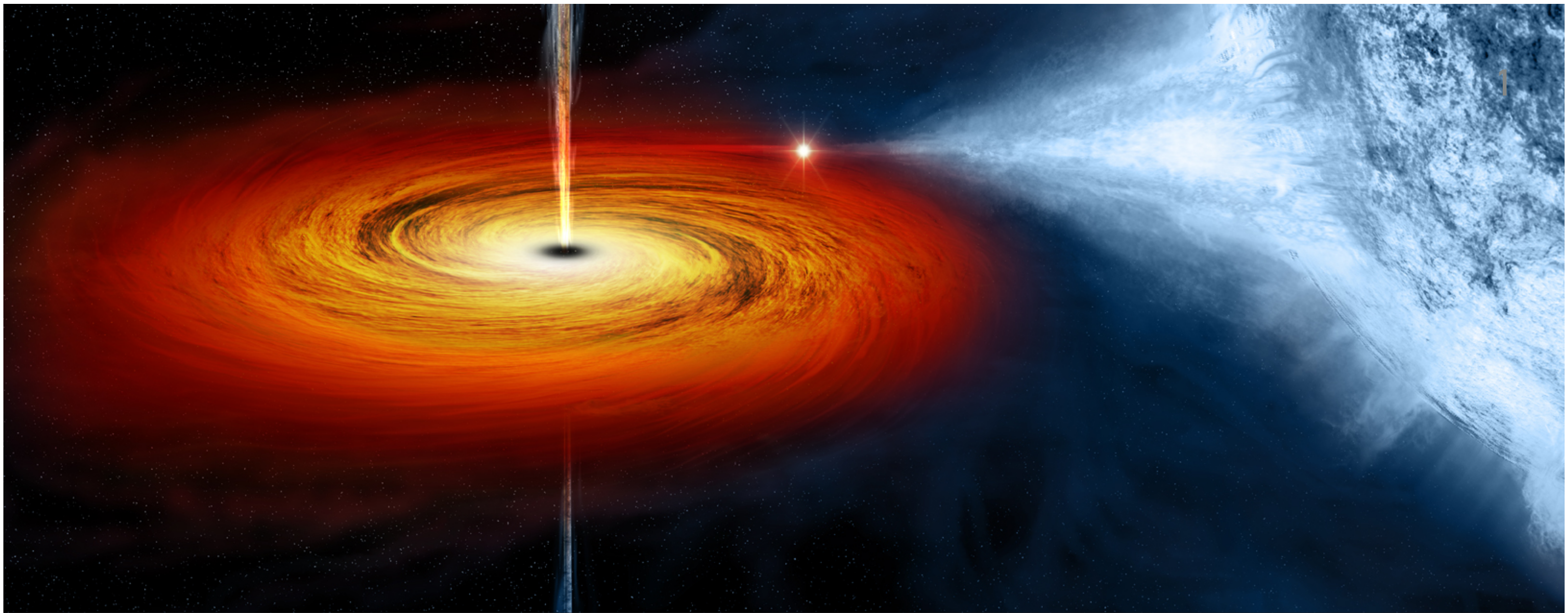


CANADA'S FLAGSHIP X-RAY TELESCOPE

THE COLIBRÌ MISSION

Taking the pulse of neutron stars and black holes

Colibrì is a proposed X-ray telescope concept designed to unveil the mysteries of neutron stars and black holes. With high spectral and time resolution, and high throughput, Colibrì will allow the study of accretion disks and coronae, including reflection and re-emission of radiation by the disk, and observations of isolated and accreting neutron stars.

The Colibrì concept is based on multiple aperture non-imaging X-ray collectors similar to NICER but with cryogenically cooled transition edge detectors for high energy resolution and sensitivity. This concept study is being funded by the Canadian Space Agency.

Mission Overview

Launch Date: December 2032

Mission Duration: 5 years

Orbit Height: Between 500km to 800km

Energy Range: 0.1 - 15 keV

Energy Resolution: finer than 1eV at 2keV (3eV at 6keV)

High Throughput: count rates up to 10 kHz

Timing resolution: better than 1 μs, matching the innermost orbit period for a 10 solar-mass black hole

Total effective area: 2000cm^2 at 6.4 keV

www.colibri-telescope.ca

Colibrì: Key Science Questions

1 - Accretion Physics

This key science theme will explore the accretion physics in the inner regions of compact objects:

- What happens within the innermost region of the accretion disc around black holes?
- What is the structure of the X-ray emitting region of the accretion disc?
- What powers the corona? What drives X-ray weak and strong sources?

2 - Feedback Mechanisms on all Scales

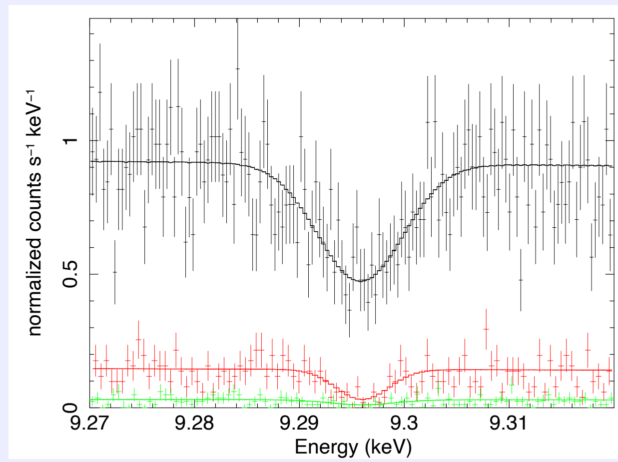
This key science theme will explore questions such as:

- What drives outflows in AGN?
- What are the properties (density, velocity, geometry, kinetic luminosity) of outflows?
- Where are the missing baryons?

3 - Physics of Extreme Matter

This key science theme will explore questions related to understanding dense matter and extreme magnetic fields:

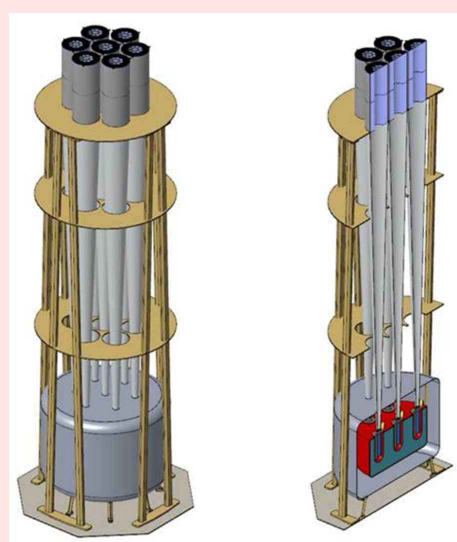
- What is the equation of state for neutron star material and how can we probe the interiors of neutron stars?
- What are the properties of material and light in strong magnetic fields?
- What is the magnetic field structure in pulsar wind nebulae and SNRs that accelerate cosmic rays?



Comparing the detection of a 9.296keV spectral feature between Colibri (black line), ATHENA (red line) and Hitomi (green)

Colibrì: Driving Canadian Innovation

In order to achieve the science goals, Colibrì will require high-energy resolution, high-time resolution and high sensitivity. This will lead the X-ray collectors to have cryogenically cooled **Transition Edge Detectors (TES)**. The major components of the X-ray collectors are be developed and fabricated in Canada, pushing Canadian innovation forward and increasing the capacity within Canada for X-ray space missions. The key technologies in the collectors are: the **Cryrocooler,** The TES detectors and **read-out electronics**, and the **mirrors**. The Stewart Blussom Quantum Matter Institute in Vancouver has already been identified for TES detector development.



A schematic of the 7 detector Colibri telescope.