DIVISION OF
ASTRONOMY AND ASTROPHYSICS
Faculty of Mathematics, Physics and Informatics
Comenius University
Bratislava

GALAXIES IN THE UNIVERSE – FROM HISTORY TO THE MODERN AGE

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Conference of Young Astronomers - Bezovec 2023

OVERVIEW

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- How it all began– a historical introduction

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- Galaxies in the Universe

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- New structures in the Milky Way

HOW IT ALL BEGAN– A HISTORICAL INTRODUCTION

FIRST HINTS

- Thomas Wright 1750:

  Theological motivation, without observations

  Visible Milky Way as a thin layer of a thoroid

  Nebulae are distant stellar islands

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IMMANUEL KANT 1755

- The Universal Natural History and Theories of the Heavens 1755
- Inspired by Thomas Wright
- Hypothesis of gravitational collapse of dust and gas to a disc
- Massive Galactic centre (today known as Galactic bulge)
- Stars and Planets form from the disc
- Postulate of multiple galactic islands apart from our own

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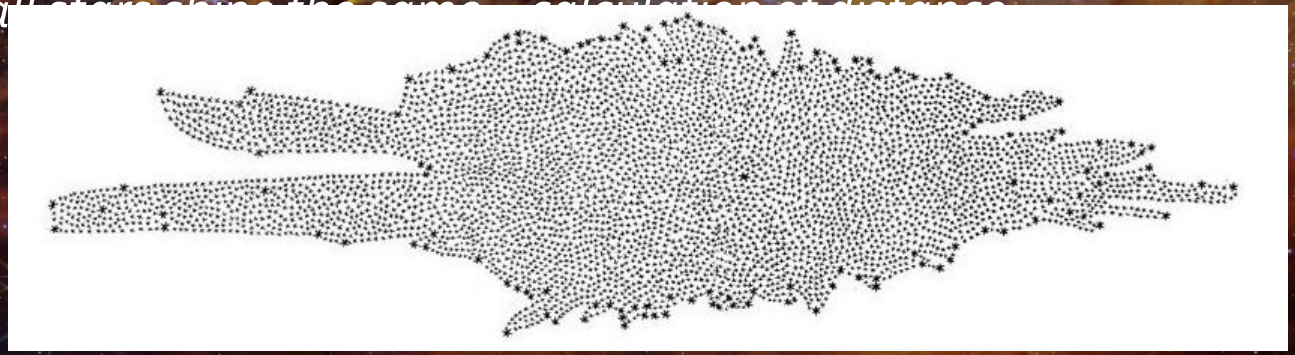

Herschel William, On the Construction of the Heavens, Philosophical Transactions of the Royal Society of London, Vol. 75 (1785), pp. 213-266

THE GREAT DEBATE

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- Discussion about spiral nebulae and size of the Milky Way


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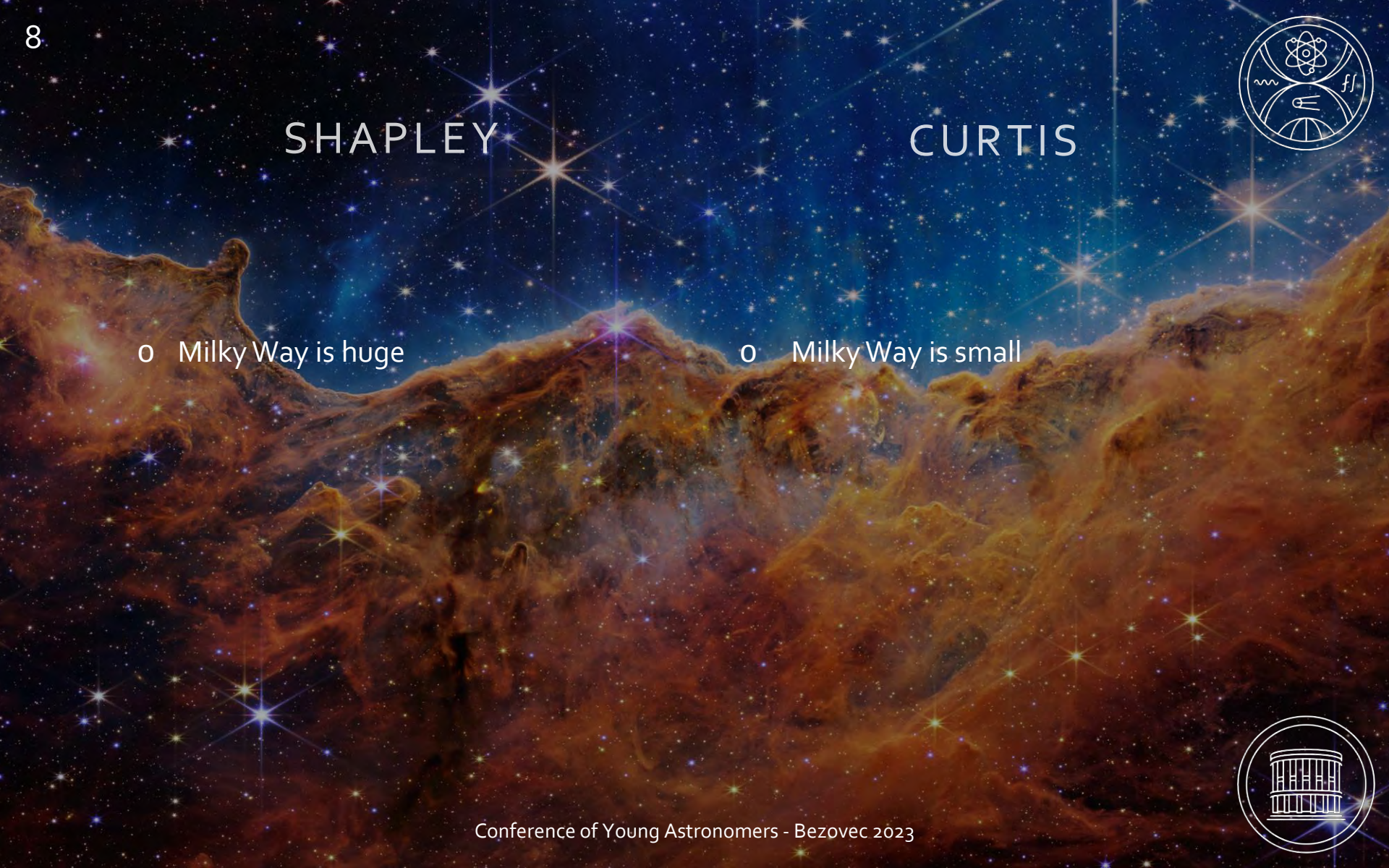

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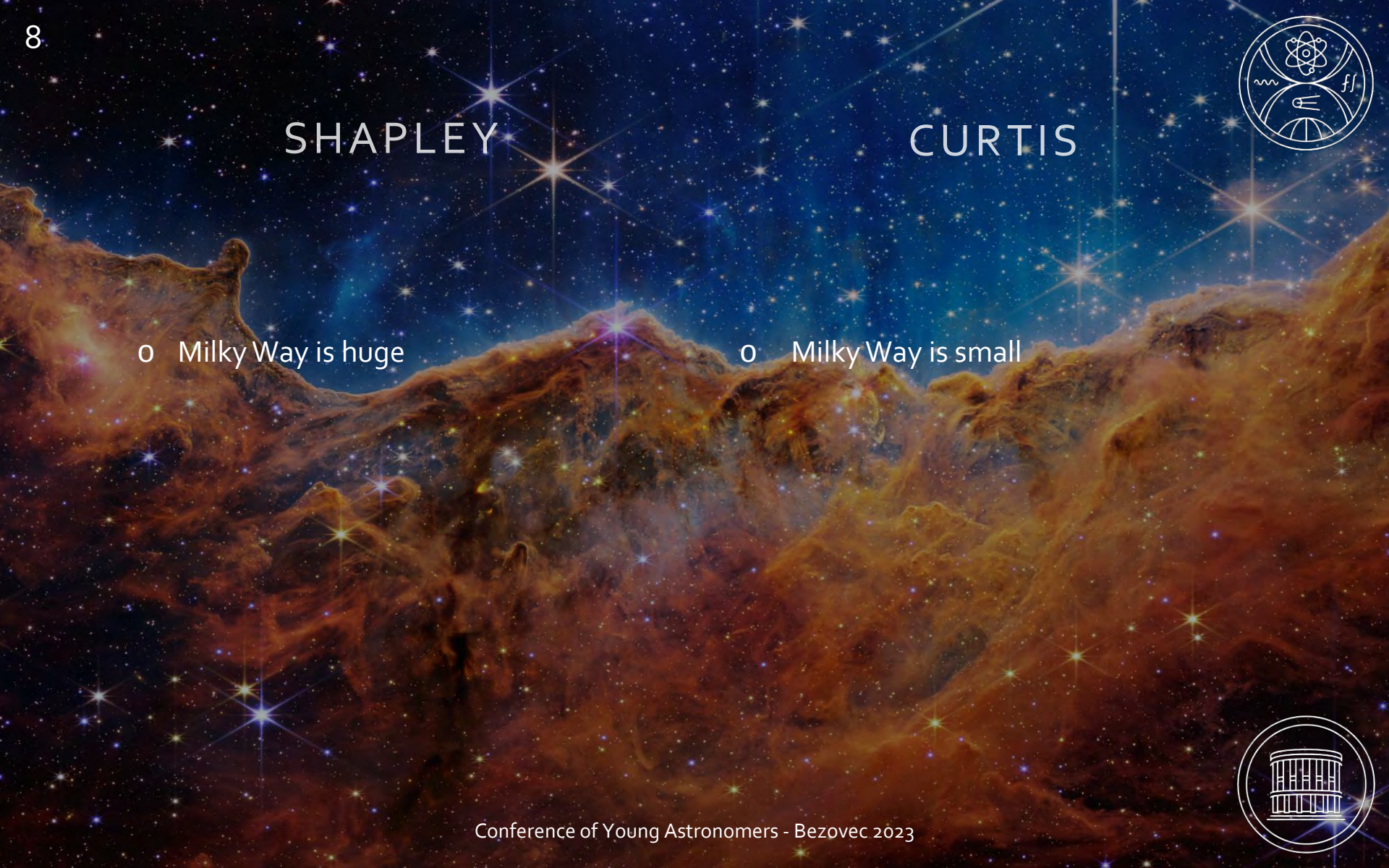

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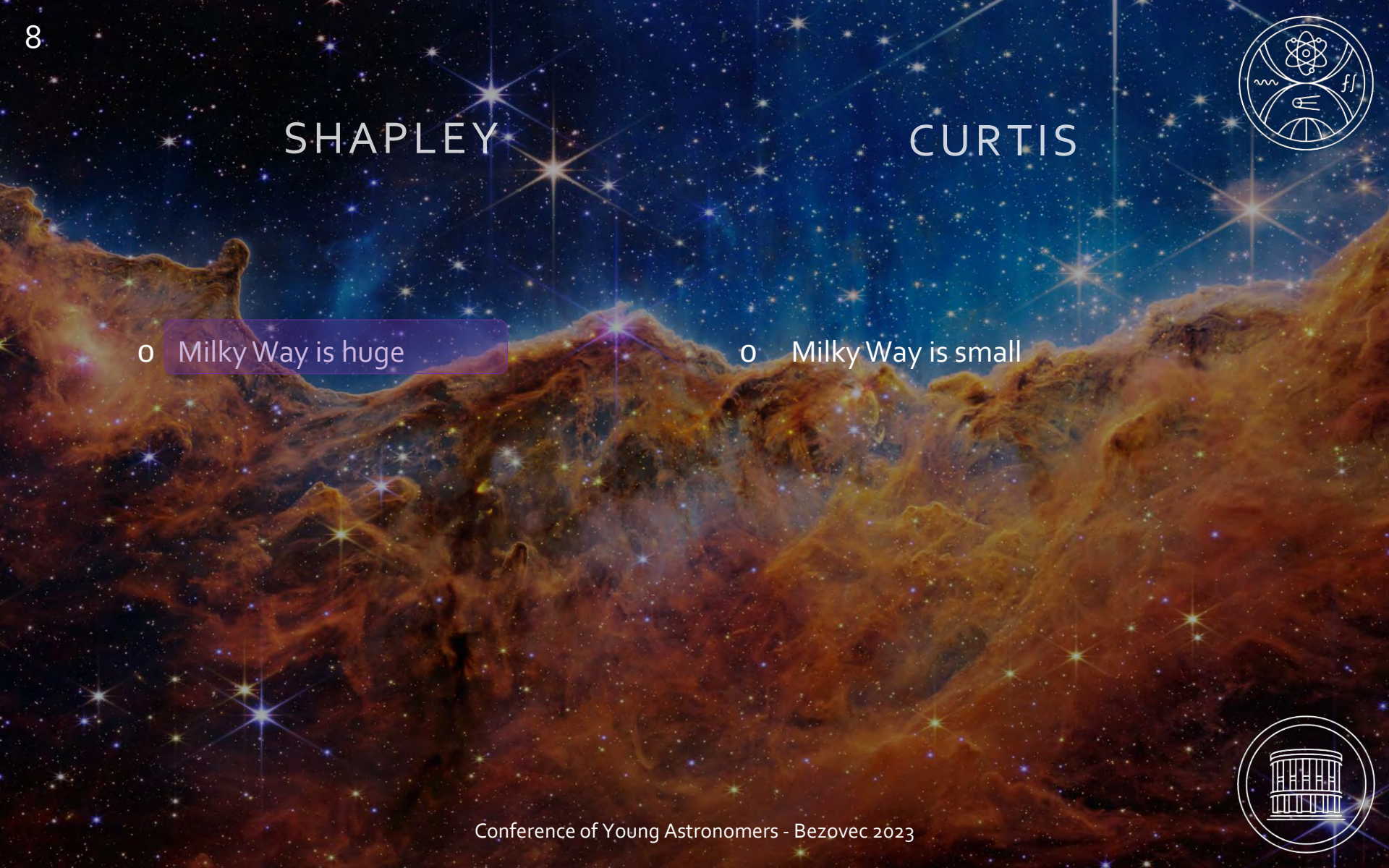

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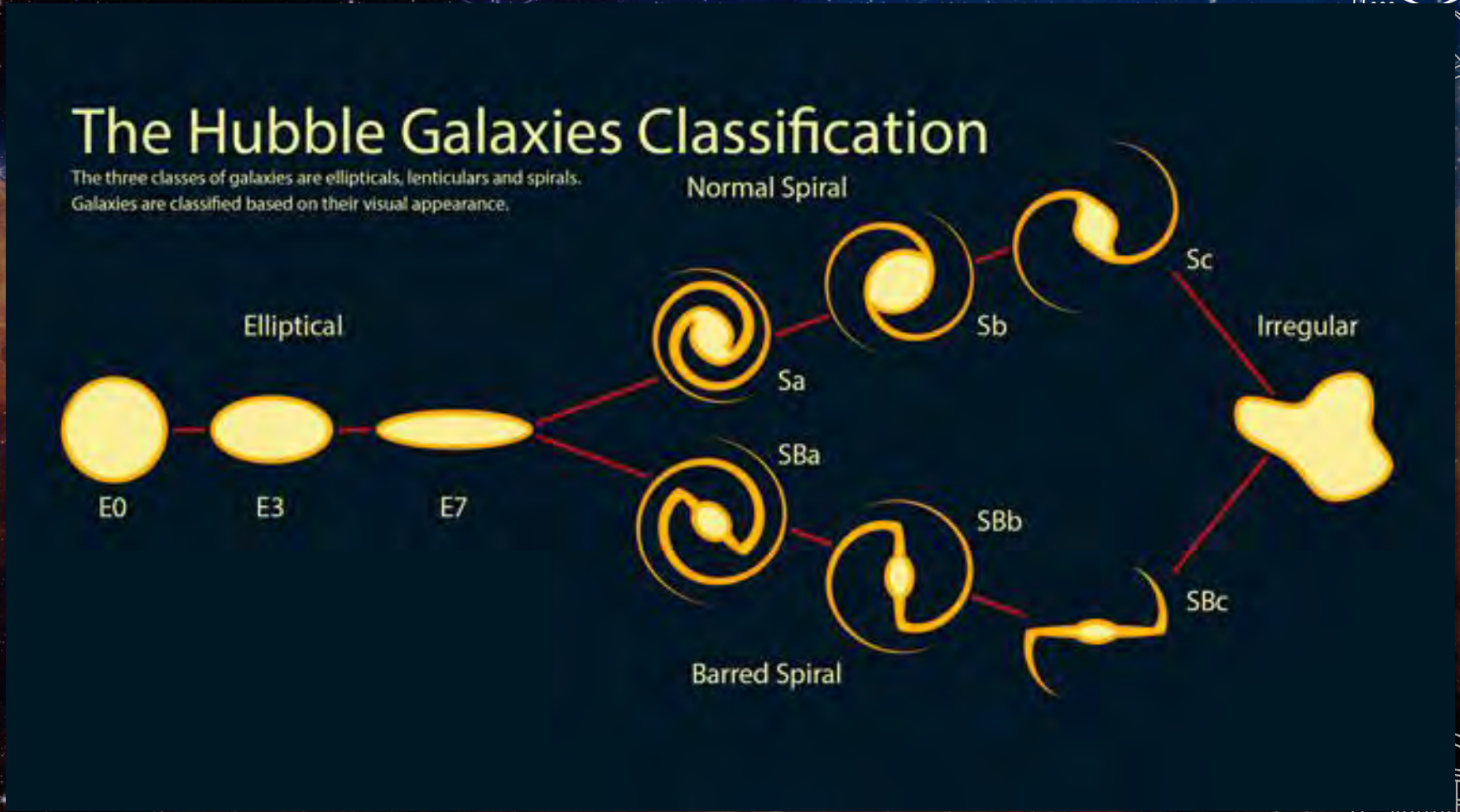
- 1926 – classification of galaxies. He considered various shapes of galaxies to be different evolution stages


The Hubble Galaxies Classification
The three classes of galaxies are ellipticals, lenticulars and spirals.
Galaxies are classified based on their visual appearance.
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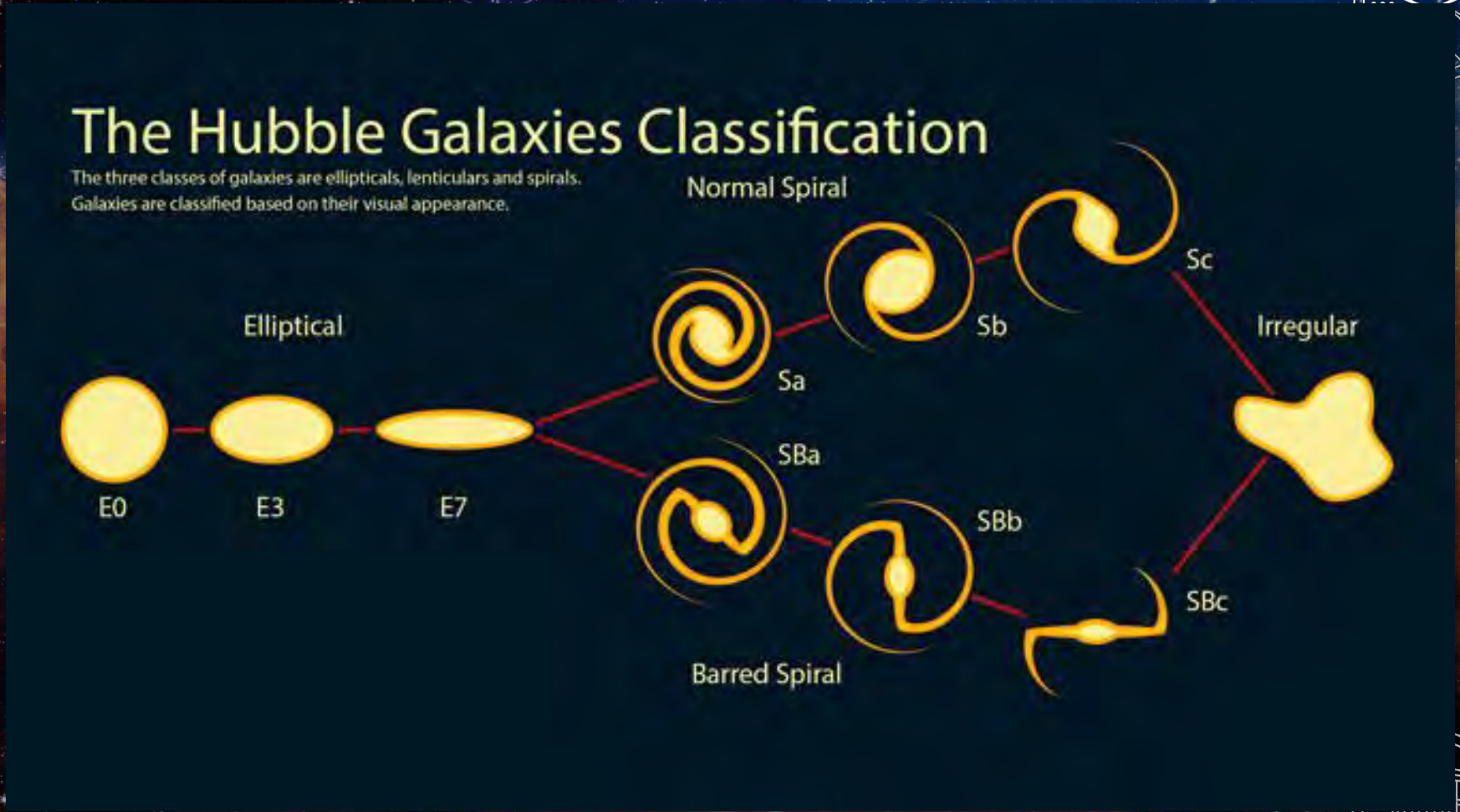
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NGC 5866

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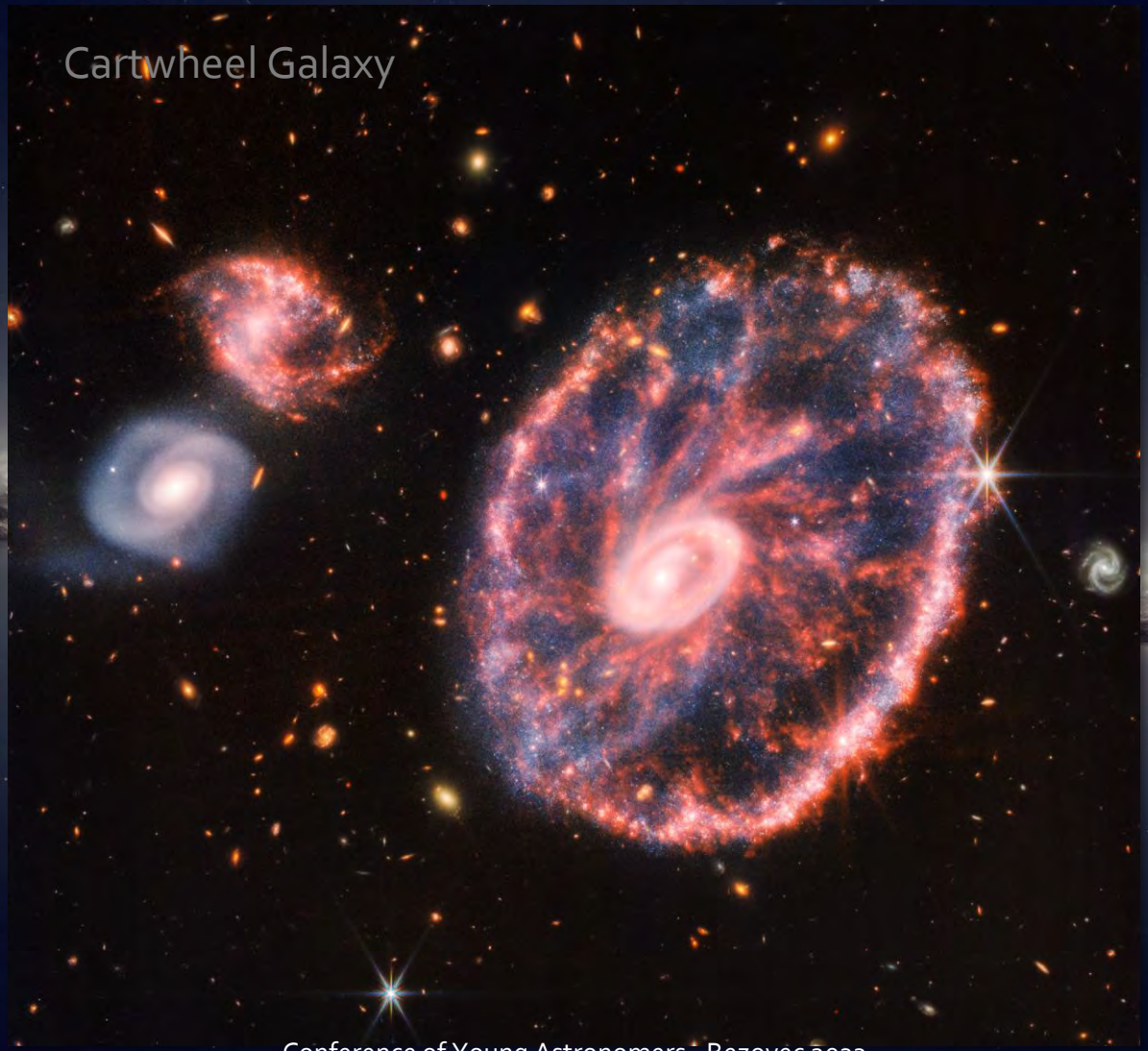
M104



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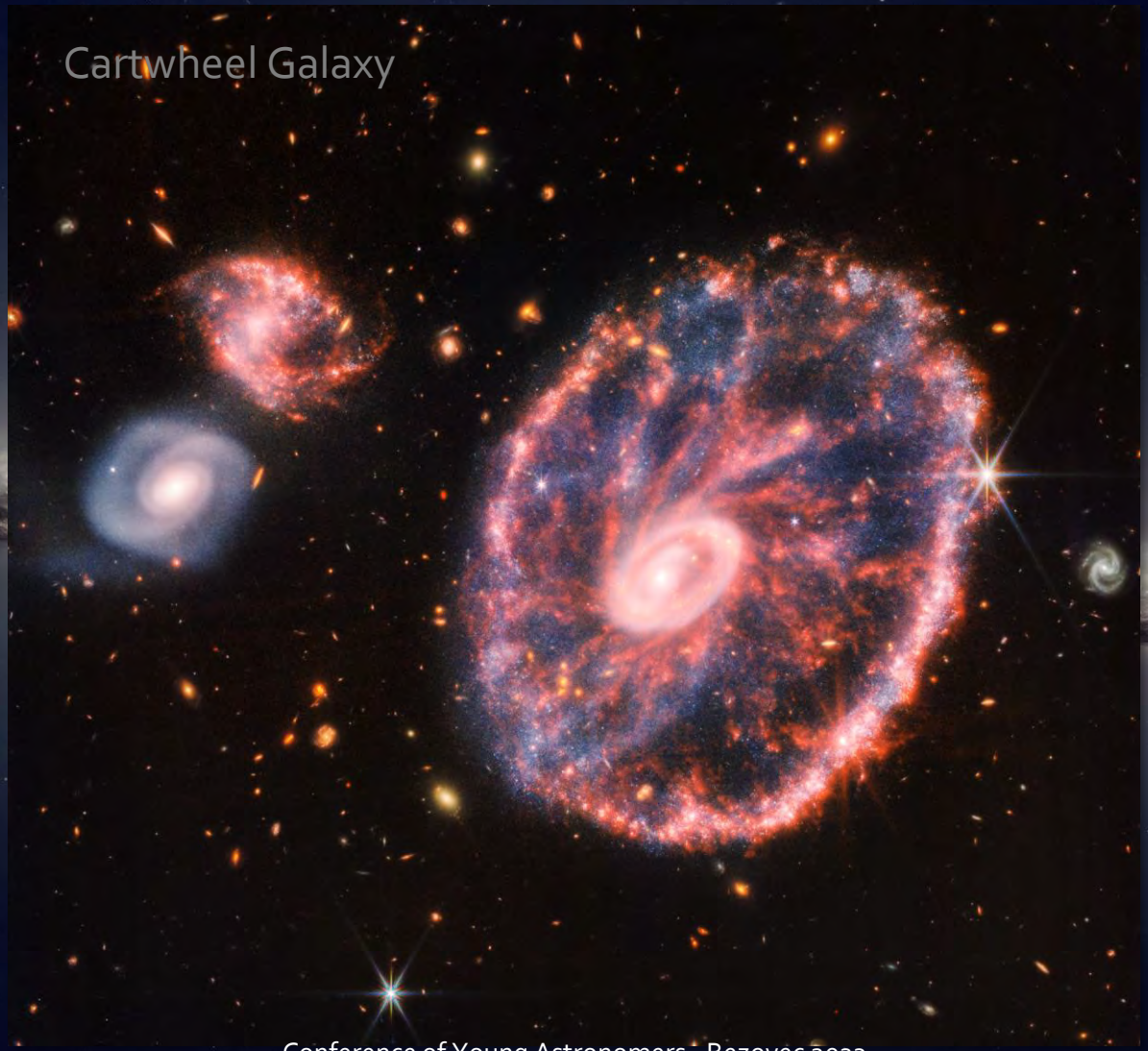

M104

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GLASS-Z12 -THE FARTHEST KNOWN GALAXIES FROM EARTH EVER DISCOVERED?

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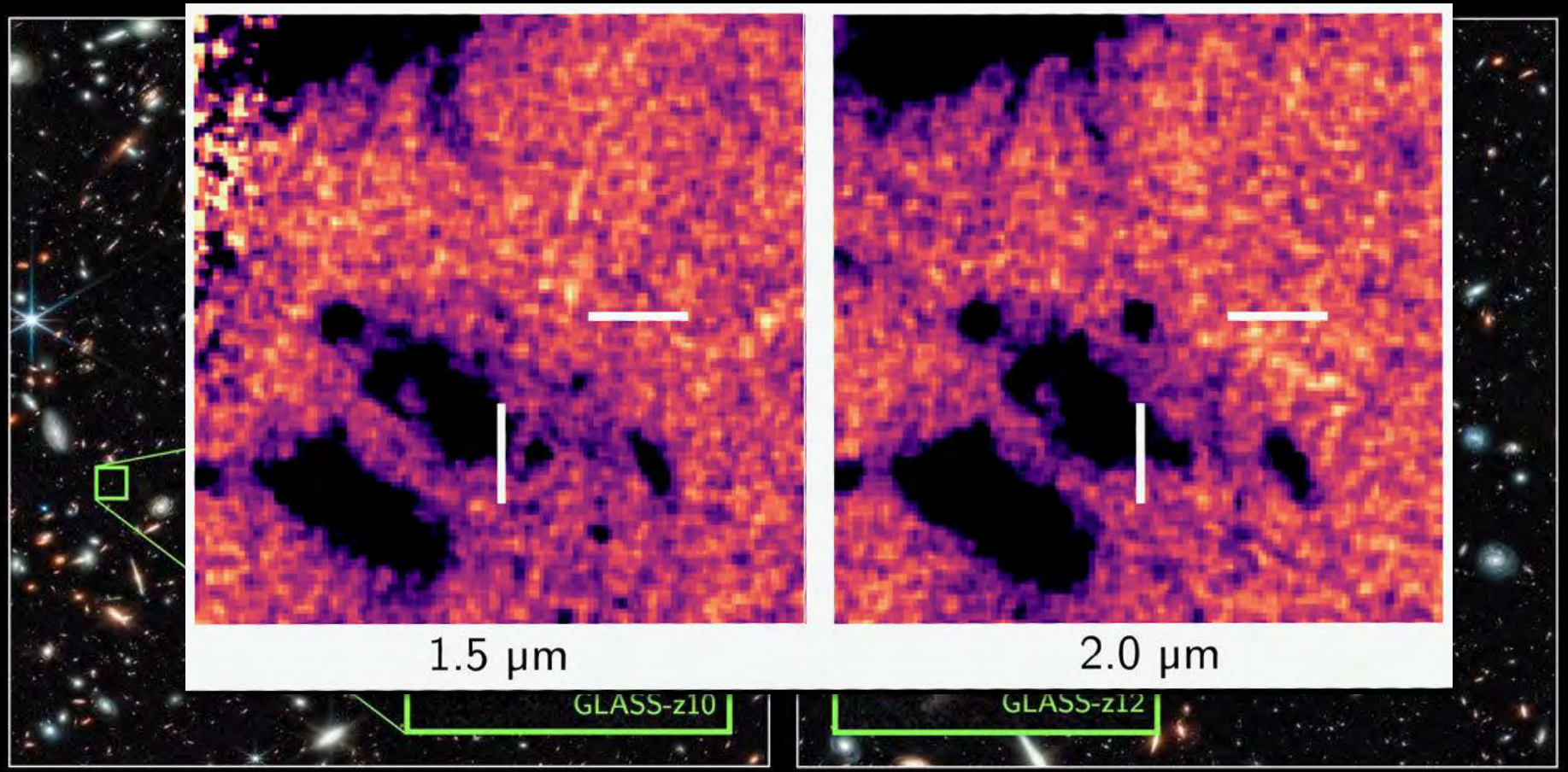
GLASS-z10


GLASS-z12


1.5 μm
2.0 μm
GLASS-z10
GLASS-z12

NEW STRUCTURES IN THE MILKY WAY

GALACTIC OUTSKIRTS

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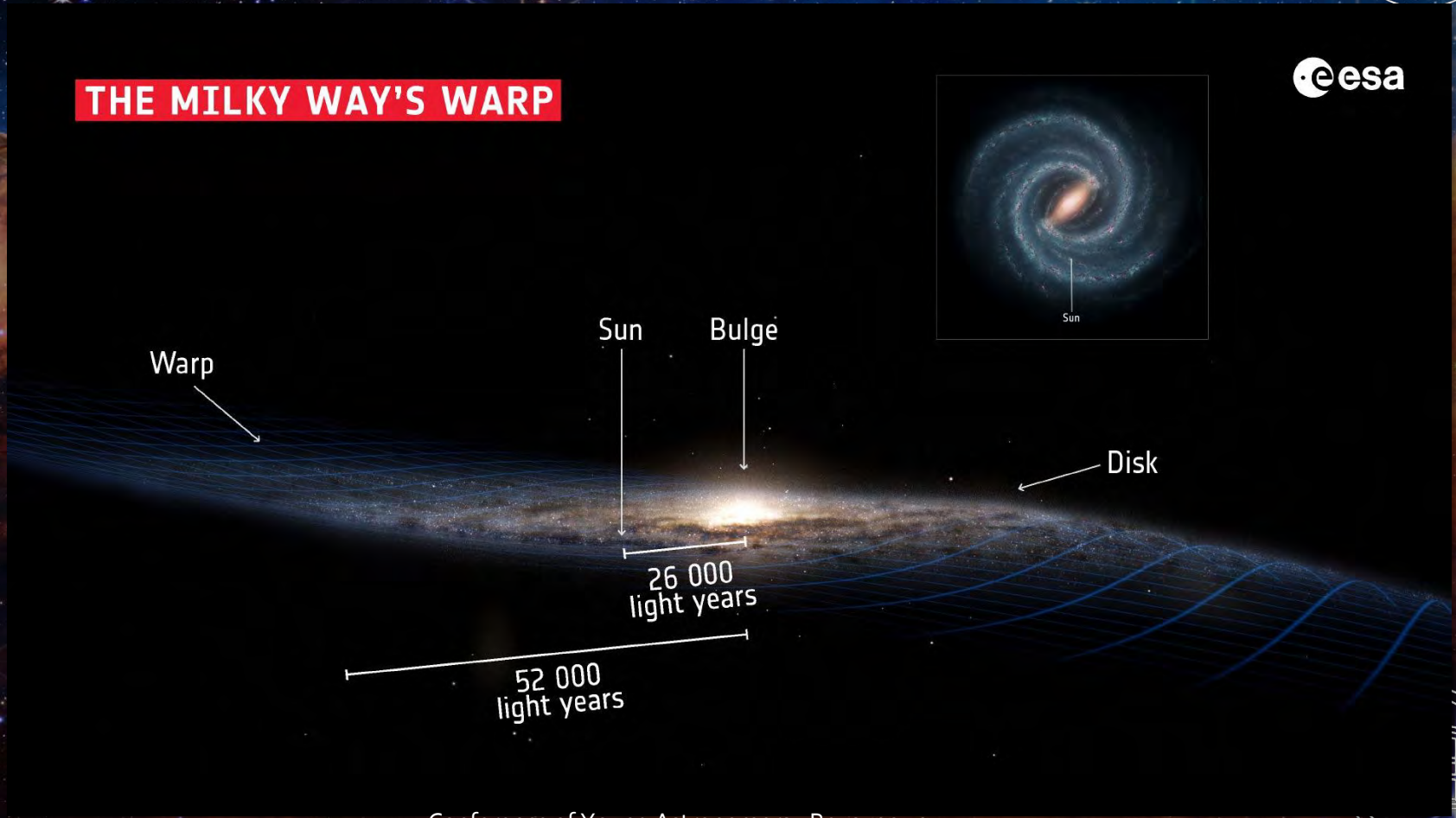
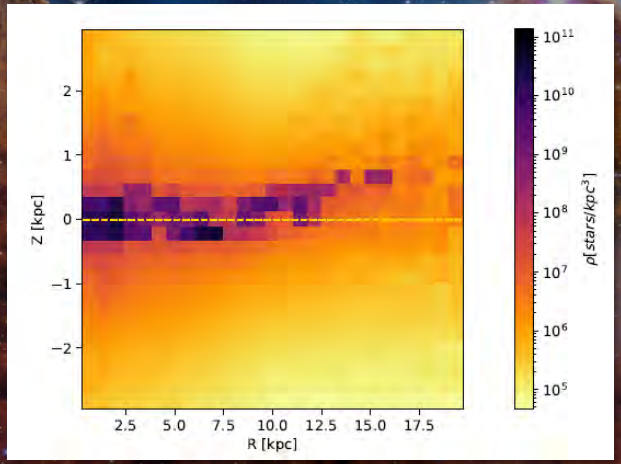
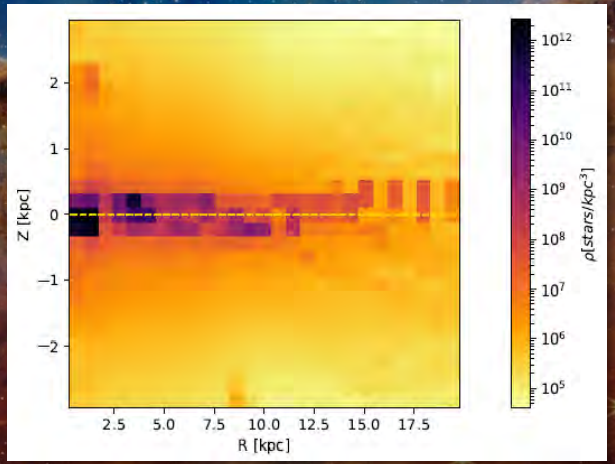


GALACTIC WARP

- Galactic warp – observed in nearly all spiral galaxies

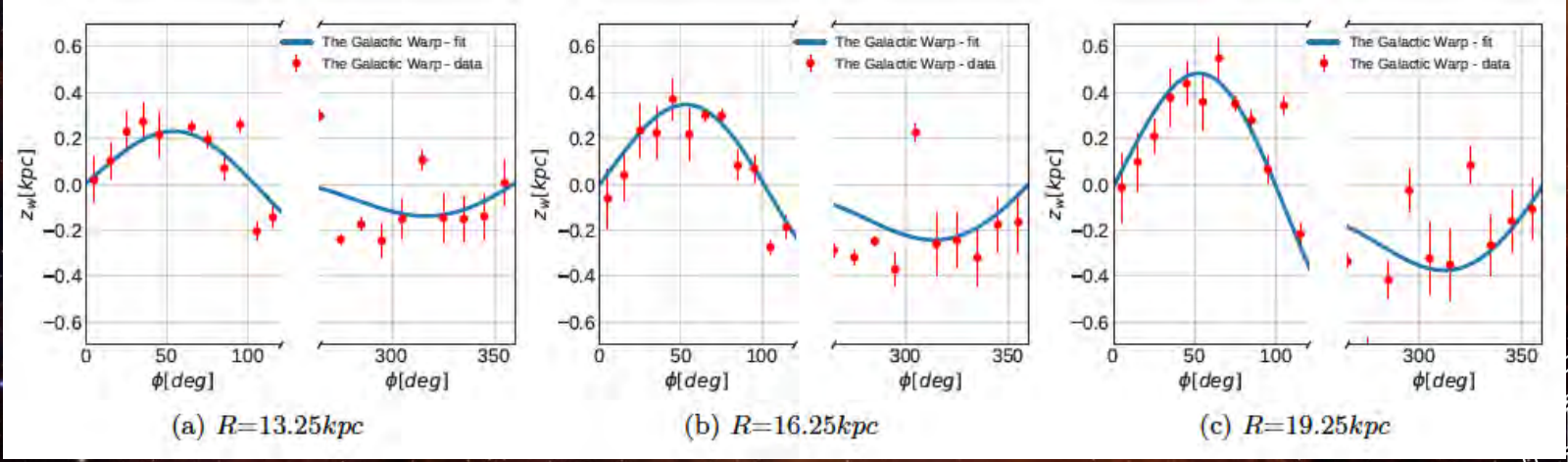




GALACTIC WARP

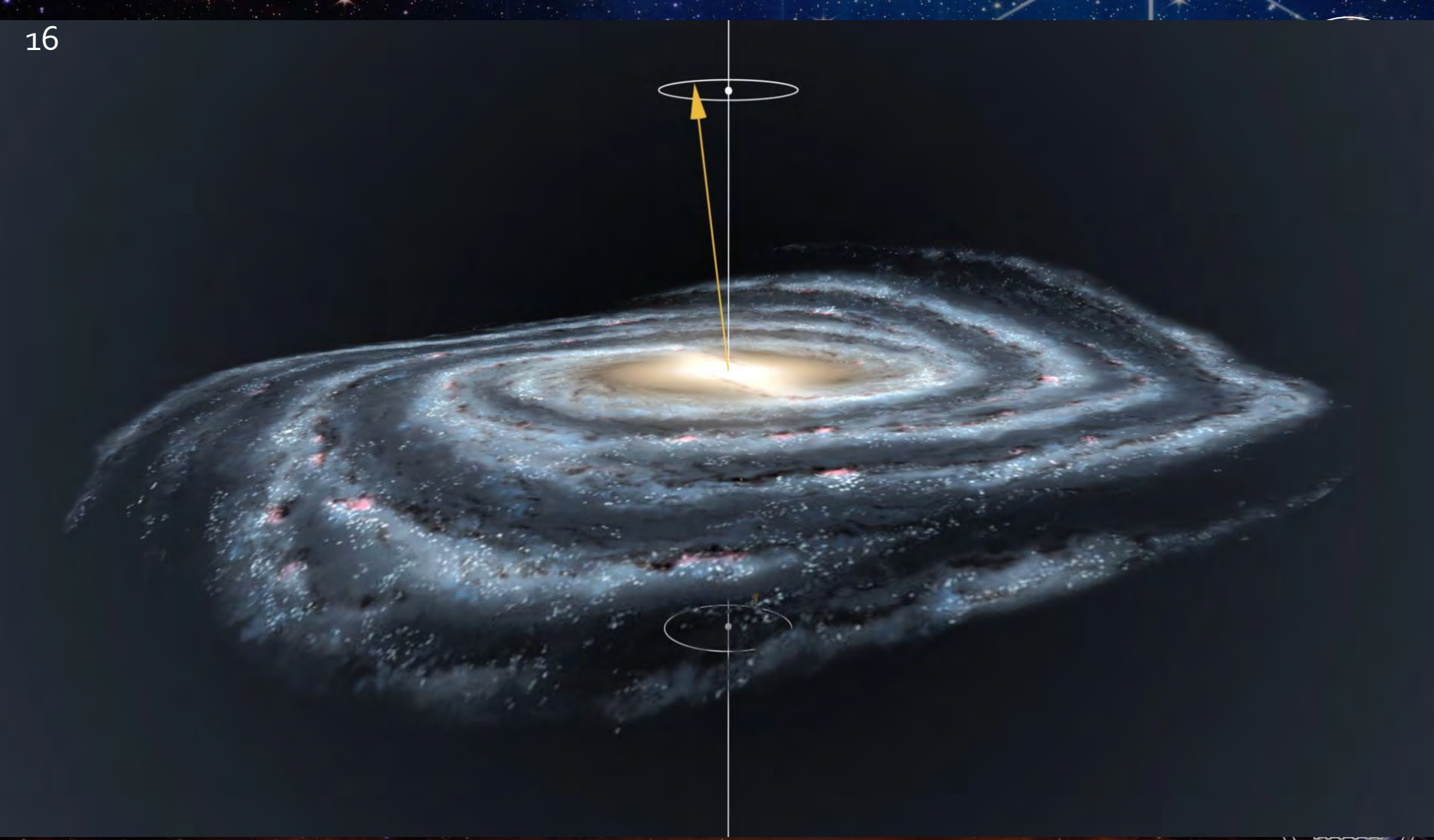
- Fitting the maximum elevation above the plane

$$z_w = z_0 + z_1 \cdot \sin(\phi - \phi_1) + z_2 \cdot \sin(2\phi - \phi_2)$$



GALAKTICKÉ DIAĽKY

- Galakticý warp



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- Possibly a combination of multiple theories

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thank you for your attention

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Erasmus+

European Collaborating Astronomer Projects: Espana-Czechia-Slovakia – Erasmus + Key Action 2

- Štúdium štruktúry galaxie Mliečna cesta pomocou GAIA dát a testovanie teórií gravitácie v galaktickom disku – VEGA 1/0761/21

roman.nagy33