

Hi, nice to meet you. I'm Carlo.

Group meeting at IFIC, January 30th, 2026

Carlo Tasillo,
Institut di Física Corpuscular (IFIC)

INSTITUT DE FÍSICA CORPUSCULAR

UNTERSTÜTZT VON / SUPPORTED BY

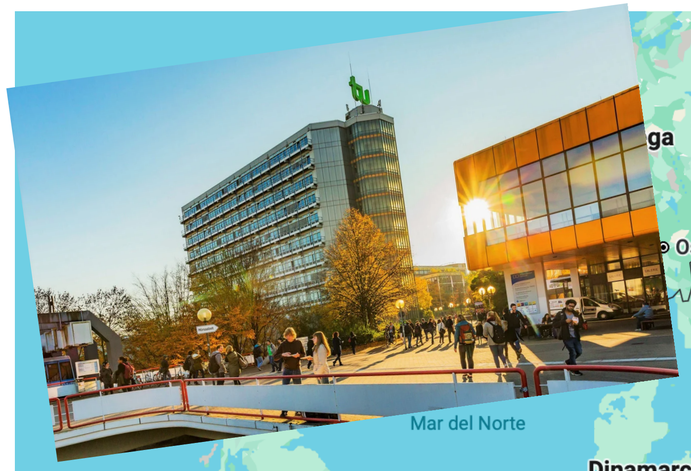
Alexander von HUMBOLDT STIFTUNG



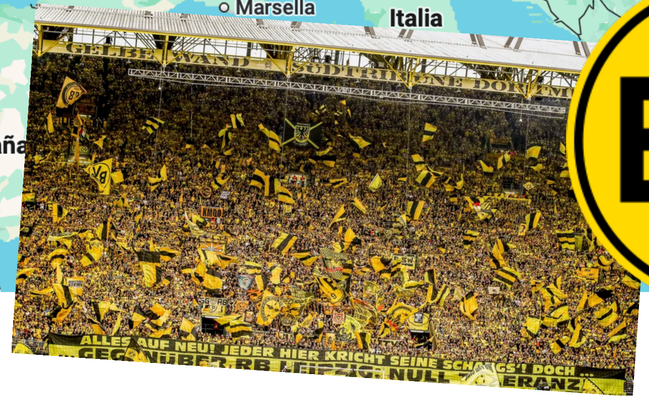
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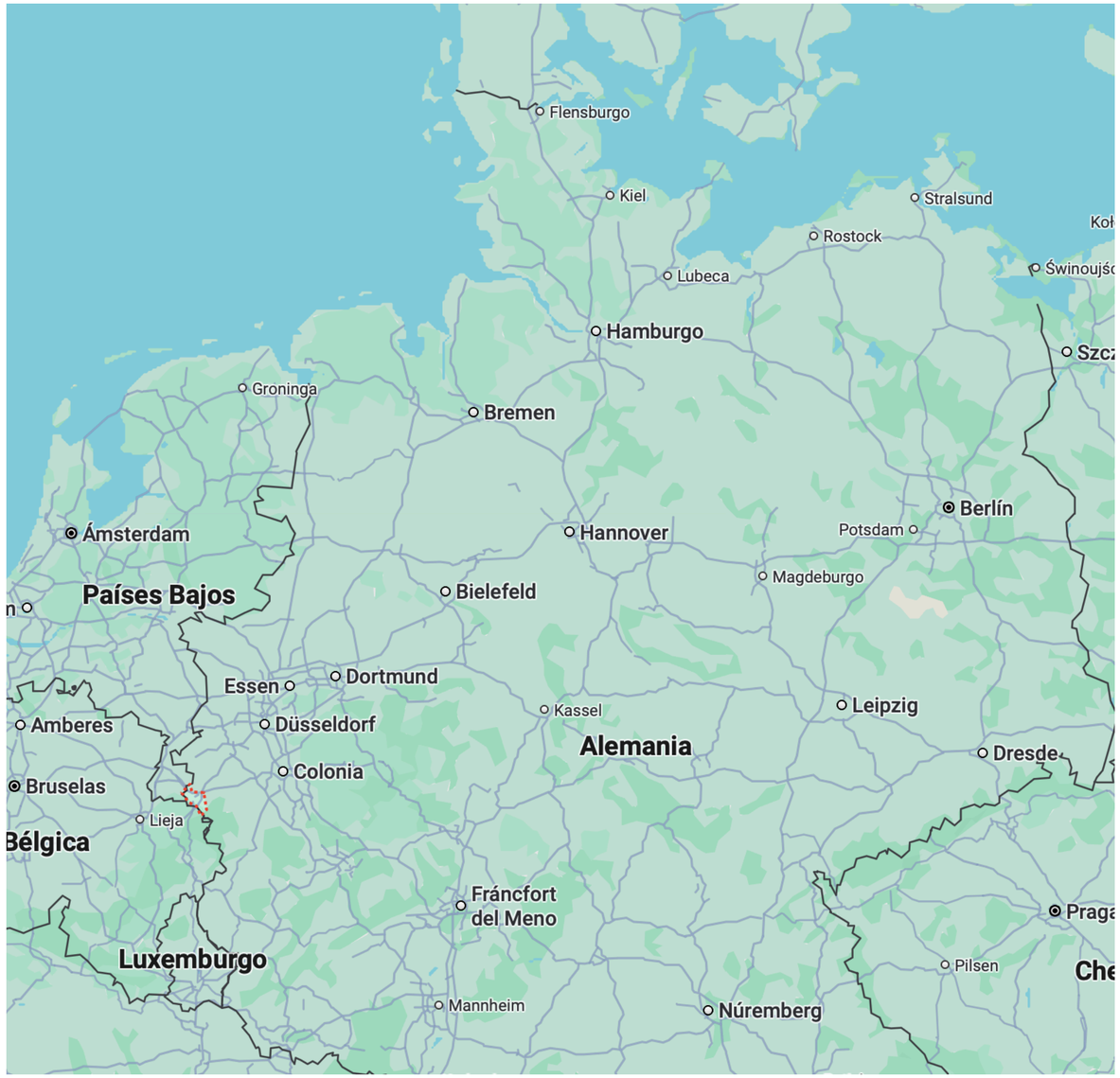
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Stralsund
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Lubeca
Hamburgo
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Berlín
Ámsterdam
Hannover
Potsdam
Magdeburgo
Países Bajos
Bielefeld
Essen
Dortmund
Kassel
Leipzig
Amberes
Düsseldorf
Alemania
Dresde
Colonia
Bruselas
Lieja
Bélgica
Fráncfort
del Meno
Luxemburgo
Pilsen
Mannheim
Núremberg



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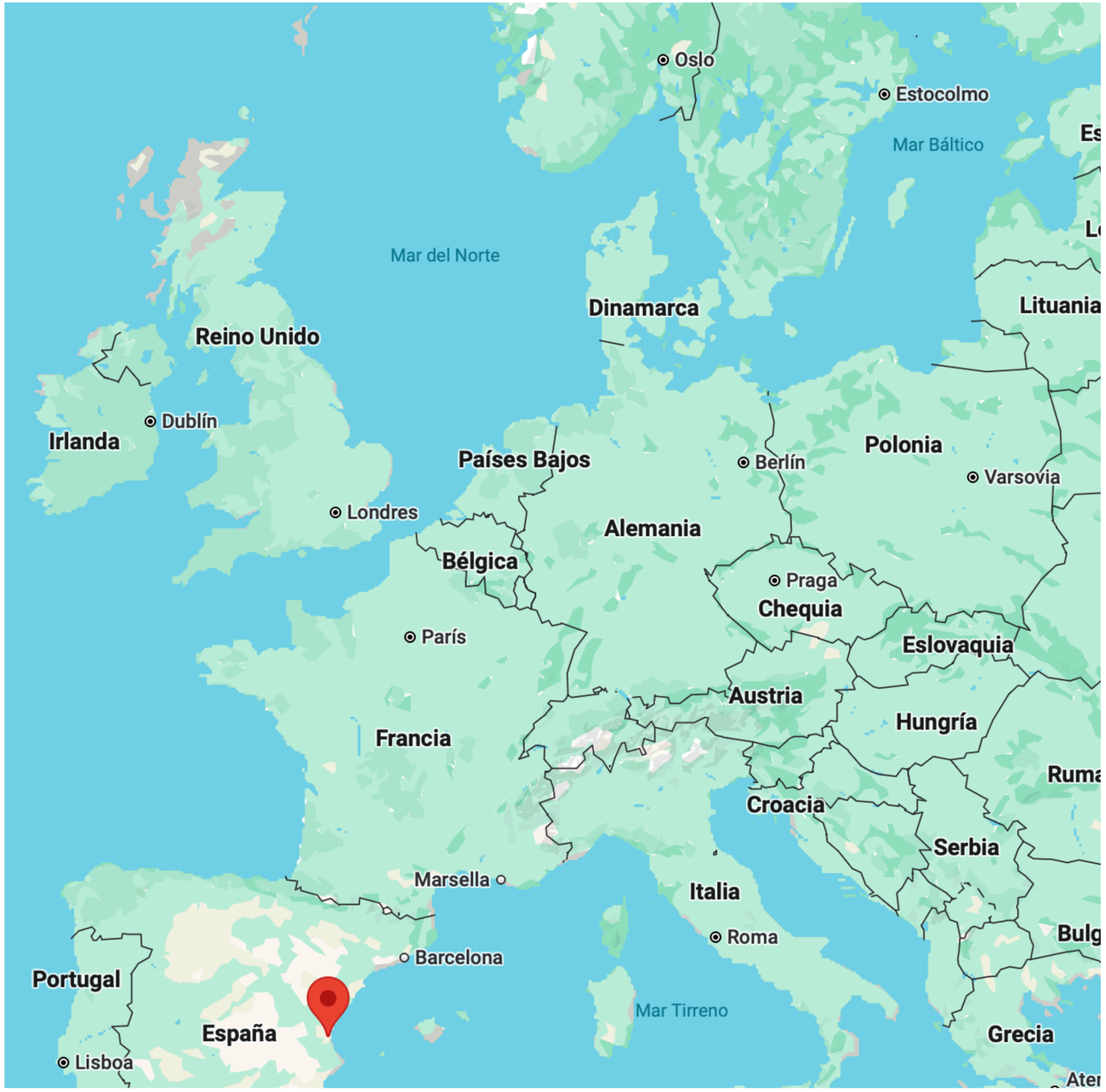






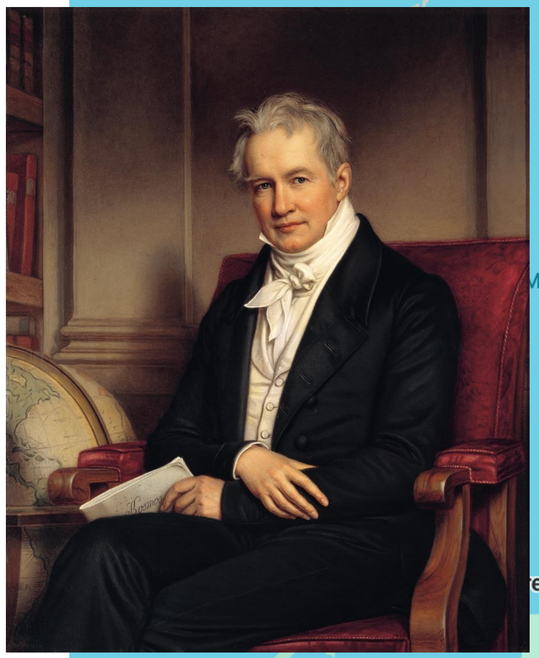


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Hi, nice to meet you. I'm Carlo.

Thanks, man!







I jumped over the part where I was living in Italy & staying at Fermilab (ask me over lunch)



At Last, There's
A globe-spa
Astronomers detect 'cosmic bass note' of gravitational waves
Sound comes from the merging of supermassive black holes across the universe, according to scientists
Scientists 'hear' cosmic hum from gravitational waves
Gravitational
Scientists have finally 'heard' the chorus of gravitational waves that ripple through the universe
Scientists have observed for the first time the faint ripples caused by the motion of holes that are gently stretching and squeezing everything in the universe
The New York Times
ack H
Galax
Space
Gravitational wave
at the center of the M
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The Cosmos Is Thrumming With Gravitational Waves, Astronomers Find
Radio telescopes around the world picked up a telltale hum reverberating across the cosmos, most likely from supermassive black holes merging in the early universe.
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massive black
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Scientists observed for the first time faint ripples caused by the motion of black
ing everything in the universe.
ASTROPHYSICS
A Background 'Hum' Pervades the Universe. Scientists Are Racing to Find Its Source
Astronomers are now seeking to pinpoint the origins of an exciting new form of gravitational waves that was announced earlier this year
Gravi
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Astro
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SCIENCE
Colossal gravitational waves—trillions of miles long—found for the first time
by studying rapidly spinning dead
giant ripples of spacetime likely
from merging supermassive black holes—
The Washington Post
Democracy Dies in Darkness
In a major discovery, scientists say space-time churns like a choppy sea
The mind-bending finding suggests that everything around us is constantly being roiled by low-frequency gravita
waves
For first time ever, scientists "hear" gravitational waves rippling through the universe
First Evidence of Giant Gravitational Waves Thrills Astronomers
re tuning in to a never-before-seen type of gravitational
pawned by pairs of supermassive black holes
rs used dead stars to
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Monster gravitational
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gravitational waves
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The results are
background, a hum o
Universe.
Physics
Gravitational waves produce a background hum across the whole universe
After decades of searching, astronomers have found a distinctive pattern of light, from spinning stars called pulsars, that suggests huge gravitational waves are creating gentle ripples in space-time across the universe


We live in the age of gravitational wave cosmology!

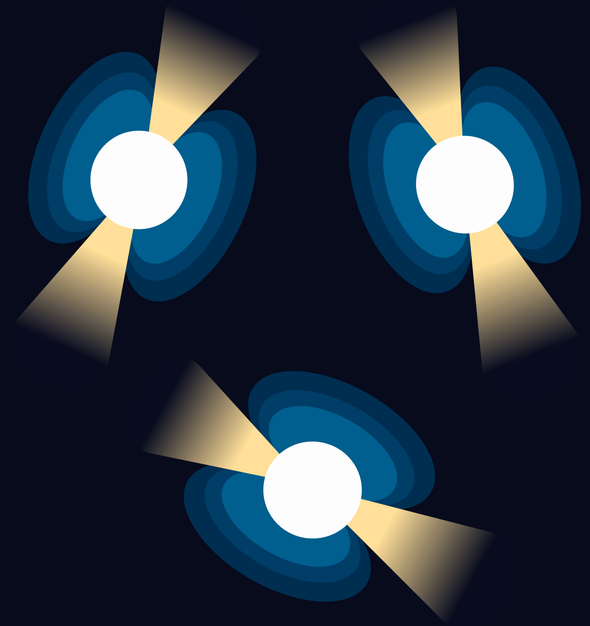


[Penelope Cowley]

The working principle of a pulsar timing array

Galactic millisecond pulsars





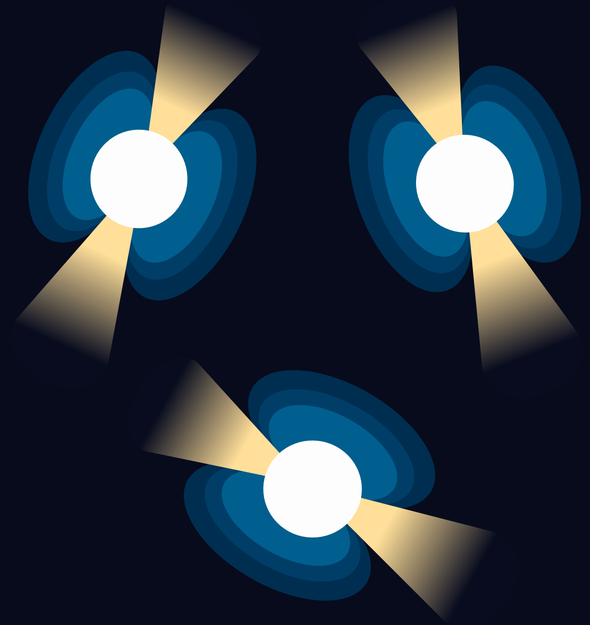
The working principle of a pulsar timing array

Galactic millisecond pulsars





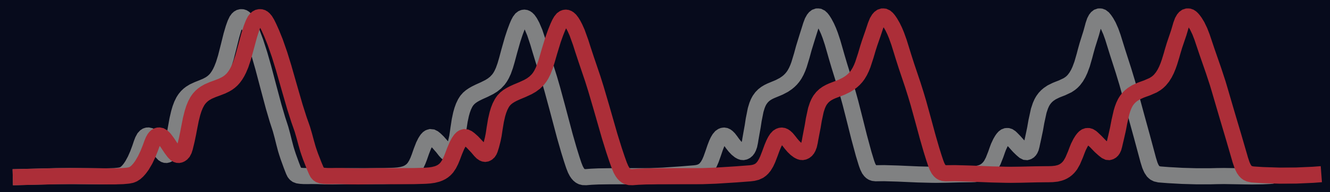
Pulses expected
from timing model



The working principle of a pulsar timing array

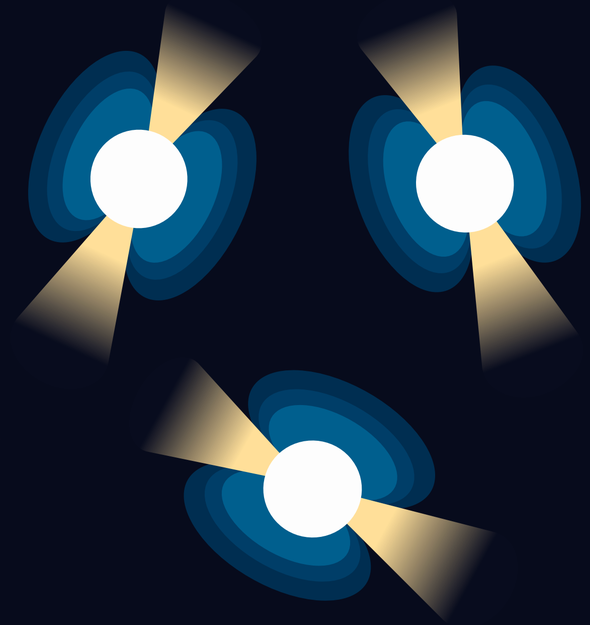
Galactic millisecond pulsars





Pulses expected from timing model

Pulses recorded by radio telescopes

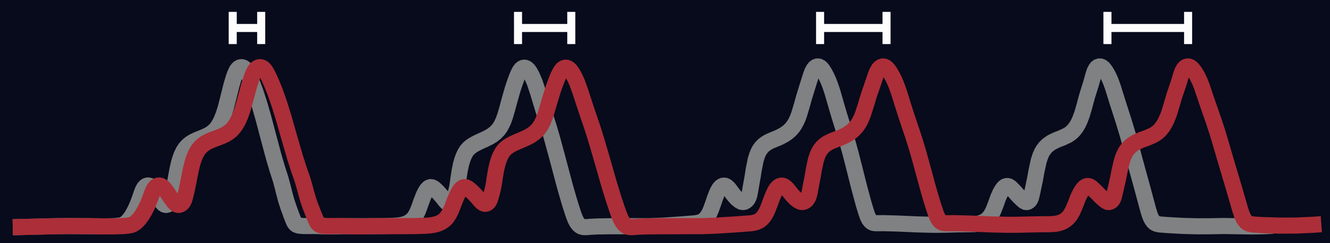


The working principle of a pulsar timing array

Galactic millisecond pulsars

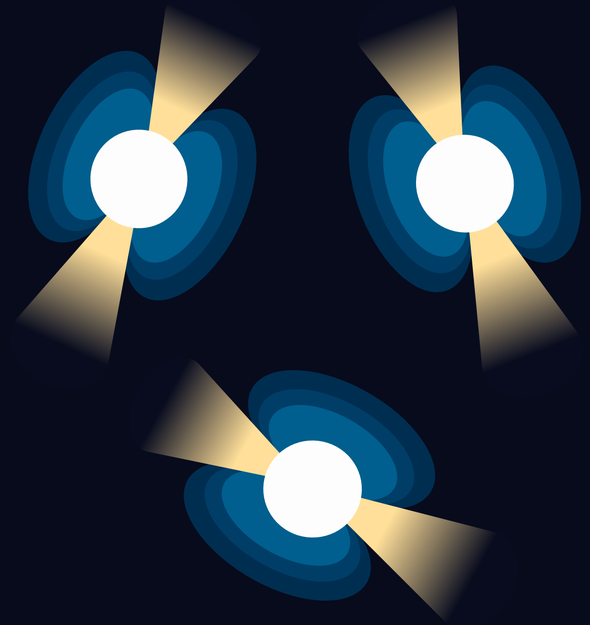


Timing residuals δt



Pulses expected from timing model

Pulses recorded by radio telescopes

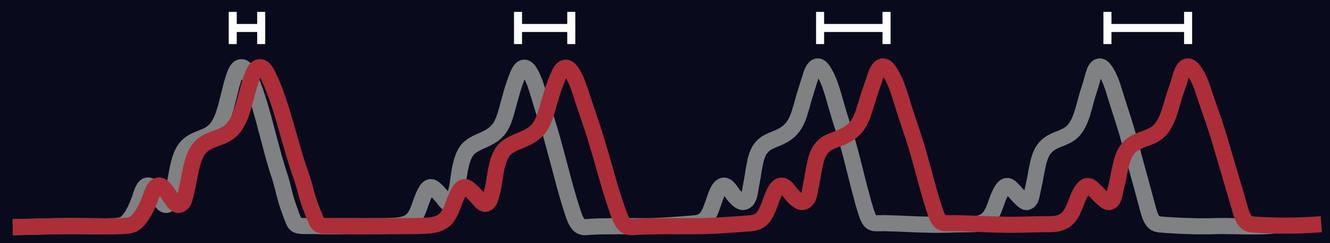


The working principle of a pulsar timing array

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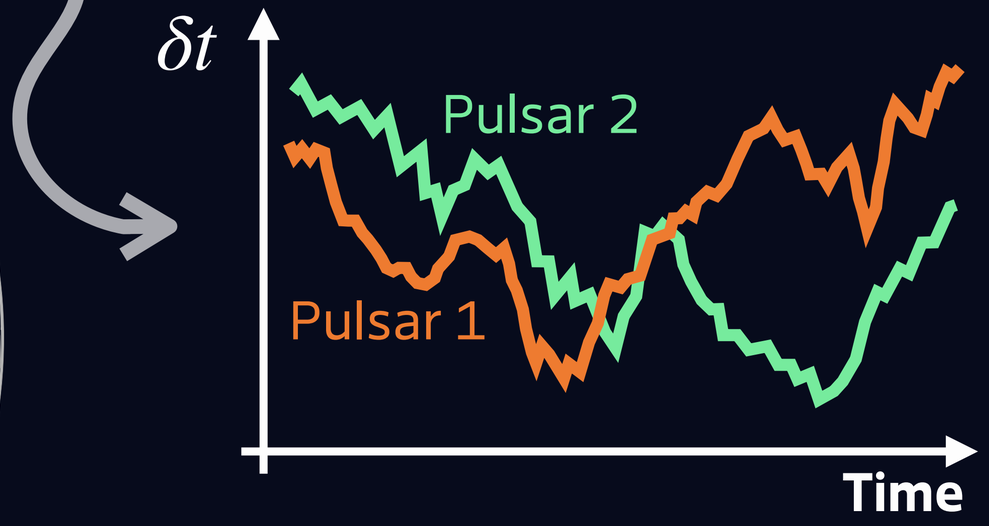


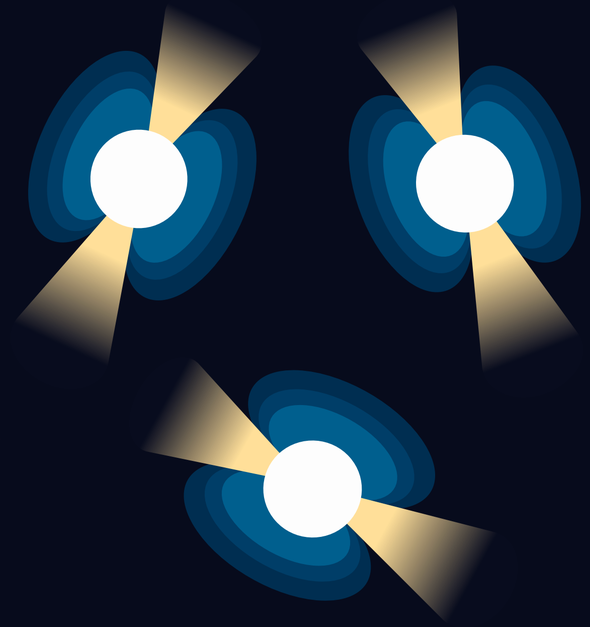
Timing residuals δt



Pulses expected from timing model

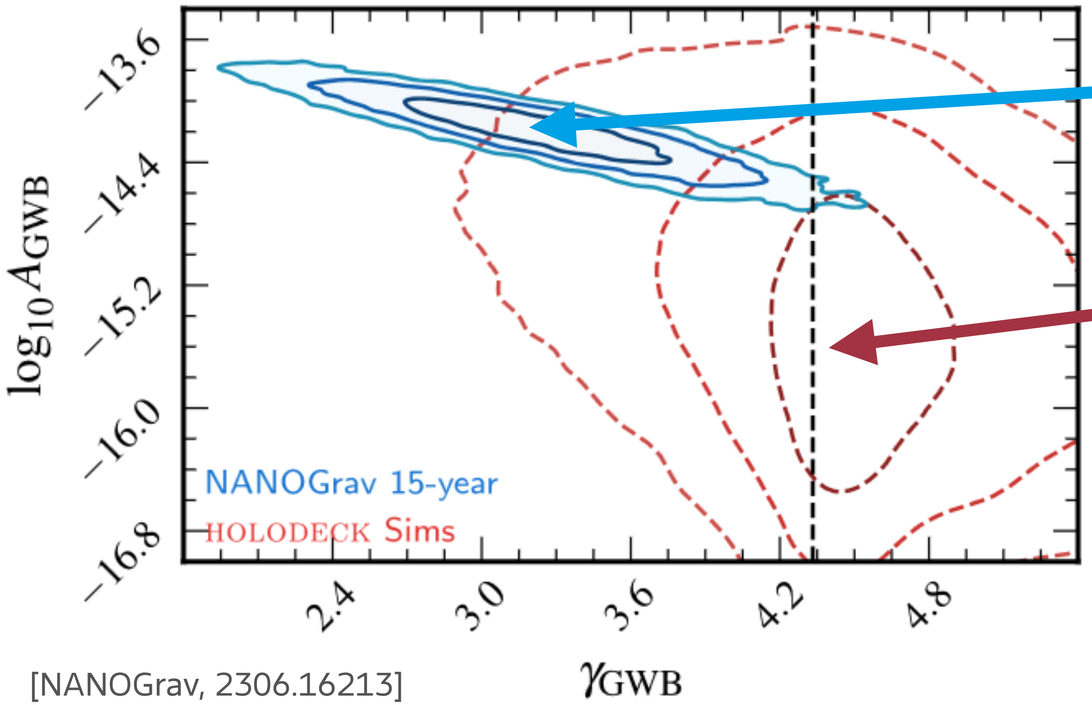
Pulses recorded by radio telescopes





A gravitational wave backgrounds imprints itself in the common evolution of the timing residuals over time

Merging supermassive black holes

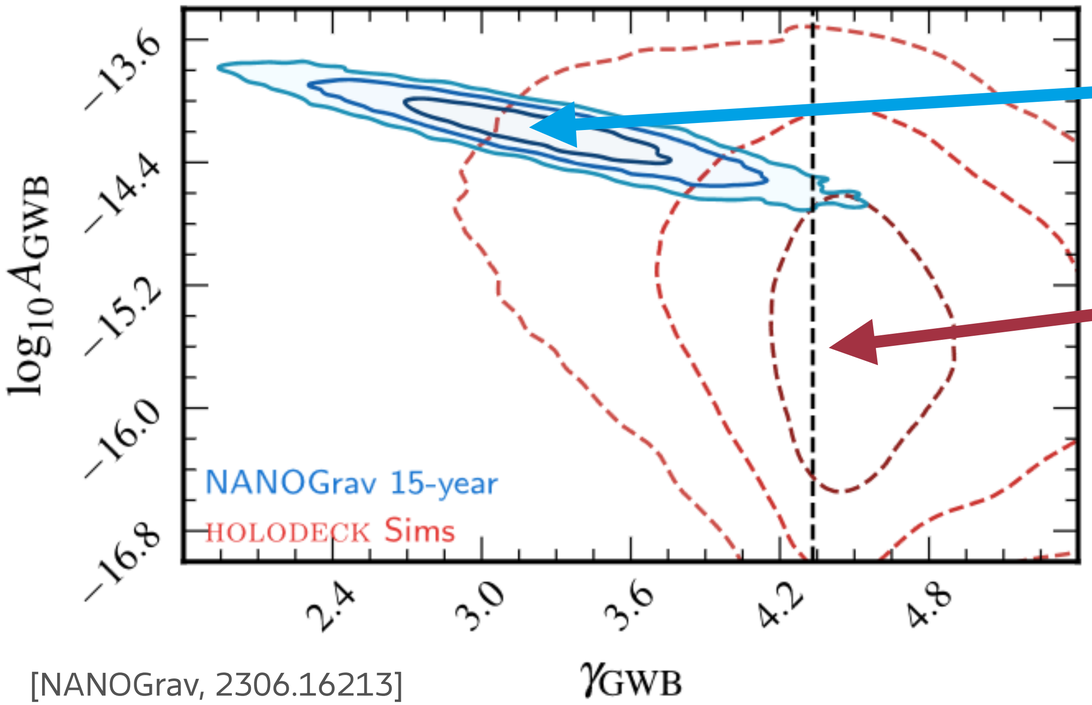


[NANOGrav, 2306.16213]

Observed signal follows a power-law spectrum with amplitude A and slope γ

Astrophysical simulations based on realistic BH populations predict much weaker signals with higher γ (more power in low frequencies). Final parsec problem?

Merging supermassive black holes



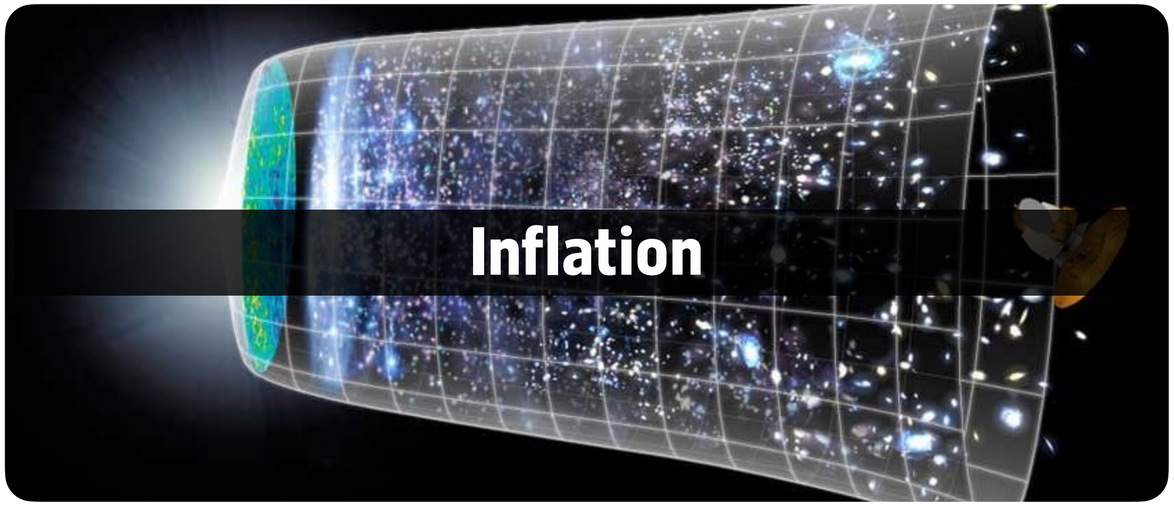
[NANOGrav, 2306.16213]

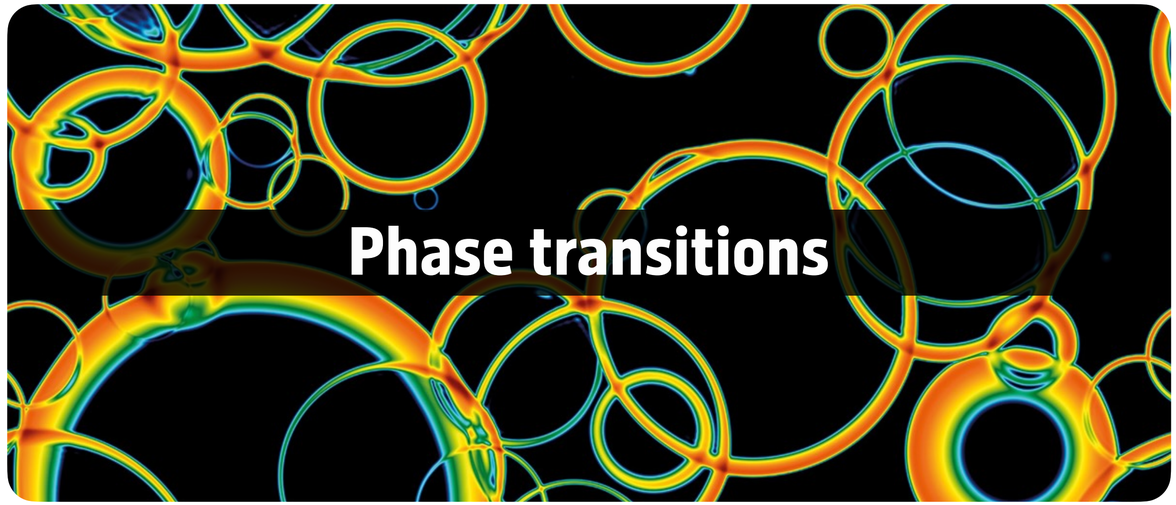
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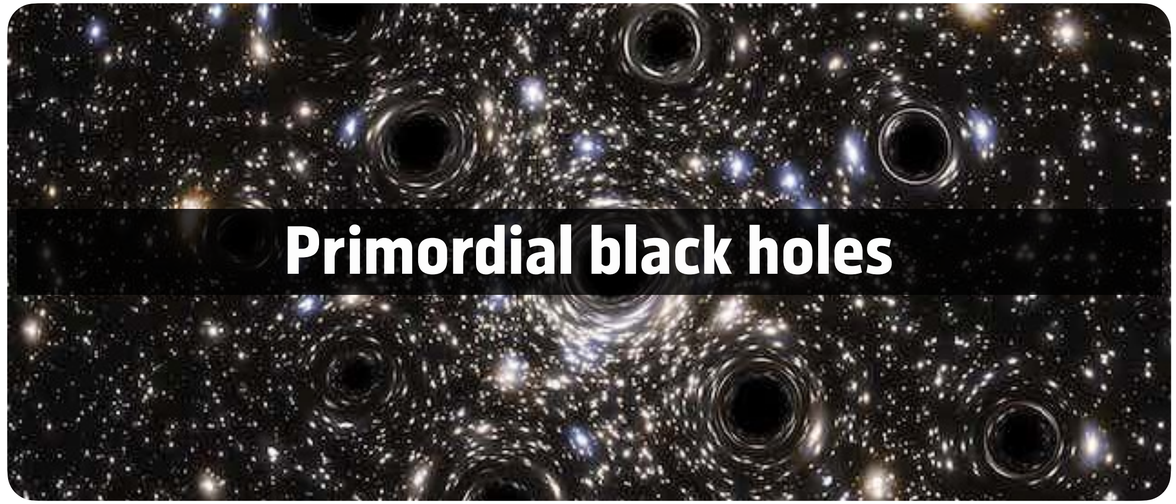
Are there other signal sources?

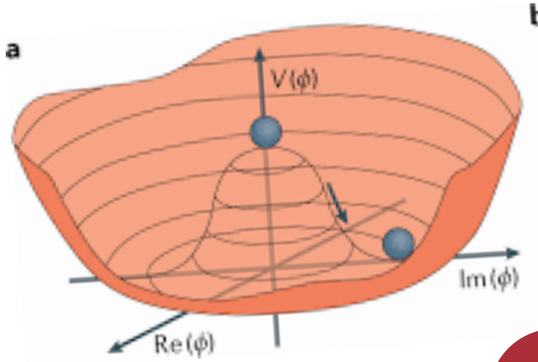
Possible cosmological sources of the PTA signal

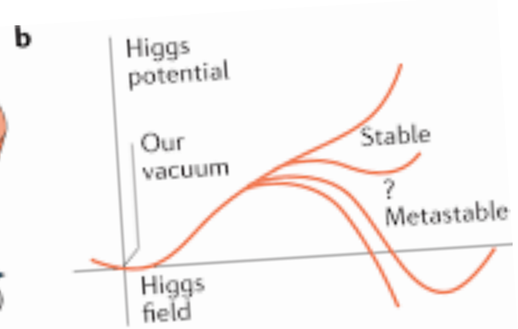






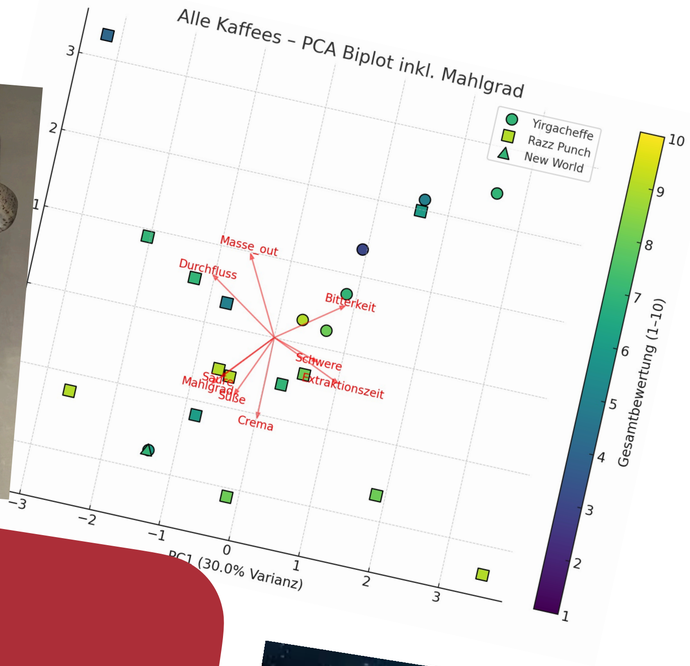














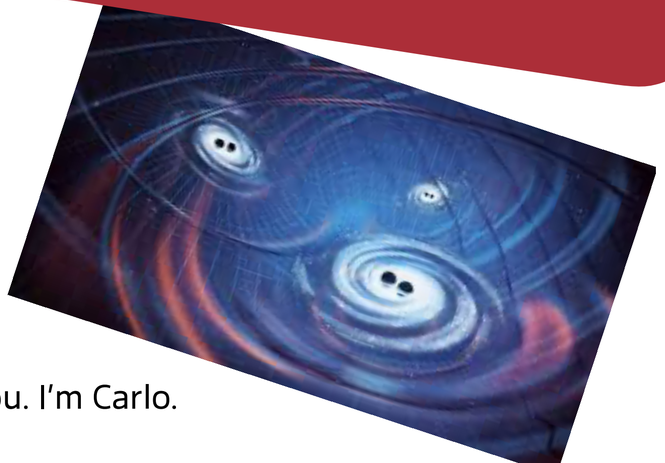
It's a pleasure to meet you all! You can ask me about...













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