

# GALAXIES & TROUS NOIRS

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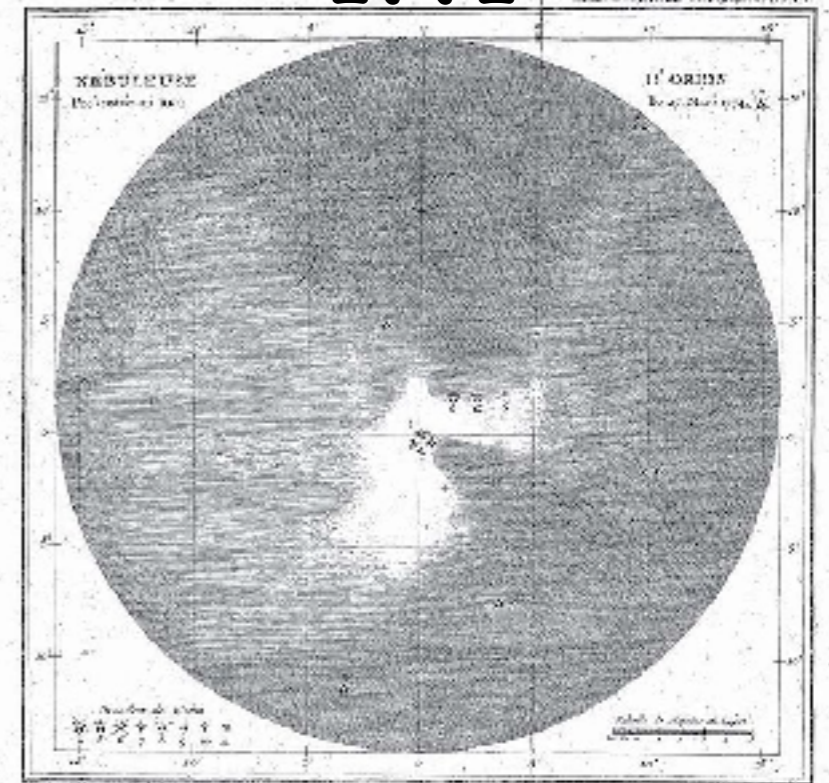
# PREMIÈRES OBSERVATIONS

**La grande nébuleuse  
d'Andromède, 1889**

Isaac Roberts



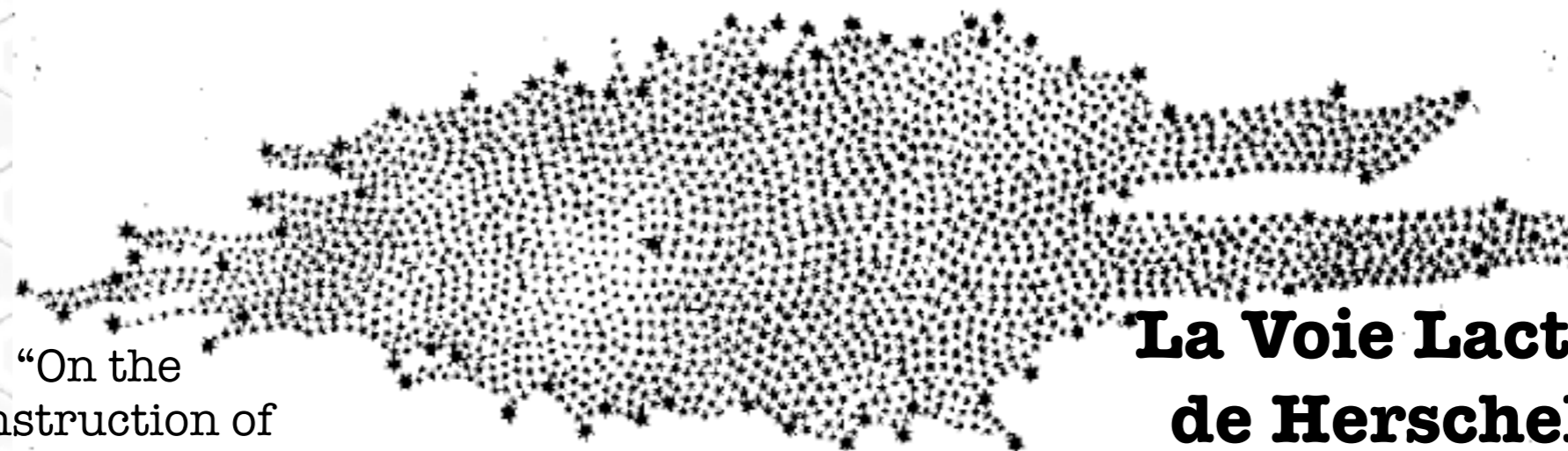
**Catalogue Messier,  
1771**



Cambridge University

“On the  
Construction of  
the Heavens”

**La Voie Lactée  
de Herschel,  
1785**





# ÎLES COSMIQUES





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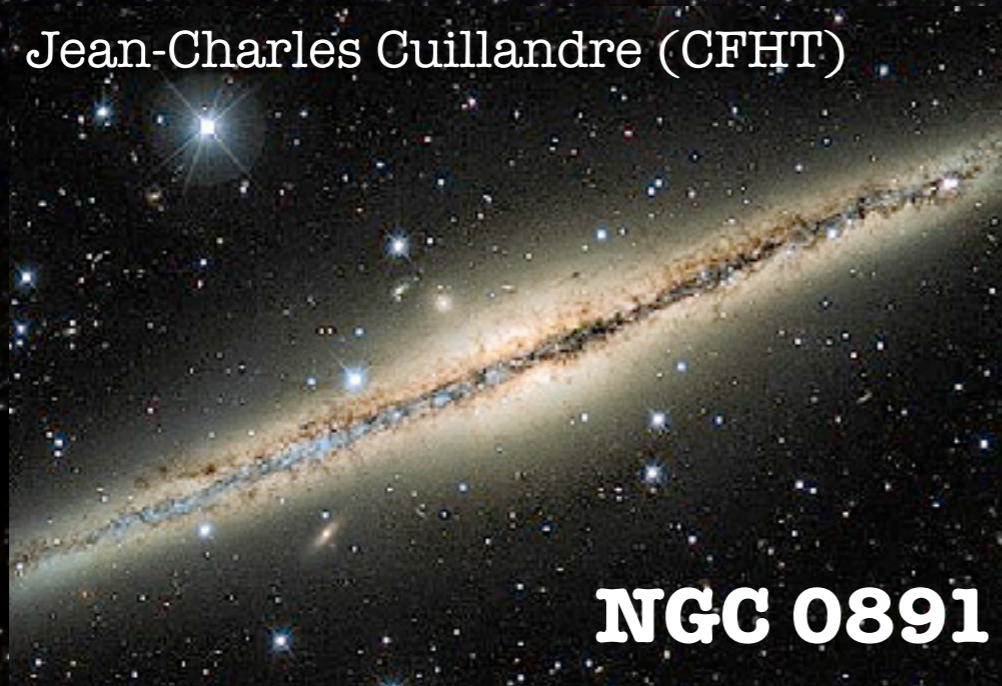
**Andromède**





# ÎLES COSMIQUES

Jean-Charles Cuillandre (CFHT)



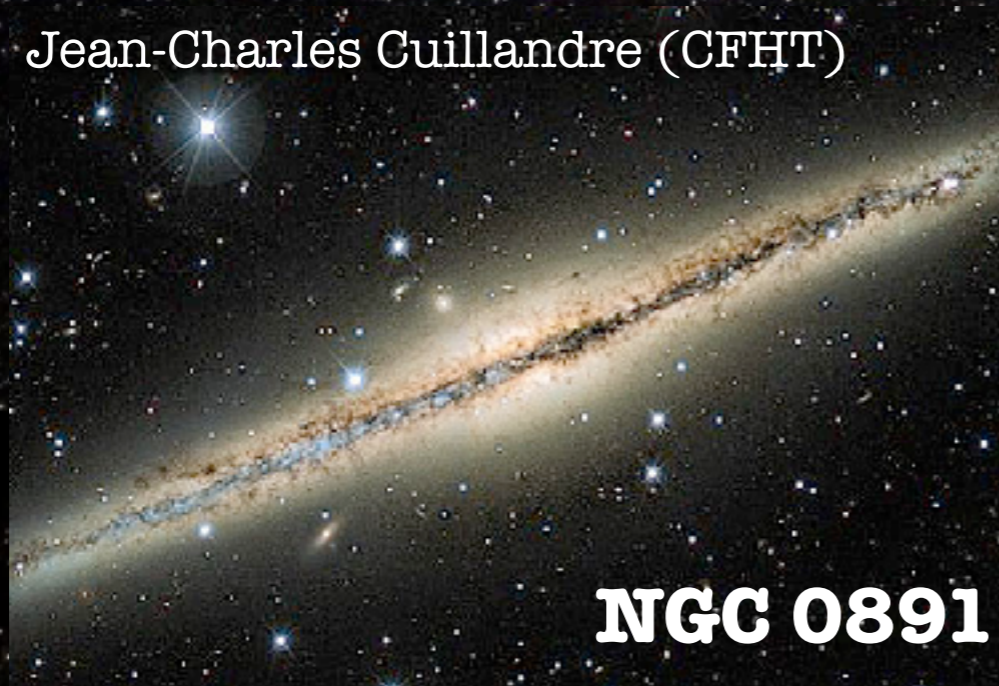
**Andromède**





# ÎLES COSMIQUES

Jean-Charles Cuillandre (CFHT)



**Andromède**

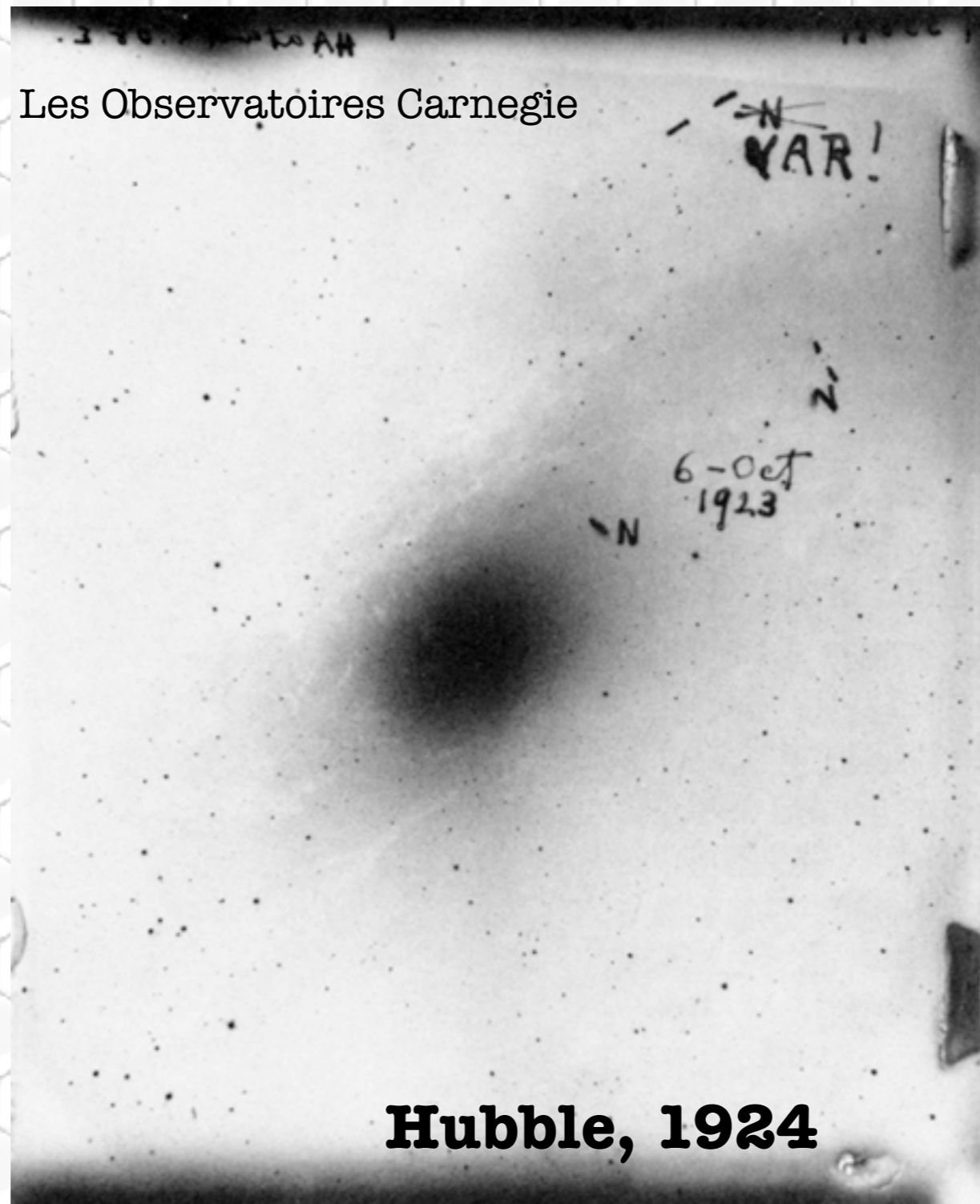


Space





# ÎLES COSMIQUES





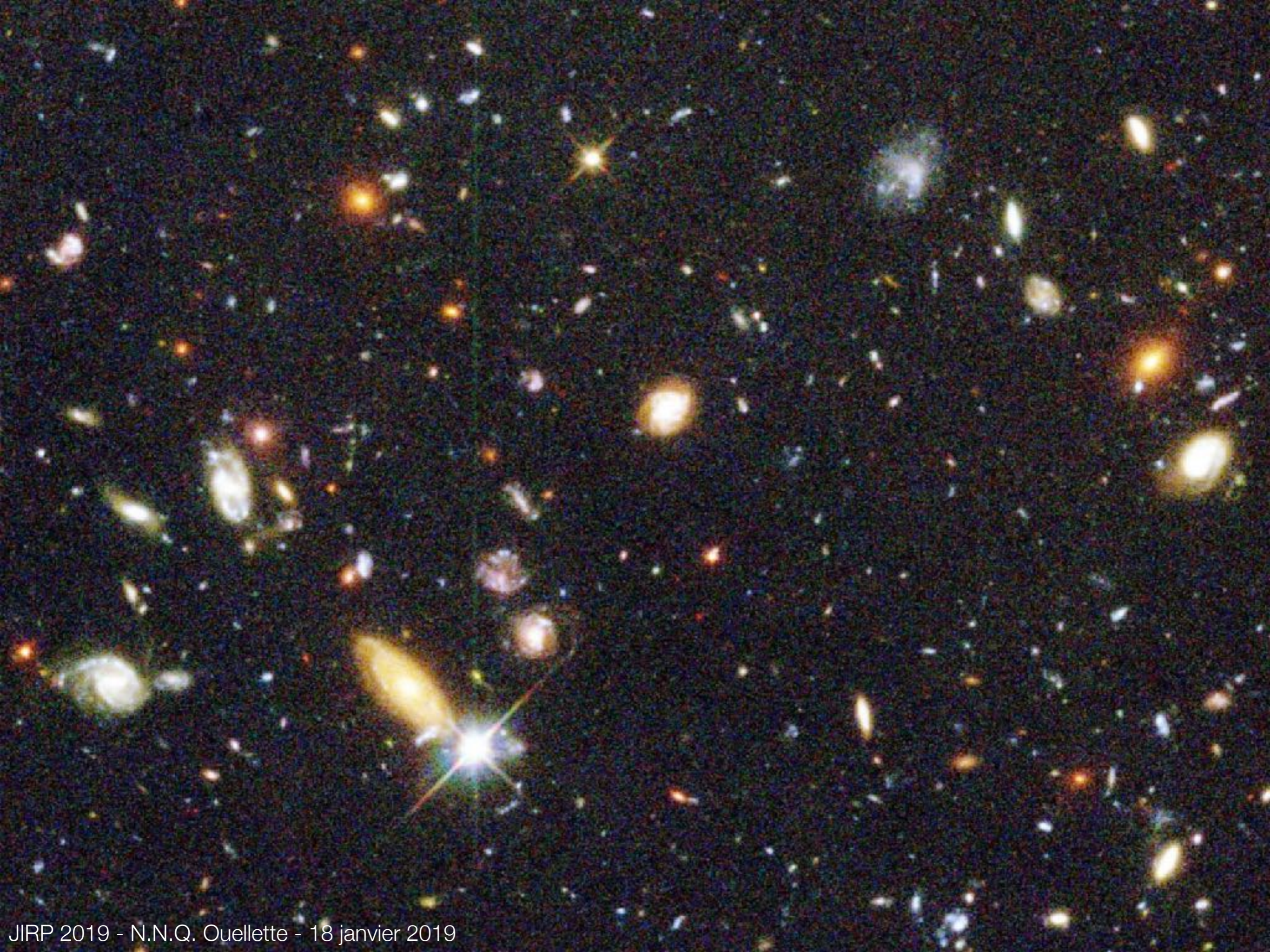
# ÎLES COSMIQUES

Les Observatoires Carnegie

NOAO

**Hubble, 1924**

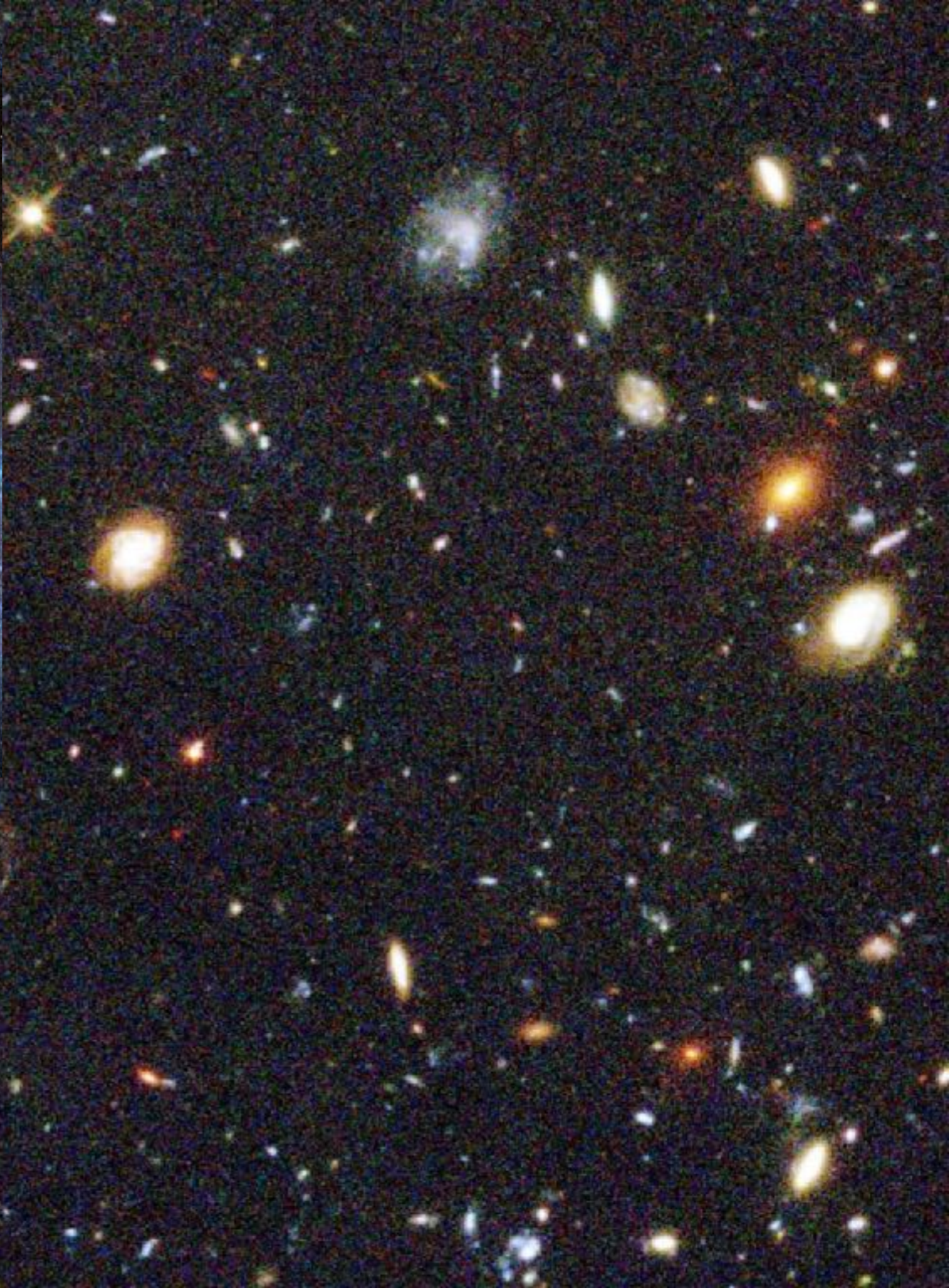








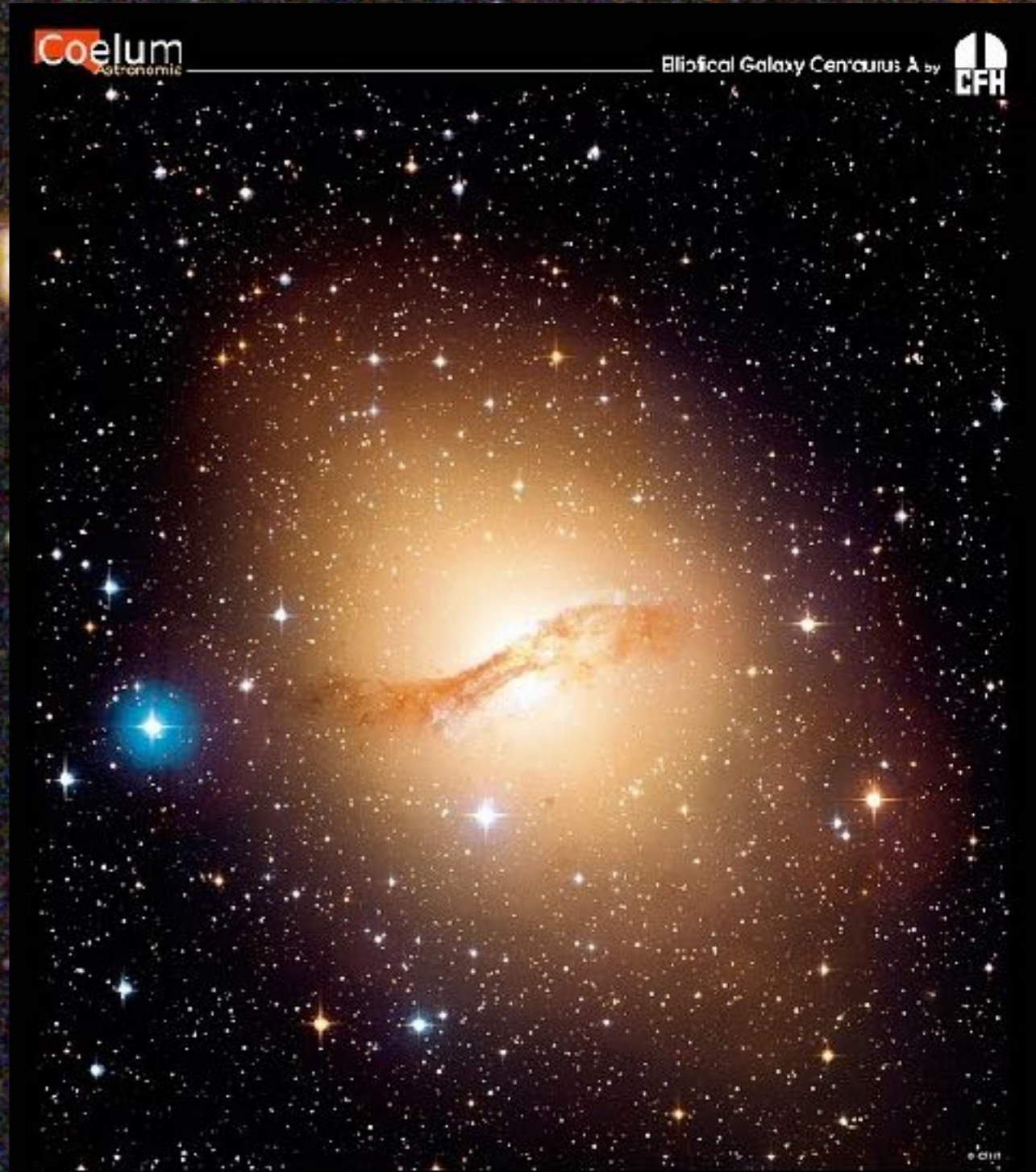
GA\_AXYZCO







© GA\_AXYZCO

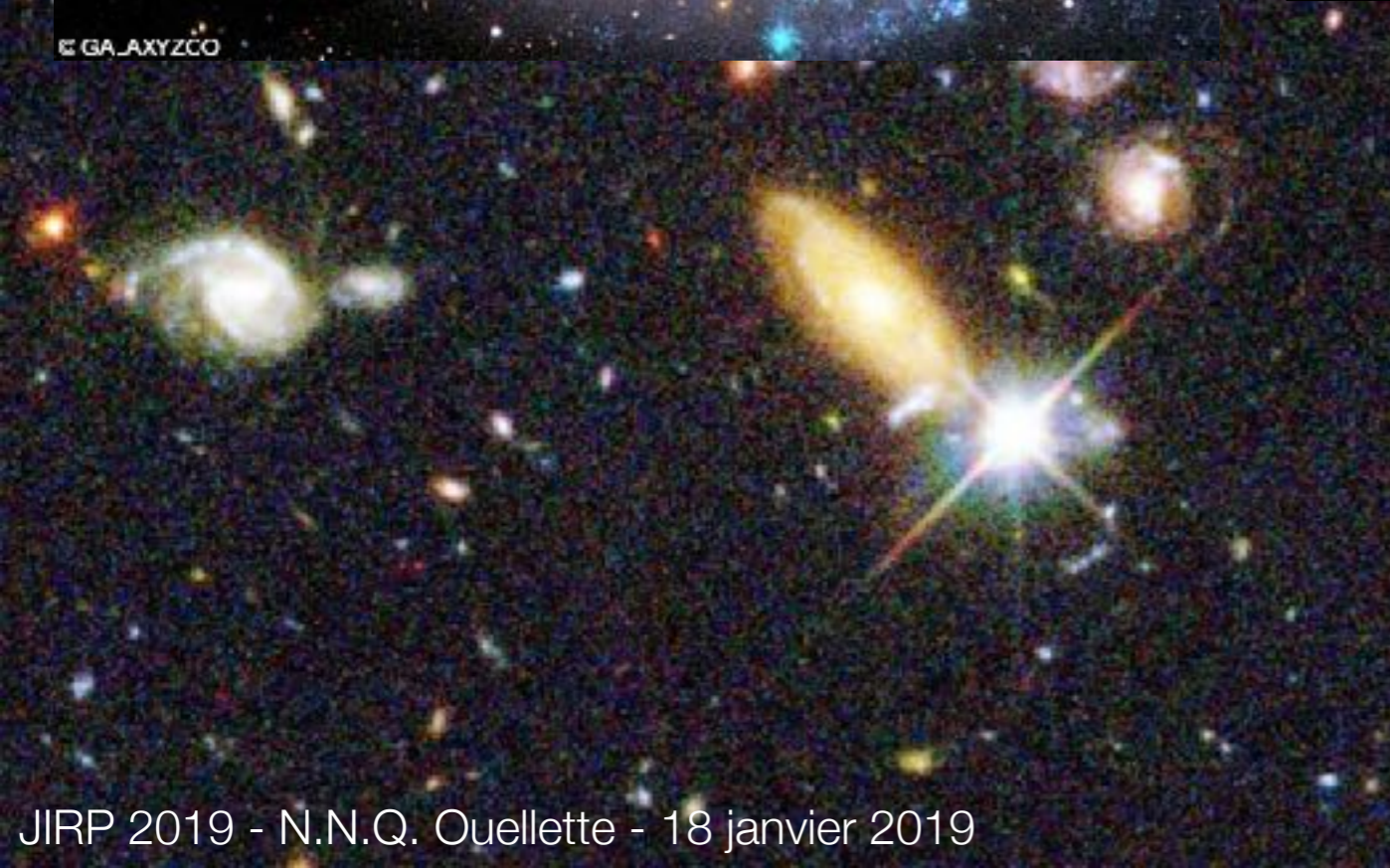
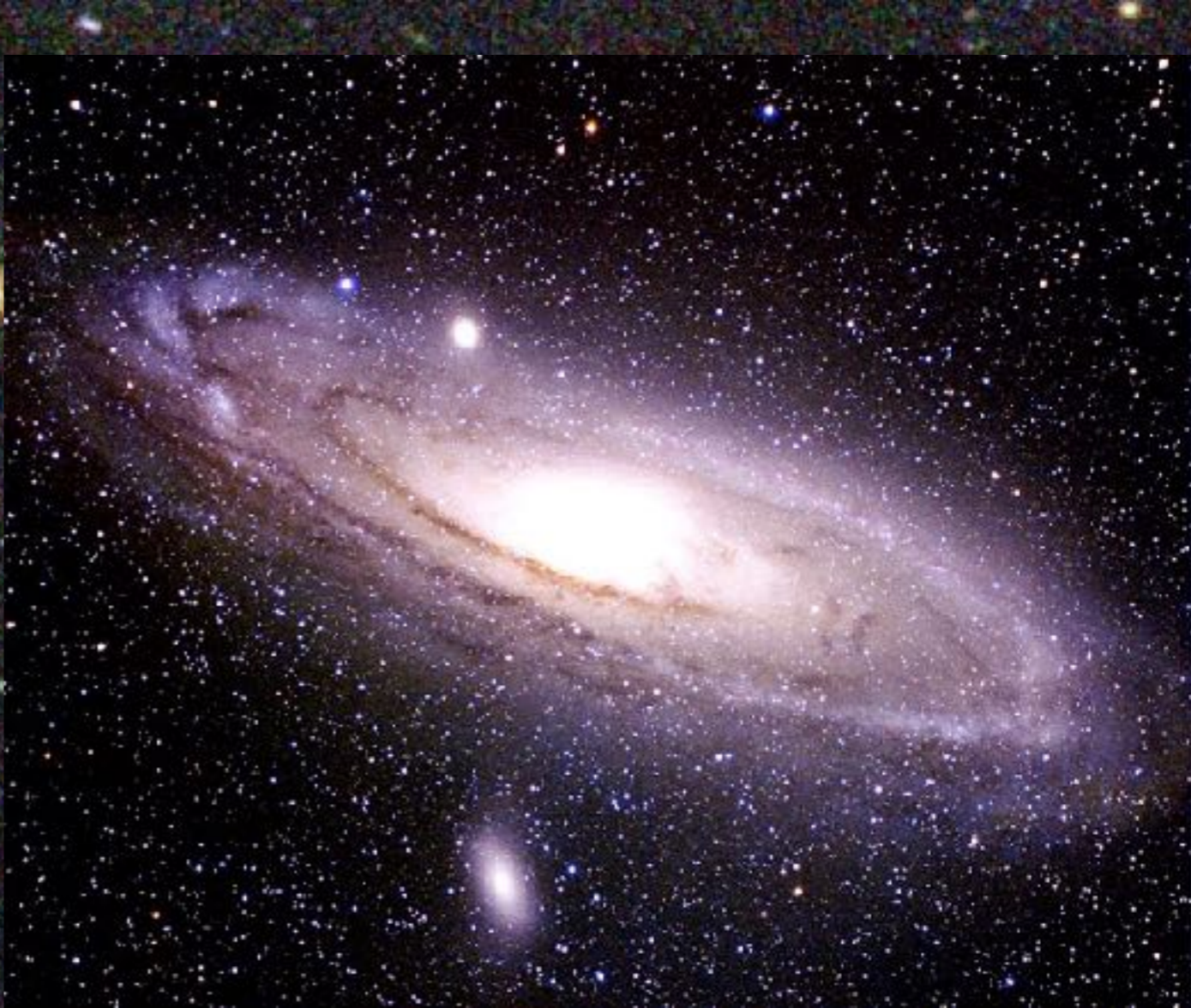


© CFH



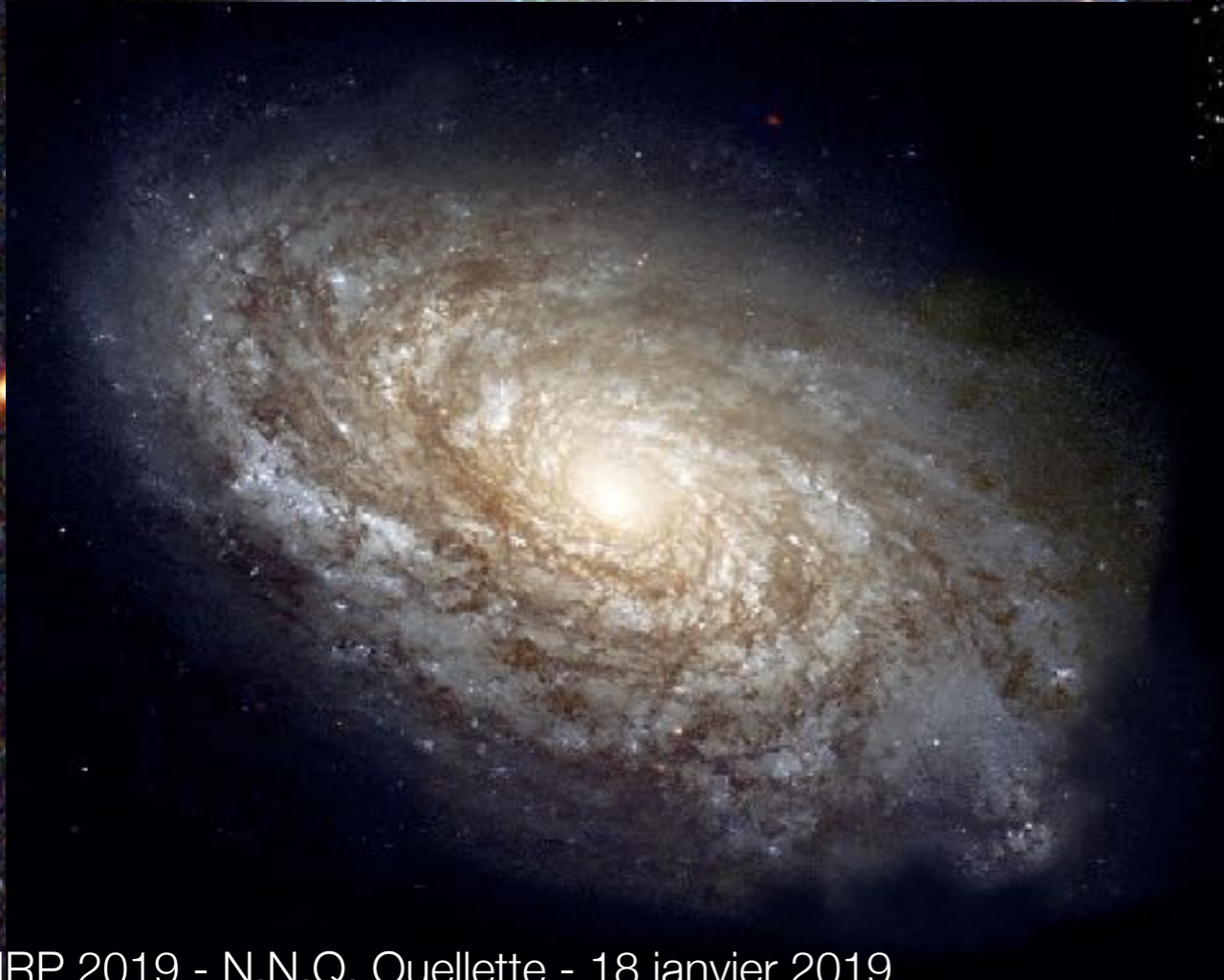
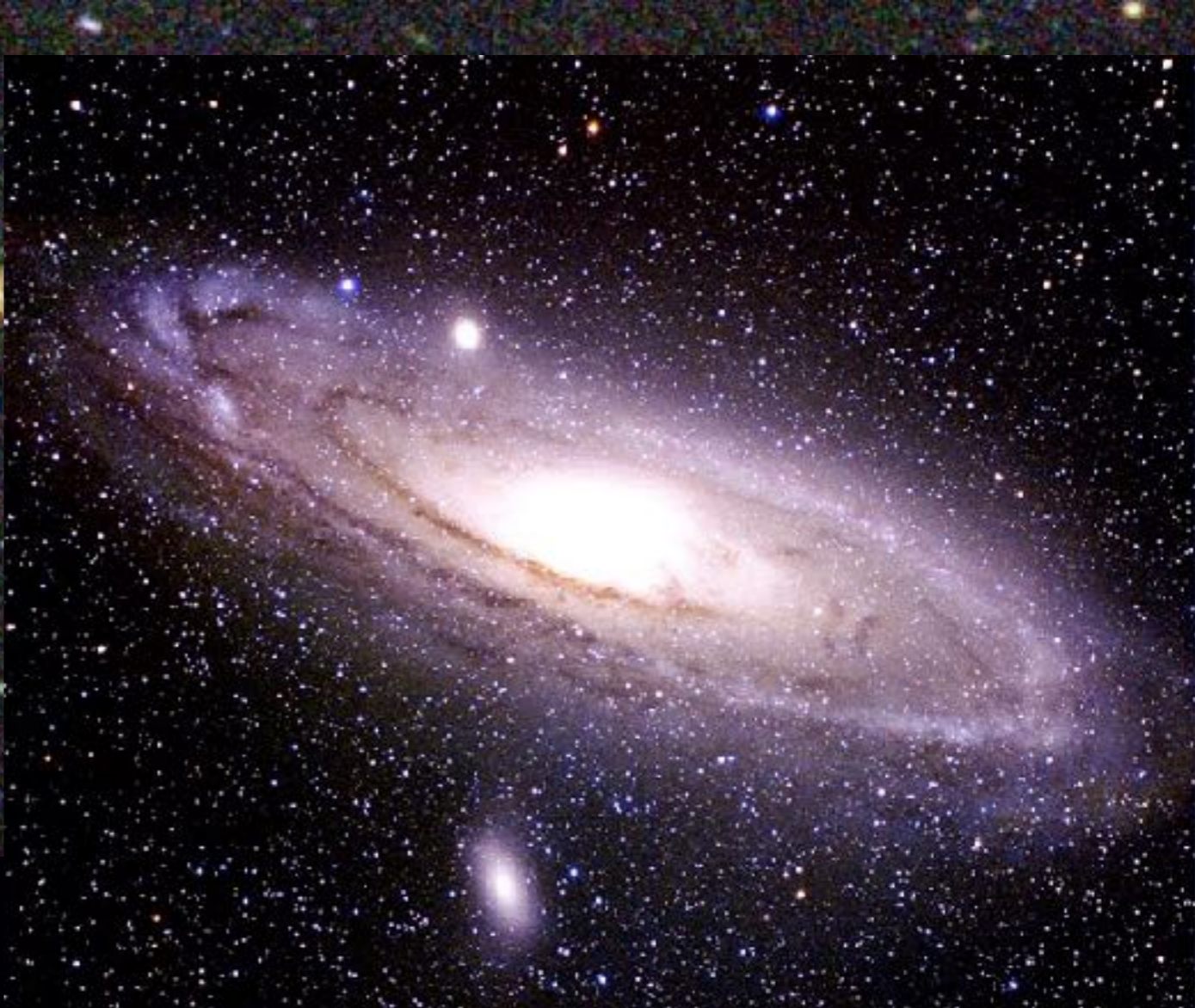


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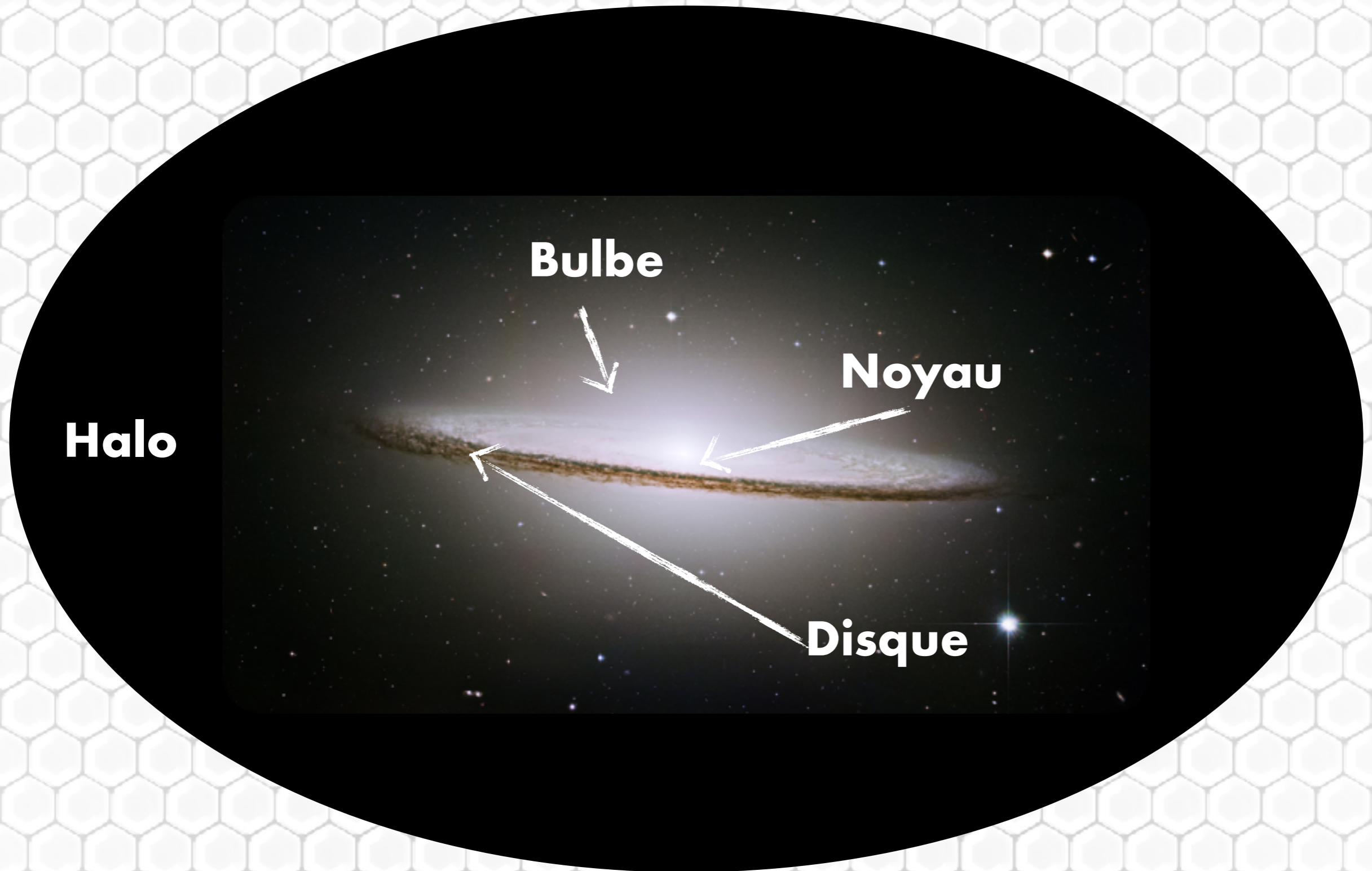




Sun



# L'ANATOMIE D'UNE GALAXIE



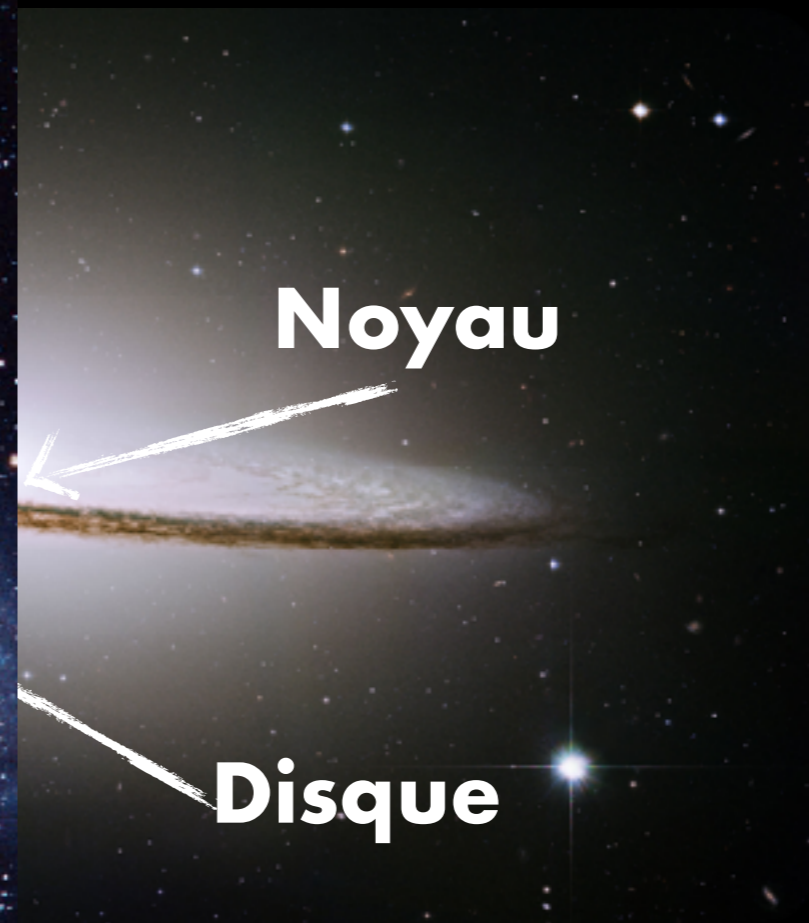


# L'ANATOMIE D'UNE GALAXIE

## Galaxie spirale



Mike Cook





# L'ANATOMIE D'UNE GALAXIE

**Galaxie spirale**



Mike Cook

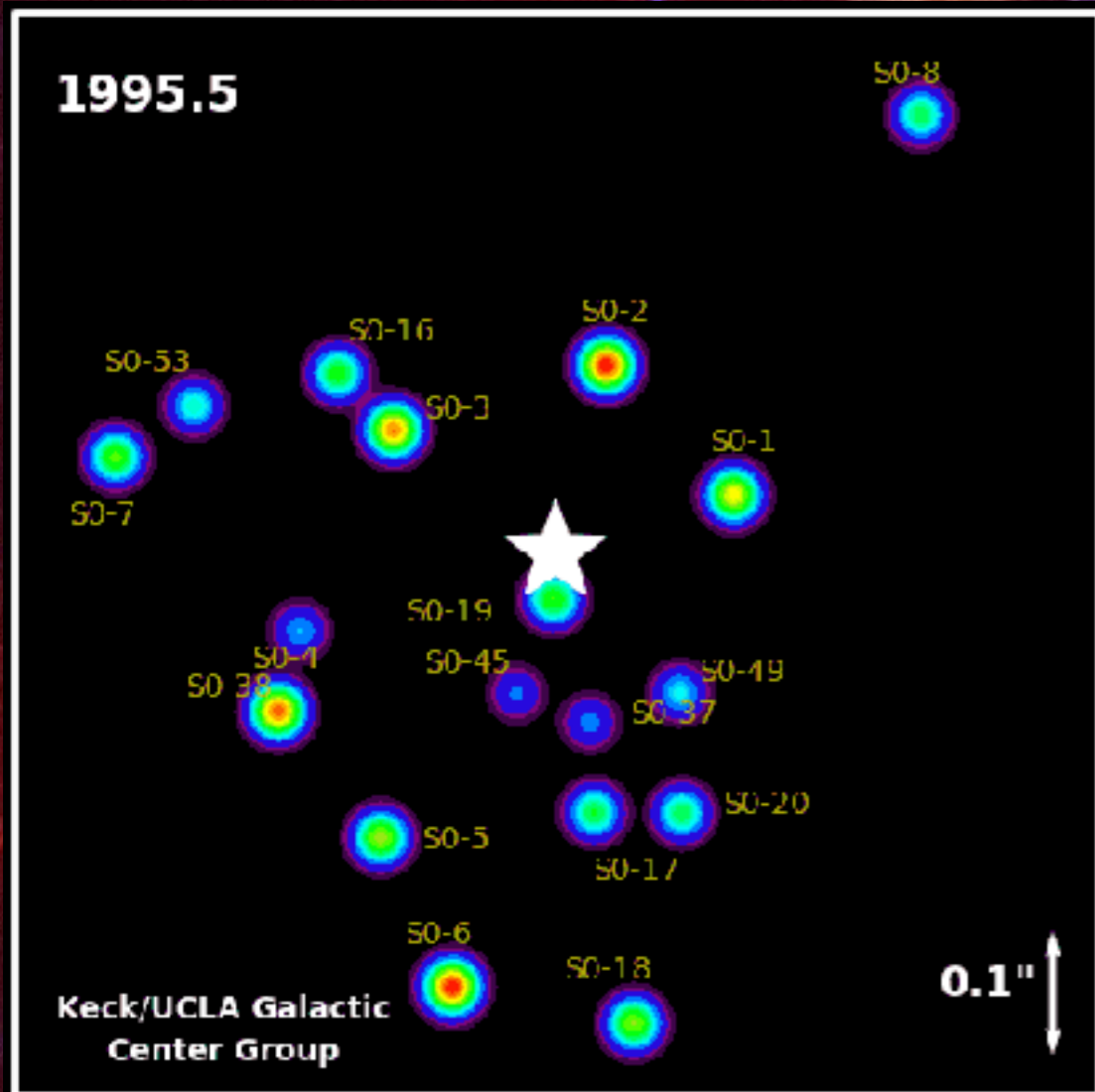
**Galaxie elliptique**



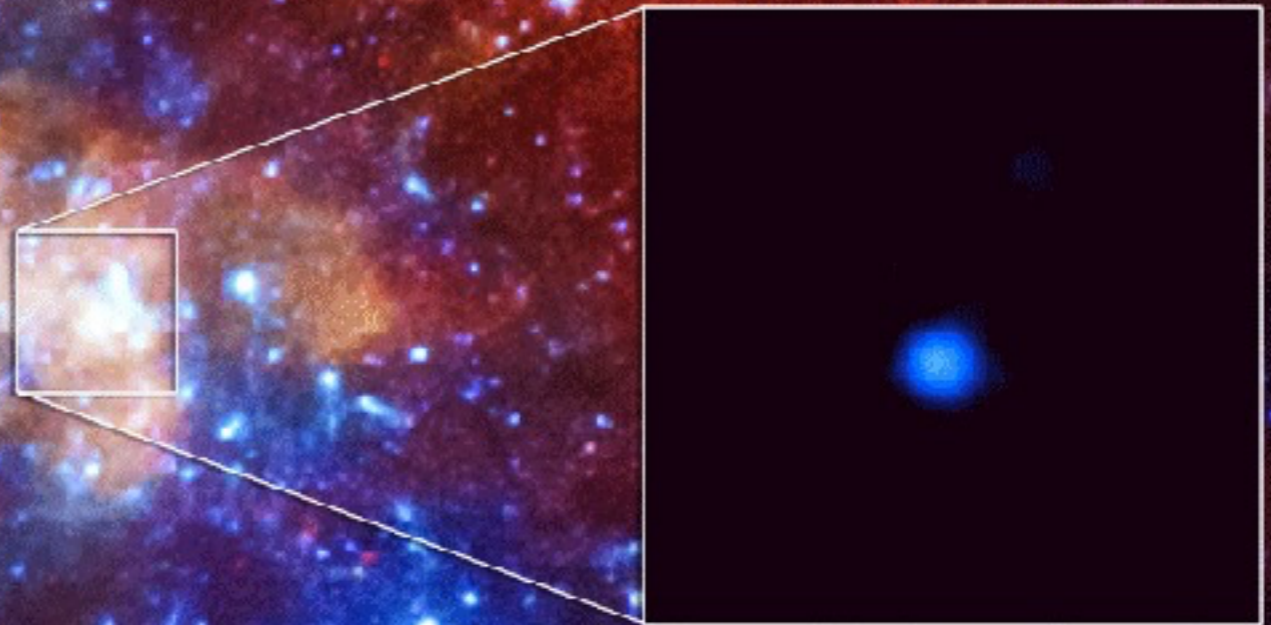
HST



# AU COEUR DE NOTRE GALAXIE

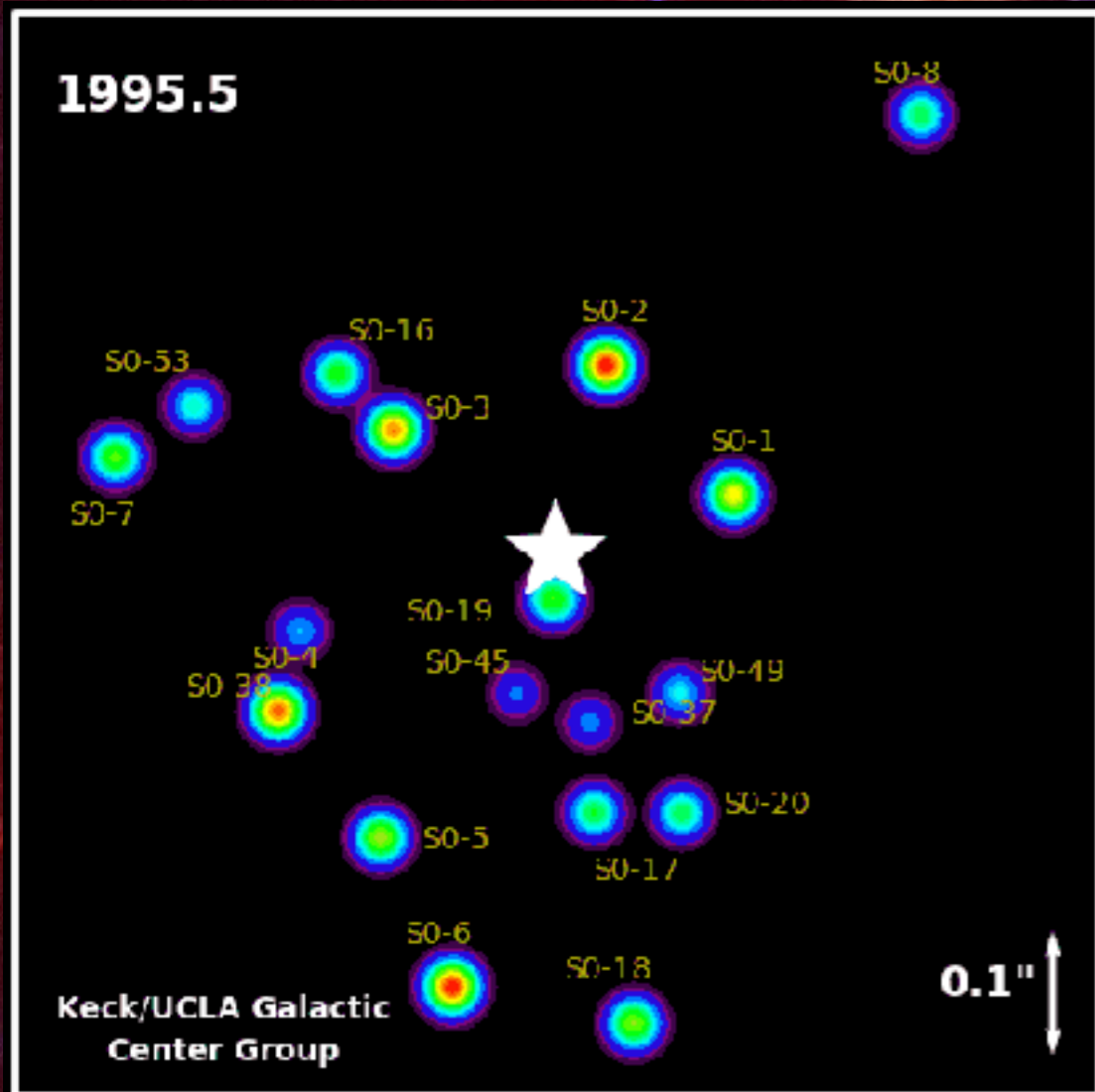


**Sagittarius A\***

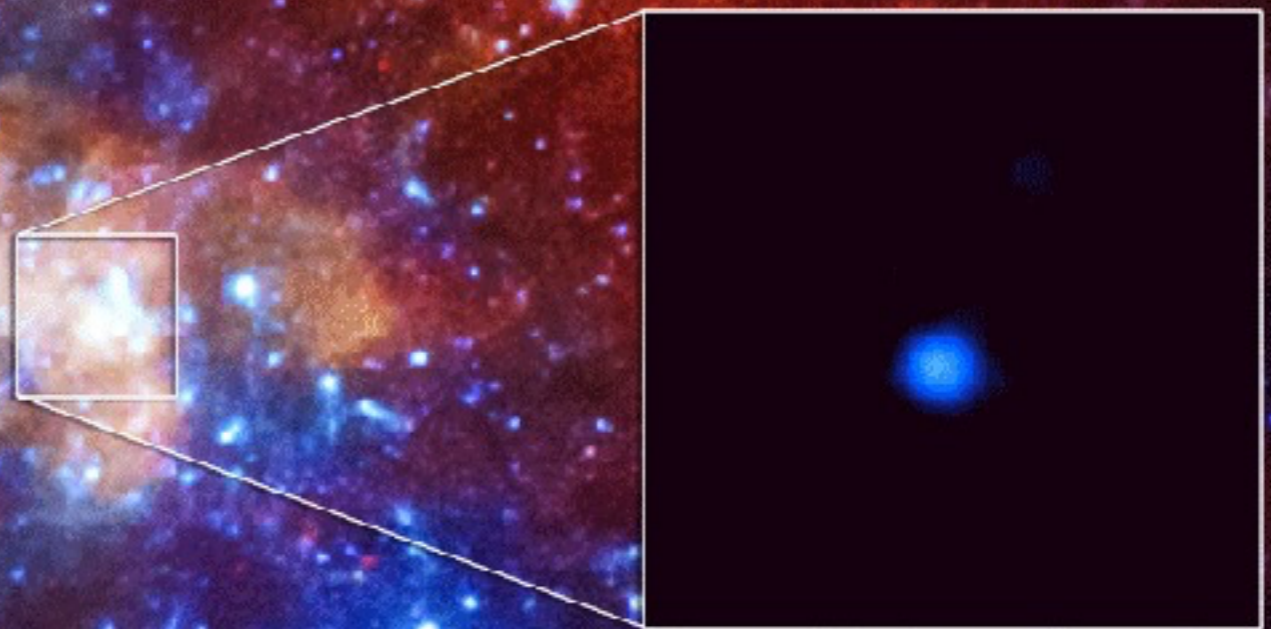




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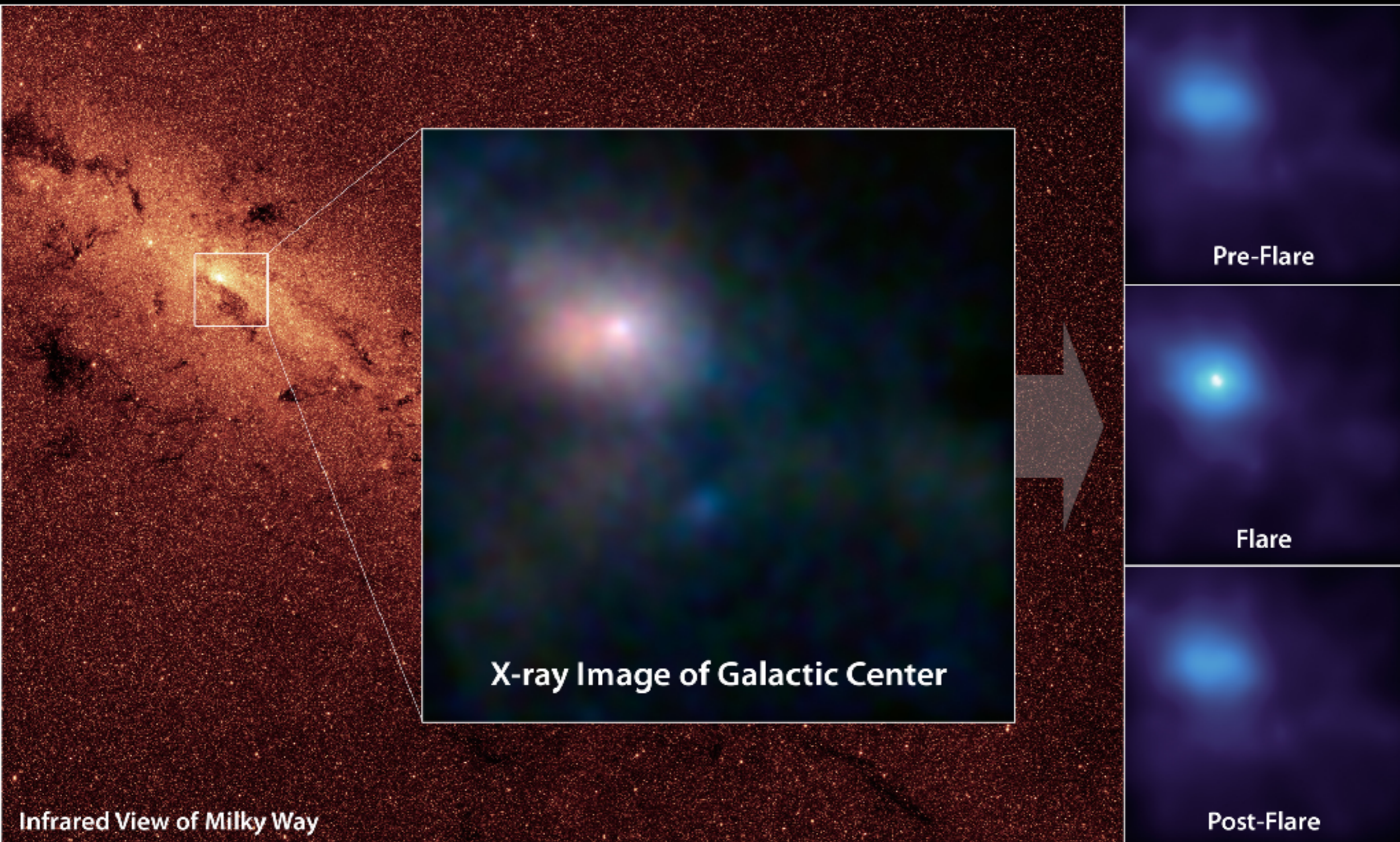


**Sagittarius A\***





# AU COEUR DE NOTRE GALAXIE





# LES TROUS NOIRS



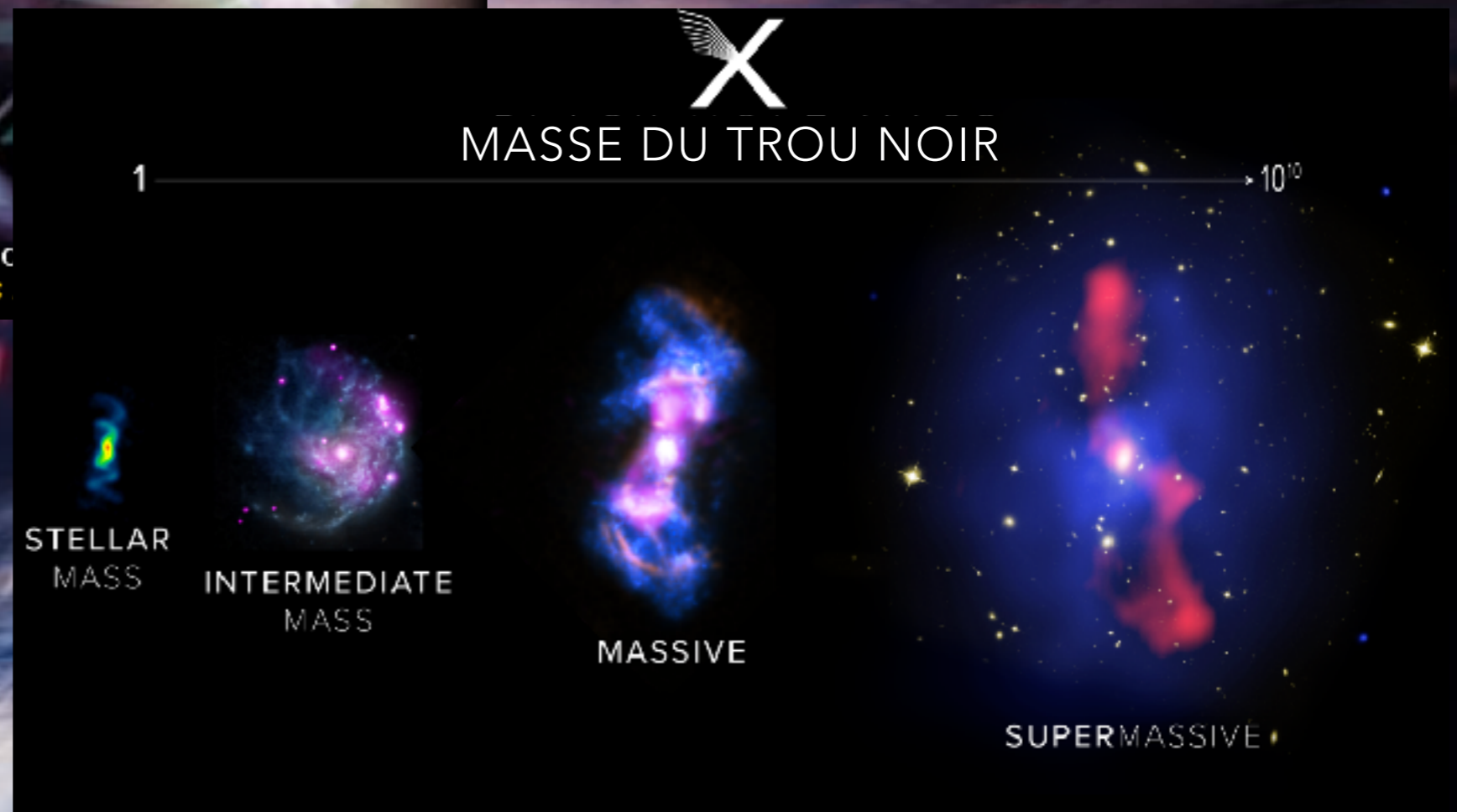
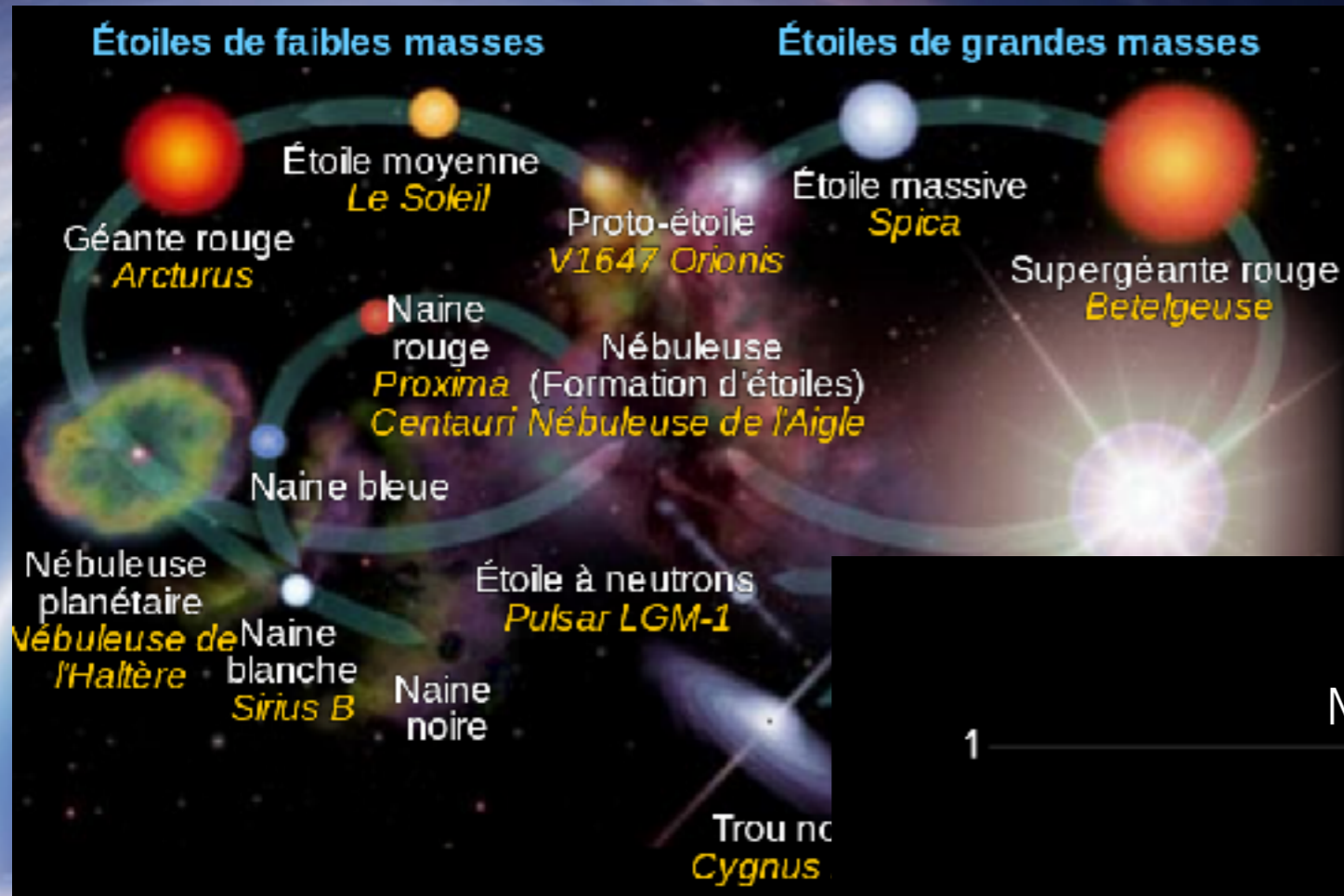


# LES TROUS NOIRS





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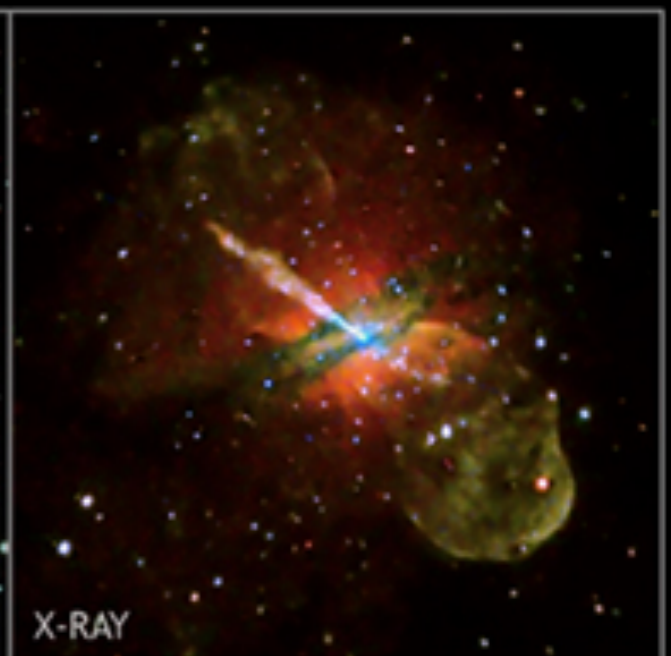




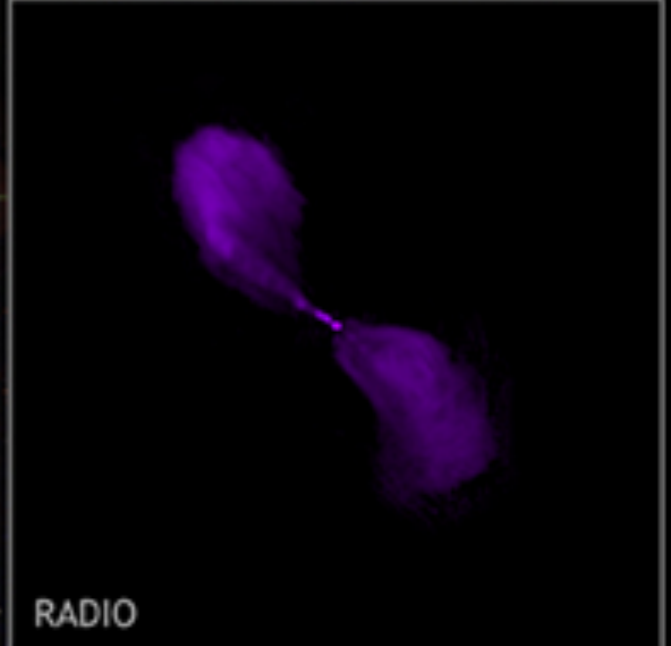
# LES GALAXIES ACTIVES



**Centaurus A**



X-RAY



RADIO



OPTICAL

COMPOSITE

NASA/CXC/CfA



# LES GALAXIES ACTIVES

100,000 années lumières

**Centaurus A**

X-RAY

RADIO

OPTICAL

COMPOSITE



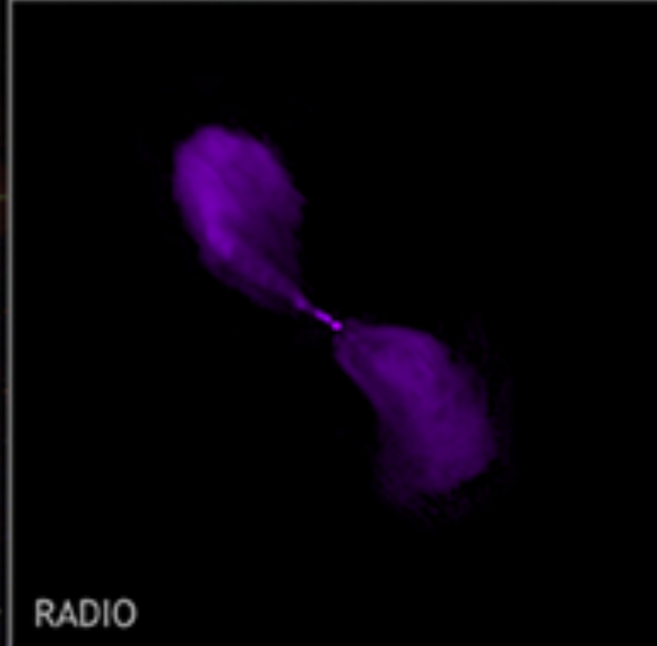
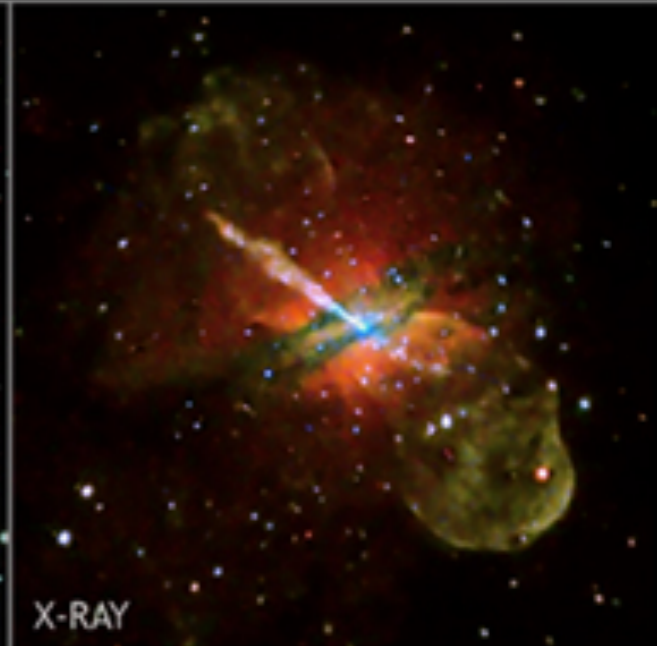
# LES GALAXIES ACTIVES

100,000 années lumières

Julie Hlavacek-Larrondo



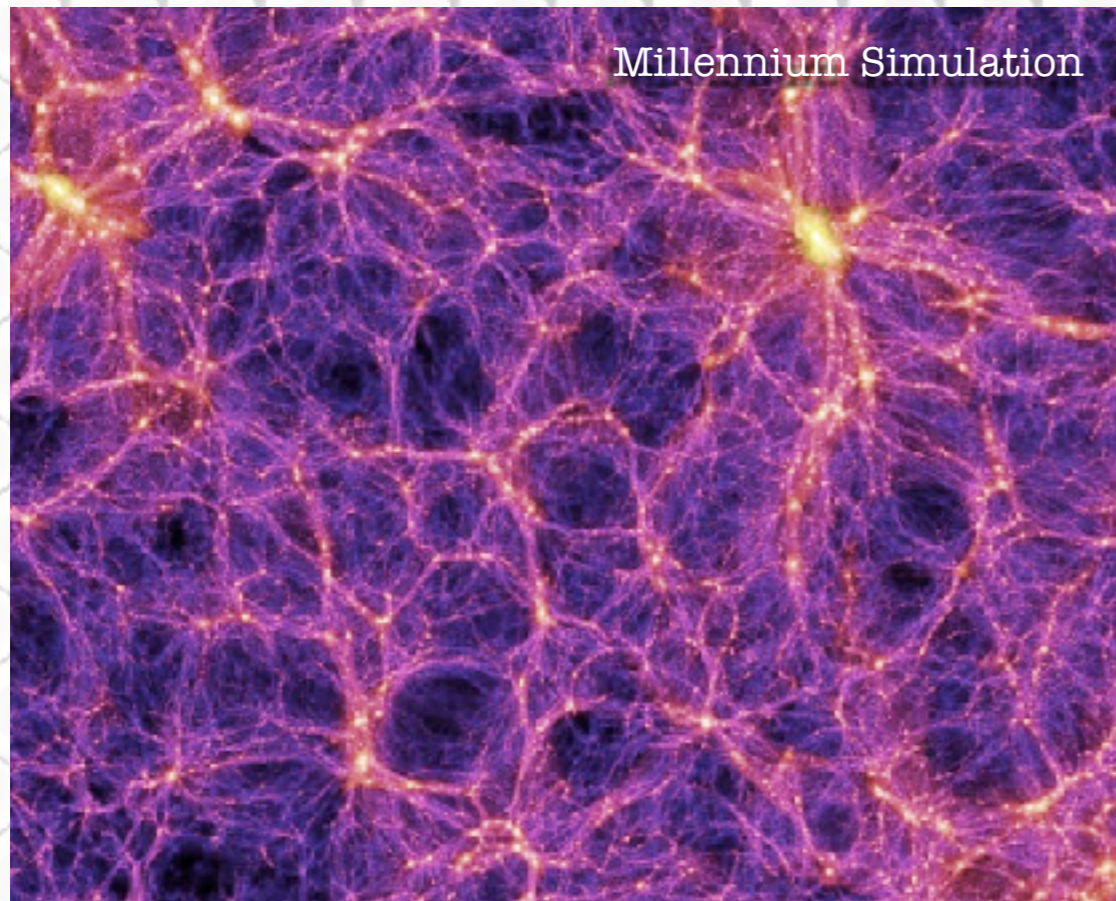
**Centaurus A**



COMPOSITE



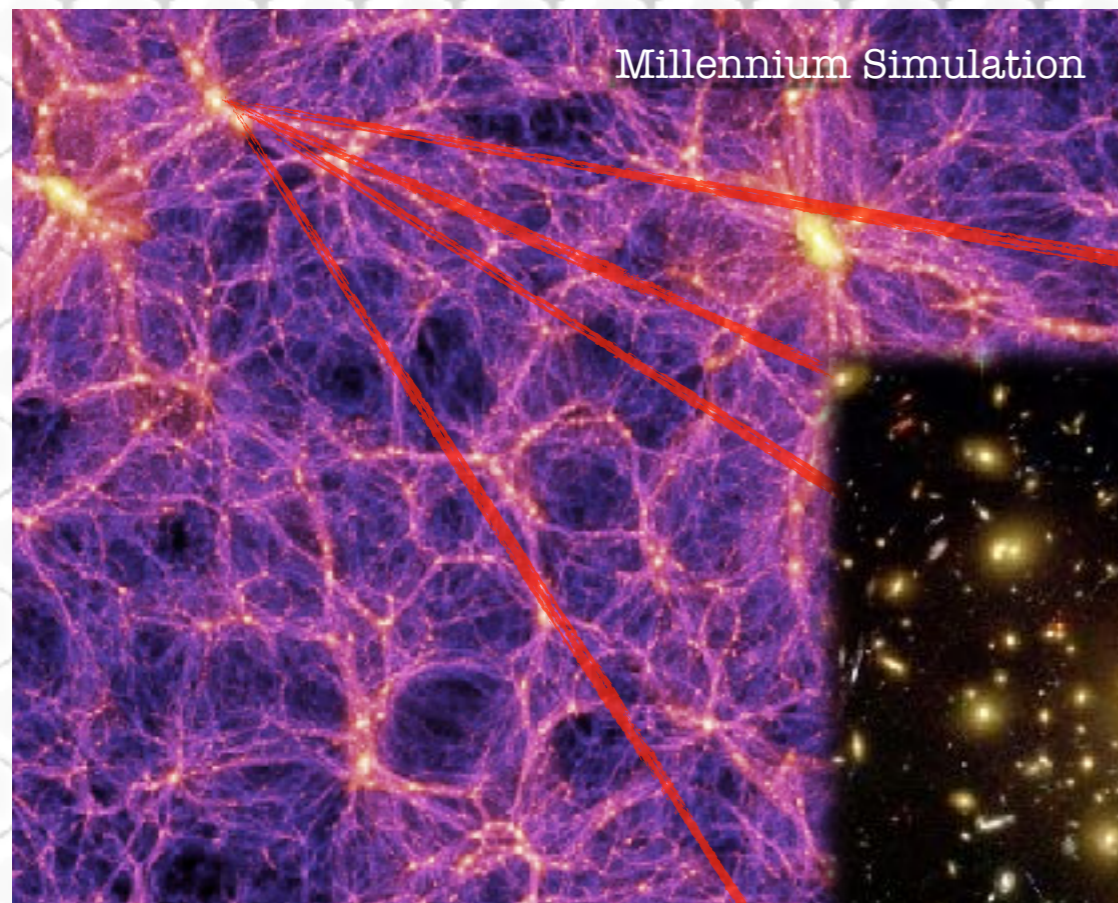
# GALAXIES EN TROUPEAU



**Structure de grande  
échelle**



# GALAXIES EN TROUPEAU



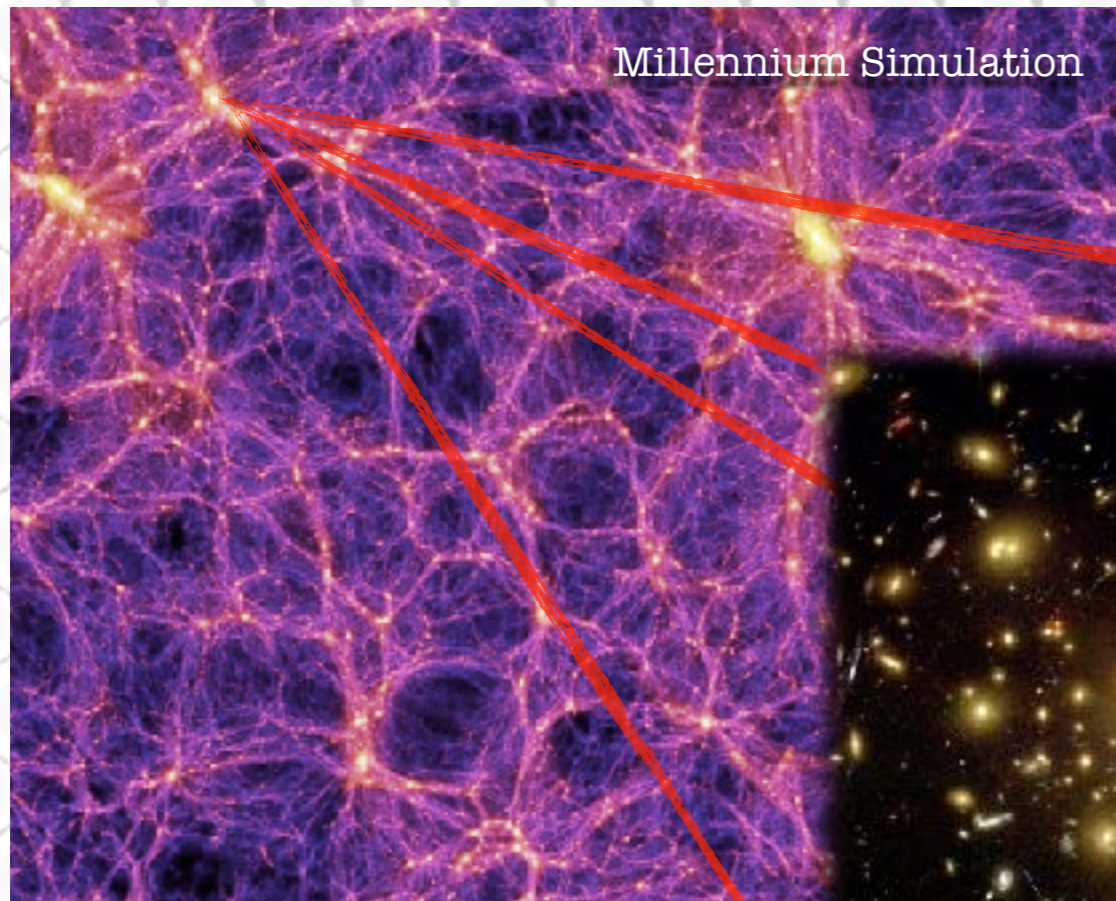
**Structure de grande échelle**



**Amas de galaxies**



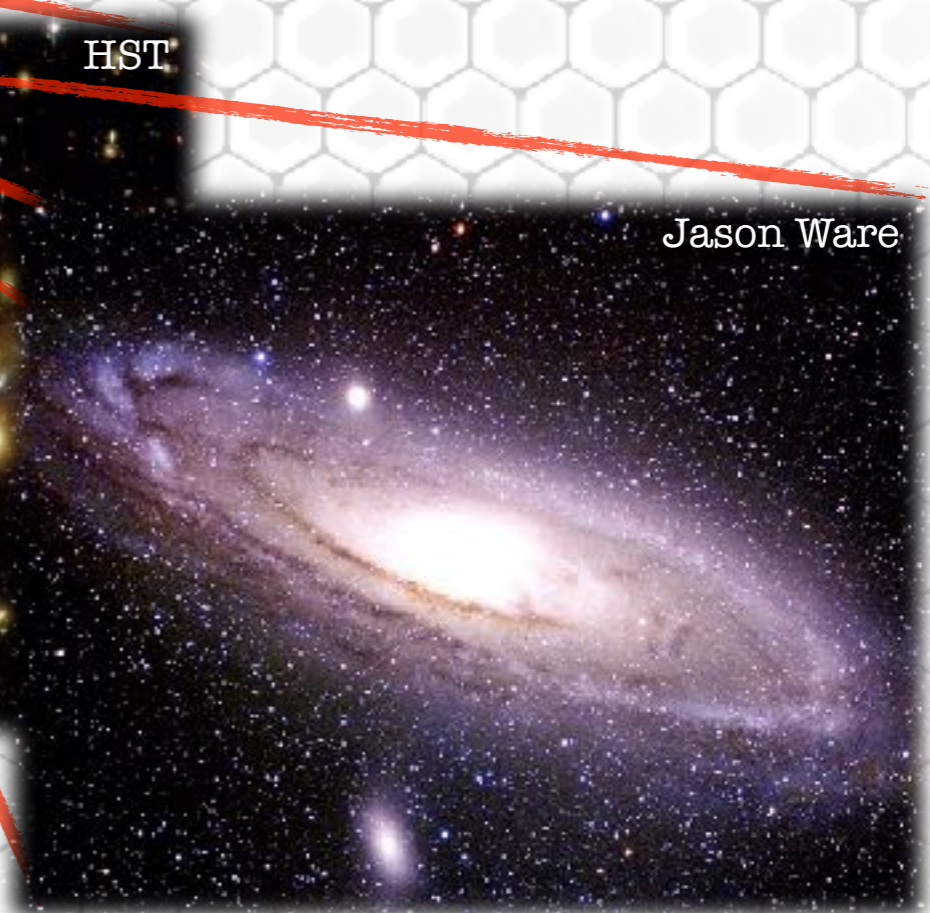
# GALAXIES EN TROUPEAU



**Structure de grande échelle**



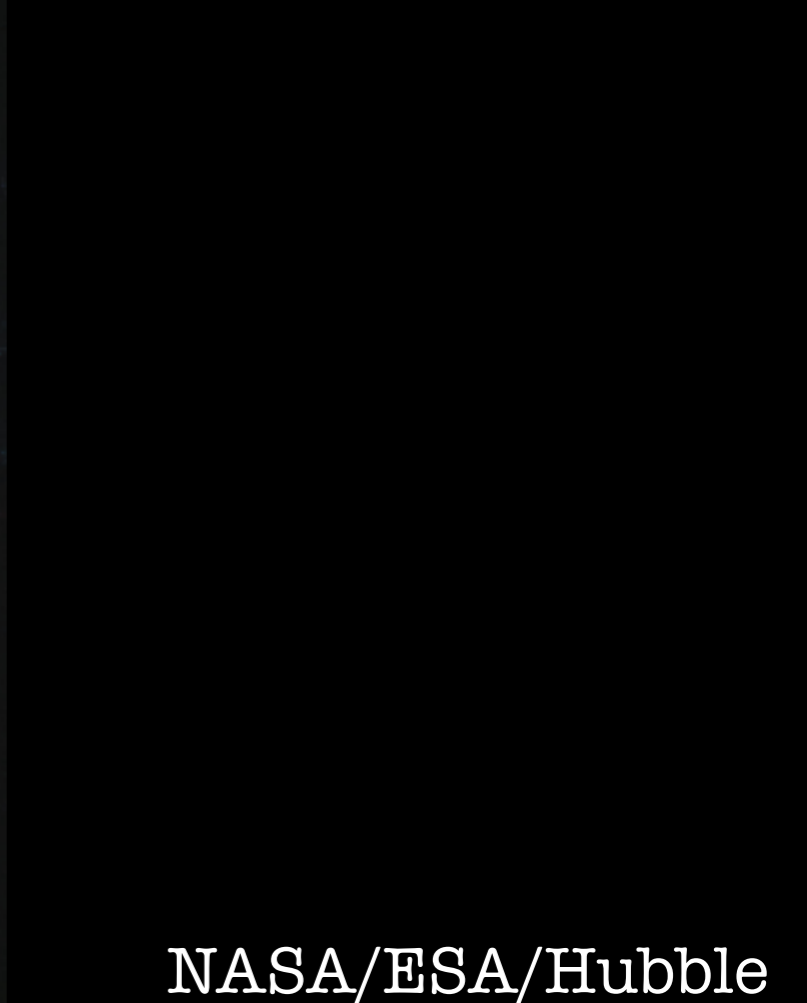
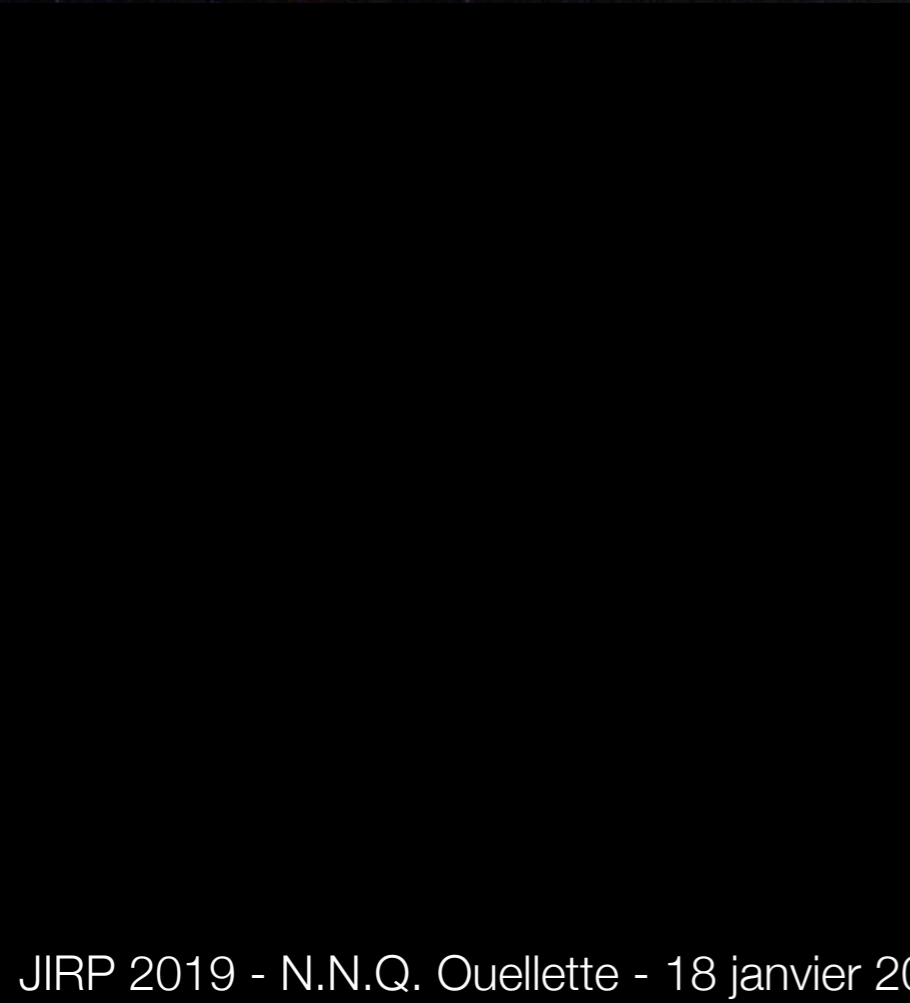
**Amas de galaxies**



**Galaxie**



# EFFETS ENVIRONNEMENTAUX





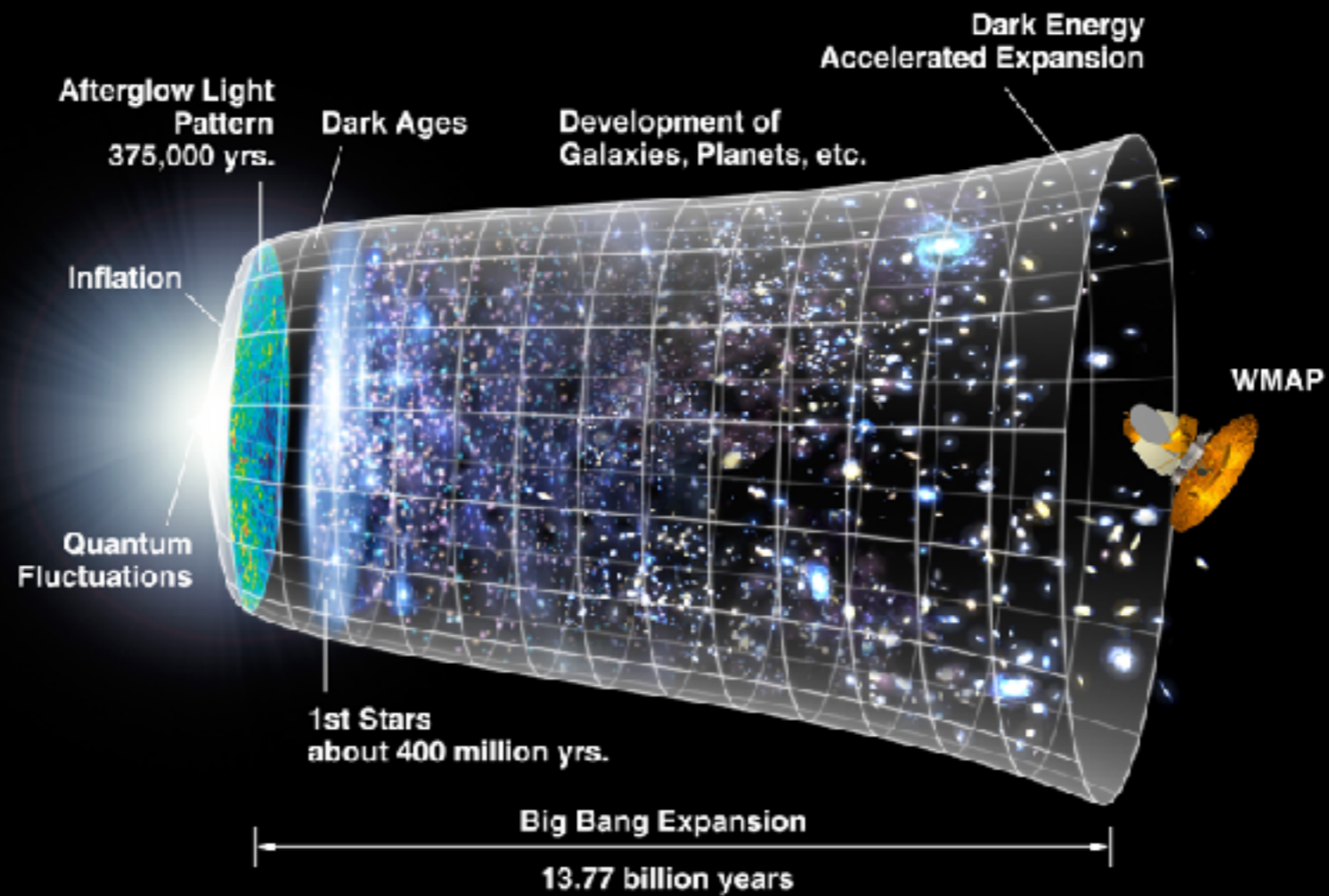
# COLLISIONS GALACTIQUES



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# LES PREMIÈRES GALAXIES

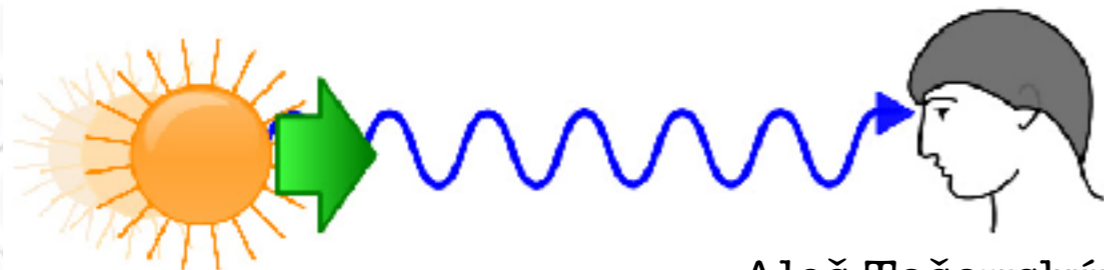


WMAP

NASA/WMAP Science Team

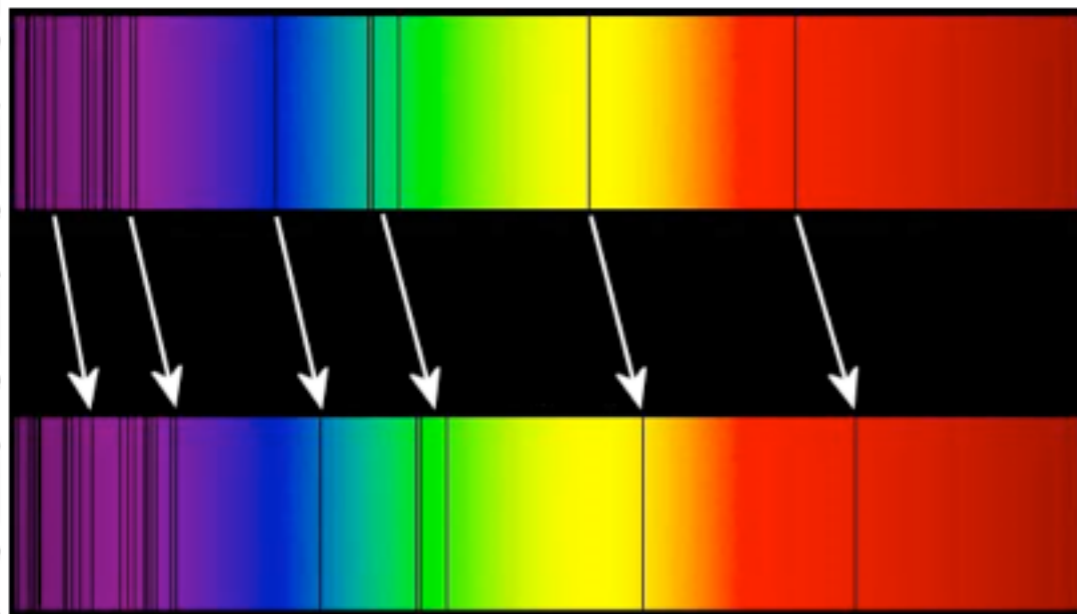


# VOIR PLUS LOIN, VOIR LE PASSÉ



Aleš Tošovský

**Décalage vers le rouge  
"Redshift"**



Science Mag

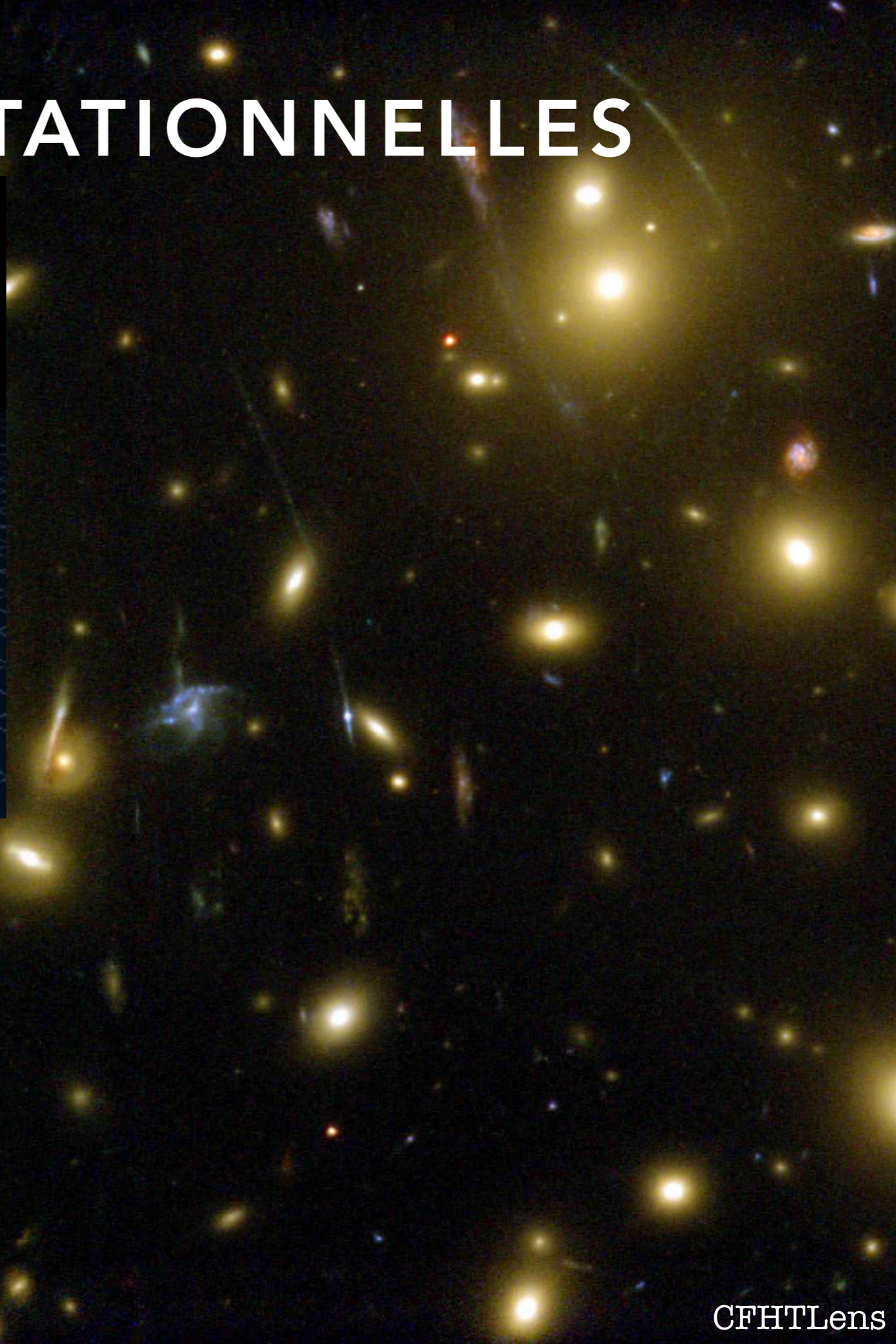
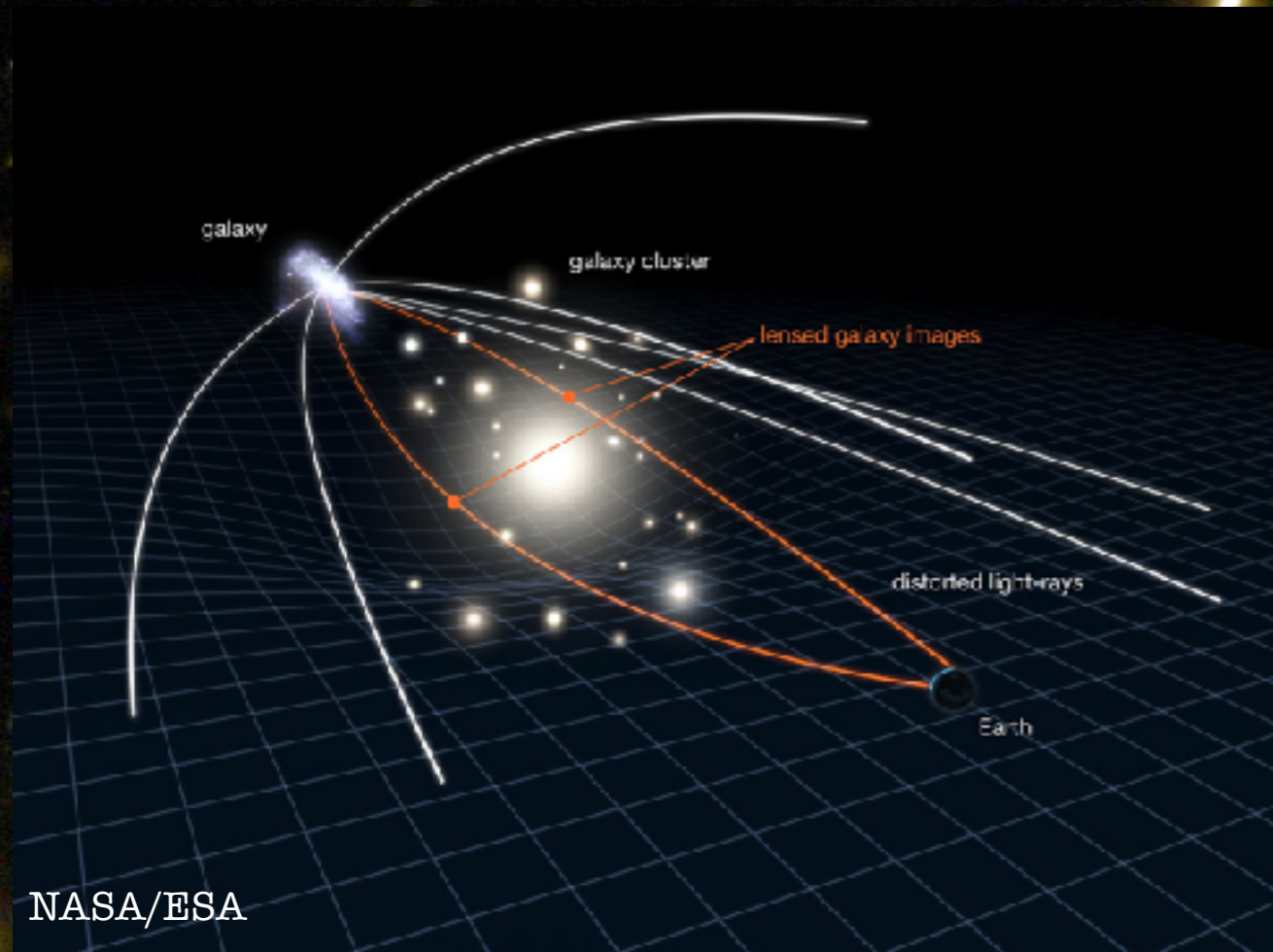


# LENTILLES GRAVITATIONNELLES



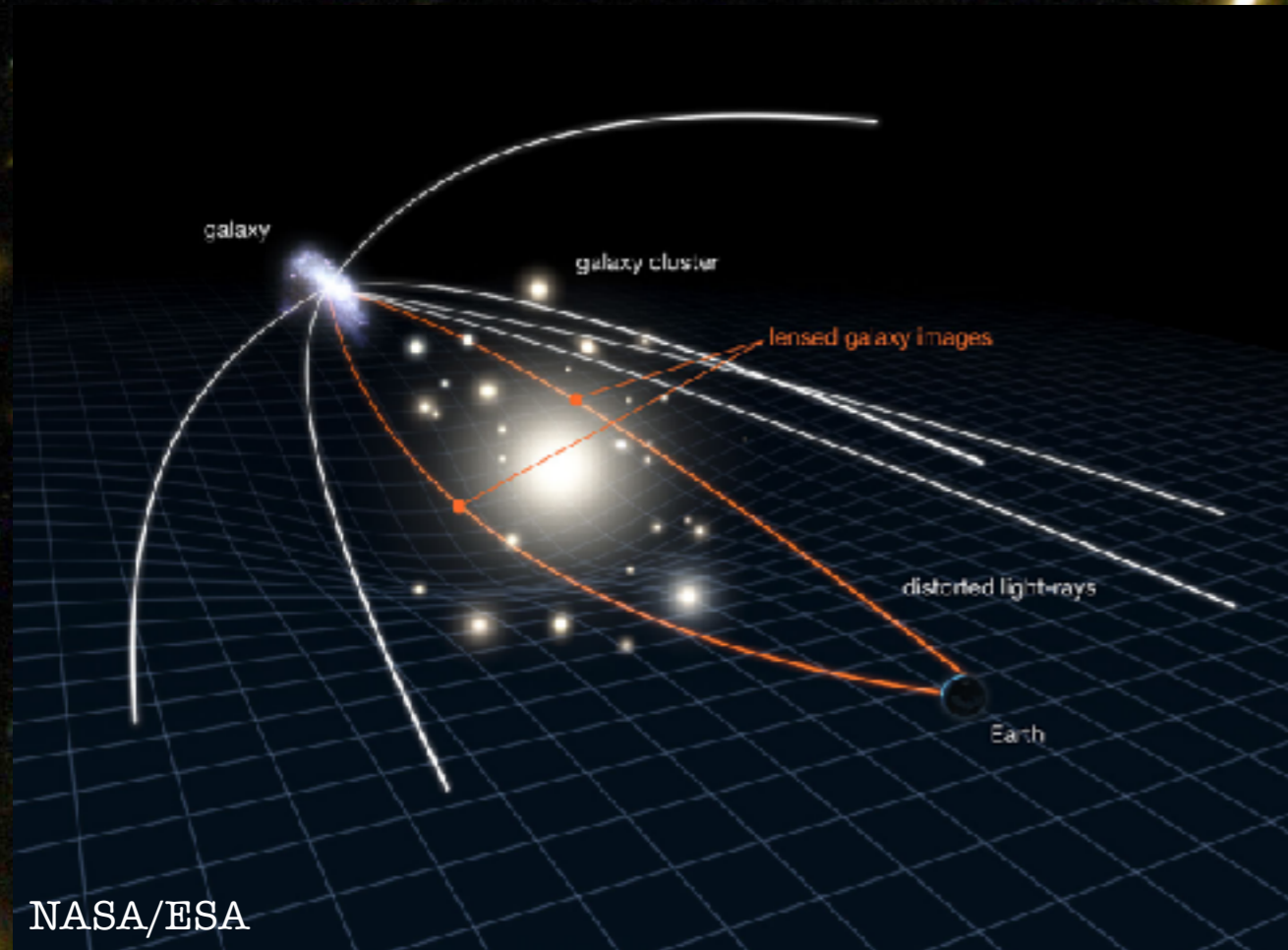


# LENTILLES GRAVITATIONNELLES

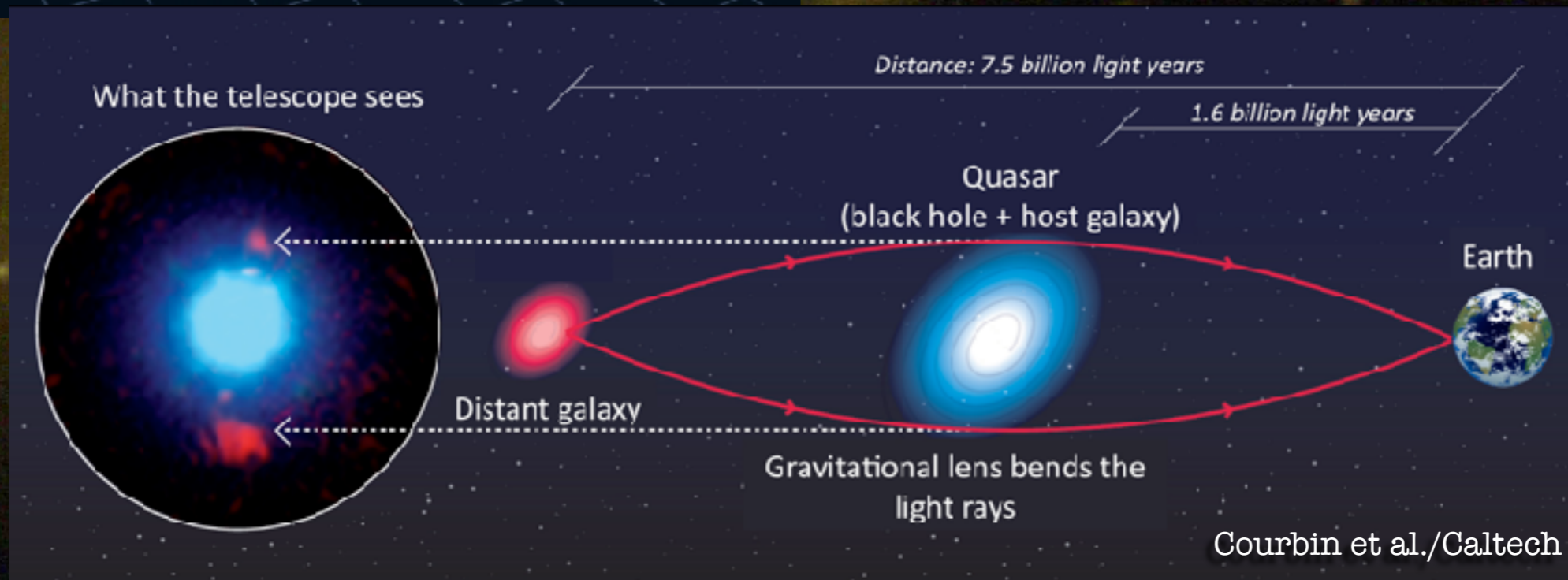
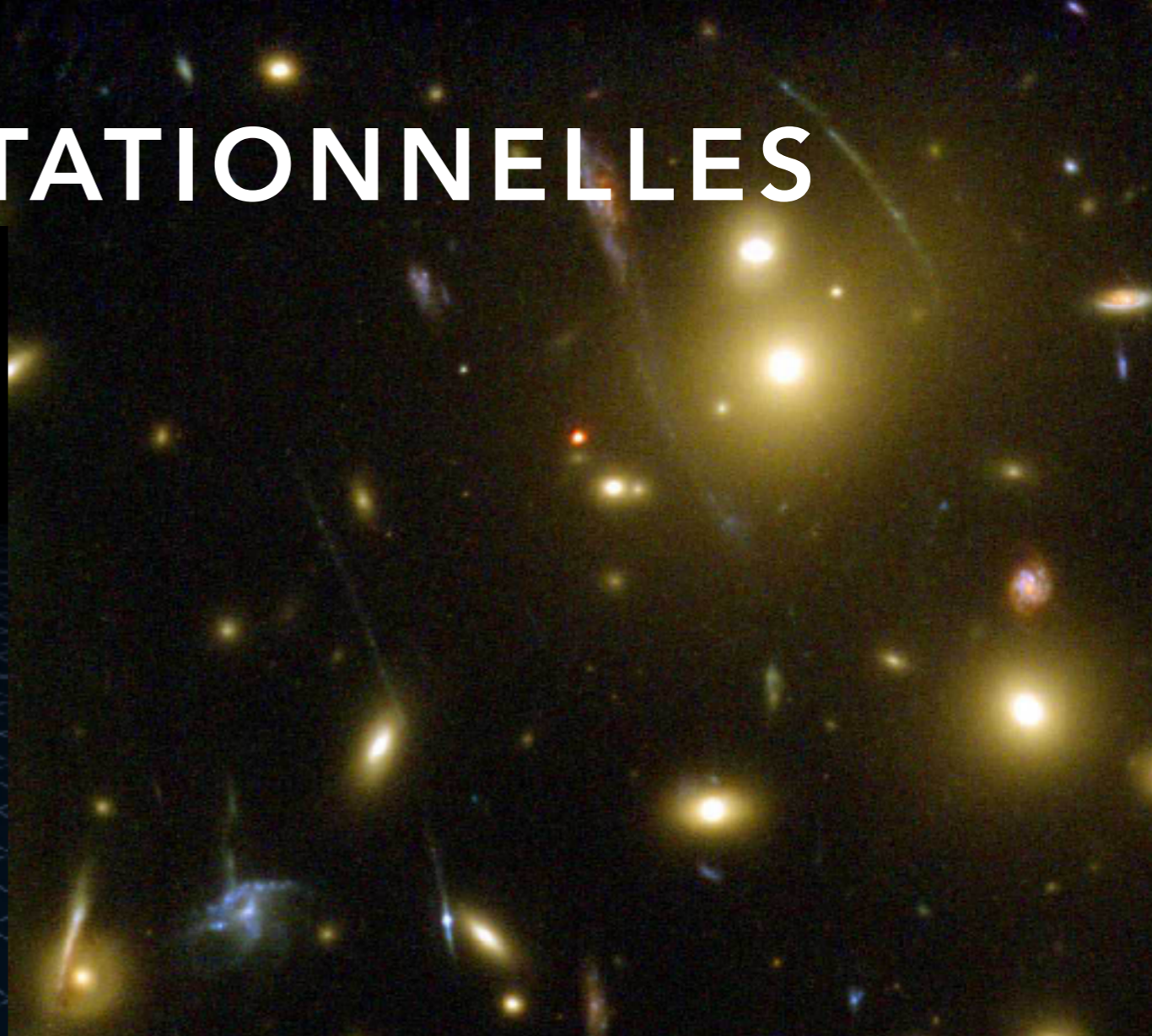




# LENTILLES GRAVITATIONNELLES



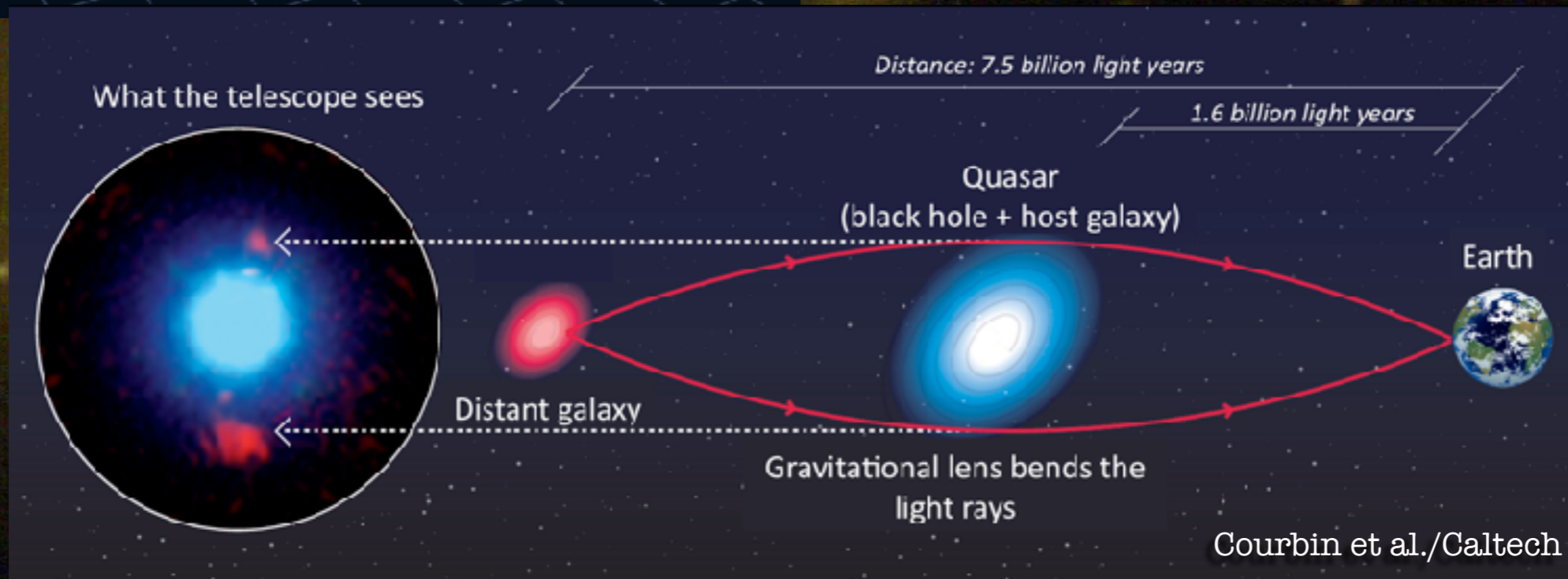
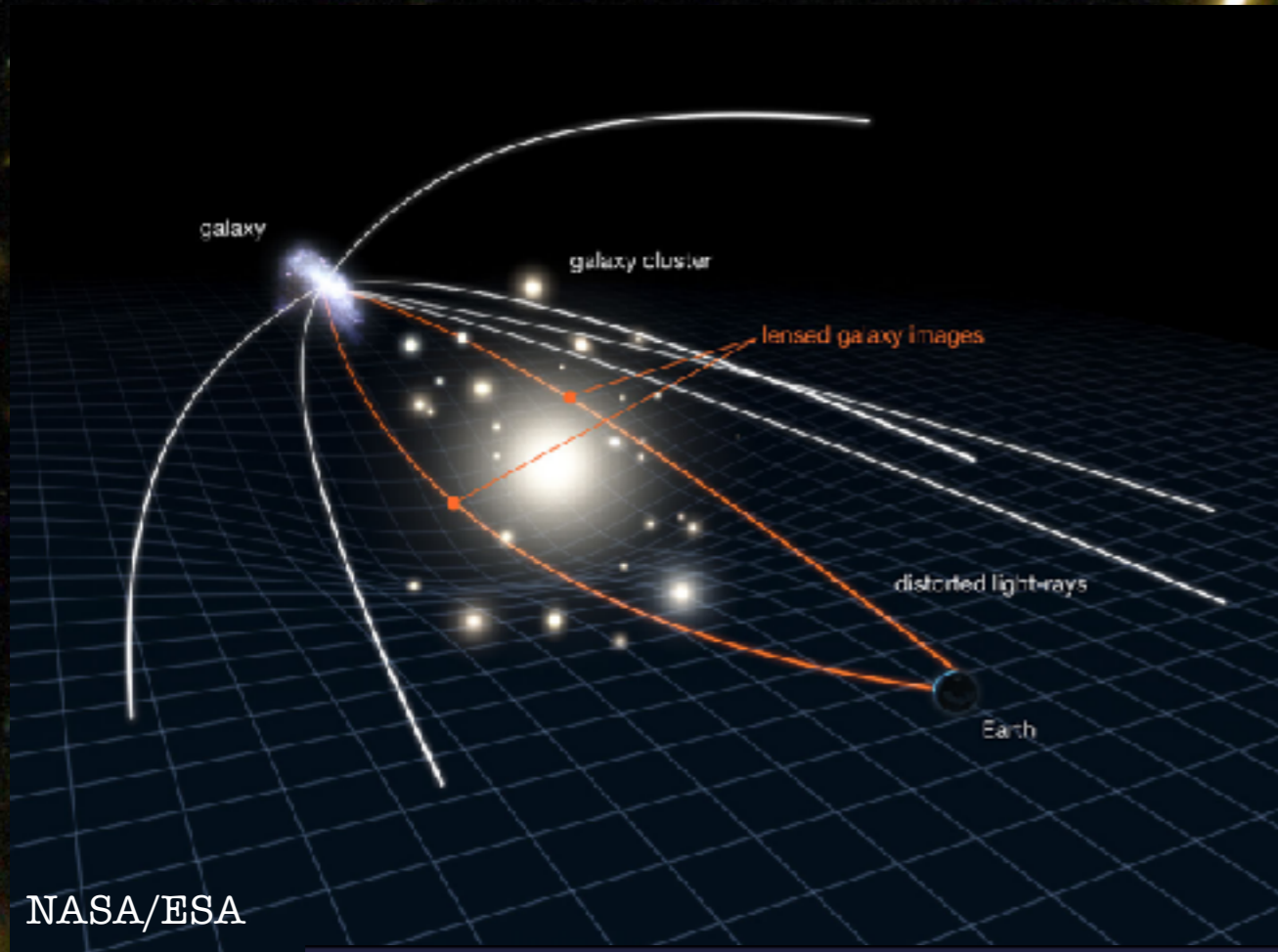
NASA/ESA



Courbin et al./Caltech

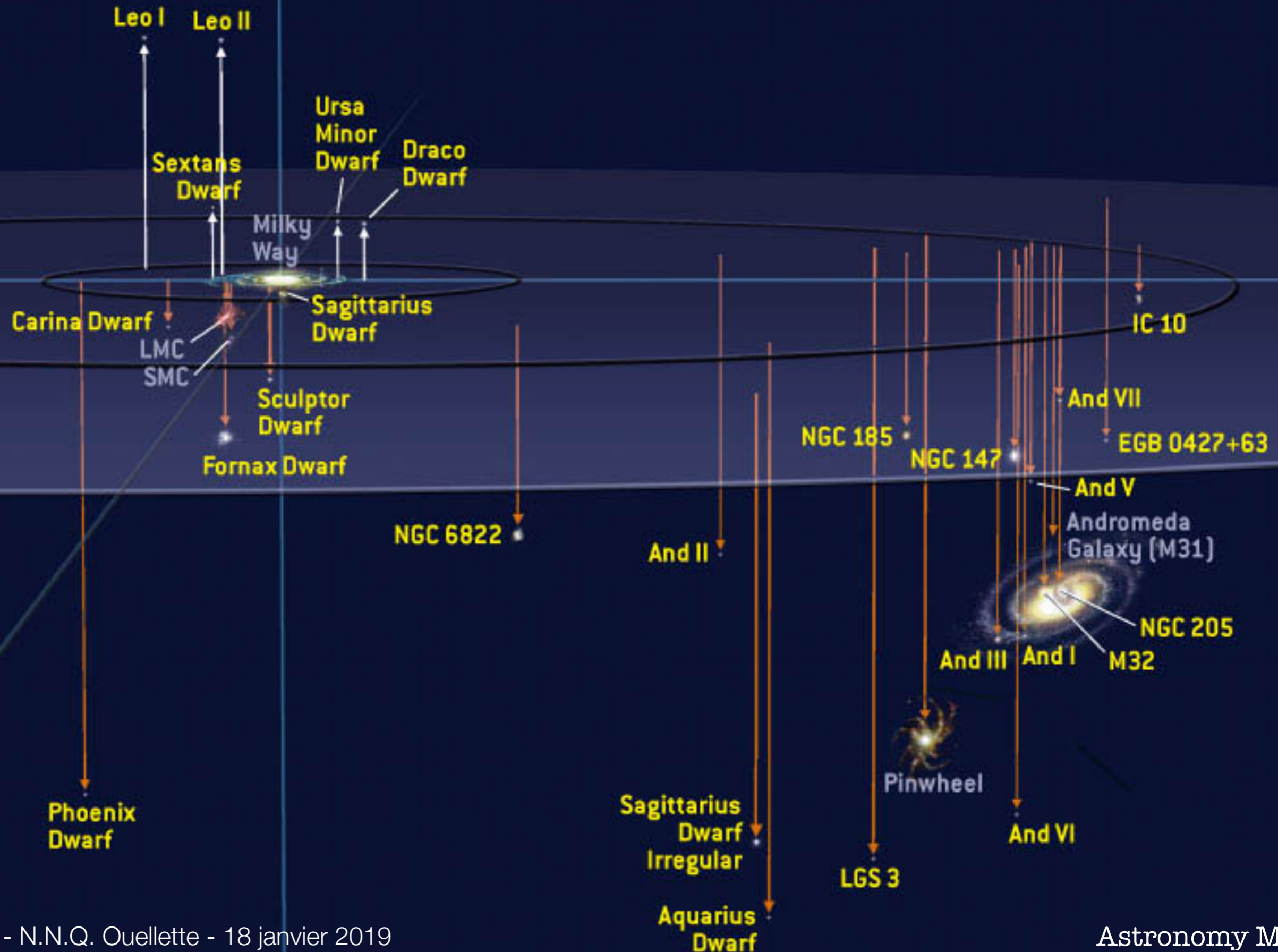


# LENTILLES GRAVITATIONNELLES





# NOTRE VOISINAGE GALACTIQUE





# ANDROMÈDE, NOTRE VOISINE



**NASA/ESA/STScI**



# ANDROMÈDE, NOTRE VOISINE



**NASA/ESA/STScI**



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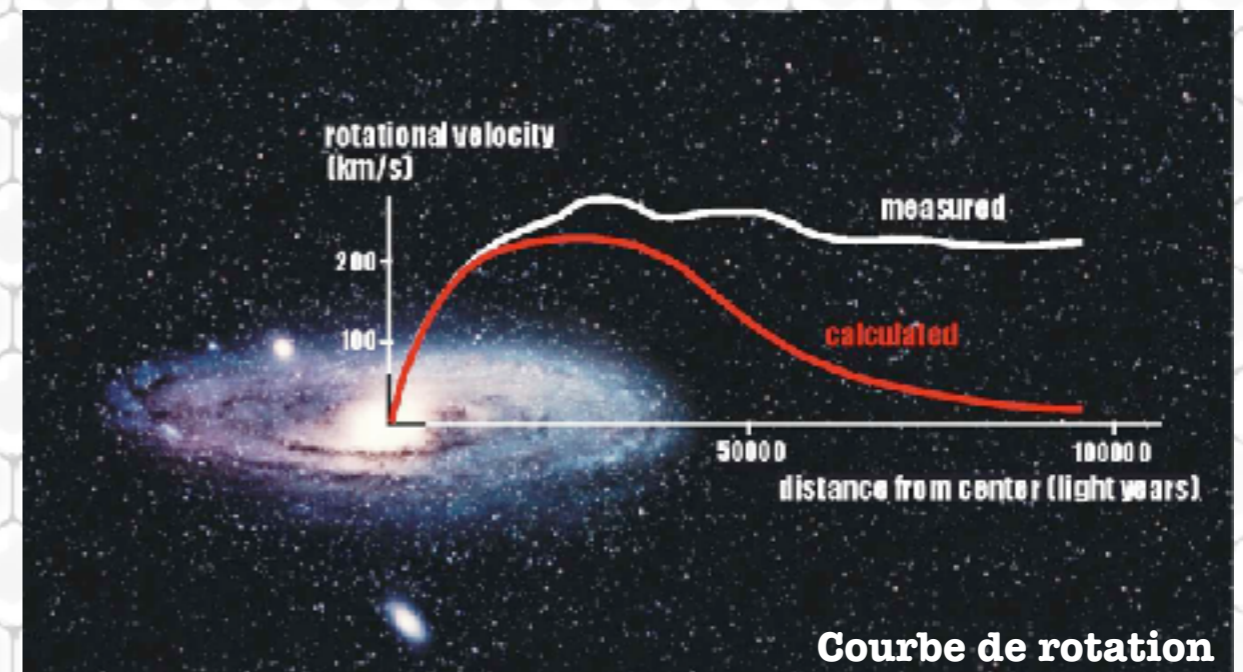
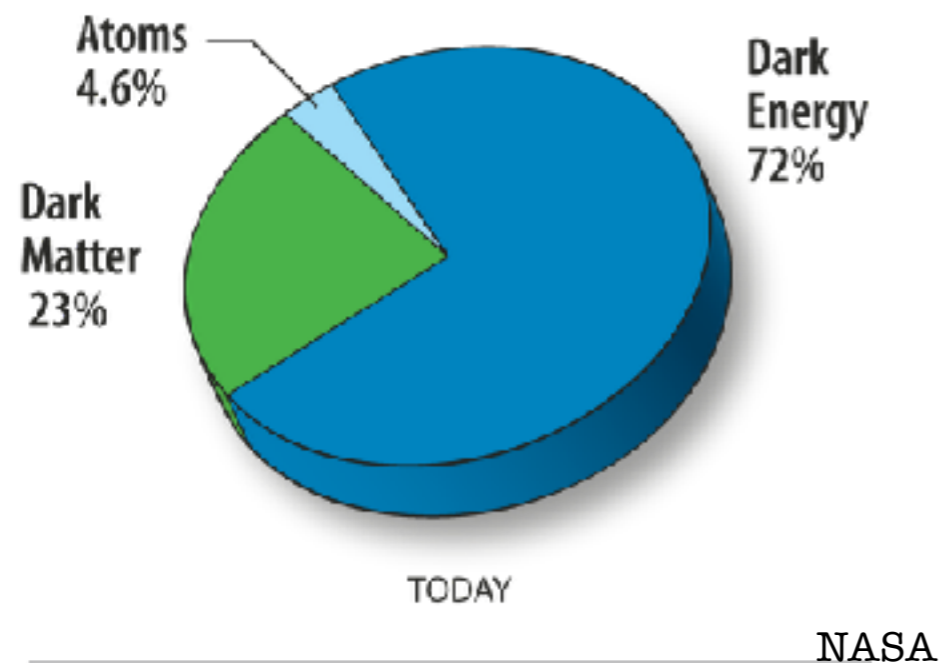
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# LA MATIÈRE DANS L'UNIVERS





# FORMATION DE GALAXIES

## How Galaxies Work Evolution of a Galaxy

One model explains that, like stars, spiral galaxies formed from collapsing and rotating clouds of gas and dust.

1. Bodies of gas, dust and young stars collide.

2. The stars begin to rotate around the center of the mass.

3. The rotation contracts the cloud and forms a galactic disk.

4. Motion created by the spinning disk causes spiral arms to form.

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