

What is a Meteorite?

- Primordial remains
- Impact Earth
- Named after location where they impacted



Nandan Meteorite: China

Types of Meteorites

- Stony
- Stony-Iron
- Iron



Rick Stankiewicz

Peekskill, New York
 October 9, 1992



Detection of Ancient Craters

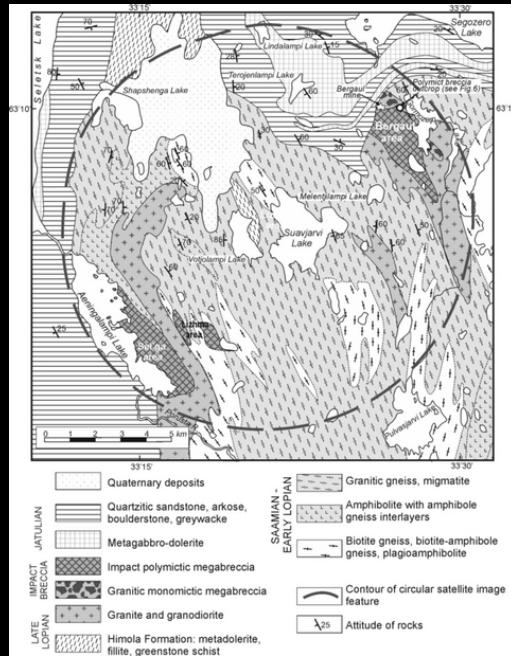
- Time
- Glaciation
- Weather
- 70% ocean
- 190 confirmed impacts (Earth Impact Database 2017)
- Satellite imaging
- Magnetic & seismic surveys
- Impact melt rocks
- Shatter cones
- Shocked quartz
- Iridium

Continent ⇄	Continent's % of Earth's land area ⇄	Continent's % of the 190 known craters ⇄	Number of craters ⇄
Asia and Russia	30%	16%	31
Africa	20%	11%	20
North America	16%	32%	60
South America	12%	6%	11
Antarctica	9%	0%	0
Europe	7%	22%	41
Australia	6%	14%	27
Total	100%	100%	190

Earth Impact Database

Suarjarvi Crater

- NW Russia
- 2 billion 200 million years old
- 16 km crater



M. Mashchak & M. Naumov

Vredefort Crater

- South Africa
- 2 billion years old
- Largest crater 300 km
- 10 - 15 km



Sudbury Impact Basin

- Ontario
- Largest in Canada
- 1 billion 849 million years old
- 130 km crater
- 10 - 15 km



Shoemaker Crater

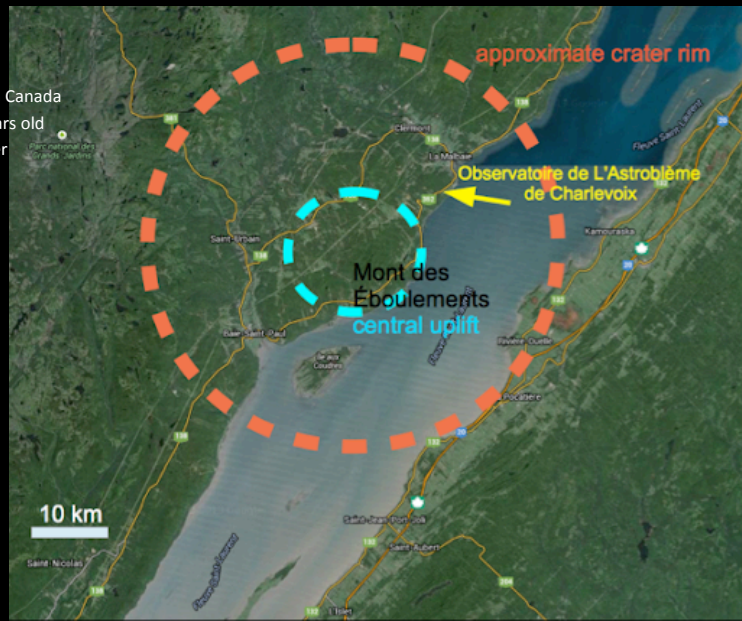
- Western Australia
- 1 billion 630 million years old
- 30 km crater





Charlevoix Crater

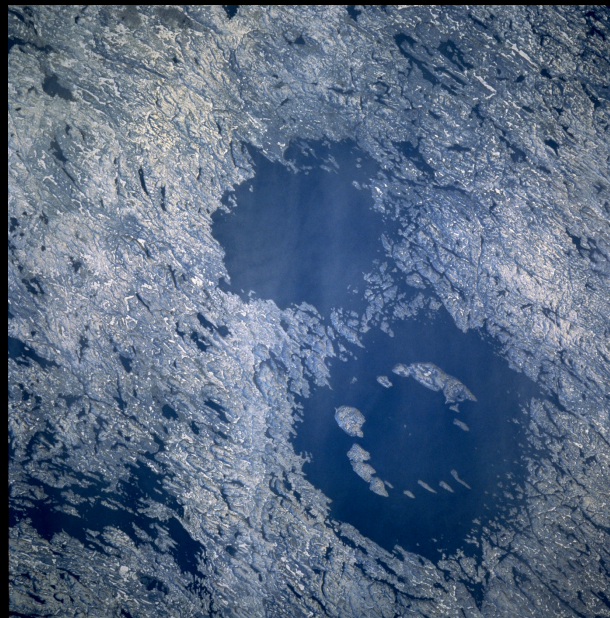
- Quebec
- Third largest in Canada
- 342 million years old
- 54 km diameter



Google Earth

Clearwater East & West Craters

- Quebec
- 460 & 286 million years old
- 26 & 36 km diameter



NASA

Saint Martin Crater

- Manitoba
- 227 million years old
- 40 km diameter

51°47' N

10 km

98°32' W

Lake Saint Martin

Gypsumville

Granite

Melt rock

Landsat - 5 Satellite

Manicouagan Crater

- Quebec
- Second largest in Canada
- 215 million years ago
- 100 km diameter
- 5 km asteroid

NASA

Tunnunik Crater

- Northwest Territory
- 130 - 350 million years old
- 28 km diameter
- Few km in size
- Shatter cone: used to estimate crater size



Gordon Osinski

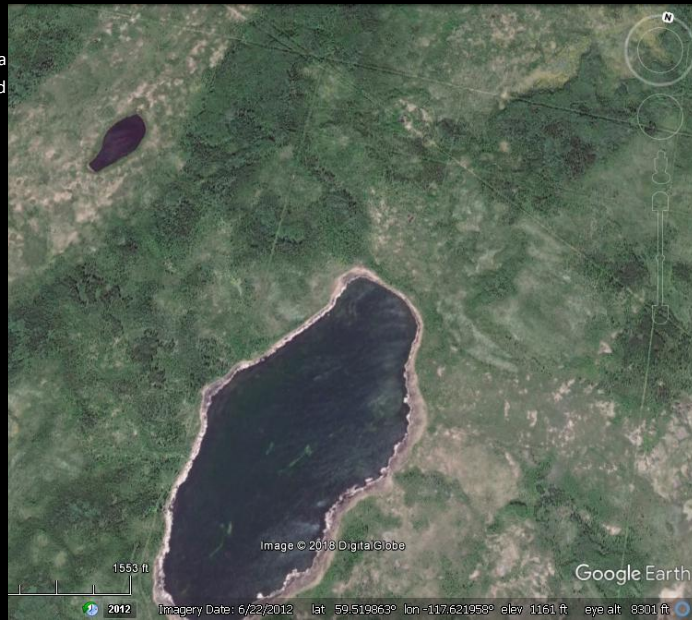
Carswell Crater

- Saskatchewan
- 115 million years old
- 39 km diameter



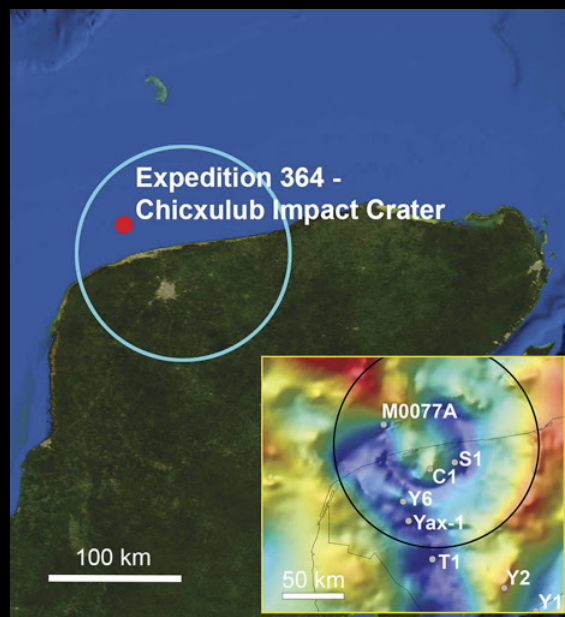
Steen River Crater

- North West Alberta
- 91 million years old
- 25 km diameter
- 1 km asteroid



Chicxulub Crater

- Yucatan Peninsula, Mexico
- 66 million years old
- 150 km diameter
- 11 km asteroid
- 70% extinction event



Kring et al



Mistastin Crater

- Labrador
- 36.4 million years old
- 28 km diameter



Popigai Crater

- Siberia, Russia
- 35 million years old
- 100 km diameter
- 5 - 7 km asteroid



Pingualuit Crater

- Ungava Peninsula, Quebec
- 1 million 400 thousand years old
- 3.44 km diameter
- 400 meters deep



NASA

Barringer Crater

- Arizona, USA
- 50,000 years old
- 1.6 km diameter
- 168 meters deep
- 46 meter asteroid



Rick Stankiewicz

Tunguska Event

- Siberia, Russia
- June 30, 1908
- Meteor Air Burst: 5 - 10 km altitude
- Asteroid or Comet
- Flattened 2,000 km²
- Charred > 100 km²
- First visited: 1927



AP/REX/Shutterstock.com

Chelyabinsk

- Russia
- February 15, 2013
- Meteor Air Burst: 29.7 km altitude
- Bright flash & shock wave
- 20 meter meteor
- Blast Yield: 26-33 times > Hiroshima
- ~ 1,500 injured
- ~ 7,200 buildings in 6 cities damaged
- Meteorite fragments discovered



M. Ahmetvaleev



Large Meteorites on Display

- Willamette
- Mbozi
- Cape York
- Bacubirito
- El Chaco
- Hoba



Rick Stankiewicz

Space Monitoring

- Near Earth Objects (NEO)
- Potentially Hazardous Objects (PHO) ~ 2,300
- Information Gathering
 - Deep Impact Mission: Comet 9P/Tempel 1 (July 4, 2005)
 - DART Mission (Double Asteroid Redirection Test) to asteroid Dimorphos: September 26, 2022
 - Psyche Mission: Asteroid 16 Psyche (August 2029)
- Deflection Strategies



WITH ONLY THREE HOURS' WARNING, NASA PANICS AND FIRES BRUCE WILLIS AT AN INCOMING ASTEROID.

Next Month Novice Astronomy Class # 19
Space Exploration: Historical
December 1, 2023

