

ADVANCES IN COSMOLOGY

Cosmology's journey to the present day has been a long one. This book outlines the latest research on modern cosmology and related topics from world-class experts. Through it, readers will learn how multi-disciplinary approaches and technologies are used to search the unknown how cosmologists form their assumptions and develop new knowledge today. The book is organized into four parts, each exploring a theme that has challenged humankind for centuries. Since the dawn of time, looking at the sky, the laws governing the Universe and their influence on human life, the laws governing it, and what influence on human life. In most ancient civilizations, astronomers embodied the power of knowledge. This knowledge was not compartmentalized, and scientists often found philosophical implications within their quests, many of which destroyed the borders between the natural sciences. Even now, as observers and scientists continue to use conjecture to generate theoretical assumptions and laws that then have to be confirmed experimentally, theoretical and experimental searches are being linked to philosophical thinking and artistic representation, as they were up until the 18th century. This multi-disciplinary book will appeal to anyone with an interest in the fields of Astronomy, Cosmology or Physics.

EDITORS

MARILENA STREIT-BIANCHI
PAOLA CATAPANO
CRISTIANO GALBIATI
ENRICO MAGNANI

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MARILENA STREIT-BIANCHI · CATAPANO
PAOLA GALBIATI · ENRICO MAGNANI EDS.



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COSMOLOGY

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science

philosophy

art

Editors

MARILENA STREIT-BIANCHI

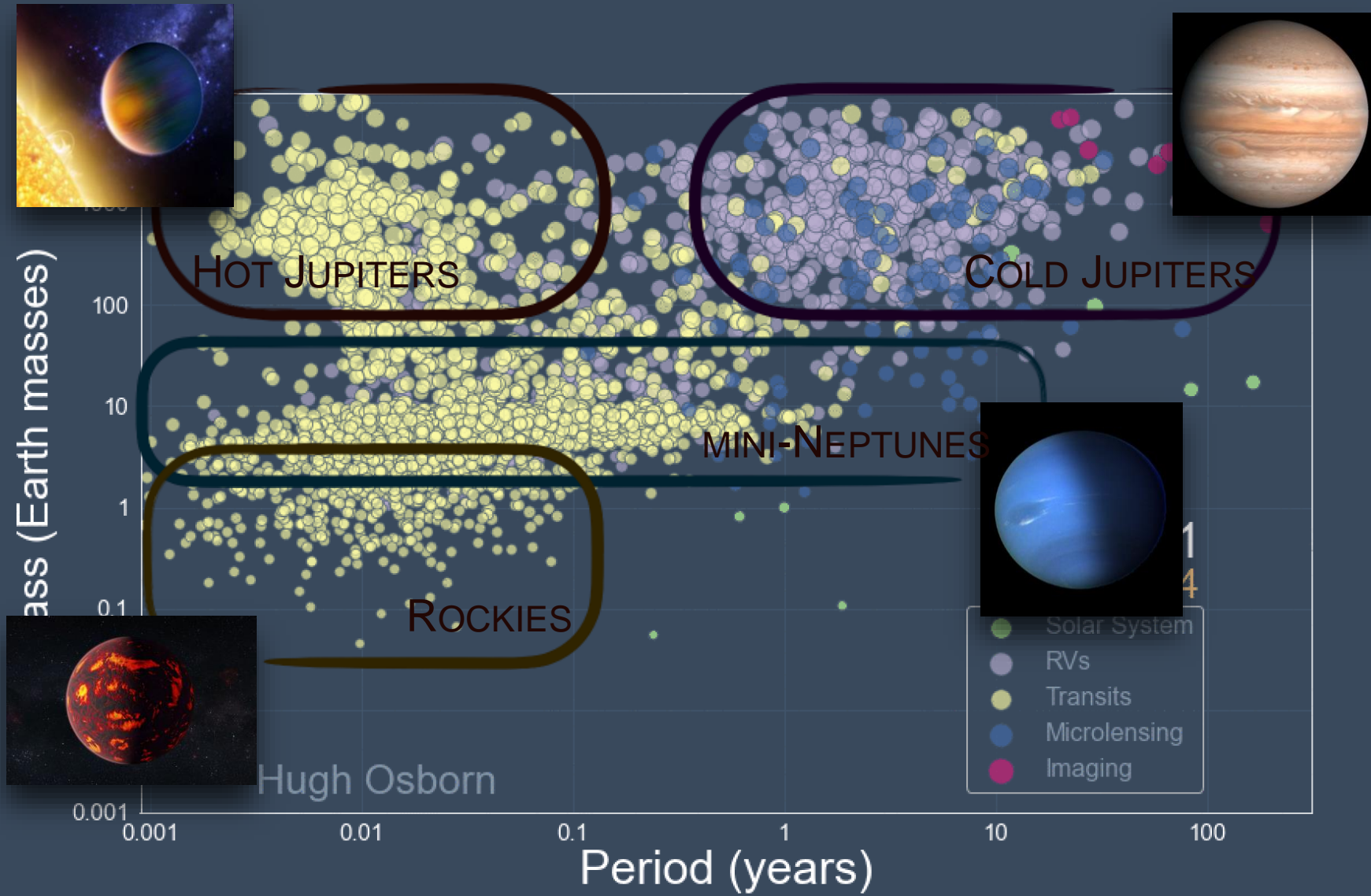


Other Worlds in the Universe

Michel Mayor, astrophysicist

Physics Nobel Laureate 2019





Formation of planetary systems ?

Protoplanetary disks observed with the HST

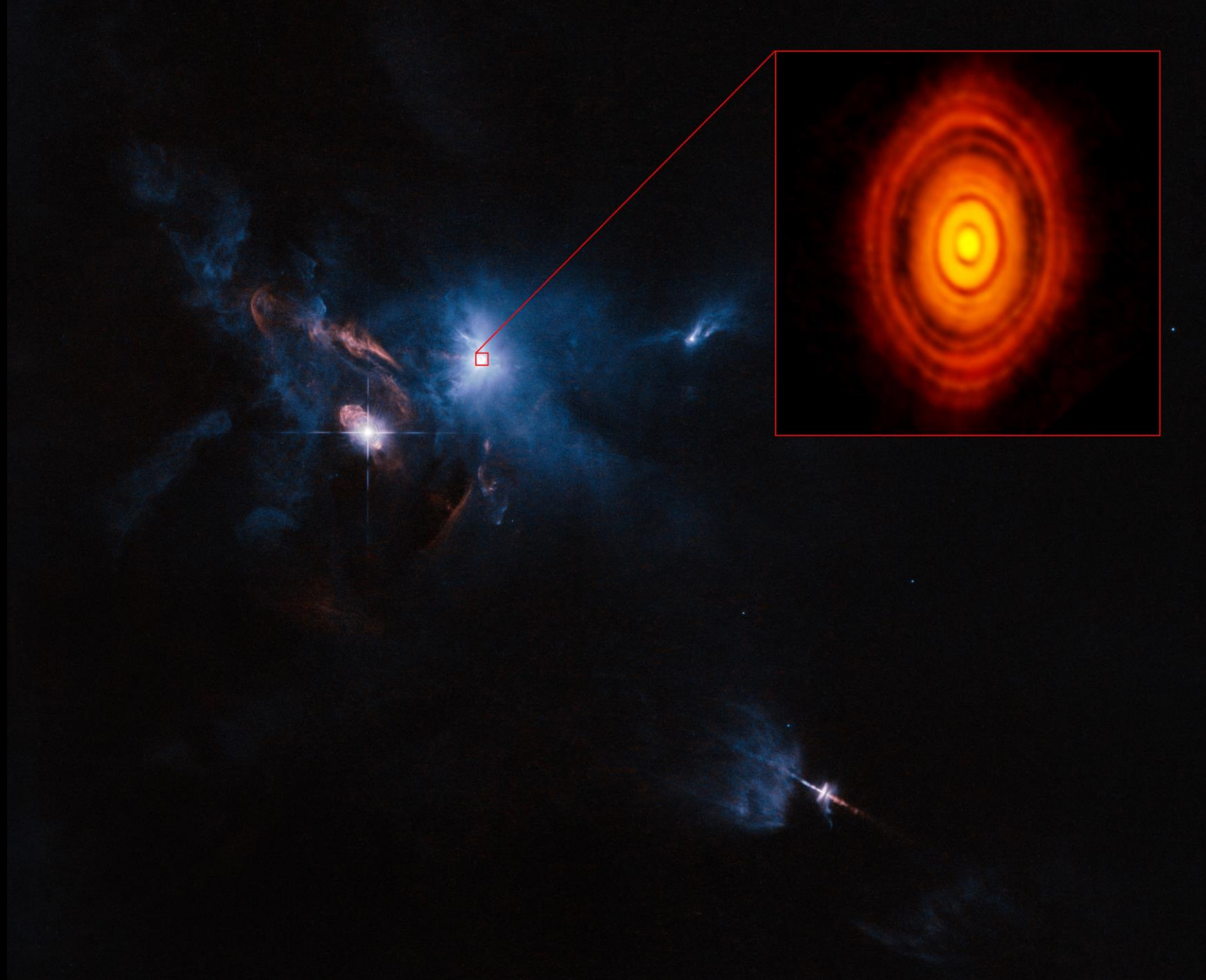


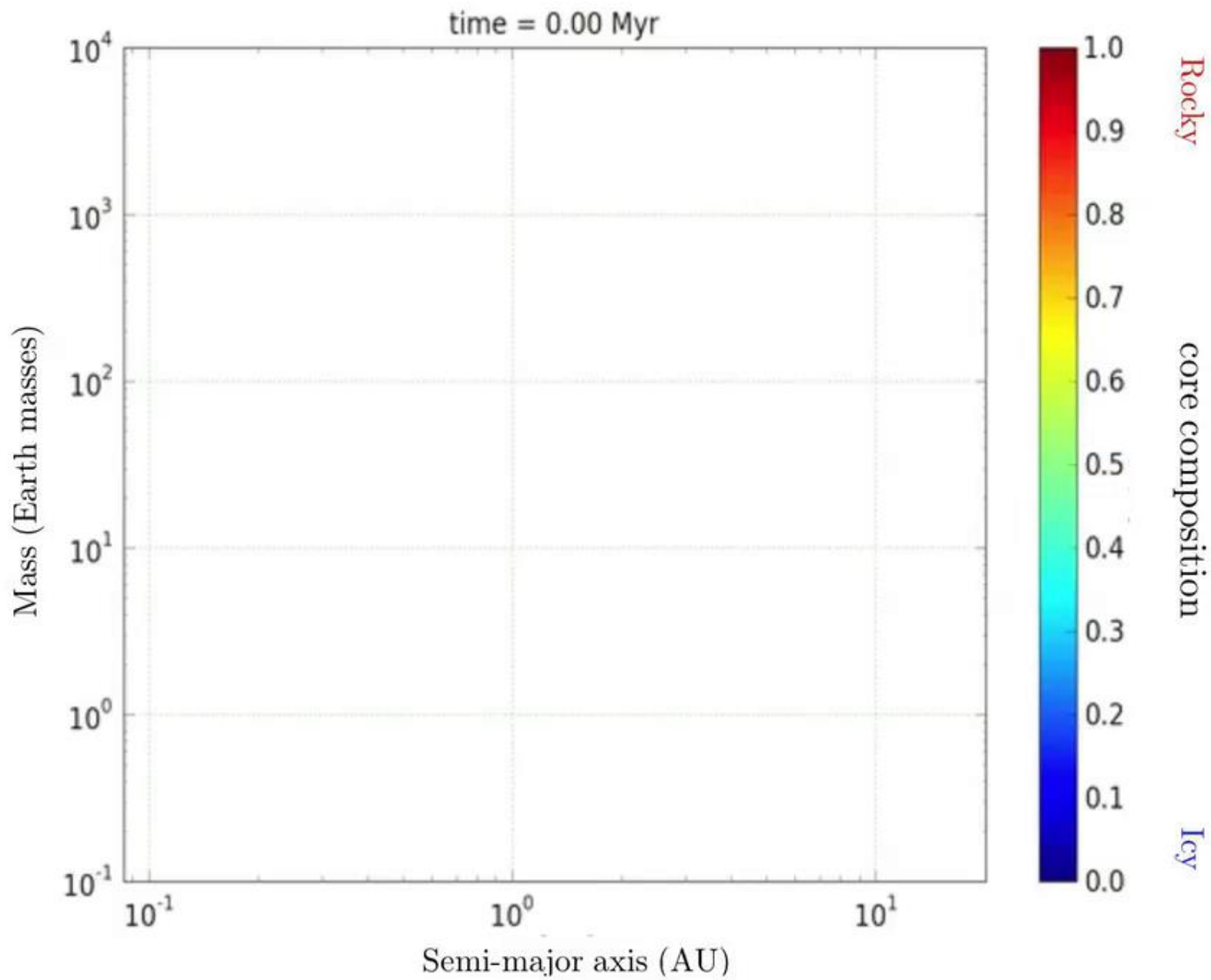
**Protoplanetary Disks
Orion Nebula**

HST · WFPC2

PRC95-45b · ST Scl OPO · November 20, 1995

M. J. McCaughrean (MPIA), C. R. O'Dell (Rice University), NASA





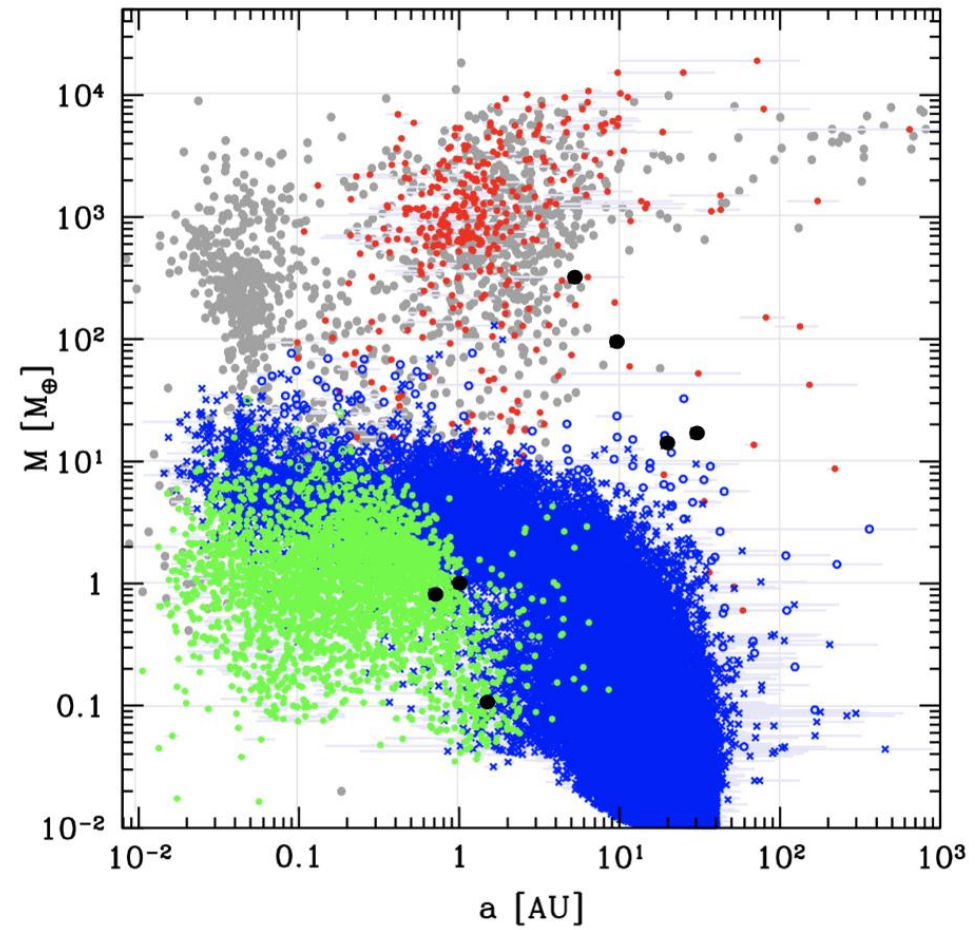
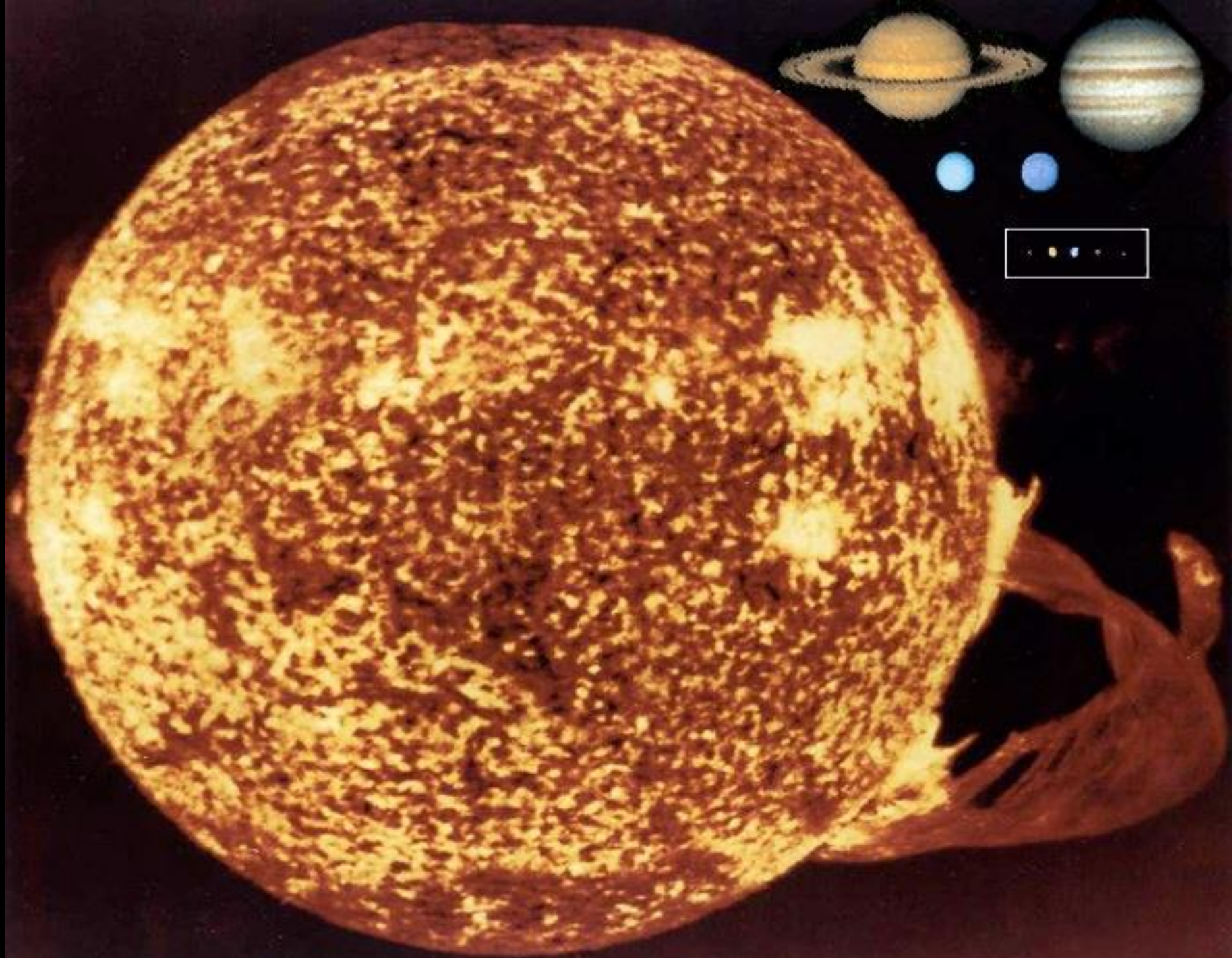


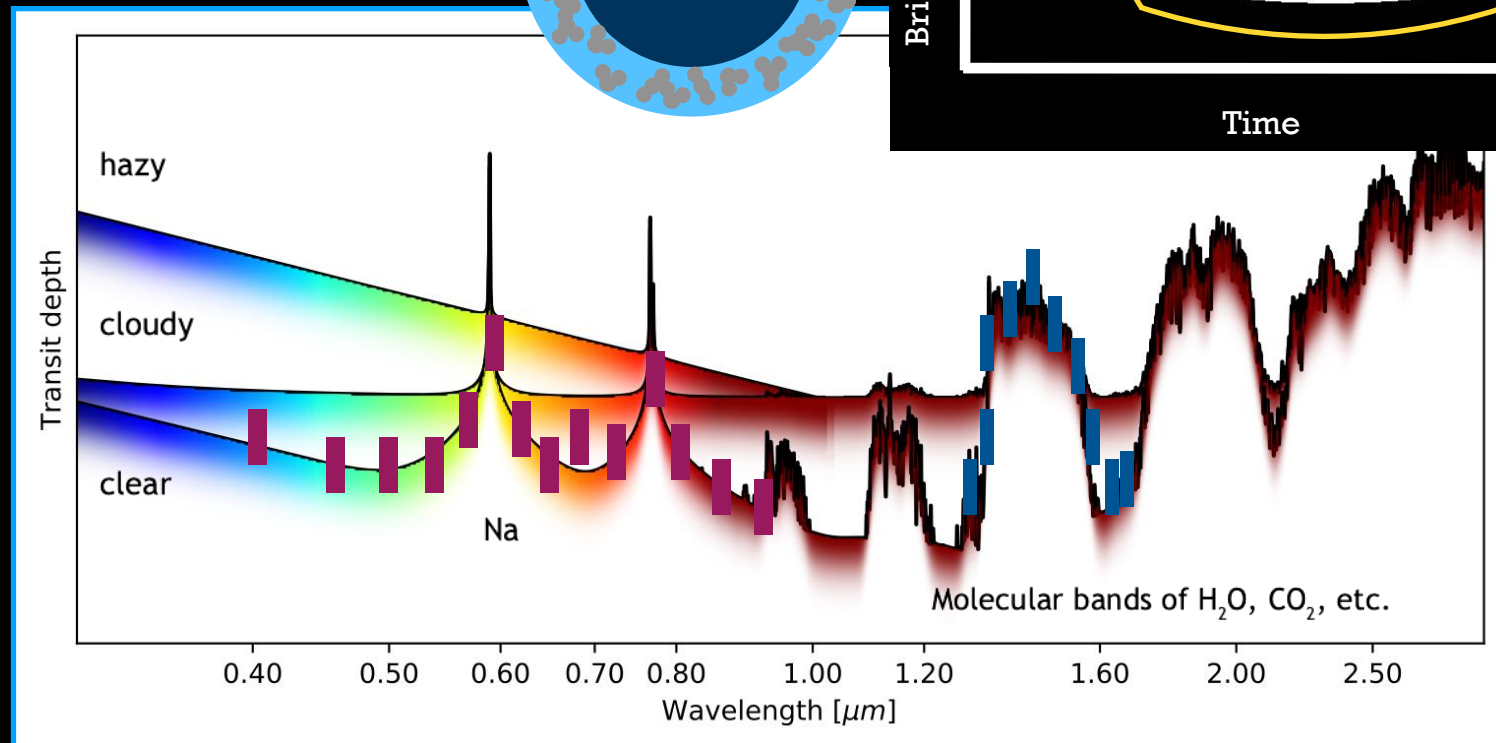
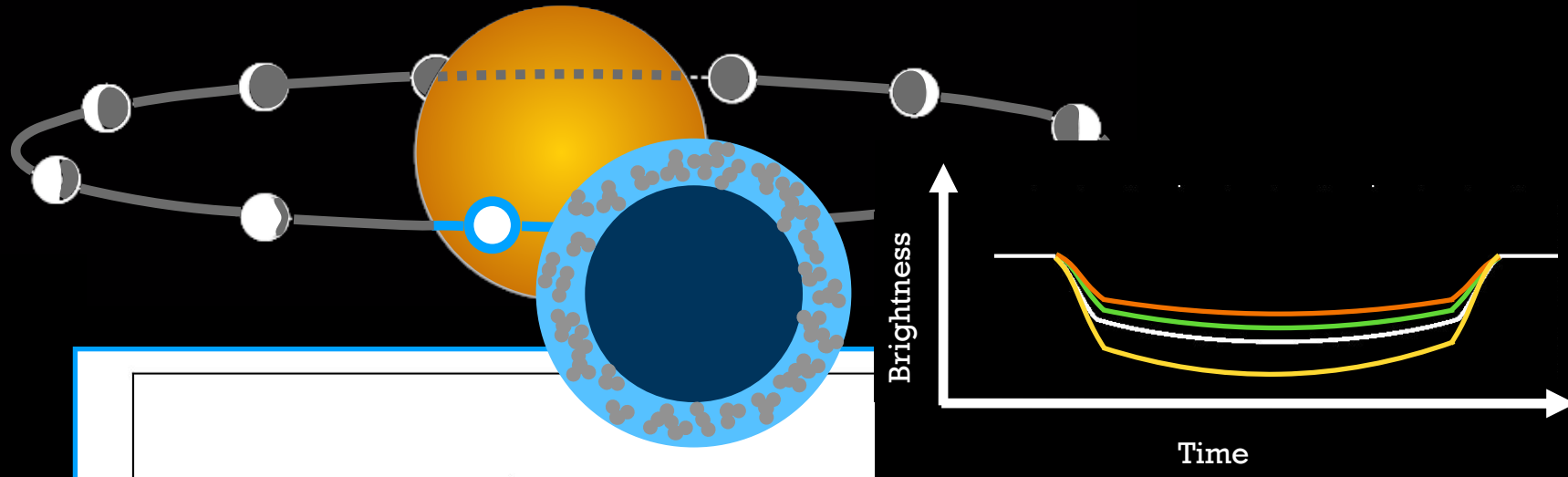
Fig. 14 Synthetic mass-distance diagram predicted by a global planet formation and evolution model. The coloured points shows the planets predicted by the model in synthetic systems of 1000 solar-like stars at an age of 5 Gyr. Green, blue, and red points represent silicate-iron, water-rich, and gas-dominated planets, respectively. Black and gray dots show the solar system and the exoplanets. The model assumes initially hundred lunar-mass proto-planets to be present in each disc (adapted from Emsenhuber et al. 2021b).

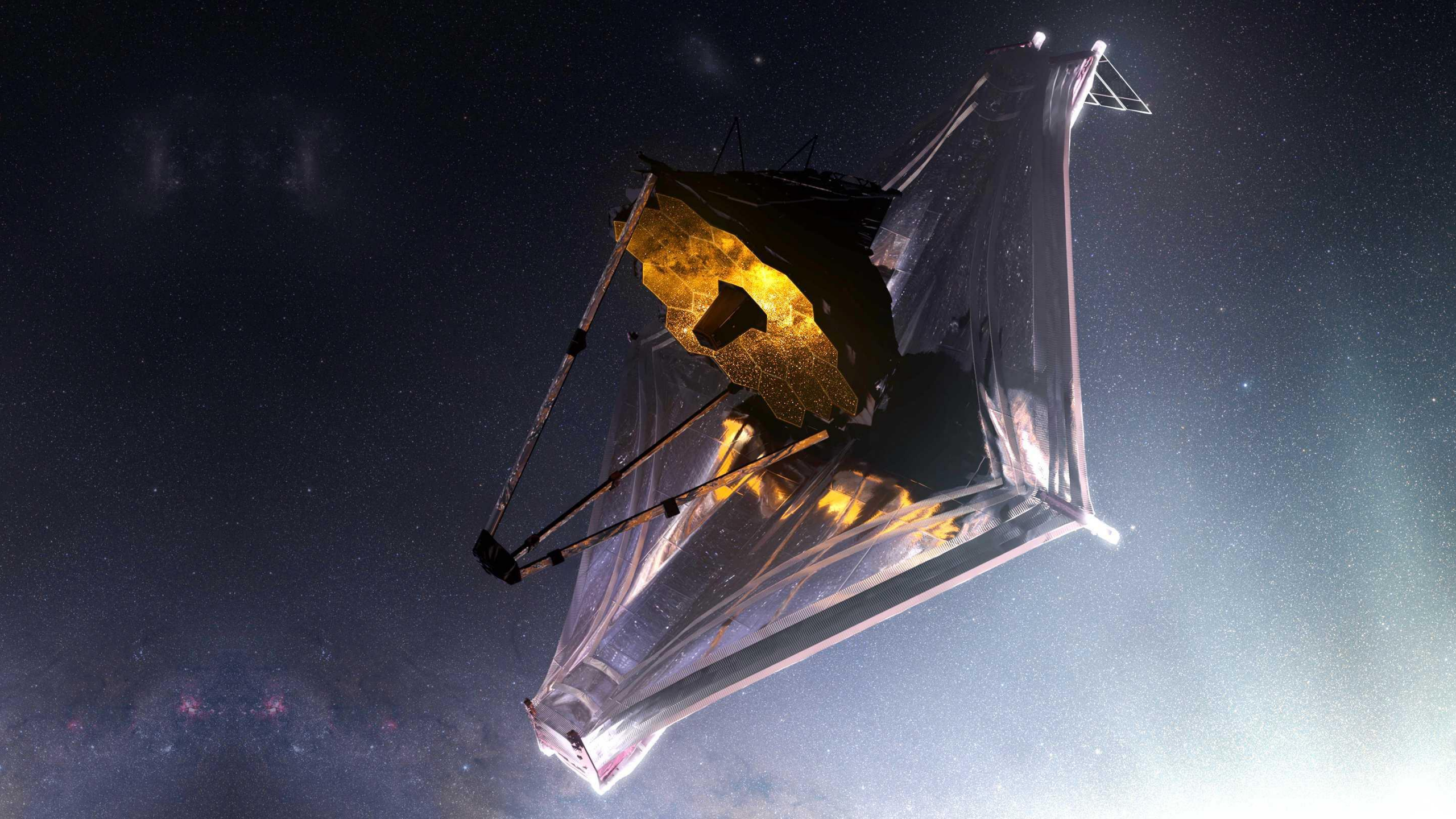
The composition
of exoplanets and their atmosphere ?

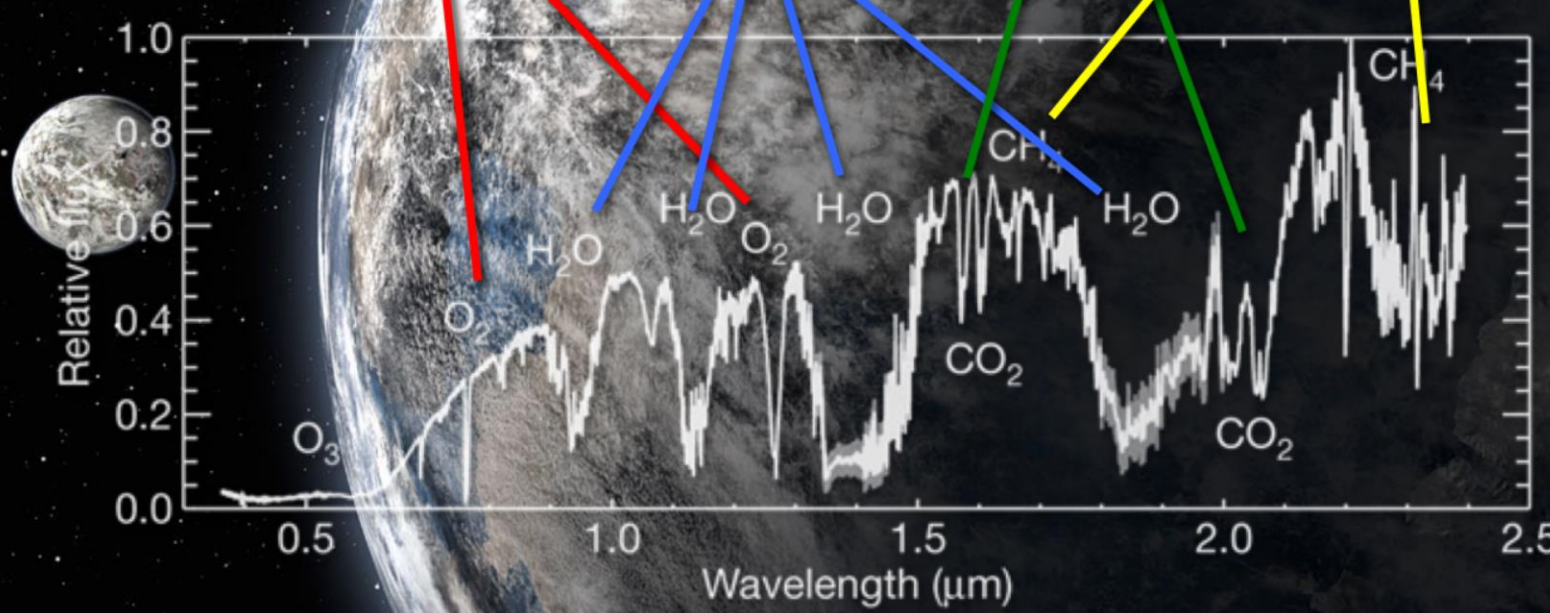
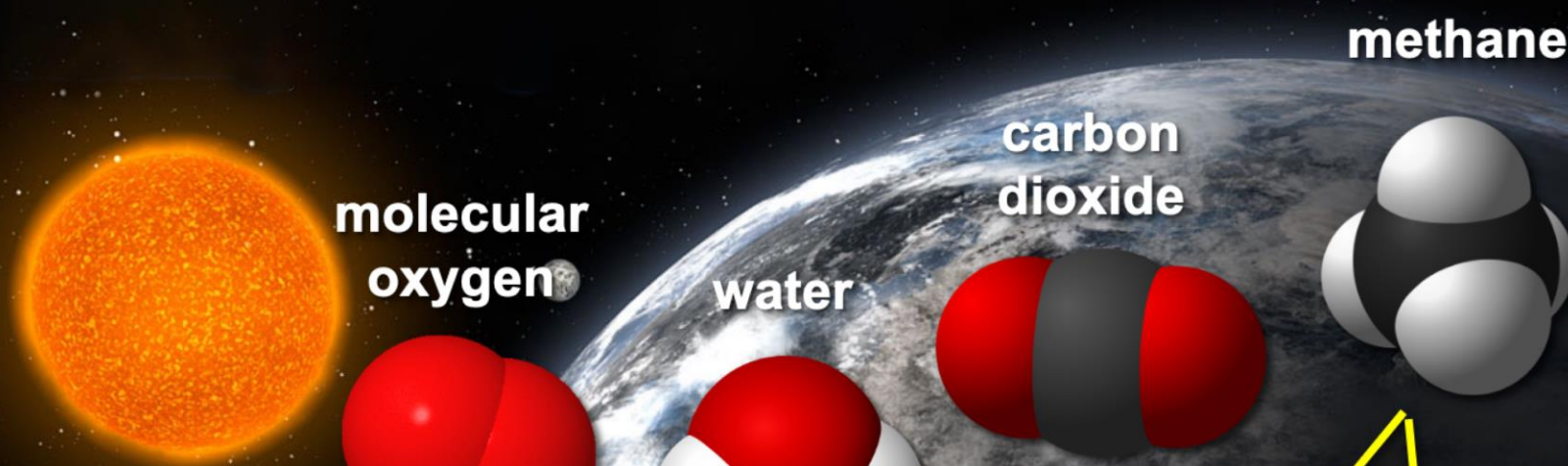
Steps toward the detection of biomarkers.

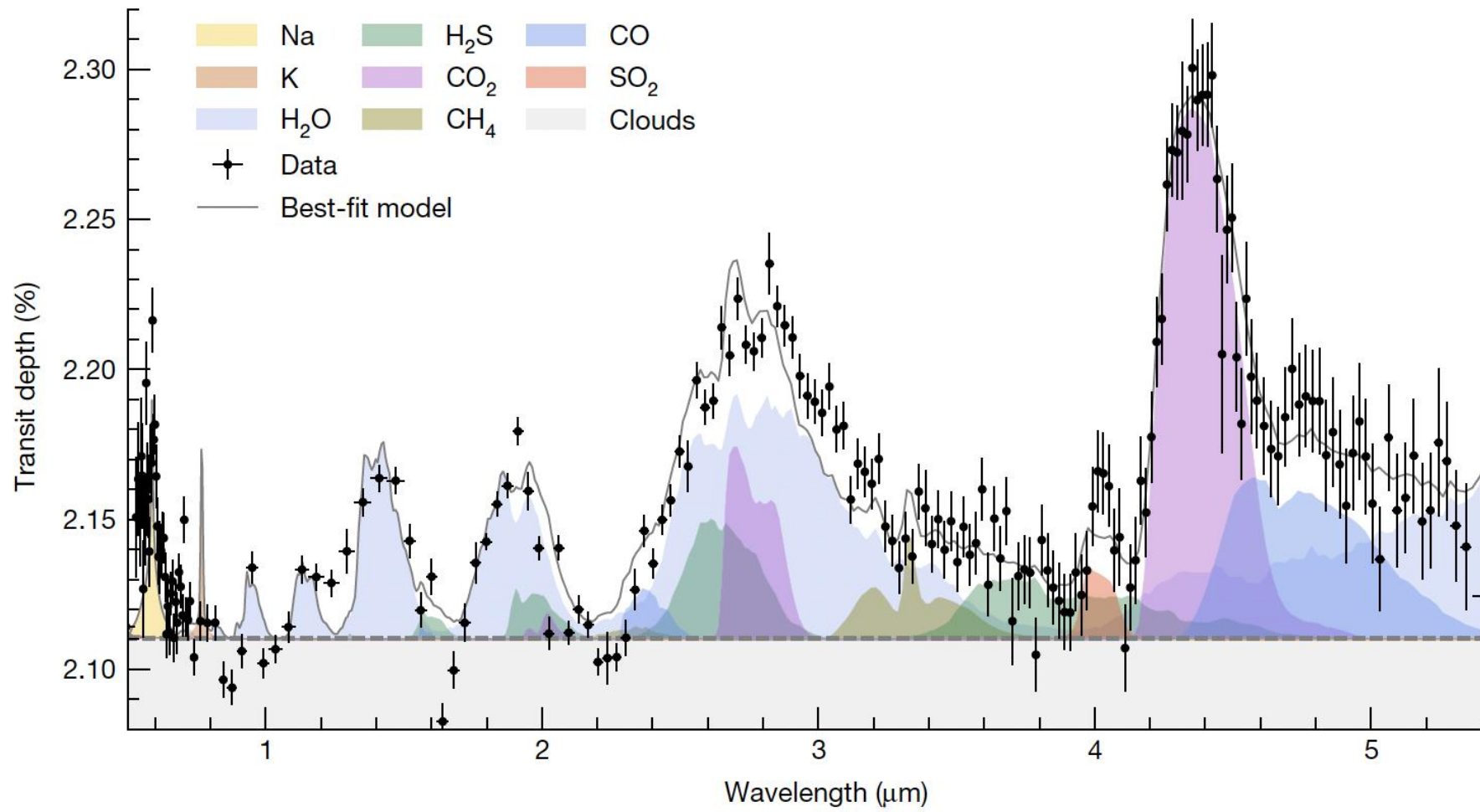


Transmission Spectroscopy





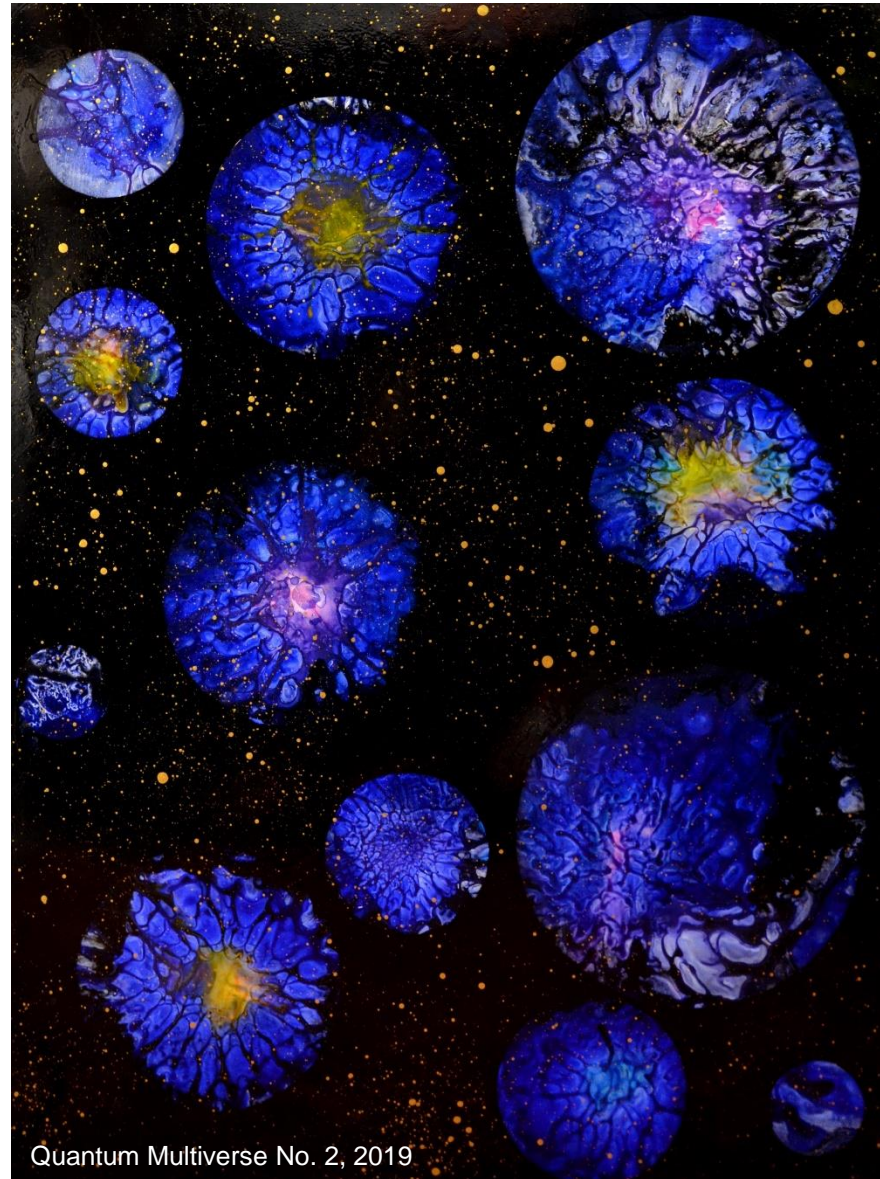


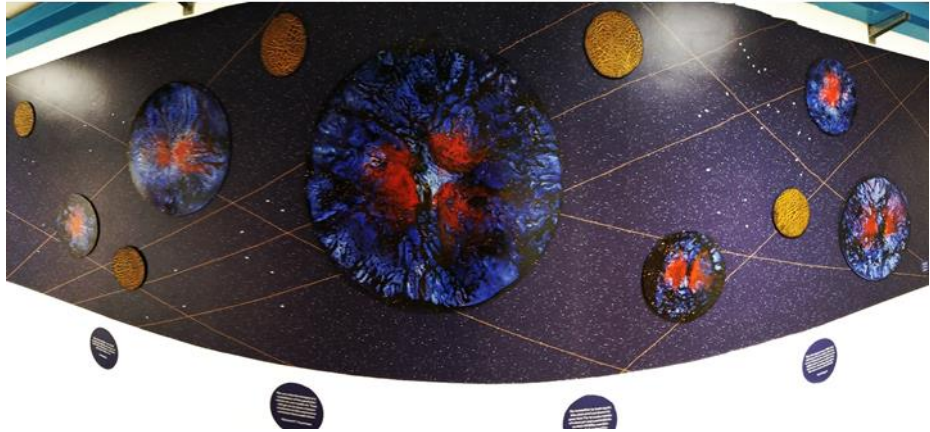
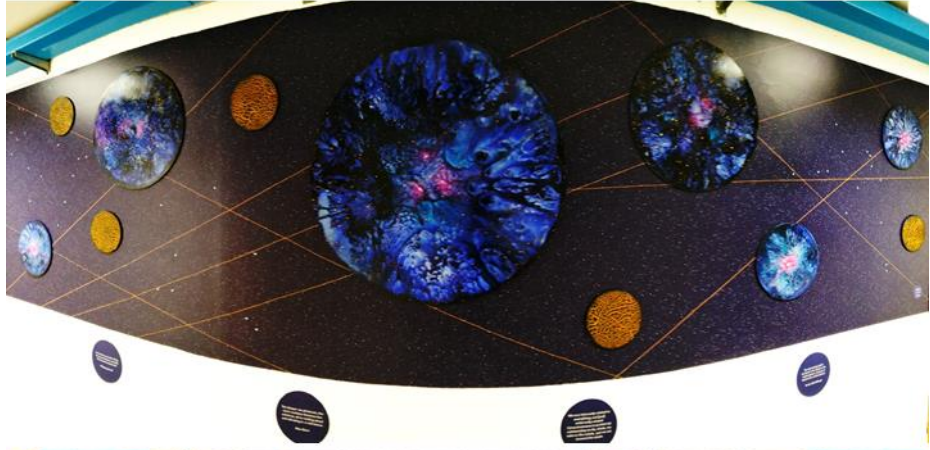
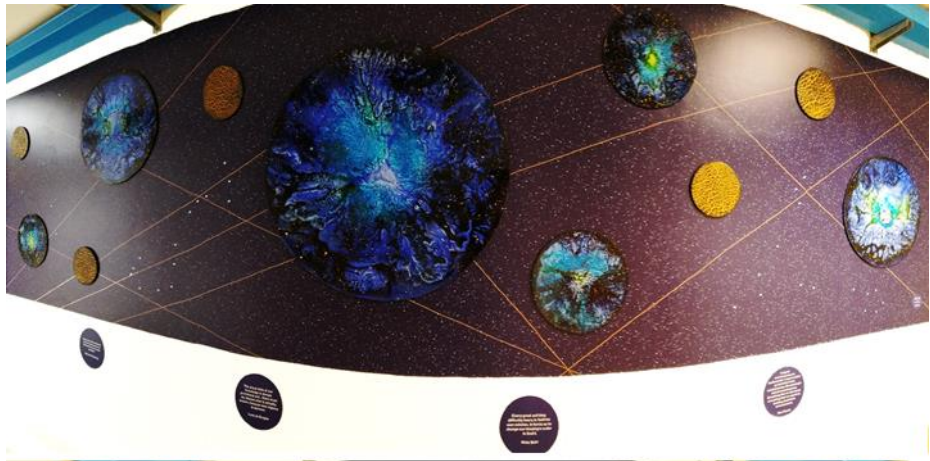


Rustamkulov et al. 2022



QUANTUM MULTIVERSE

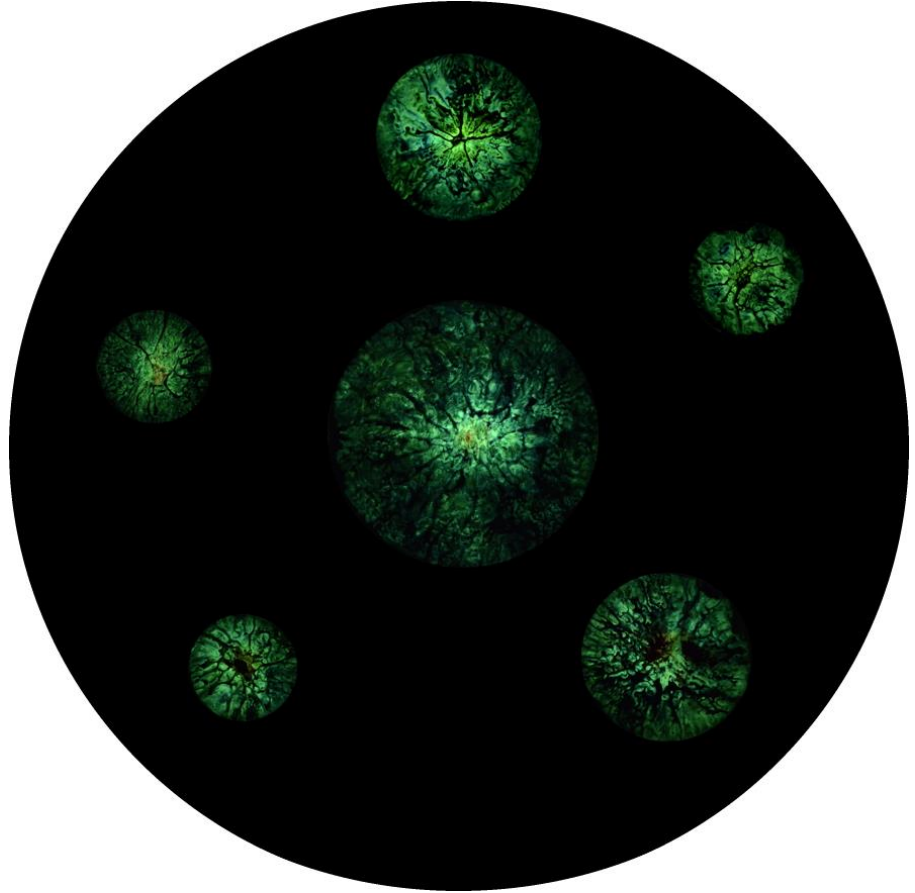
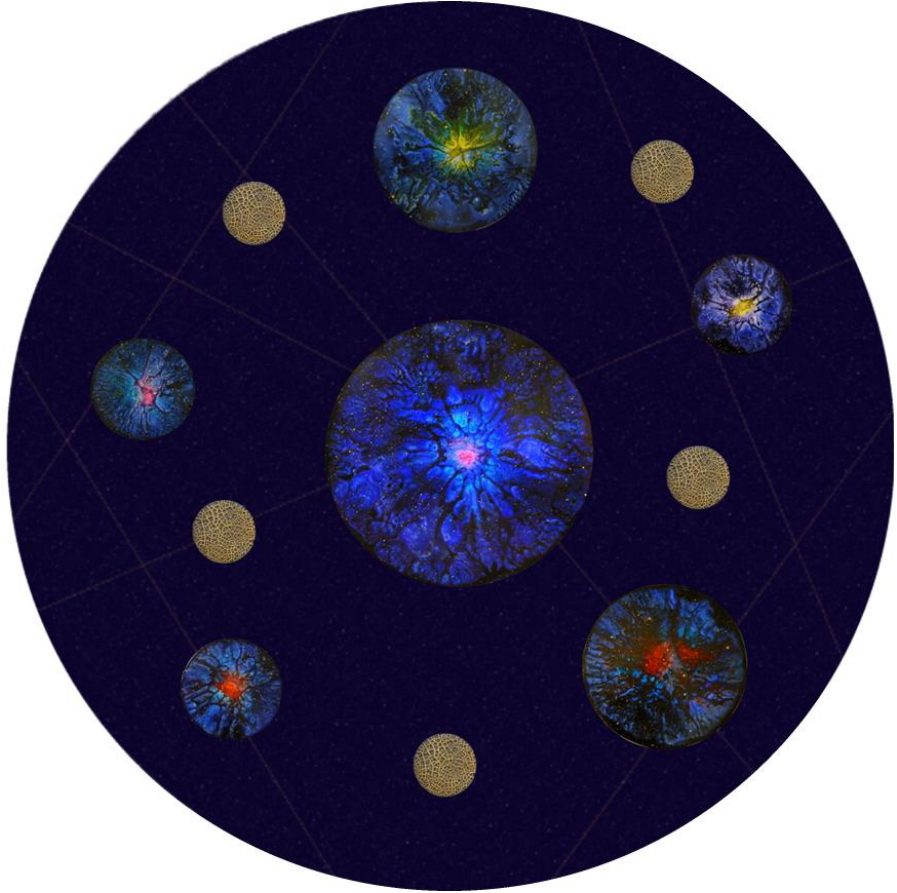




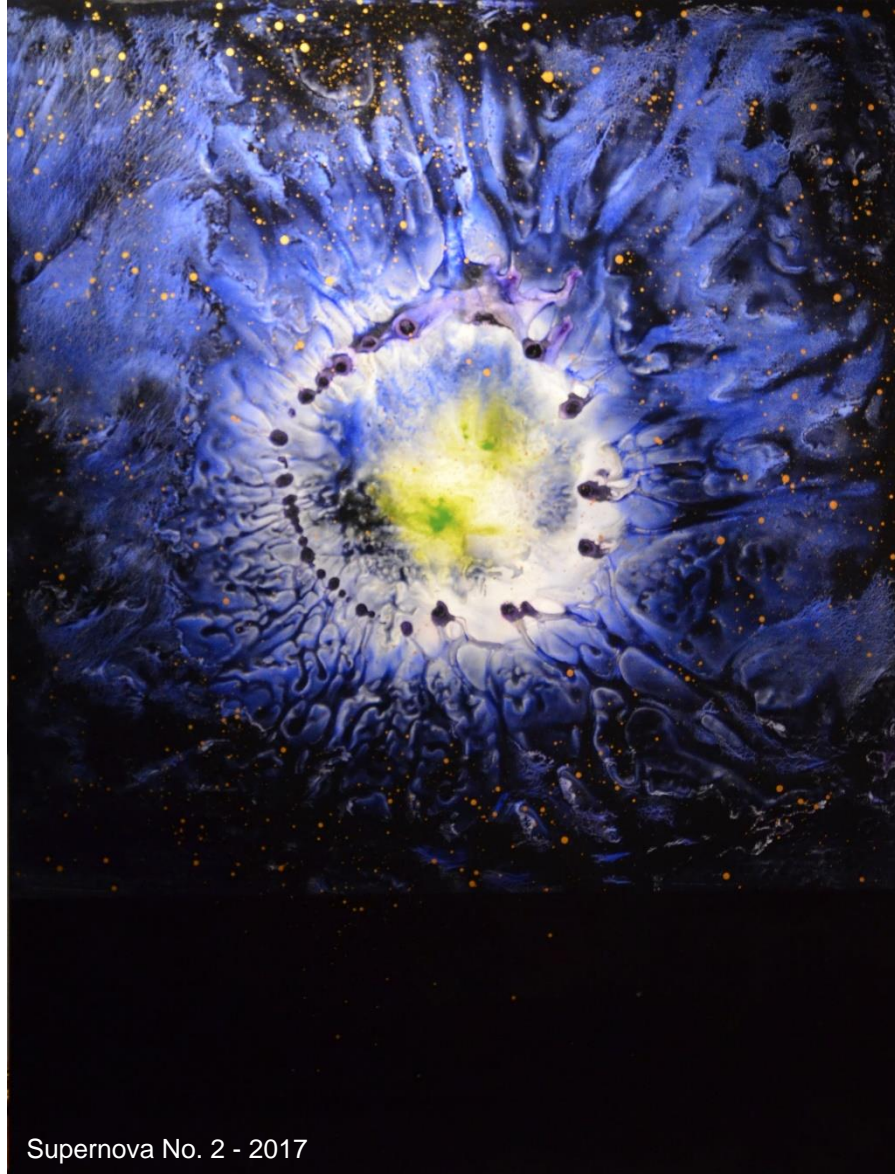
QUINTESSENCE – Wall 1, 2, 3 , 4

Permanent installation at LNGS – INFN, L'Aquila, Italy.





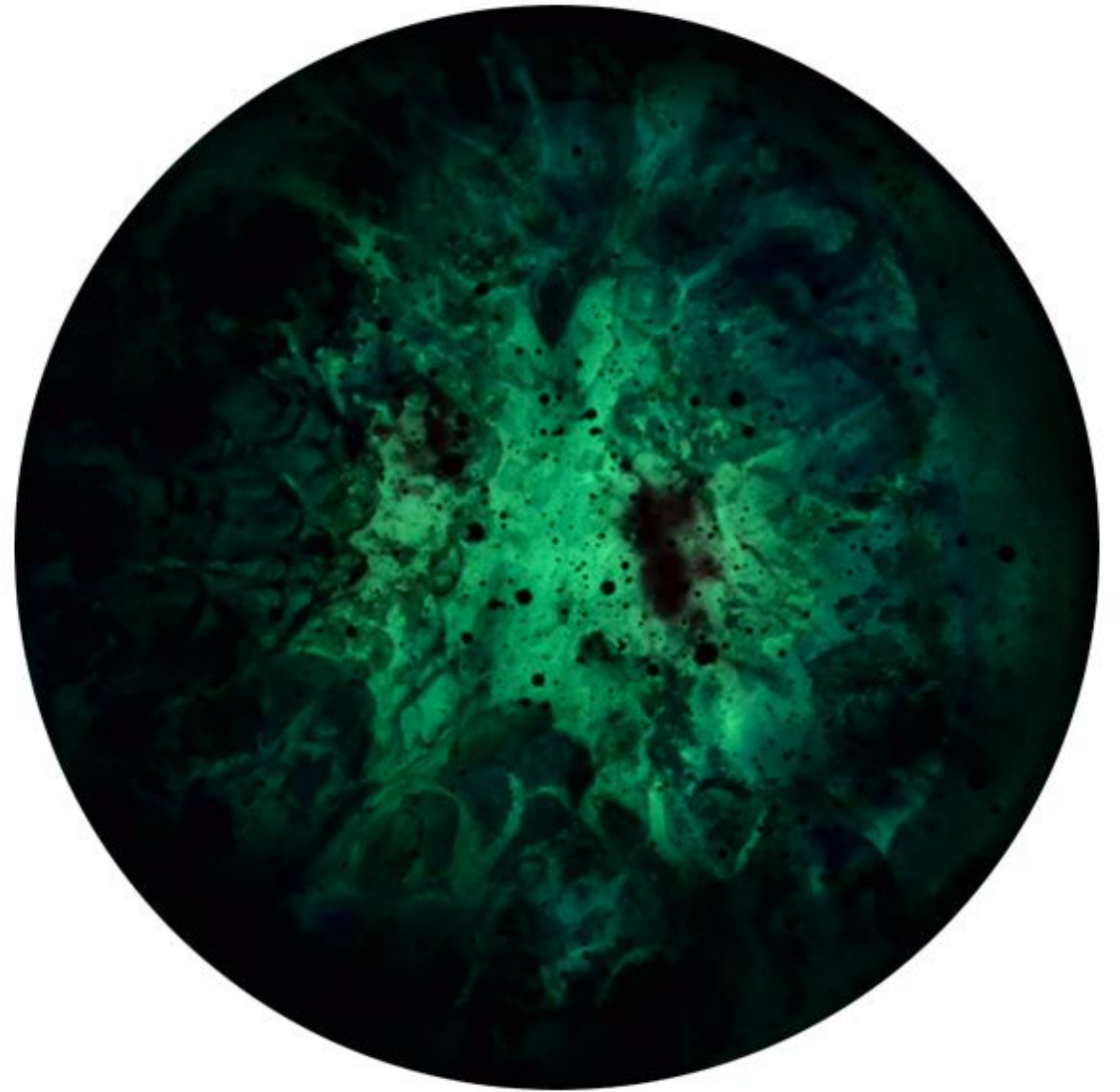
SUPERNOVA



SUPERNOVA – DARK MATTER



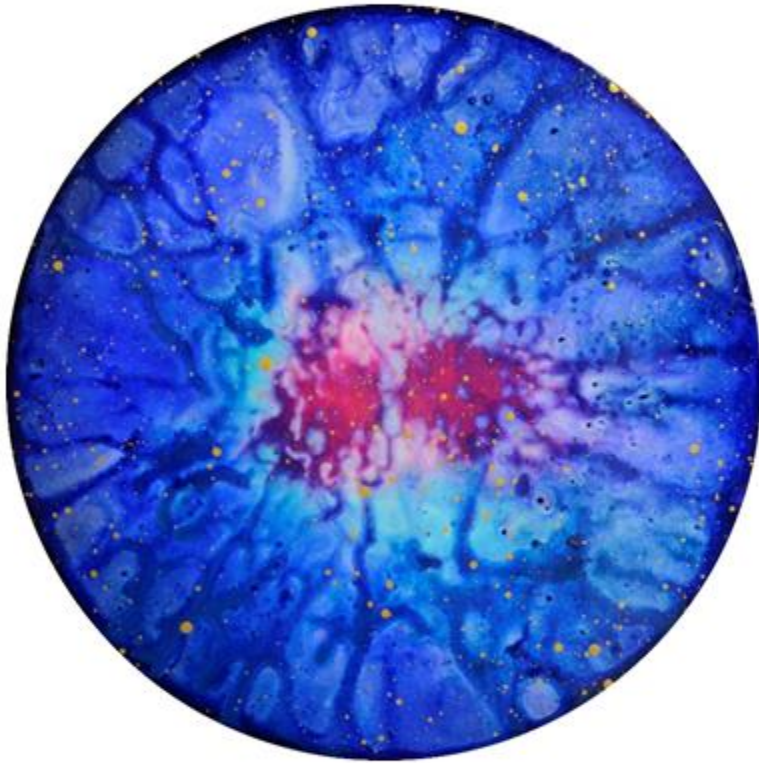
Artwork with visible light



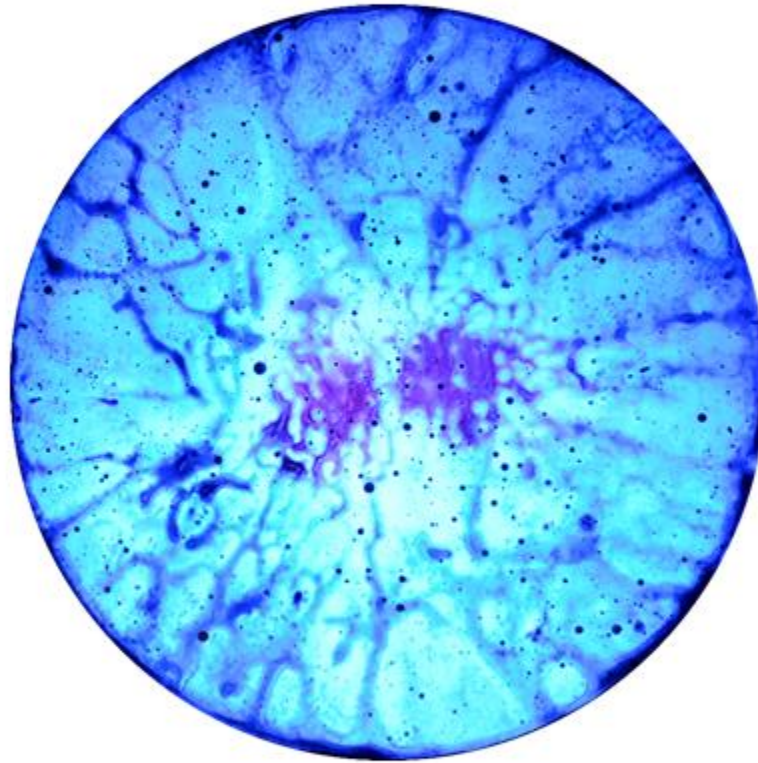
Artwork in absence of light

Supernova Dark Matter R1-19 - 2019

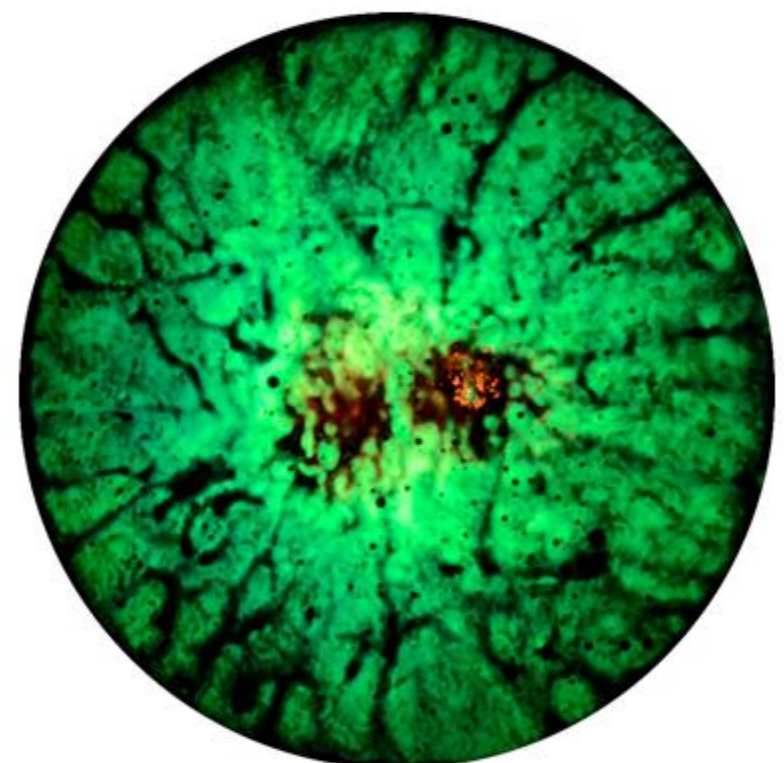
SUPERNOVA – DARK ENERGY



Artwork with visible light

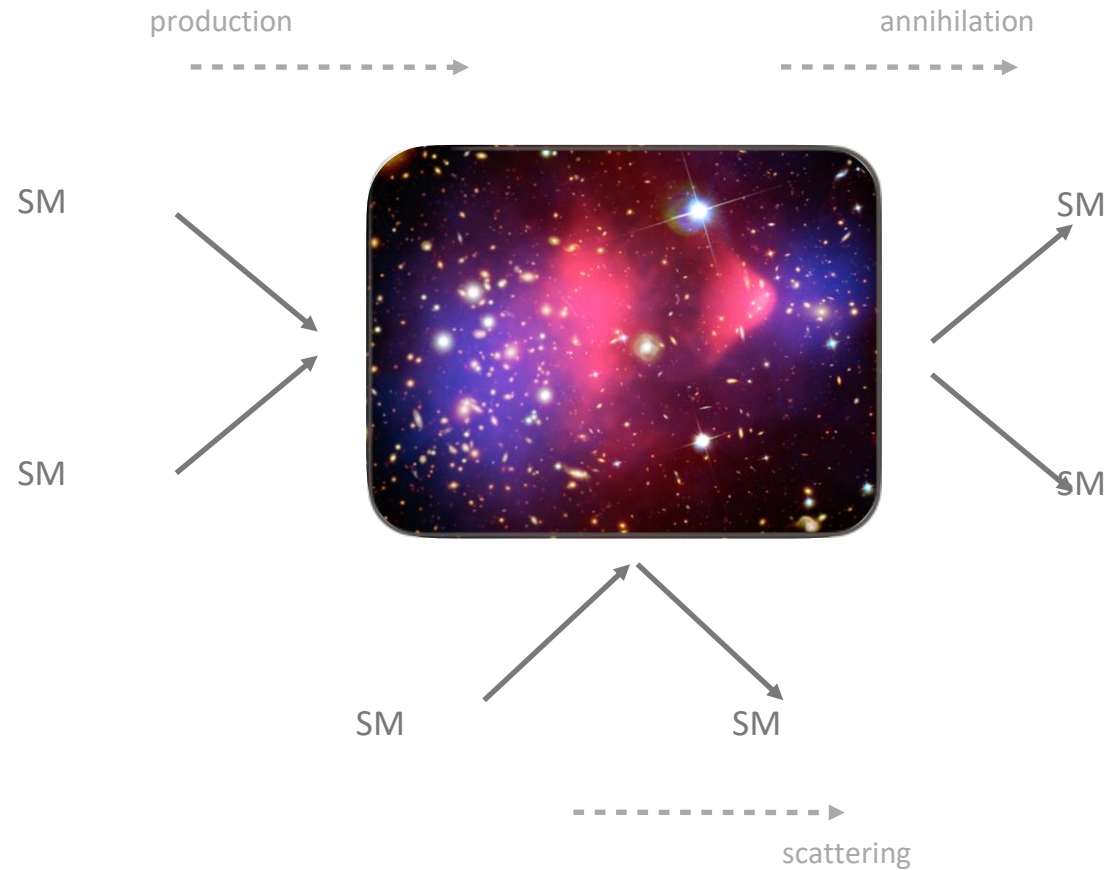


Artwork with UV light

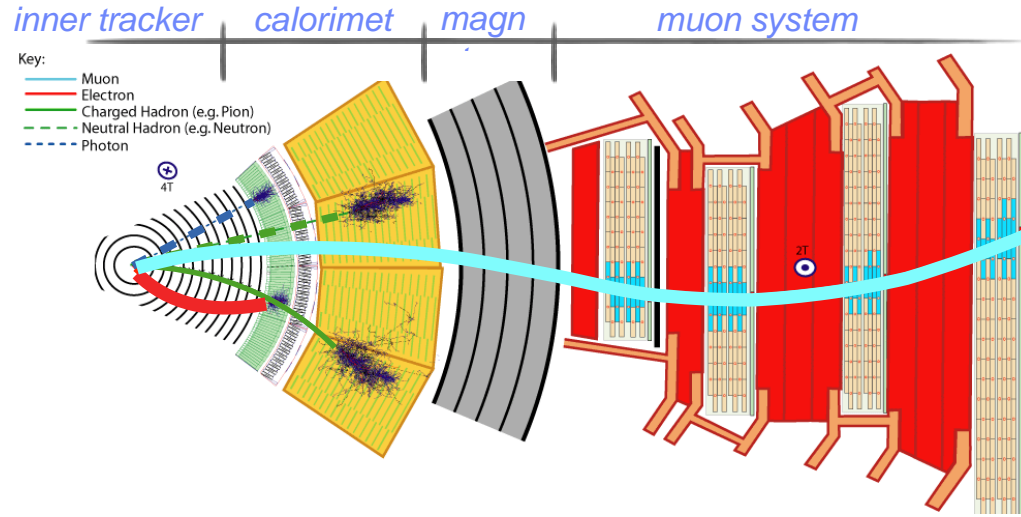
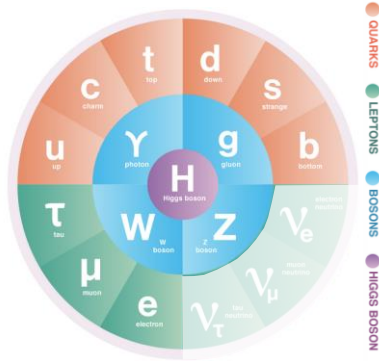


Artwork in absence of light

How can we study DM interactions with SM?



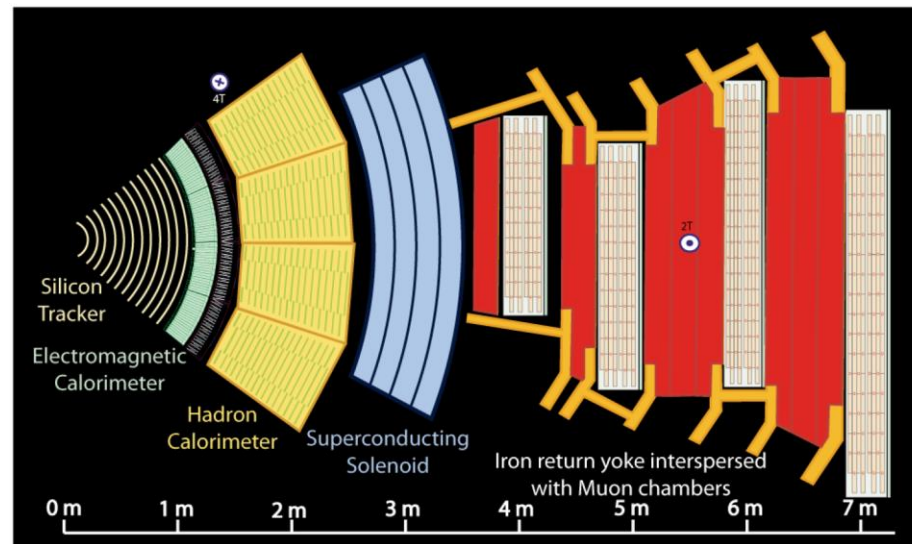
How can we detect DM at colliders?



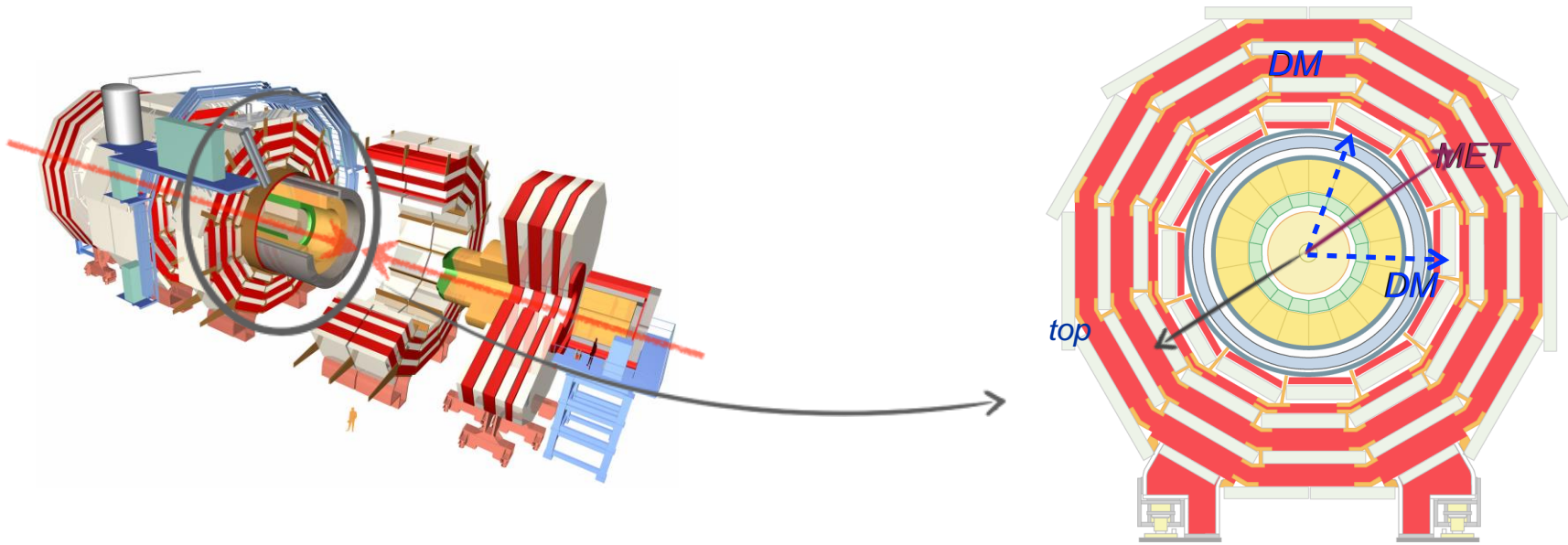
dark matter

Properties

- stable
- electrically neutral
- massive



How can we detect DM at colliders?

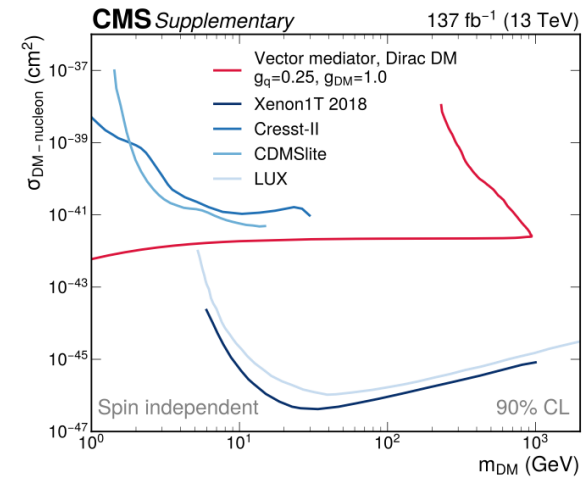
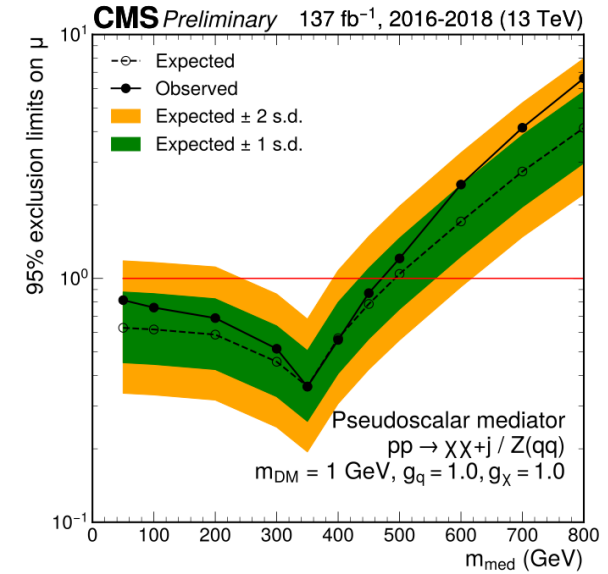
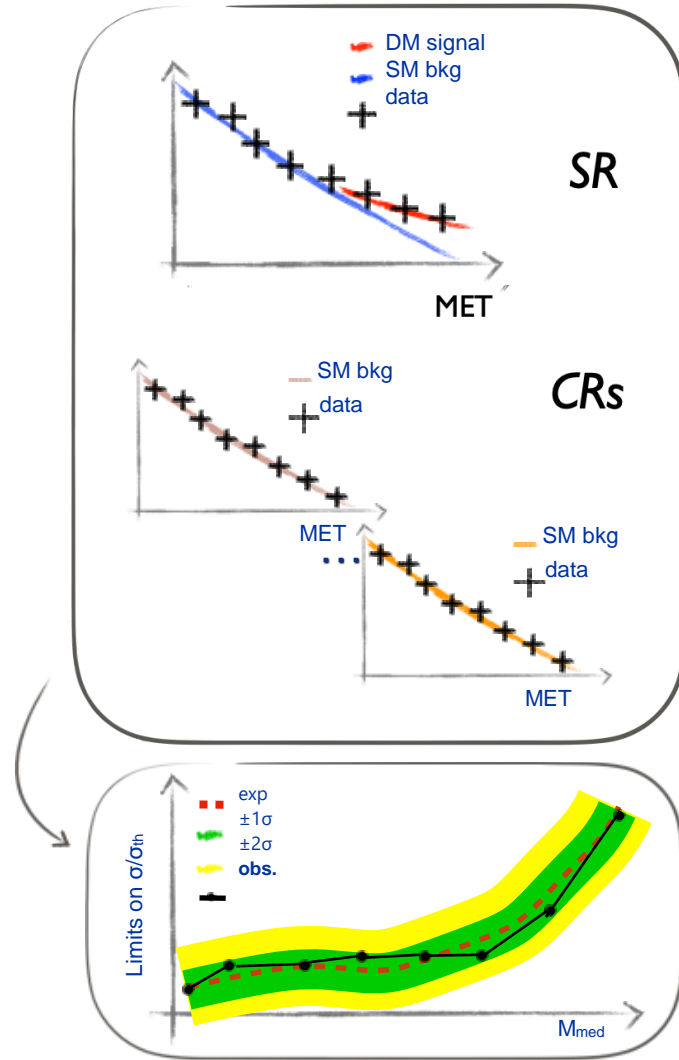


▶ to see the invisible we need the visible ...

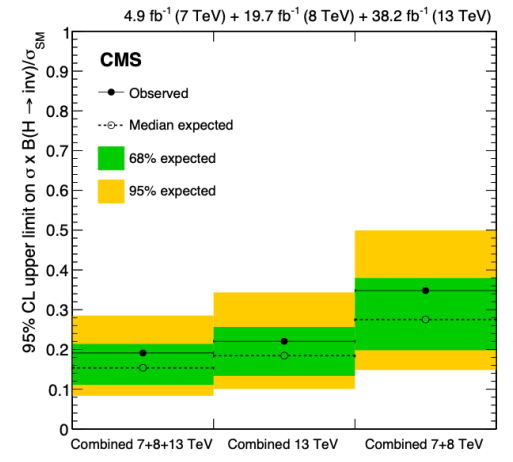
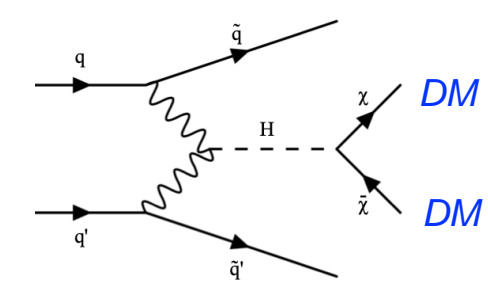
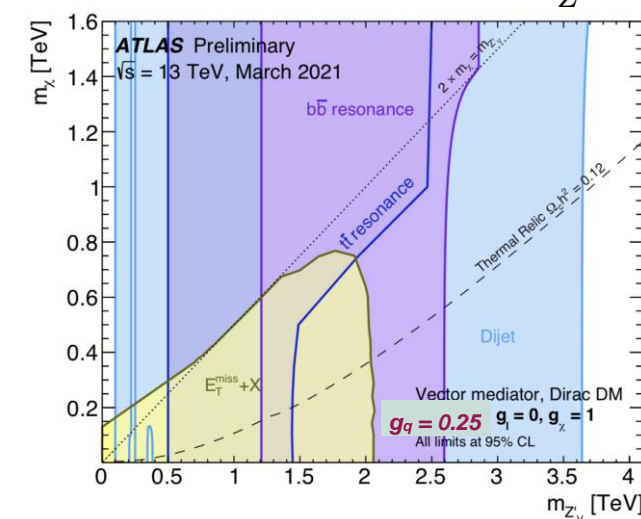
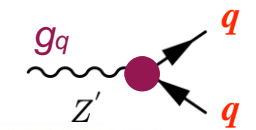
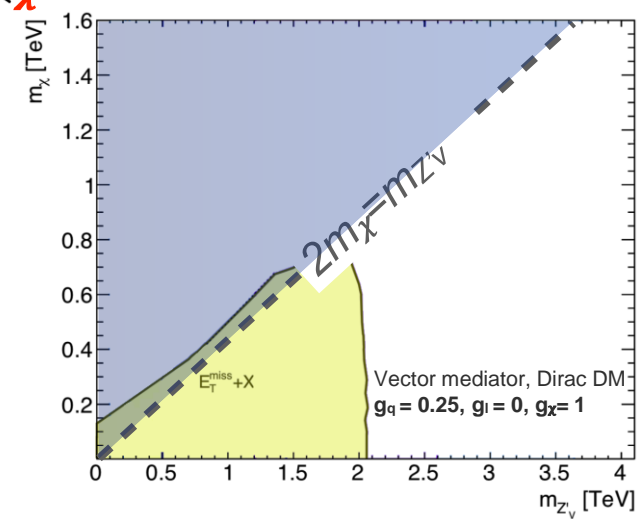
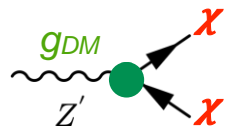
Dark matter phenomenology: guess “who”



How do we search for DM at colliders?



The invisible through the visible and the Higgs



How can we understand DM at colliders?

