immersive Synthesizer, Germany)
- International Cosmic Ray Conference 2019 in Madison
- "Highlights of Physics" September 16–21, 2019 in Bonn



IIHE (ULB-VUB) 2019 Events



- South Pole Experiment Contest
 - 11 schools participated (Flemish)
 - Winning experiments will be performed at South Pole
 - 4th edition underway
- Exposition event @VUB in May for 30 students
- Pint of Science Brussels in May for adults
- Workshop @VUB in August for 40 students



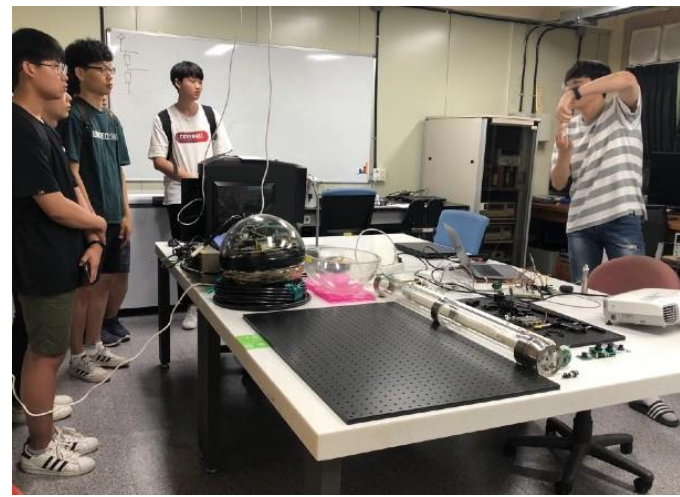
THE SOUTH POLE EXPERIMENT CONTEST

joining science exploration in antarctica



Sungkyunkwan University

- Tested IceCube camera at local high school
- Lecture series at 2019 Summer Institute and SKKU Physics Festival
 - Five days of lab tours with multiple groups per day
- Global Youth Academy at Beomeo library in Daegu
 - ~150 elementary to high school students



WIPAC Activities

- DC Meets Madison
- Grandparents University
- WI Science Festival and Science Expeditions
- High school internship
- IceCube Masterclass
- Saturday Science at WID
- South Pole webcasts



Communications

- New press officer - Madeleine O'Keefe
 - Education
 - B.A. in Astronomy (Boston University)
 - M.S. in Science Journalism (also BU)
 - Experience
 - CMS Experiment at CERN
 - Argonne National Laboratory
 - Boston University Physics Department
 - Favorite particle
 - muon



Mokeefe@icecube.wisc.edu

Web Articles

- Continuing news articles for every IceCube paper
- More profiles/Q&As with collaborators

The screenshot shows the IceCube website with a navigation bar (Home, About Us, Science, Collaboration, Outreach, Life @ Pole) and several news articles under the heading "IceCube News Topic: Research".

- Fast radio bursts and neutrinos: Is there a connection?** (2020-02-18)
 - Includes a small line graph showing data trends.
 - Text: "Fast radio bursts (FRBs) are some of the most enigmatic phenomena in the universe. These millisecond-long pulses of radio waves most likely originate outside of our galaxy, but we don't know much more than that. The IceCube Collaboration recently looked for neutrino events that coincided with 28 nonrepeating FRBs and one repeating FRB. Searching for neutrinos emitted from the same part of the sky as FRBs could provide clues to help test models that suggest particle acceleration near the FRB source. Results from this search are outlined in a paper published today in *The Astrophysical Journal*."
- New insights into the astrophysical neutrino flux** (2020-02-10)
 - Includes a small scatter plot with a red trend line.
 - Text: "In a paper recently submitted to *Physical Review Letters*, the IceCube Collaboration presents new results of an analysis to determine and characterize, with unprecedented precision and across the entire sky, the combined flux of astrophysical electron and tau neutrinos."
- New optical telescope proves to be fit for the South Pole** (2020-02-05)
 - Includes a small image of a telescope structure.
 - Text: "For South Pole experiments like the IceCube Neutrino Observatory, all instruments—whether in the ice or on the surface—must undergo feasibility studies to make sure they can operate in the harsh Antarctic conditions. Optical instruments, especially, are subject to icing and snow accumulation. Recently, the IceCube Collaboration proved the successful operation of a new instrument, an imaging air-Cherenkov telescope, at the Pole. They outline the details of the study in a paper published today in the *Journal of Instrumentation*."
- Optimizing the "eyeballs" of the IceCube Neutrino Observatory** (2020-02-05)
 - Includes a small image of a detector component.
 - Text: "Researchers in the IceCube Collaboration are always looking for ways to improve the understanding of the PMTs so they can get the highest-quality"

Meet Jocelyn Argueta, our 2019 PolarTREC educator 2019-11-21



IceCube's South Pole crew will have another pair of helping hands (and flippers) this summer season: Jocelyn Argueta will be at the Pole from November 30 to December 27 as our 2019 PolarTREC educator. (As for the flippers...keep reading to find out.)

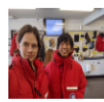
Jocelyn is a bilingual scientist-performer with Phantom Projects Theatre Group in La Mirada, California. She has a Bachelor's degree in biochemistry and molecular biology from the University of California, Irvine, and has her own show based around her character, Jargie the Science Girl!

Meet Shaun O'Boyle: Photographer of Antarctica 2019-11-14



American photographer Shaun O'Boyle is about to embark on his third Antarctic expedition. His unique trips are possible through the National Science Foundation's Antarctic Artists and Writers (AAW) Program, which has sent him to McMurdo Station, Palmer Station, and now the South Pole. On this trip, O'Boyle plans on photographing IceCube's scientific instruments.

Meet our 2019-2020 winterovers: Yuya and John 2019-11-06



From November 2019 to November 2020, IceCube's winterovers will be Yuya Makino and John Hardin. Here are some quick facts about the newest members of our South Pole squad.

Off the ice: a Q&A with our 2018-19 winterovers, Kathrin and Benjamin 2020-01-28



Our winterovers for the 2018-2019 season, Kathrin Mallot and Benjamin Eberhardt, returned from Antarctica last November. Now that they've had a couple of months to relax and readjust to life "up north," we asked them to reflect upon their recent experience at the South Pole. Read our Q&A to find out what they missed the most, what they learned while they were there, and other things they shared about their adventure.

Taking to the skies: How one IceCuber is spending her sabbatical year 2020-02-11



Katherine Rawlins, a University of Alaska Anchorage physics professor and IceCube collaborator, is spending her sabbatical year flying around the continental United States in her own Cessna 172 airplane. It turns out that IceCube played a role in helping Rawlins achieve her dream of flight.



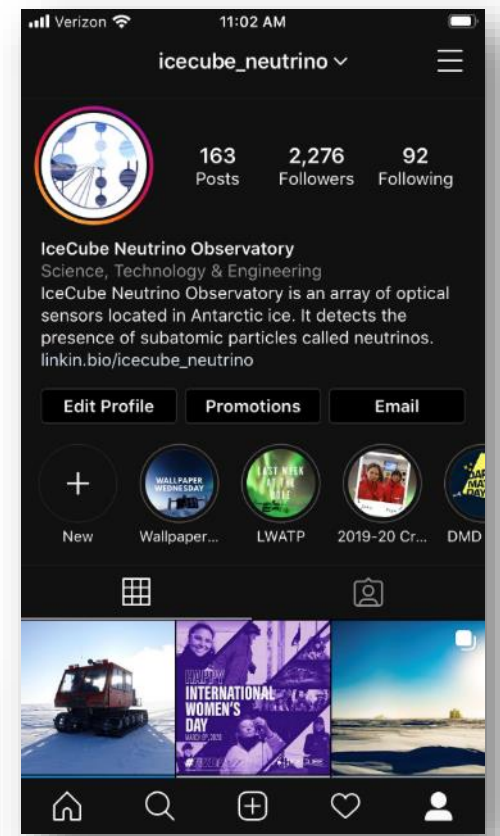
Social Media Updates (3/10/20)



Twitter:
10,376 followers
@uw_icecube



Facebook:
10,764 followers
@icecube.neutrino



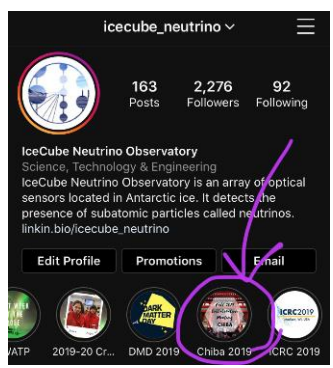
Instagram:
2,276 followers
@icecube_neutrino



Increasing Instagram Stories



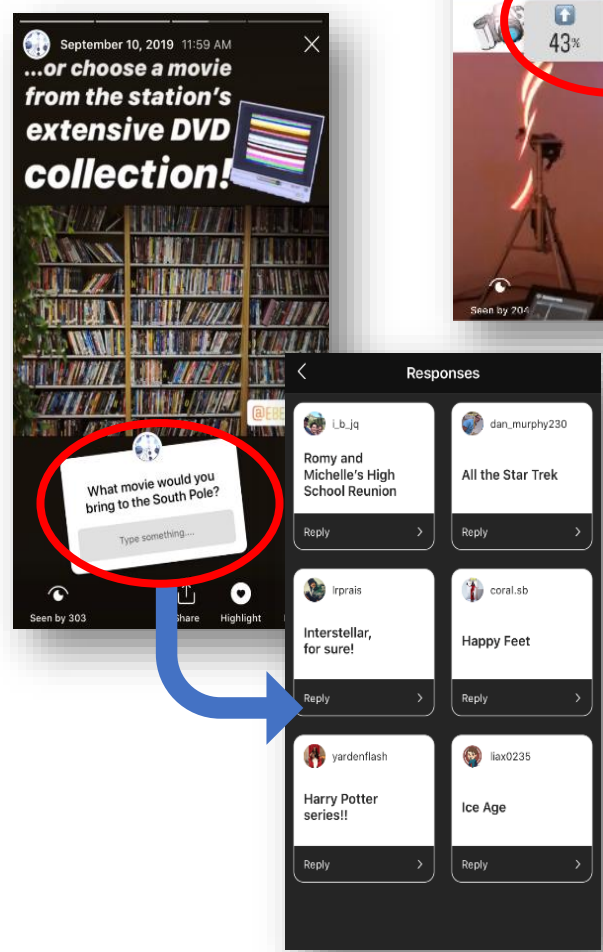
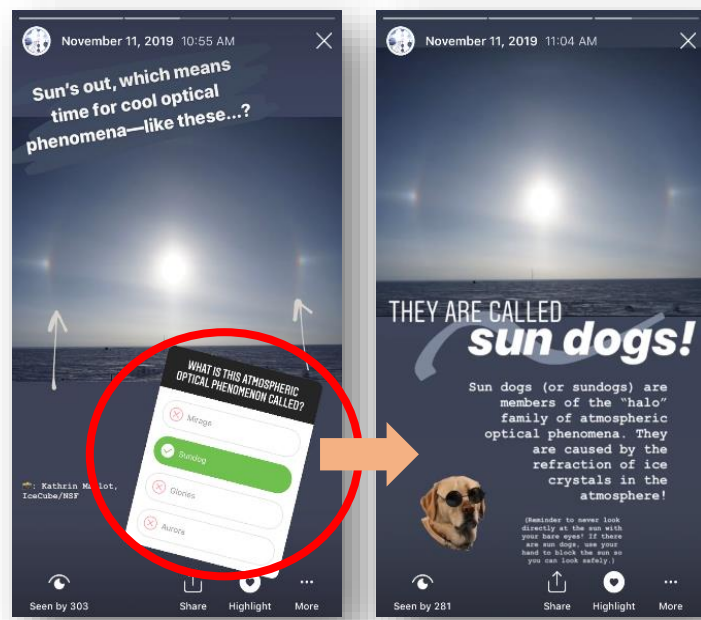
- Photos/video that appear on profile for 24 hours
- Can be saved to profile indefinitely as a "Highlight"
- Can also view on Facebook profile
- **Examples:** Fall 2019 Chiba Collaboration Meeting



Instagram Stories (cont.)

Promotes follower interaction through...

- Voting/polls
- Free response
- Quizzes



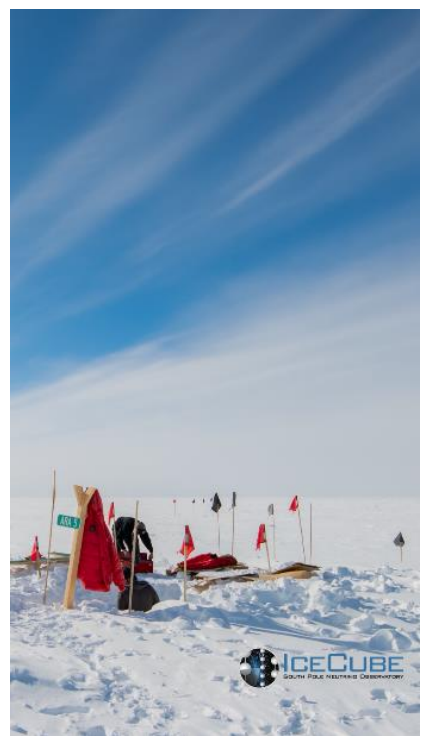
Wallpaper Wednesdays

- Screenshot photos posted on Instagram stories for phones

It's **Wallpaper Wednesday!**

Tap through today's story and follow these instructions to save your favorite photos for your phone's wallpaper!

- 1 Press and hold**
- 2 Screenshot!**
- 3 Set as wallpaper**
- 4 Take IceCube with you wherever you go!**



Festive IceCube DIY projects

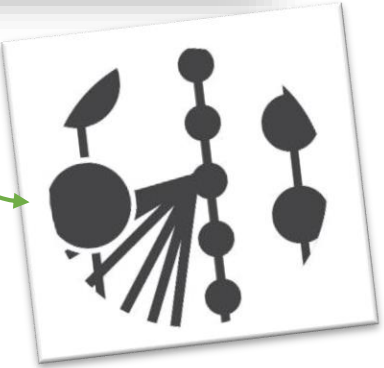
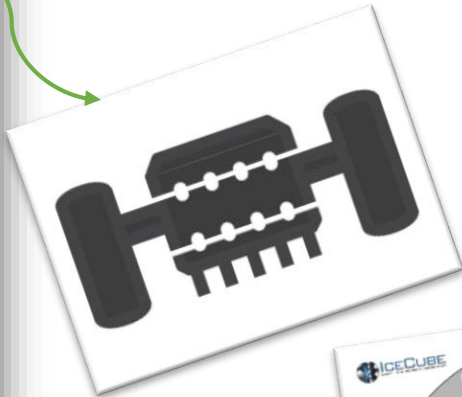
Happy Halloween! Try these IceCube pumpkin stencils
 By the IceCube Collaboration, 28 Oct 2019 11:00 AM

Like Tweet

IceCube Logo IceCube Logo - Inverted ICL
 Electron Neutrino Muon Neutrino Tau Neutrino

Six IceCube-themed pumpkins. Which one(s) will you make? Credit: IceCube Collaboration

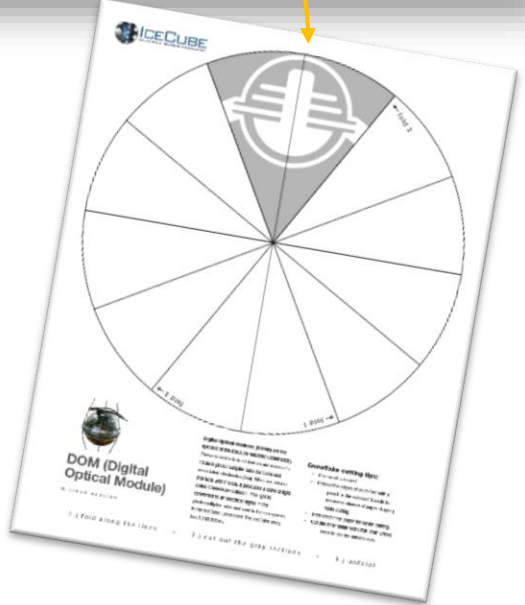
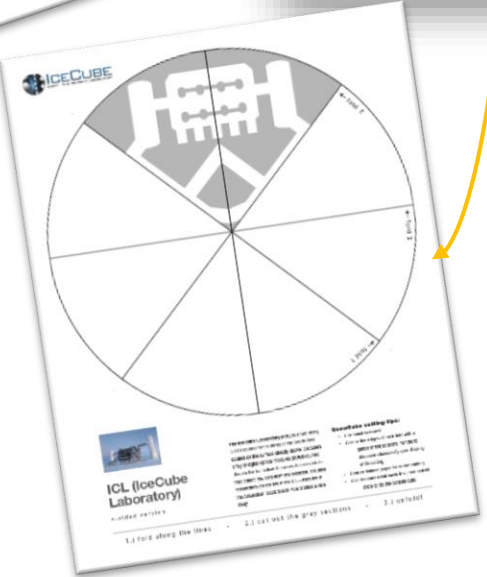
What's missing from your Halloween celebration? Some IceCube-themed pumpkins, probably. Never fear! We are providing you with a variety of stencils to use in your Halloween decor. Choose from our logo, the IceCube Lab, or one of the ghostly particles themselves. Better yet, make all 6!



Get festive with these IceCube snowflake patterns
 By IceCube Communications, 19 Dec 2019 09:30 AM

Like Tweet

Try one (or more) of our festive, IceCube-themed snowflake templates. Credit: IceCube Collaboration



Diversity

- Social media campaigns supporting Pride month and #LGBTQSTEMDay on July 5
- Multimessenger Diversity Network growth
 - Increase collaborations from 4 to 7
- At IceCube Collaboration meeting in Chiba
 - First LGBTQ+Allies dinner
 - Women+Allies networking
 - Science communication workshop
 - Pronoun stickers



Opportunity
to go beyond individual accomplishments

Structure
through organizational principles and tools

Legitimacy
in broadening participation efforts



Training
for members of the network

Presence
at conferences, on websites and media outlets

Support
from each other and for current and future STEM professionals



MDN Conference Presentations & Publications

- NSF Large Facility Workshop: **Talk**
 - April 2-4, 2019, Austin, Texas
 - Jim Madsen - *The Multimessenger Diversity Network: a collaborative effort to broaden participation in multimessenger astronomy*
- Astro2020 APC White Paper: Pursuing diversity, equity, and inclusion in multimessenger astronomy collaborations over the coming decade: **Article** (arxiv.org/abs/1907.06970)
 - July 16, 2019
 - E. Bechtol, K. Bechtol, S. BenZvi, B. Cenko, L. Corlies, P. Couvares, A. Furniss, E. Hays, C. M. Hui, D. L. Kaplan, J. S. Key, J. Madsen, M. McLaughlin, F. McNally, R. Mukherjee, M. Santander, S. Vigeland, J. Zuniga-Paiz
- Inclusive Astronomy 2: **Talk**
 - October 14-15, 2019, Baltimore, Maryland
 - Ellen Bechtol - *The Multimessenger Diversity Network: Creating diverse and inclusive science collaborations*
- IAUS 358: Astronomy for Equity, Diversity and Inclusion — a roadmap to action within the framework of the IAU 100th Anniversary: **Talk/Proceeding**
 - November 12-15, 2019, Tokyo, Japan
 - Jim Madsen - *The Multimessenger Diversity Network: Creating diverse and inclusive science collaborations*

Summary

- IceCube Education and Outreach Continues to Evolve
- Strong Partnerships Leverage Resources
- Public Fascination with IceCube Remains High
- More Projects on the Horizon

