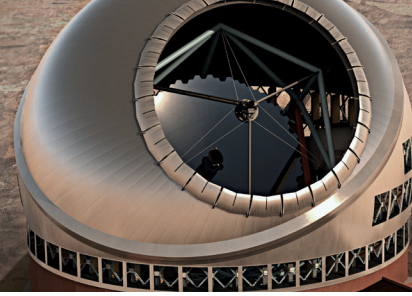


# Star struck



Canadian Geographic's July/August 2017 issue explores the construction of what will soon be the most powerful observatory in the Northern Hemisphere, the Thirty Meter Telescope (TMT). With construction set to begin in 2018 and finish by 2024, the TMT will allow its users to see the structure of dark matter and even observe the birth of the universe's oldest stars. With your students, use the infographic and the following questions to learn about this innovative project and some of its key features.



## Check for understanding

1. What are some of the reasons for choosing Mauna Kea, Hawaii, as the new location for the TMT observatory?

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2. What has Canada contributed to the project other than funding? Explain the importance of Canada's contribution.

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3. What are some of the concerns that the indigenous Hawaiians might have over the construction of a 14th observatory at Mauna Kea?

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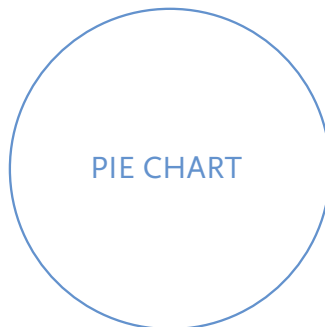
### 4. Math break

Draw a pie chart to show the shares that each country has invested into the TMT project. Your chart will need a legend and a title.

TITLE:

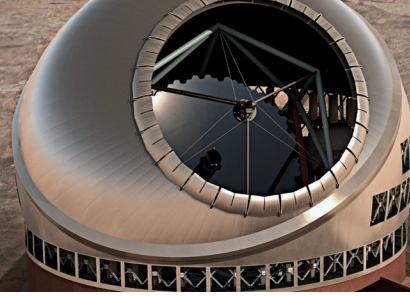
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LEGEND:

# Star struck



## Extend your geographical thinking

### 1. Part A: Name that observatory!

Using Google Maps, locate the three observatories mentioned in the infographic. Explore the areas around the observatories and propose another name for each observatory based on your observations and findings. Present your names to the class and explain your choices.

### Part B: Why there?

After studying and researching the areas, make a list of the physical and human characteristics that make these locations ideal for observatories. (Why Spain's Canary Islands? Why Mauna Kea, Hawaii? Why Cerro Paranal, Chile?) Based on your list, choose another location in the world that would be suitable for an observatory. Share with the class and, using Google My Maps, map out all the locations proposed by the class. Look for trends and patterns.

### 2. Find that star!

Using an interactive sky map to guide you, such as [this one](#) from Neave Interactive, head outside to observe the night sky. Draw a map of what you can see with the naked eye. Label the constellations. Seek out a location away from light pollution and add more detail to your map. Use a telescope if you have one.

## Resources

- [Canada under the stars](#)
- [Nature Canada: Connect with Nature](#)
- [Thirty Meter Telescope](#)
- [PBS: Seeing the dark](#)
- [McDonald Observatory Activities](#)

# DISCOVERY

## INFOGRAPHIC

### Star struck

The Thirty Meter Telescope will be the Northern Hemisphere's most powerful observatory

By Nick Walker

The atmospheres of distant exoplanets, the structure of dark matter and the birth of the universe's oldest stars. That's what the Thirty Meter Telescope will be capable of probing when it goes online.

Named in the down-to-earth fashion of the world's major observatories and funded by a global consortium of governments and academic institutions (BELOW), the TMT will be the Northern Hemisphere's largest-ever optical and infrared observatory (the 39-metre European Extremely Large Telescope will be covering the southern skies from Chile by 2022). Luc Simard, the TMT's group leader on scientific instruments and director of the National Research Council Canada's astronomy technology program, says the TMT will outshine other observatories with help from its Canadian-made "adaptive optics" system, which uses a powerful sky-directed laser to read and correct for atmospheric turbulence.

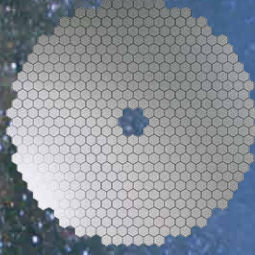
The telescope's planned home is Mauna Kea, Hawaii, a 4,205-metre dormant volcano and one of Earth's top astronomy sites thanks to its altitude, pure, thin air, and remove from city lights. Construction will start in 2018, with "first light" to come by 2024.



Teachers! Bring this and other science innovations into your classroom by visiting [cangeoeducation.ca/resources](http://cangeoeducation.ca/resources).

THE SHARES (of \$1.5-billion cost and future TMT use)			
	25%		10%
	20%		10%
	15-20%	Other	15-20%

**THE MIRROR** About three times the diameter of the world's current largest telescopes, the TMT's mirror comprises a honeycomb of 492 light-scooping mirror segments and two smaller mirrors steering all that light into an array of instruments on adjacent platforms. Its resolution will be 12 times sharper than that of the Hubble Space Telescope. "If you could put the TMT in Vancouver and point it east," says Simard, "you'd be able to see a loonie someone was holding up in Calgary."



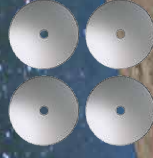
**Thirty Meter Telescope**  
Mauna Kea, Hawaii (2024)  
30 metres



**Gran Telescopio Canarias**  
La Palma, Canary Islands (2007)  
10.4 metres



**Keck Telescope**  
Mauna Kea, Hawaii (1993; 1996)  
10 metres X 2



**Very Large Telescope**  
Cerro Paranal, Chile (1998-2000)  
8.2 metres X 4

56 m

**THE DOME** Canada's largest contribution is the innovative *calotte* ("skullcap") style enclosure being built by Coquitlam, B.C.-based Dynamic Structures (which also specializes in everything from bridges to roller coasters). At 64 metres in diameter, it's a bit narrower than the wingspan of a 747-8 jumbo jet — the most space-efficient housing possible, providing a full-range of motion and protection from mountaintop winds.

**THE MOUNTAIN** Mauna Kea (shown here) is sacred to indigenous Hawaiians, and debates erupted over whether a 14th observatory should be built on the mountain, no matter how small its footprint. If construction is blocked, the alternative site is a 2,426-metre-high extinct volcano on the island of La Palma, in Spain's Canary Islands.

