

# Instituto de Física Teórica UAM/CSIC



$$\mathcal{L} = \frac{1}{2} M_{\text{pl}}^2 R - \frac{1}{4} F^2 + \bar{\Psi} i \not{\partial} \Psi + |D\Phi|^2 - (\bar{\Psi} \gamma \Phi \Psi + \text{hc}) - V(\Phi) + \dots$$



Dedicated to Theoretical Particle Physics  
and Cosmology

Participation in the main experiments in the field

Recent Research Lines in Quantum  
Information and Computation and  
Theoretical Condensed Matter

$$\mathcal{L} = \frac{1}{2} M_{\text{pl}}^2 R - \frac{1}{4} F^2 + \bar{\Psi} i \not{\partial} \Psi + |D\Phi|^2 - (\bar{\Psi} \gamma \Phi \Psi + \text{hc}) - V(\Phi) + \dots$$



Joint institute between

Universidad Autónoma de Madrid (UAM)

UAM Theoretical Physics Dept.

Spanish Research Council (CSIC)

UAM-CSIC affiliation approx 50-50%

# People

Senior 36  
+ Postdocs 22  
Predocs 48

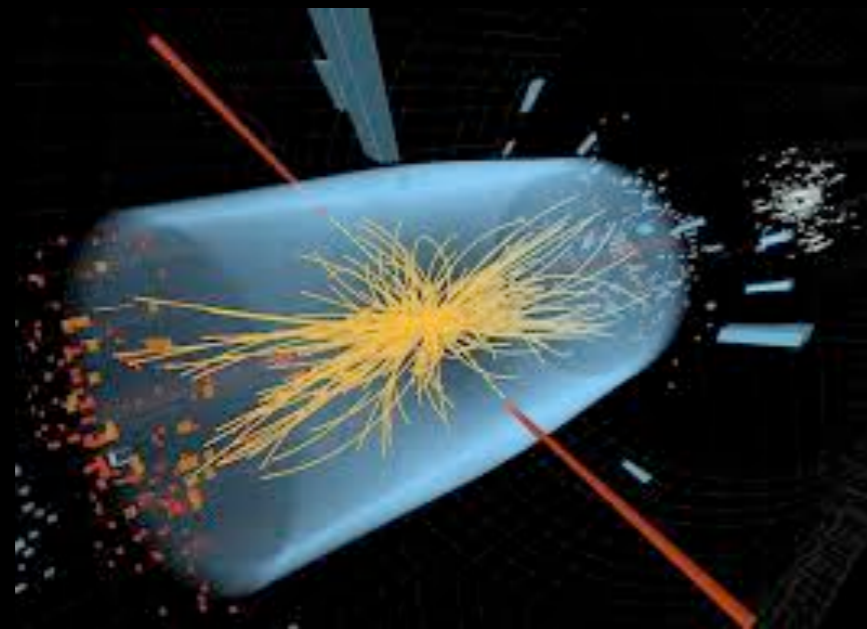
---

Total Physicists: >100

18% female



# Research at IFT



SM AND BEYOND

Neutrino and Flavour

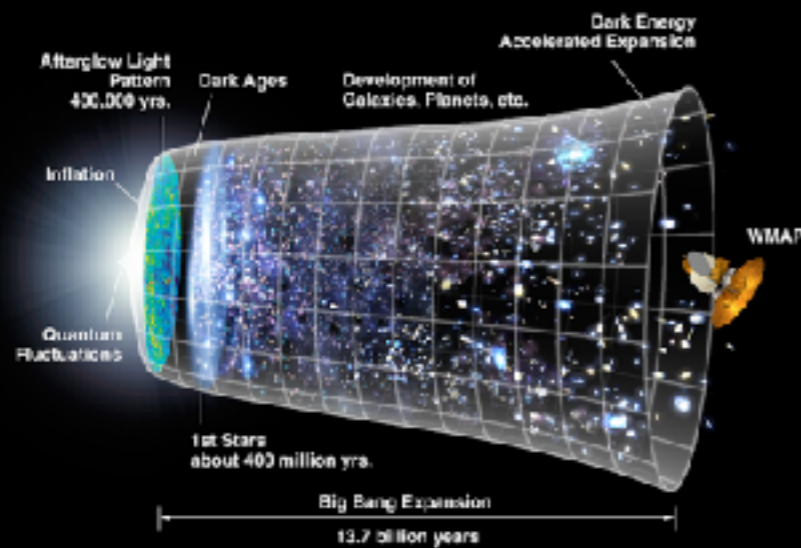
Collider Physics

Higgs Physics

Axions

Beyond the SM Physics

# Research at IFT



COSMOLOGY,  
ASTROPARTICLE

Dark Matter

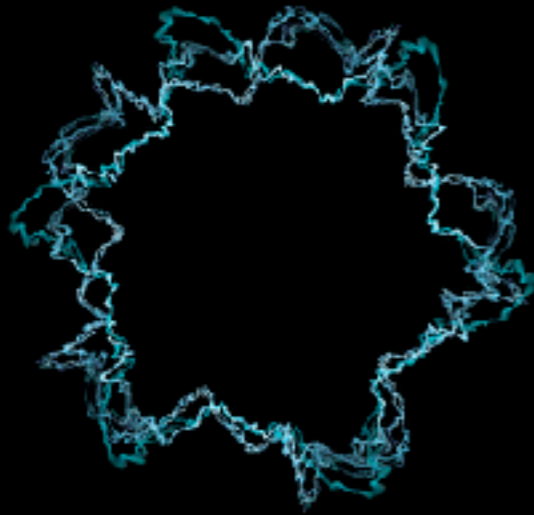
Multi-Messenger Astronomy

Primordial Black Holes

Inflation

Gravitational Waves

# Research at IFT



GRAVITY AND  
STRINGS

Quantum Gravity

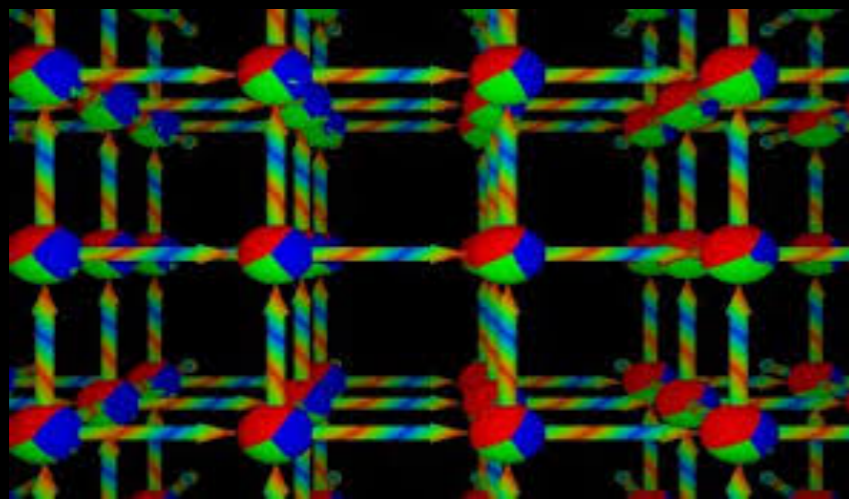
String Phenomenology

Black Hole Physics

Holography

Supergravity

# Research at IFT



LATTICE

Strongly Coupled QFT's

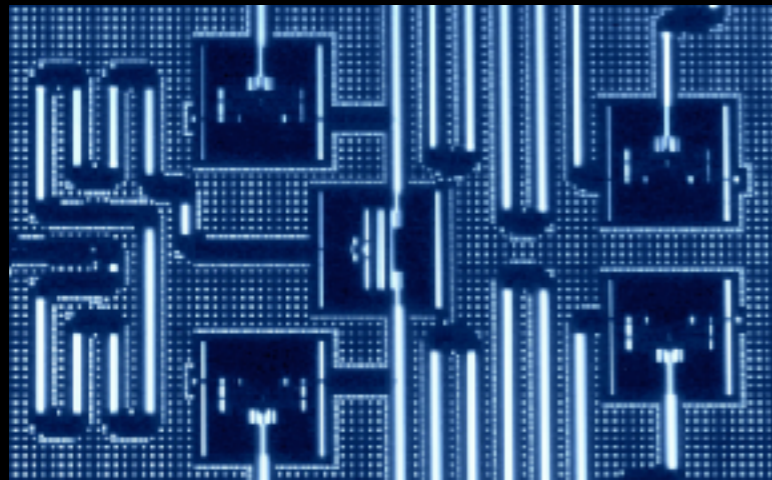
Flavour Phenomenology in  
the Hadronic Sector

Gauge Theories at Large  $N$

Computational Physics



# Research at IFT



QUANTUM INFORMATION  
AND CONDENSED MATTER

Tensor Networks

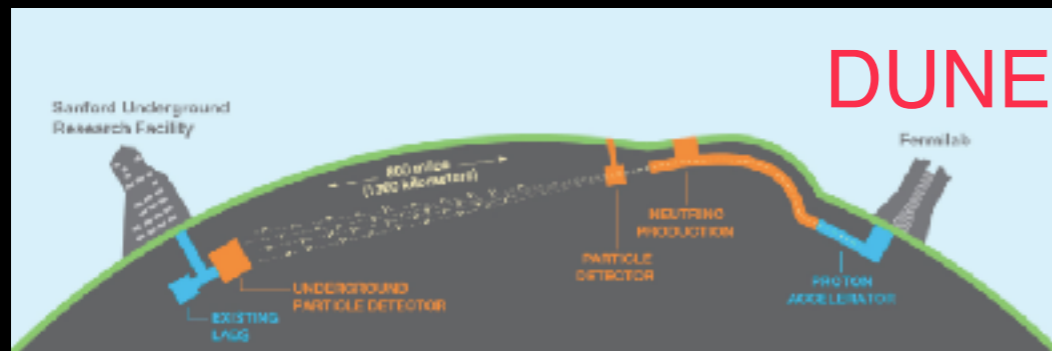
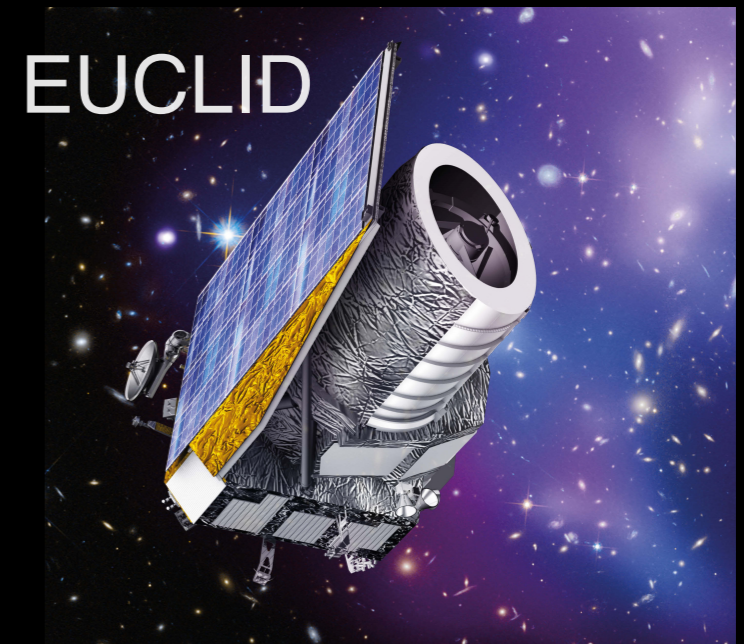
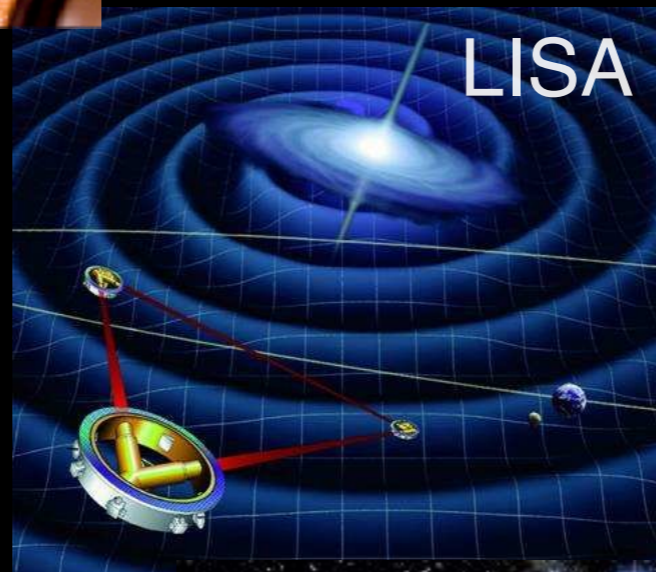
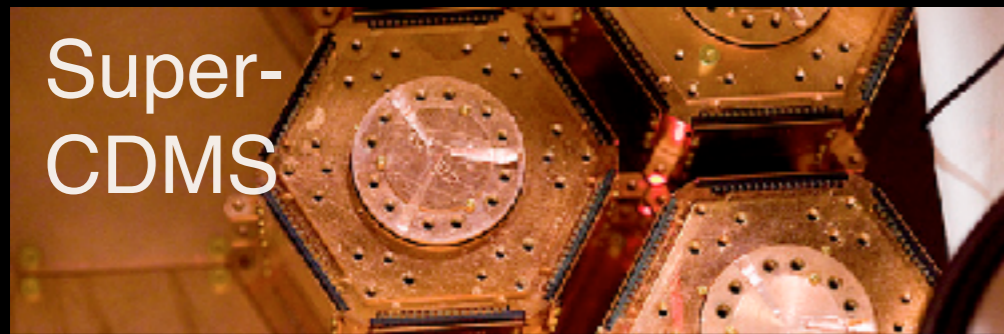
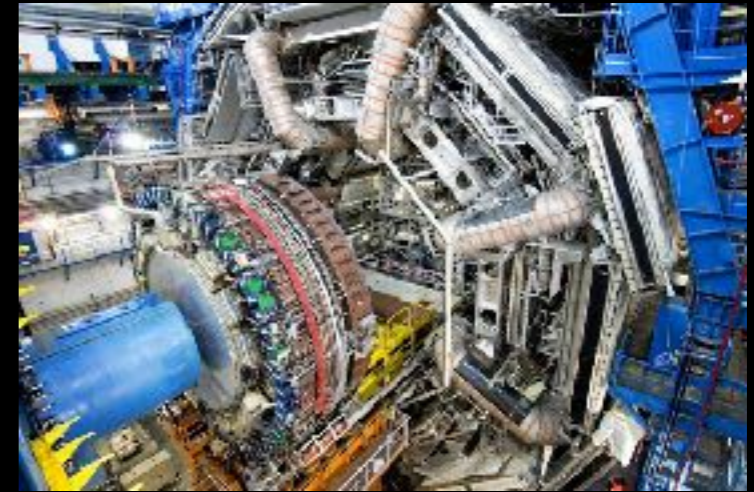
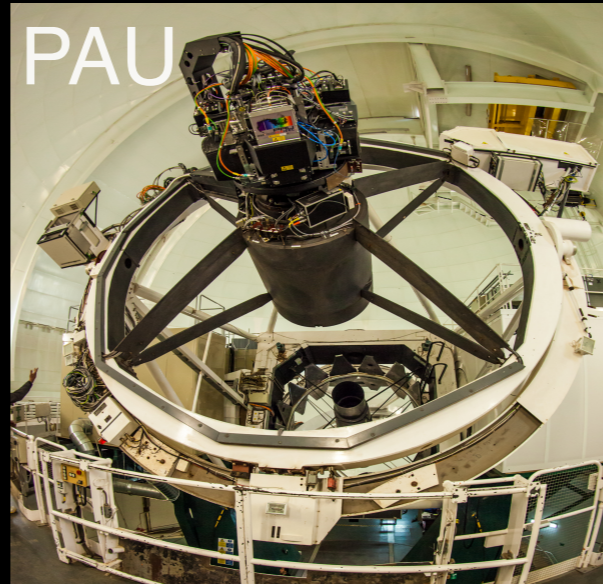
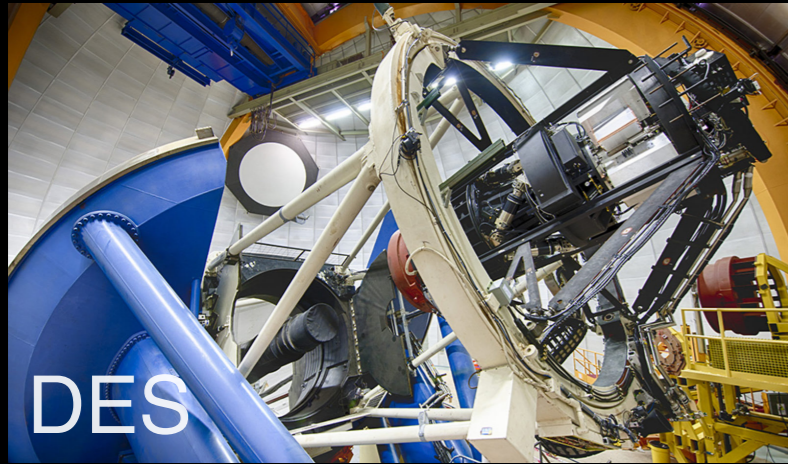
Quantum Simulations

Integrability and CFT's

Topological Matter

Applied Holography

# Participation in Experiments



# Workshops, Programs and Conferences



## Seminars

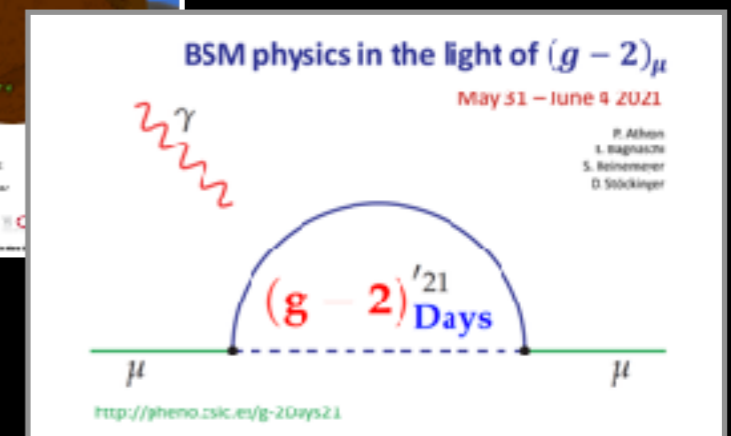
- general interest seminars on a weekly basis
- specialized seminars
- colloquia
- Journal clubs



Webinars



Online workshops



# Exchange Agreements



The Abdus Salam  
International Centre  
for Theoretical Physics



Instituto de  
Física  
Teórica  
UAM-CSIC



International Centre for Theoretical Physics  
South American Institute for Fundamental Research



Instituto de  
Física  
Teórica  
UAM-CSIC



Scuola Internazionale  
Superiore di Studi Avanzati



Instituto de  
Física  
Teórica  
UAM-CSIC



Severo Ochoa Program



Large grant awarded by the Spanish government to excellence in research

2012-2016, 2017-2021, renewed for 2022-2026

Launch an ambitious visitor program

Improve computing facilities: CPU Cluster, 2100 cores

# Besides research

- Training of young researchers
- Transfer of knowledge to society

are also IFT priorities

# Master in Theoretical Physics



IFT collaborates with the UAM  
Th. Phys. Dept. in the organization  
and teaching of the Master

Possibility of funding

Move on to Ph.D.

Completed with a large offer of PhD courses



# SCHOOLS

**inVisibles 15 School** 14<sup>th</sup>-20<sup>th</sup> June, 2015

**School Lectures include:**

- The LHC experiment
- Phenomenology of the BIC
- Effective Field Theory
- Flavour Physics
- Beyond the Standard Model topics
- MadGraph tutorial

Place: La cristalera UAM facility, Madrid  
[www.invisibles.eu](http://www.invisibles.eu)  
 School info and registration: <http://www.invisibles.eu/news/invisibles15>  
 La Cristalera UAM facility: <http://www.fach.usm.es>




## The IFT School on Cosmology Tools



Instituto de Física Teórica UAM/CSIC  
 Madrid, 13-17 March 2017

Programs: CosmoMC, IFT/CAMB, Healpix, Redfast/CosmoRec, CosmoSIS, SzPack/CosmoTherm, IHTClass, MontePython, qevolution/Gadget2/RAMSES

**Lecturers:**  
 Julian Adamek  
 Jens Chluba  
 Chia-Hsun Chuang  
 Juan García-Bellido  
 Will Handley  
 Matteo Martinelli  
 Savvas Nesseris  
 Jose A. Rubiño-Martín  
 Alessandra Silvestri  
 Miguel Zumalacarregui  
 Joe Zuntz

**Local Organizers:**  
 Savvas Nesseris  
 Juan García-Bellido  
 Manuel Trachter

**Tutors:**  
 Manuel Trachter  
 Marcos Pellejero-Ibeniz

**International Advisory Committee:**  
 Antony Lewis  
 Volker Springel

**IT support:**  
 Andres Diaz-Gil

**Secretary:**  
 monica.vergel@csic.es

EXCELENCIA SEVERO OCHOA



## SUMMER IFT SCHOOL

Instituto de Física Teórica UAM/CSIC  
 Madrid, 15-20 July 2019

**Shiraz Minwalla**  
 Gravitational Dynamics at large D

**Miguel Montero**  
 The Holographic Swampland

**Kyriakos Papadodimas**  
 AdS/CFT and the Black Hole Interior

**Eran Palti**  
 String Theory and the Swampland

<https://ift2019.csic.es/ifts2019>

ORGANIZERS  
 J.L.F. Barbon  
 E. Marnasco  
 M.J. Rodríguez




## Tutorial on Monte Carlo tools for colliders



Program:  
 Feynrules  
 MadGraph  
 Pythia  
 CheckMATE

Invited speakers:  
 N. Desai (ITP, Heidelberg)  
 B. Fuks (IPHC, Strasbourg)  
 O. Mattelaer (IPPP, Durham)

Organizers: J.S. Kim, K. Roliecki, J.J. Sanz-Cillero

<http://workshops.ift.uam-csic.es/MCTutorial>



# Outreach

Outreach is a distinctive trademark of the IFT

All IFT members contribute

Many activities, reaching a very broad audience

## Public Talks



## High Schools programs



Around 100 talks per year at High Schools  
International Particle Phys. Master Classes

EPS Outreach Prize 2021

Social Media

Over half a million



followers

Ask a scientist short videos



Live events

11F: International Day of Women and Girls in Science

also on





Thanks for  
your attention !