

IceCube Neutrino Observatory

Physics from UW–Madison
to the South Pole



Image: Yuya Makino, IceCube/NSF

IceCube is the **largest** neutrino
detector in the **world**.



Image: Martin Wolf, IceCube/NSF



Image: Connor Duffy, IceCube/NSF

One **terabyte** of unfiltered data is collected **daily** from **5,160** digital optical modules (DOMs).

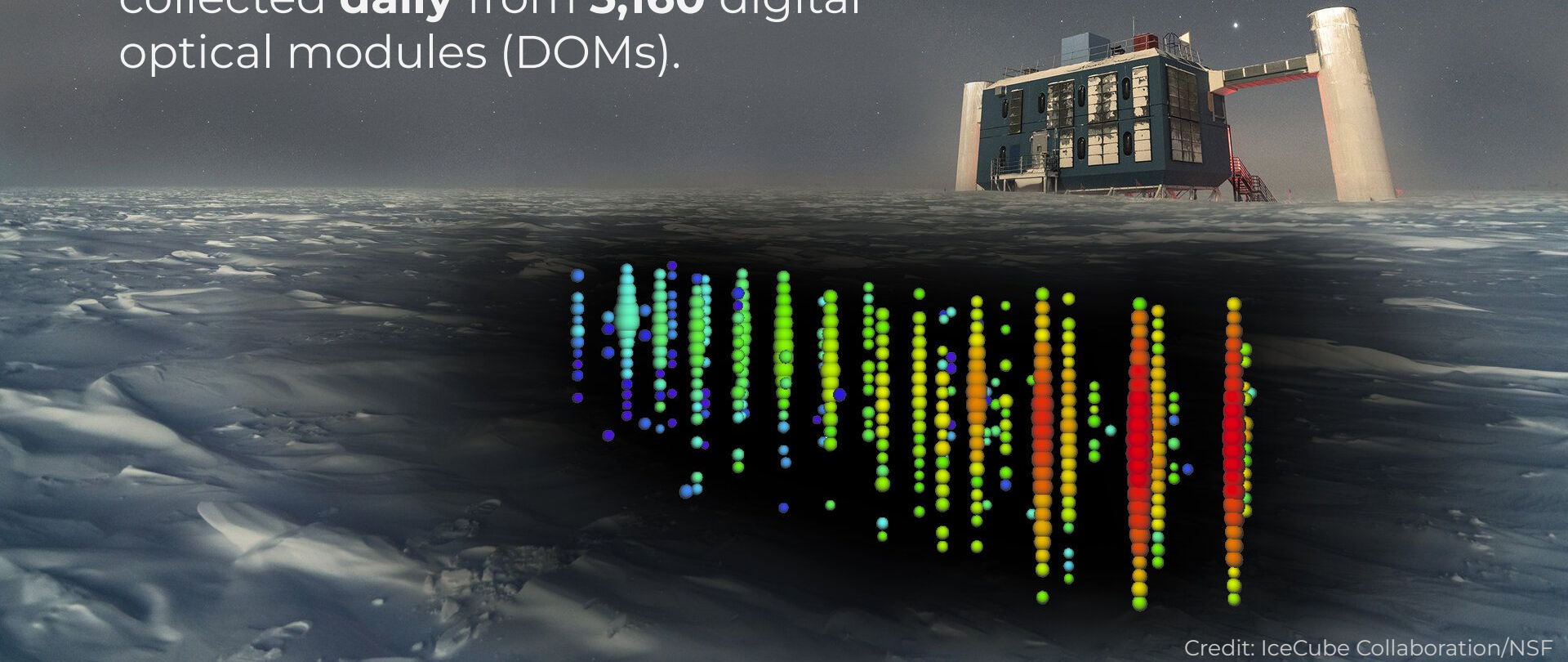




Image: Martin Wolf, IceCube/NSF

The **IceCube** detectors are suspended within **one cubic kilometer of ice**—that's enough water to fill **one million swimming pools!**





Image: Connor Duffy, IceCube/NSF

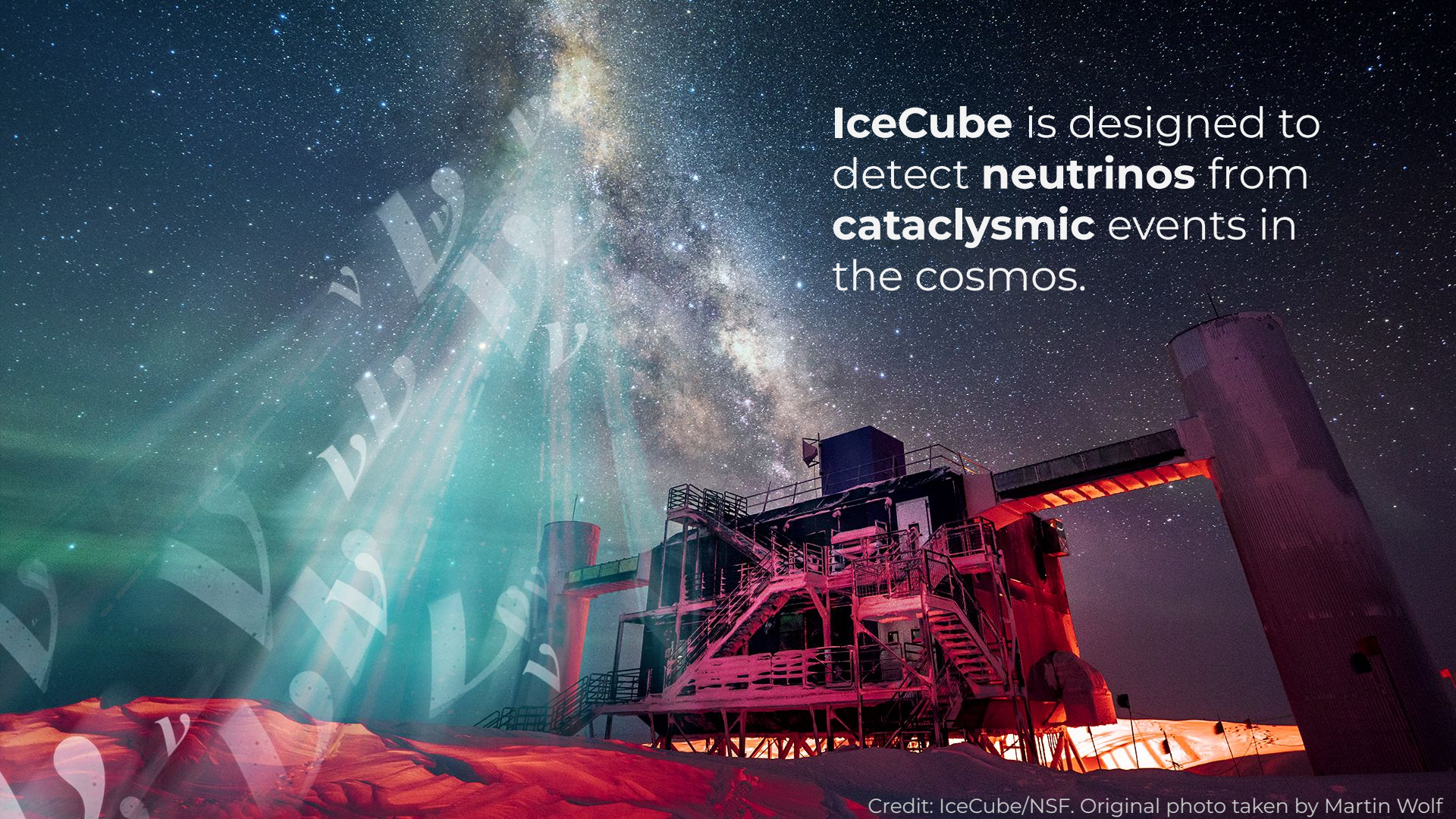


Image: Felipe Pedreros, IceCube/NSF

The **Milky Way** in **neutrinos**



Credit: IceCube Collaboration/U.S. National Science Foundation (Lily Le & Shawn Johnson)/ESO (S. Brunier)

A composite image featuring the IceCube detector structure at night. The structure is illuminated with red and blue lights. In the background, the Milky Way galaxy is visible in a starry sky. On the left, a vibrant green aurora borealis is shown. Overlaid on the left side are faint, translucent Hebrew characters. The text 'IceCube is designed to detect **neutrinos** from **cataclysmic** events in the cosmos.' is positioned in the upper right.

IceCube is designed to detect **neutrinos** from **cataclysmic** events in the cosmos.

Credit: IceCube/NSF. Original photo taken by Martin Wolf



Image: Christopher Michel, IceCube/NSF

IceCube detects **275**
atmospheric neutrinos **daily**,
that's about **100,000 per year**.





Image: Connor Duffy, IceCube/NSF

IceCube detects
275 million
cosmic rays **daily.**



Image: Yuya Makino, IceCube/NSF

There are **5,160 extremely sensitive light detectors** within the ice that use **minicomputers** to relay data to the surface.





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IceCube Laboratory

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



Digital Optical Module (DOM)

5,160 DOMs deployed in the ice

50 m

1450 m

2450 m

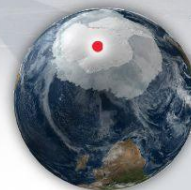
IceTop

86 strings of DOMs,
set 125 meters apart

IceCube
detector

DeepCore

Antarctic bedrock



Amundsen-Scott South Pole Station, Antarctica

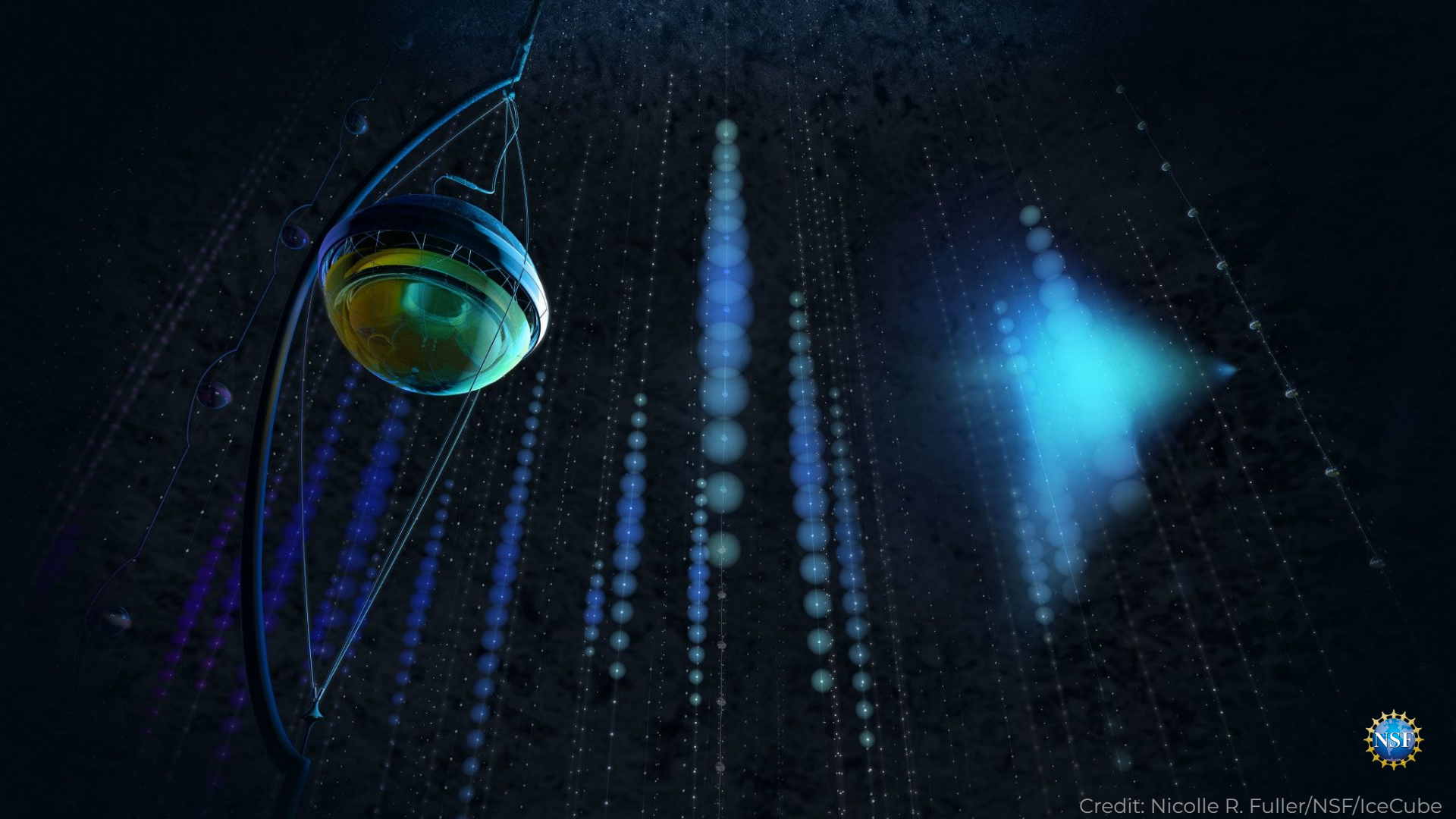
A National Science Foundation-managed research facility

60 DOMs
on each
string

DOMs
are 17
meters
apart

IceCube is
composed of
86 cables,
each holding
**60 digital
optical
modules**
(DOMs).





Credit: Nicolle R. Fuller/NSF/IceCube



Image: Mel Macmahon, NSF

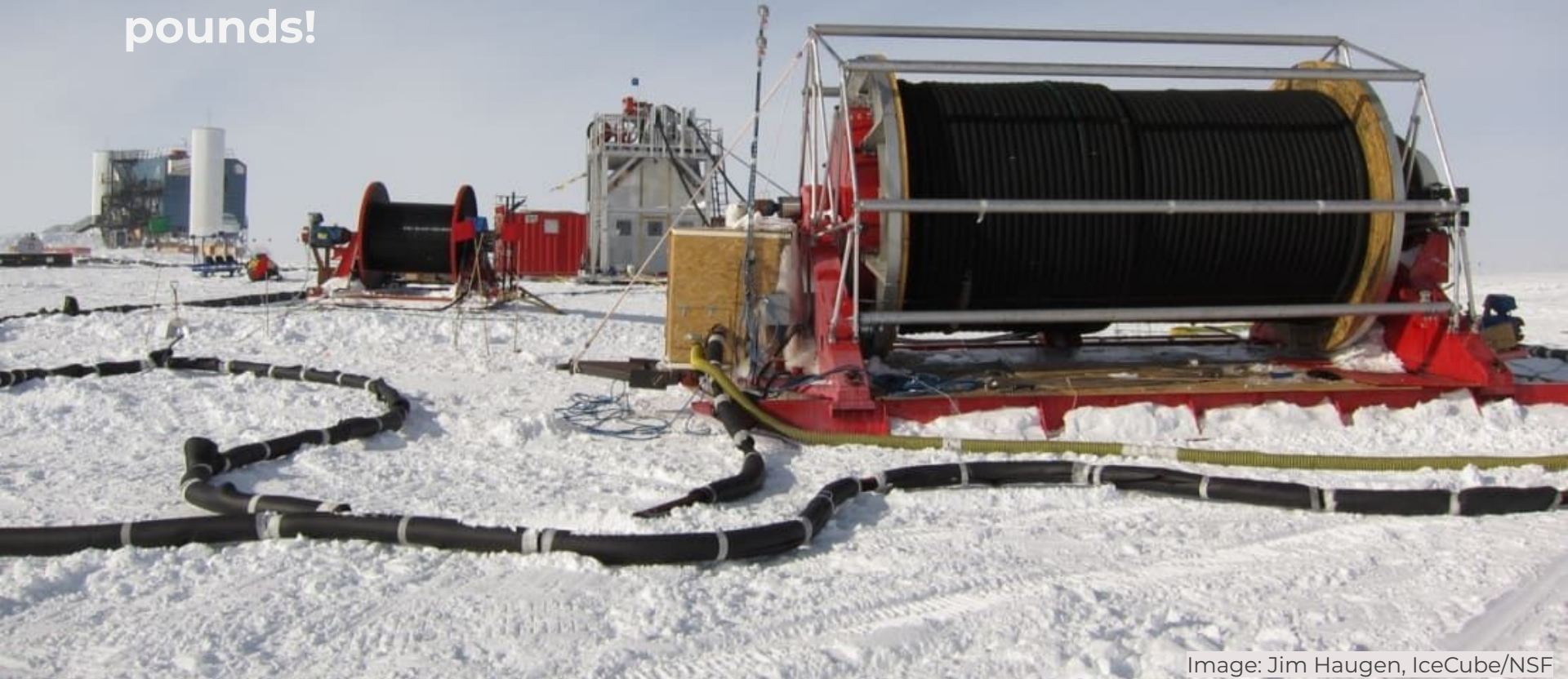
It took **seven years** of work to complete the construction of **IceCube**.





Image: Michael Rayne, ASC-ARFF

The hot water hose used
for **drilling** weighs **25,000**
pounds!



A photograph showing four researchers in red parkas and black helmets standing in a deep, snow-filled trench. They are surrounded by thick, white snow walls. In the background, a tall, silver, cylindrical structure, likely part of the IceCube observatory, rises above the snow. The sky is clear and blue. The researchers are positioned along a line of black cables that run through the trench. The text 'It took about 60 hours to drill and deploy each cable.' is overlaid on the right side of the image.

It took about **60**
hours to **drill** and
deploy each **cable**.



Image: Martin Wolf, IceCube/NSF



Construction activities could only take place during the **summer** in the **Southern Hemisphere** (Nov–Feb).



Image: Dale Mole, IceCube/NSF

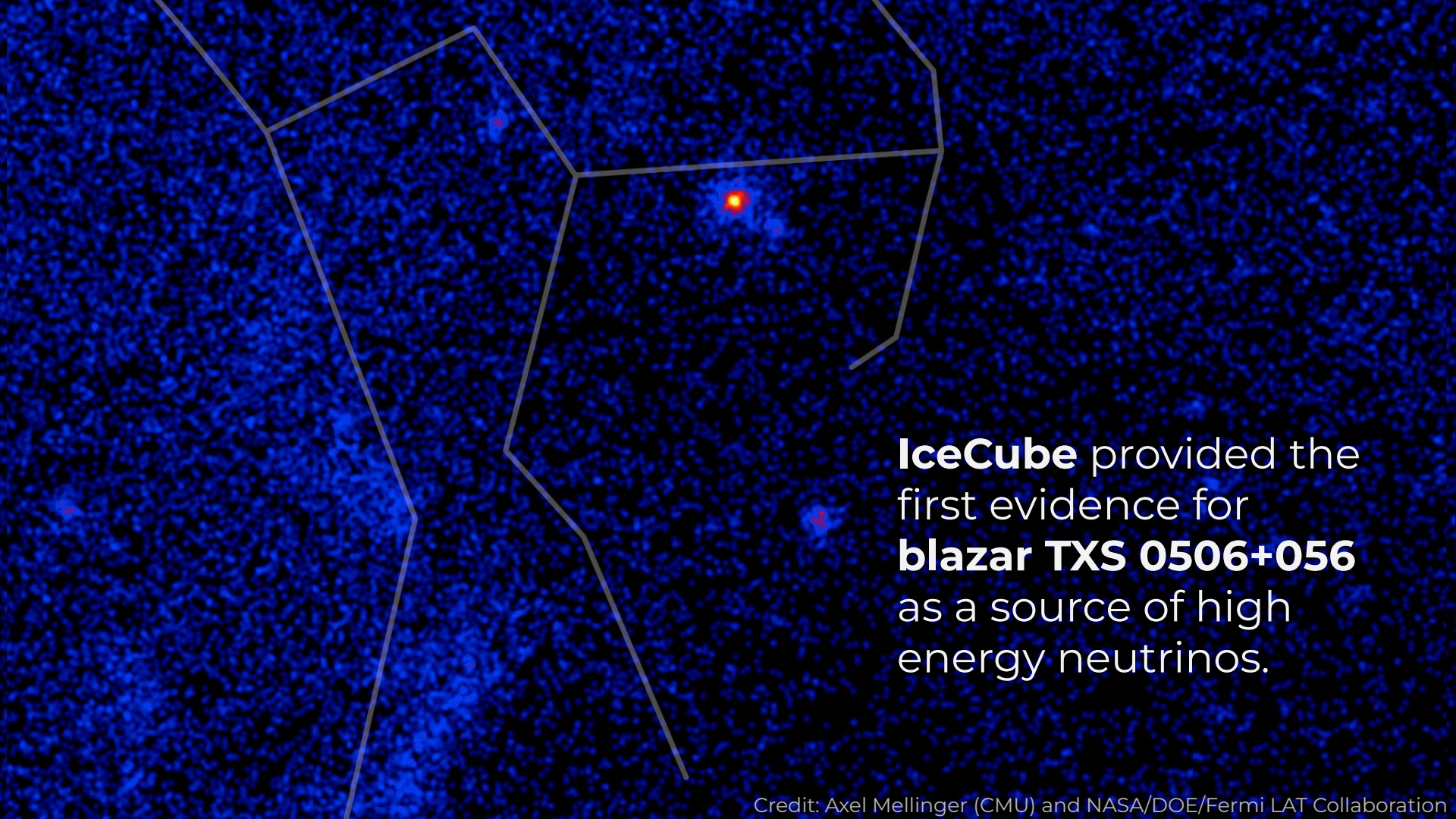


Image: Connor Duffy, IceCube/NSF

About **100 trillion**
neutrinos pass
through your body
every second!







IceCube provided the
first evidence for
blazar TXS 0506+056
as a source of high
energy neutrinos.

Credit: Axel Mellinger (CMU) and NASA/DOE/Fermi LAT Collaboration



Credit: Artist's rendering of quasar P172+18 | European Southern Observatory on Flickr

Around **350 scientists** from
58 institutions in **14 countries**
conduct science with **IceCube**.

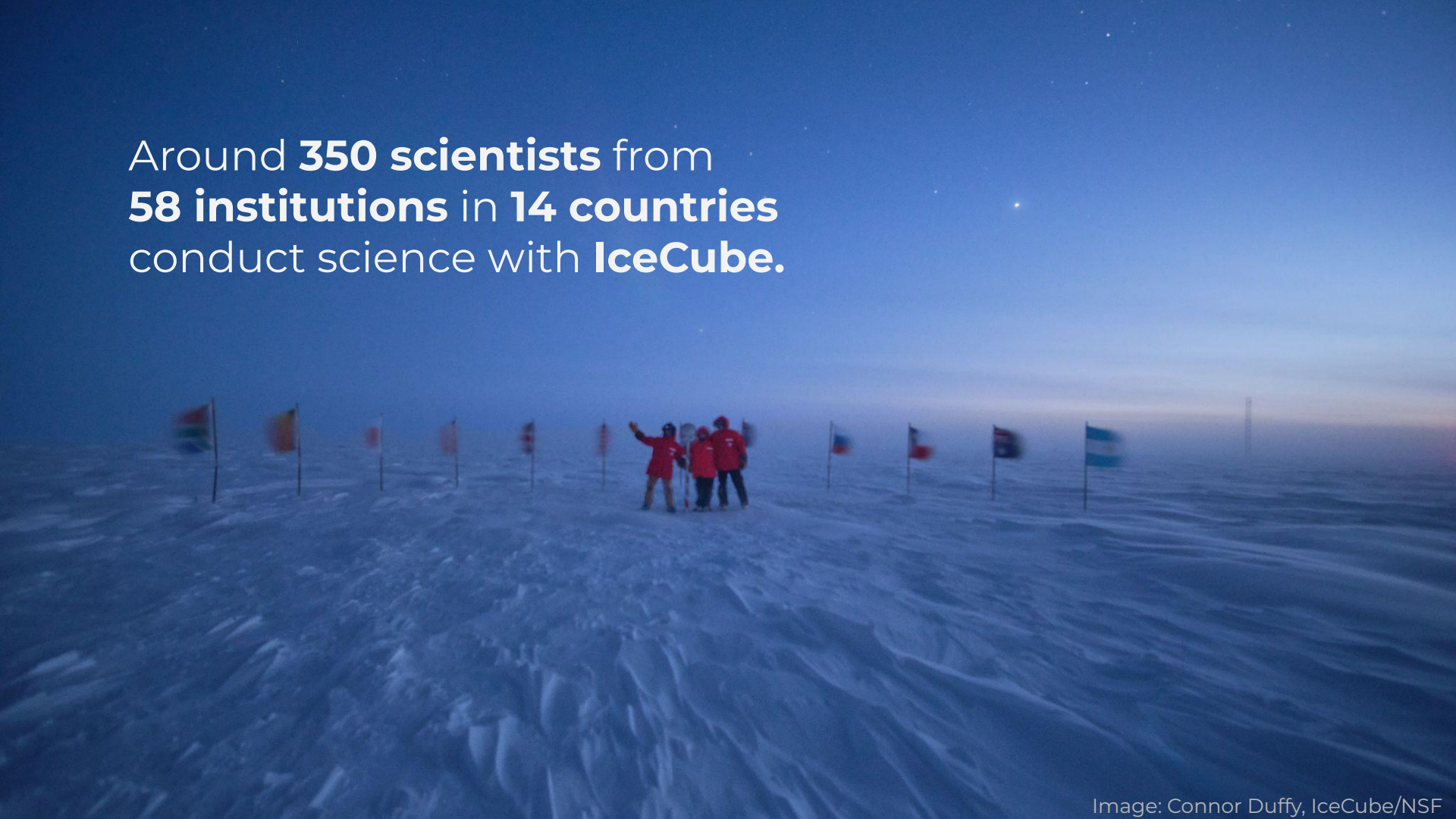




Image: Josh Veitch-Michaelis, IceCube/NSF

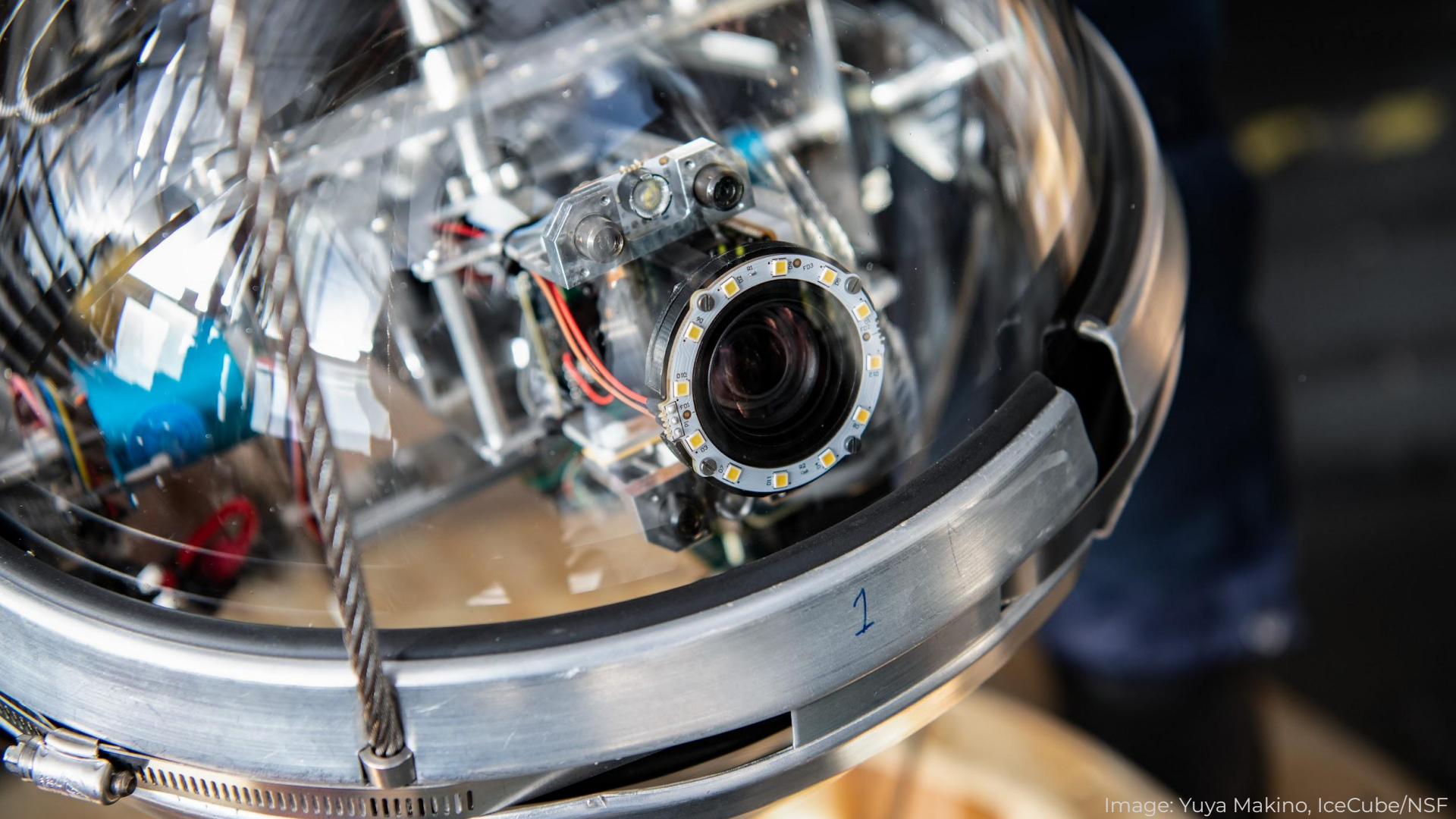


Image: Yuya Makino, IceCube/NSF

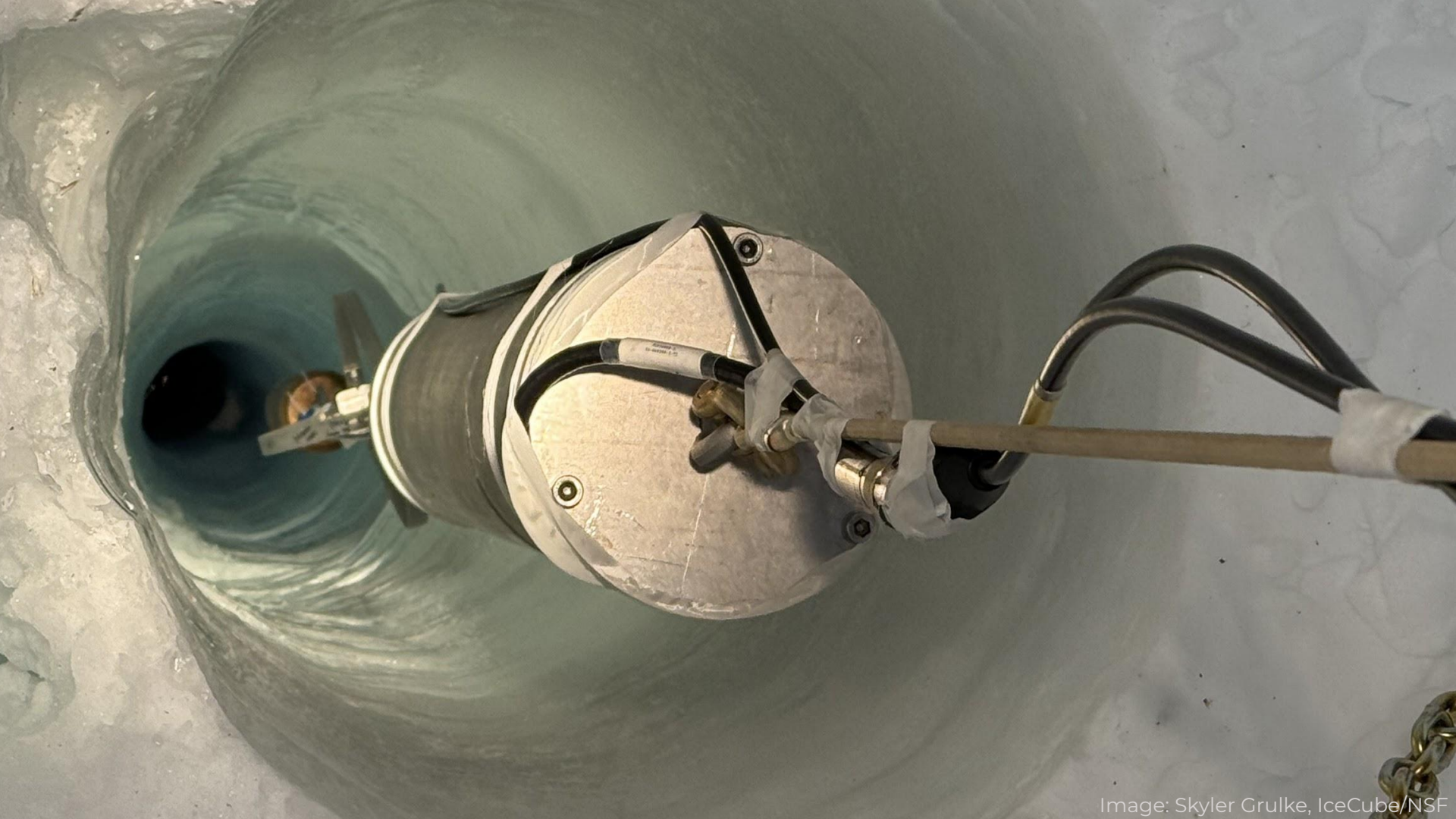


Image: Skyler Grulke, IceCube/NSF



Image: Colton Hill, IceCube/NSF



Image: Yuya Makino, IceCube/NSF



Image: Yuya Makino, IceCube/NSF



Image: Ilya Bodo, IceCube/NSF



Image: Yuya Makino, IceCube/NSF



Image: Yuya Makino, IceCube/NSF



Image: Delia Tosi, IceCube/NSF



Image: Kurt Studt, IceCube/NSF

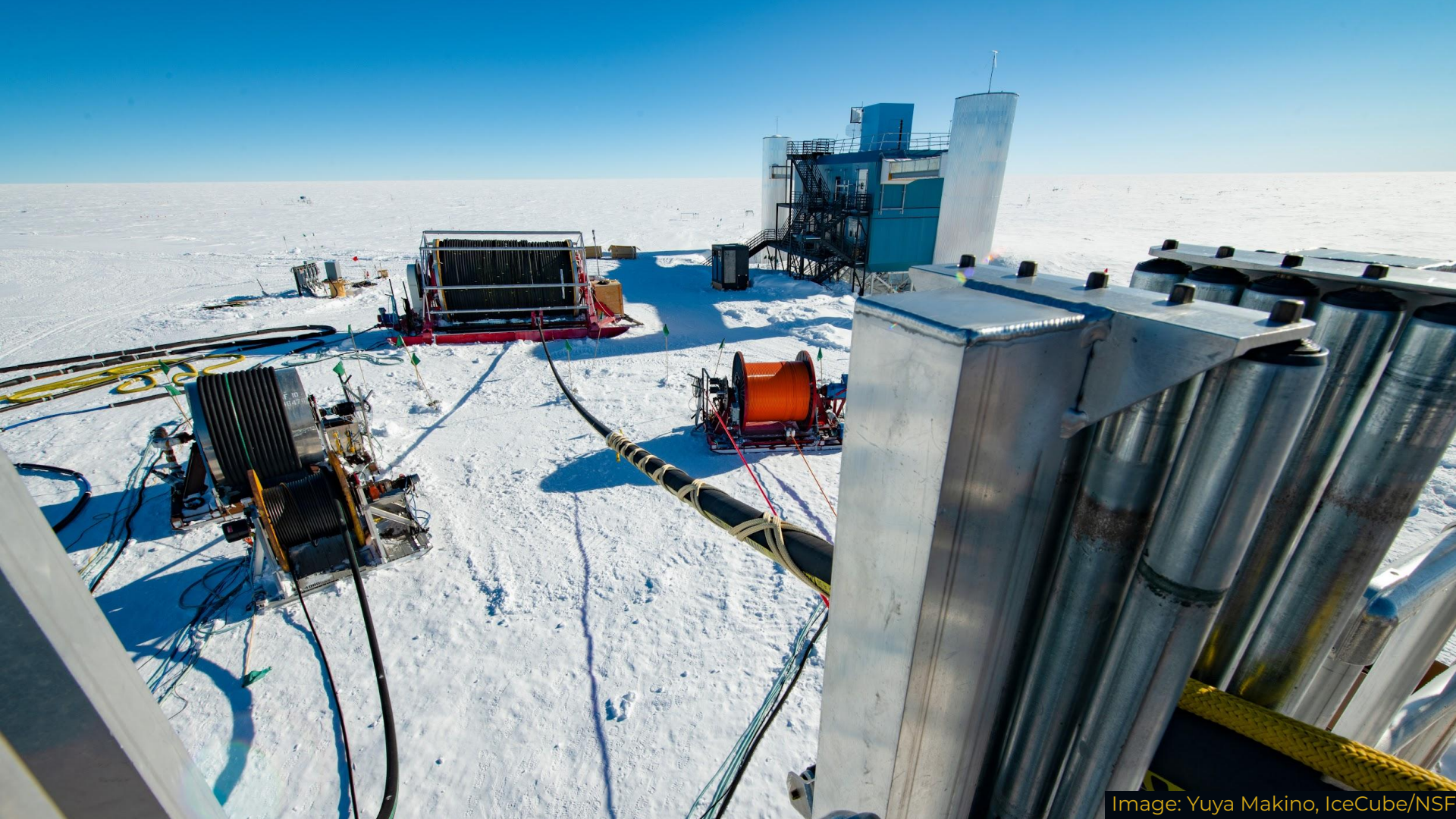


Image: Yuya Makino, IceCube/NSF

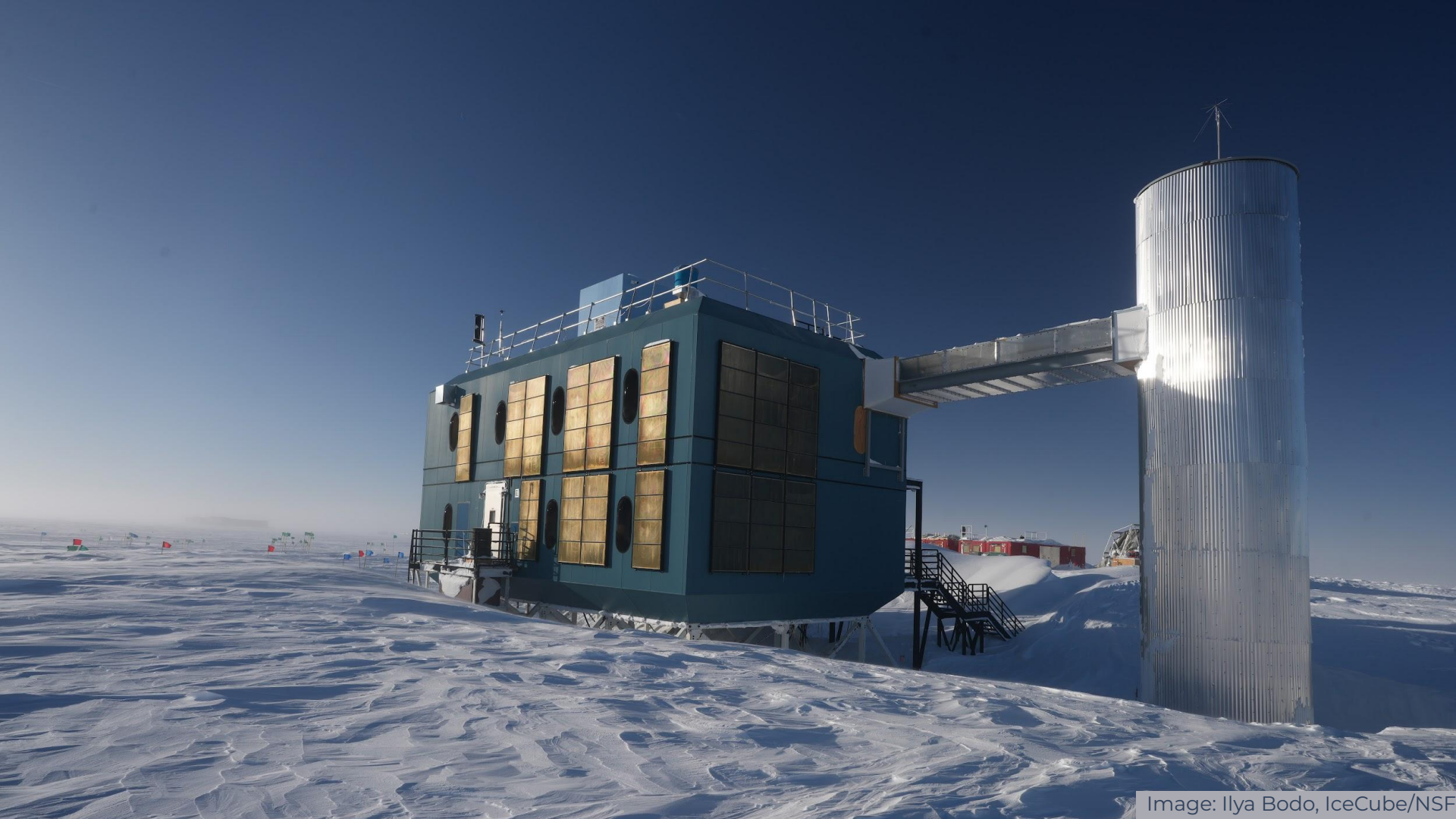
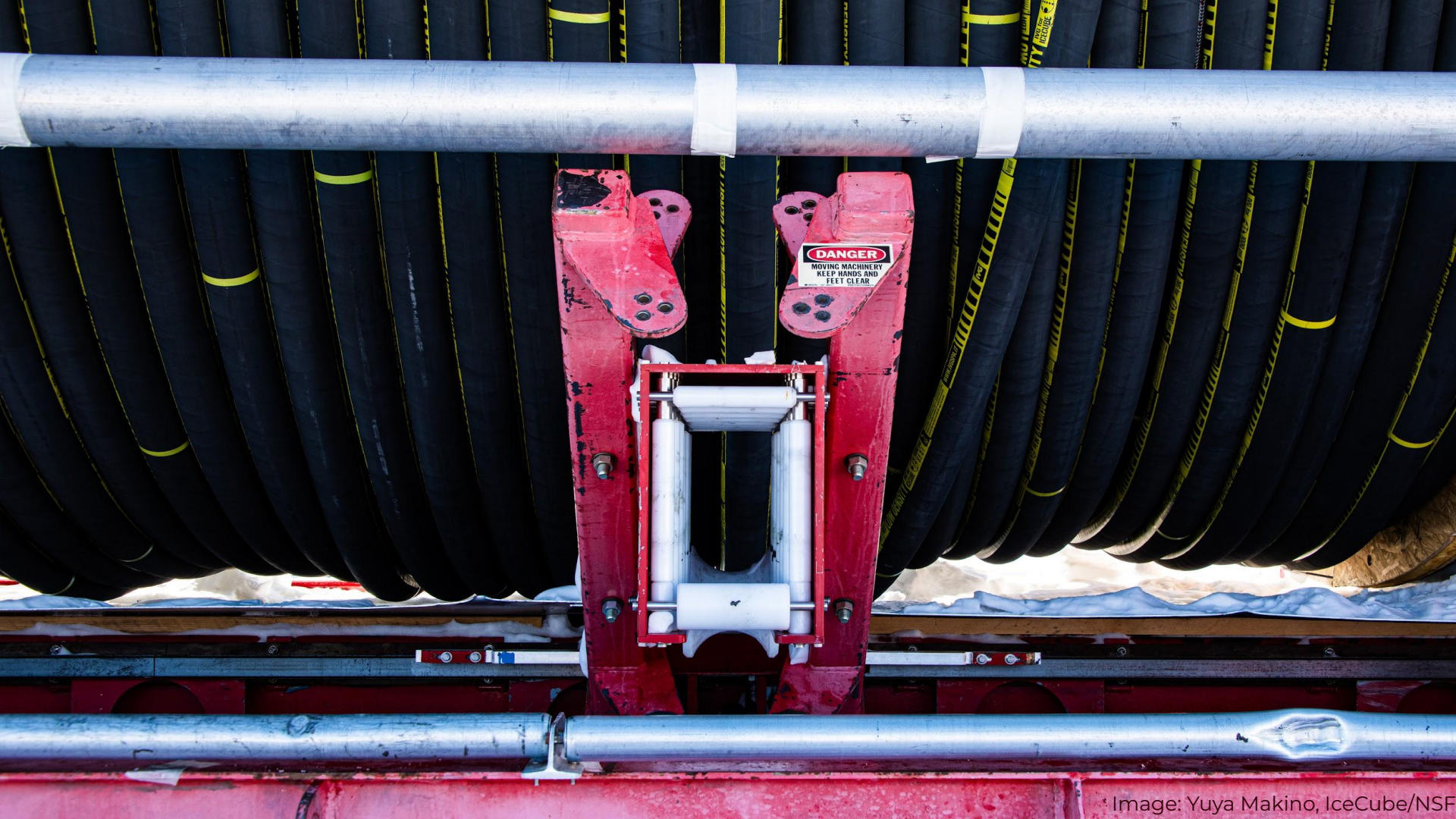


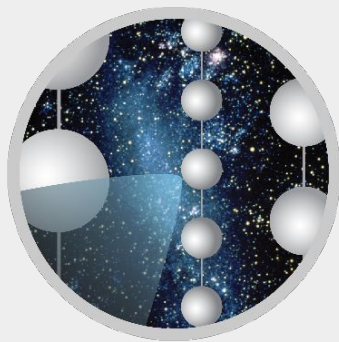
Image: Ilya Bodo, IceCube/NSF



Image: Yuya Makino, IceCube/NSF







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