Maria de Maeztu Strategic Plan 2026-2029

Vision, scientific priorities, technology leadership, and societal impact

IPARCOS

UNIVERSIDAD COMPLUTENSE MADRID

IPARCOS Scientific Advisory Board: Bi-Annual Review 2026

EXCELENCIA MARÍA DE MAEZTU

The purpose of the call is twofold:

- To recognize the best centers and units of excellence that stand out for their international impact and relevance during the reference period.

- Second, to **fund the strategic plans** developed by the centers and units for a **four-year period**, with the aim of **strengthening their capacities and contributing to the leadership of Spanish research**.

The maximum amount of the funding is 2.250.000€

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IPARCOS MISSION

Research in cutting edge physics	Develop a space of scientific excellence, addressing frontiers problems in physics, enhancing talent and internationalization of research.
Train future generation of scientists	Train future scientists in a vibrant, collaborative environment
Innovate in techology and transfer to society	Promote innovation for science with social commitment from a sustainable perspective.

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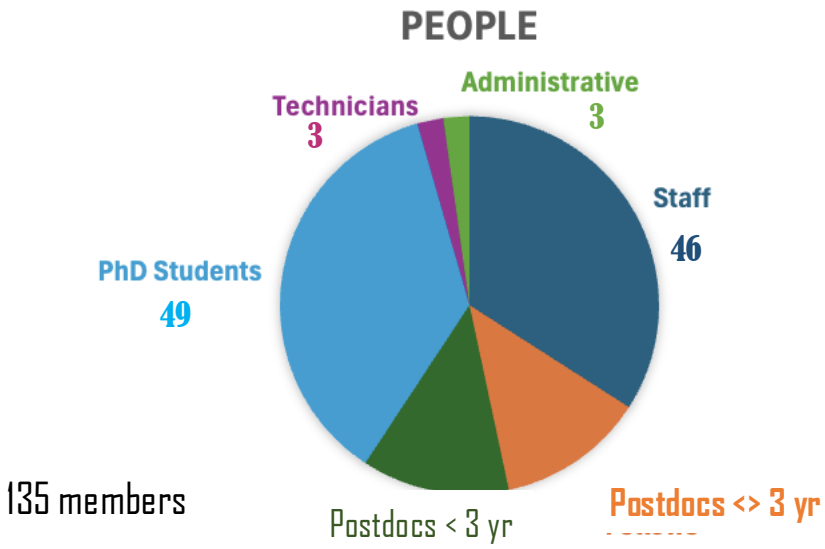
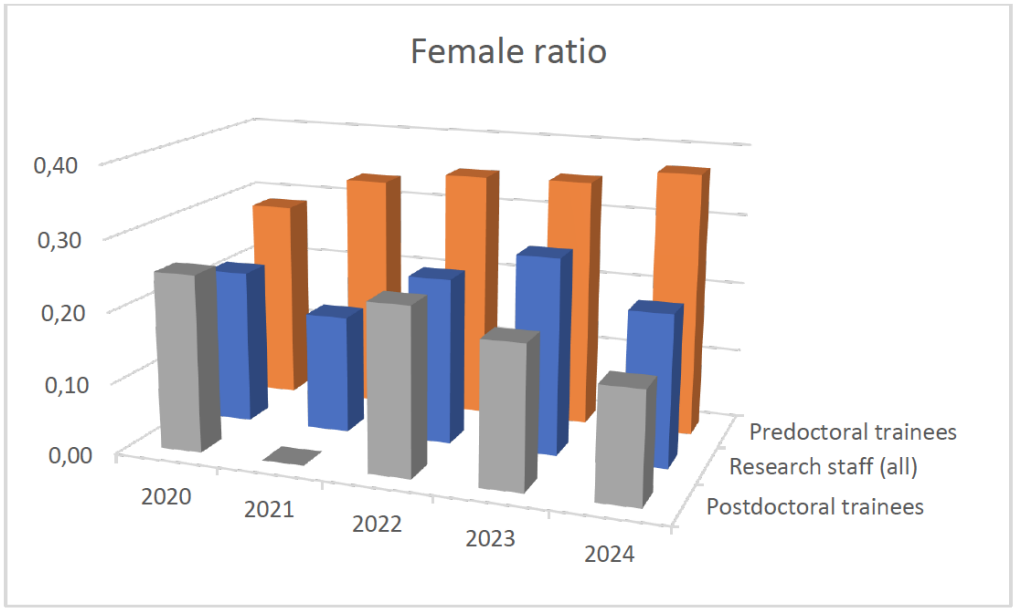
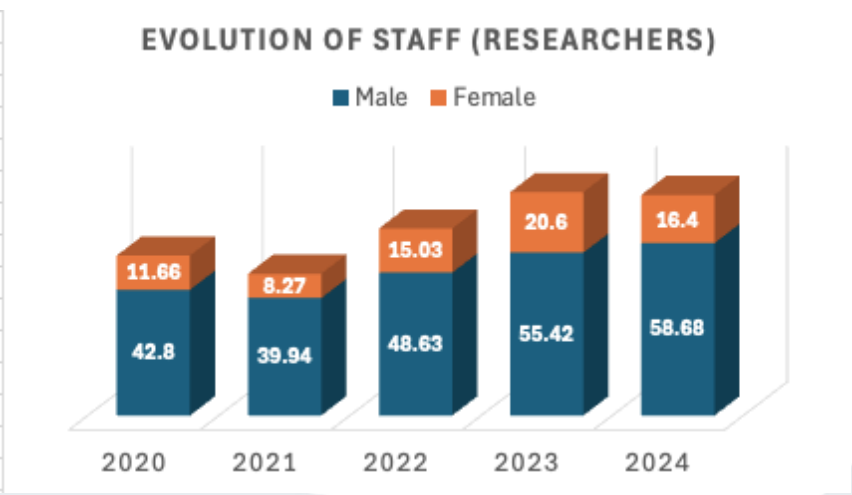
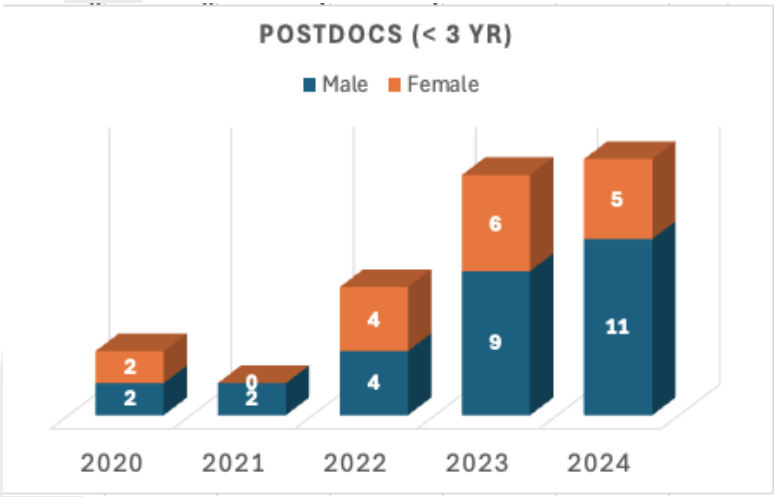
People at the Institute

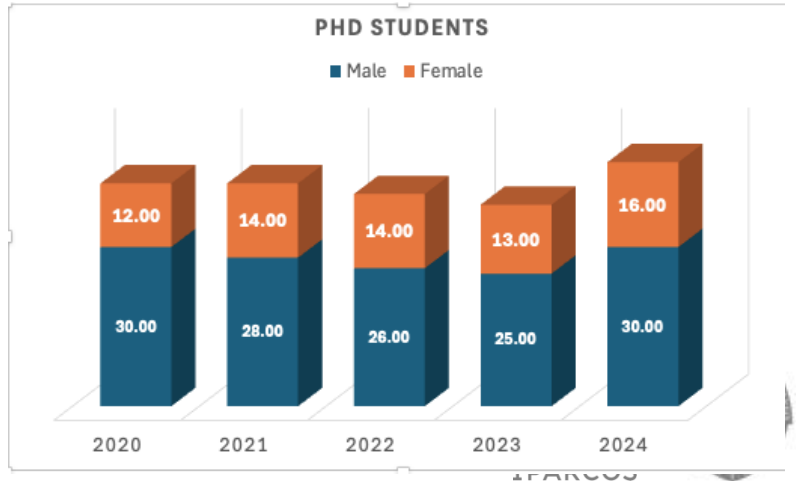


135 members



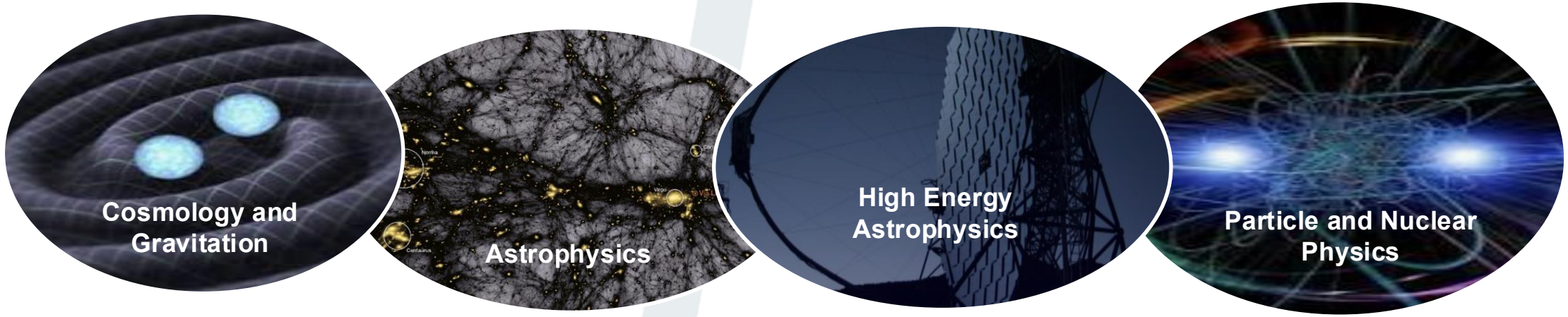






Research Areas

- IPARCOS is organized around four core research areas
- These areas address fundamental questions in modern physics- that demand a multidisciplinary approach.
- Many specific research objectives are shared across areas and tackled from complementary perspectives that include both theoretical and experimental viewpoints.



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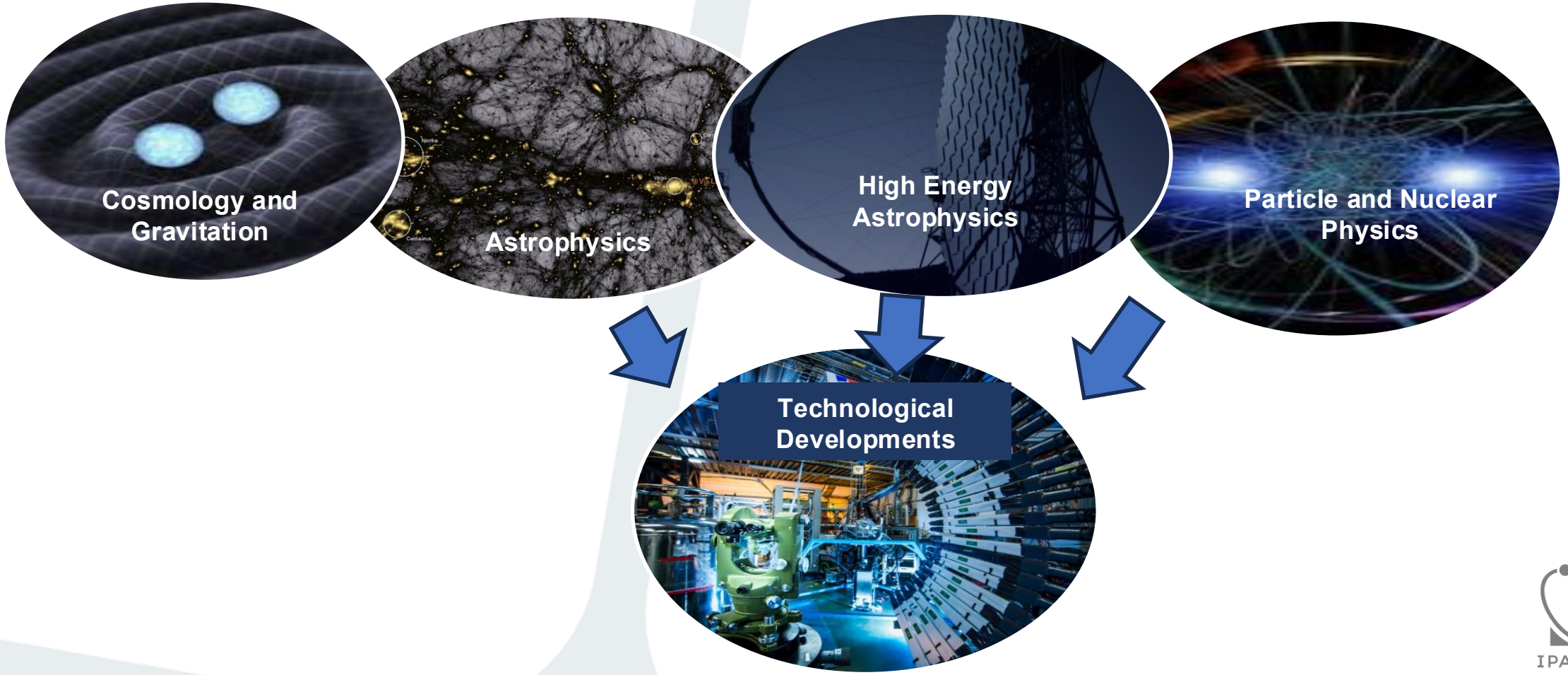

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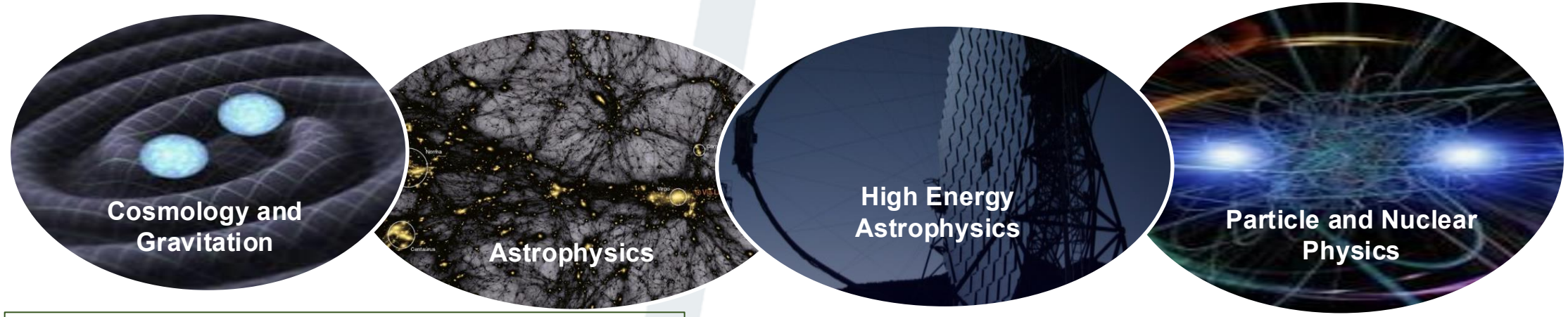


CG1: Compact Objects and Black Holes
CG2: Quantum Gravity and Quantum Cosmology
CG3: Artificial Intelligence and Holographyic Gravity
CG4: Cosmology and the dark sector

HEA1: Observational Cosmology
HEA2: Compact Objects
HEA3: Instrumentation for Cherenkok Telescopes

A1: Stellar Systems
A2: Extragalactic Astronomy
A3: Large scale structure
A4: Computational Astrophysics
A5: Cosmic Magnetic Fields
A6: Instrumentation for Teslescopes

PNP1: Hadron Physics and Quantum Chromo Dynamics (QCD)
PNP2: Hadron Interactions and Spectroscopy
PNP3: Evolution of shell structure and nuclear shapes
PNP4: Nuclear Processes in Astrophysics
PNP5: Instrumentation for Particle Physics
PNP6: Instrumentation for Medicine

BENCHMARK

IFAE Institut de Física d'Altes Energies

IAA INSTITUTO DE ASTROFÍSICA DE ANDALUCÍA

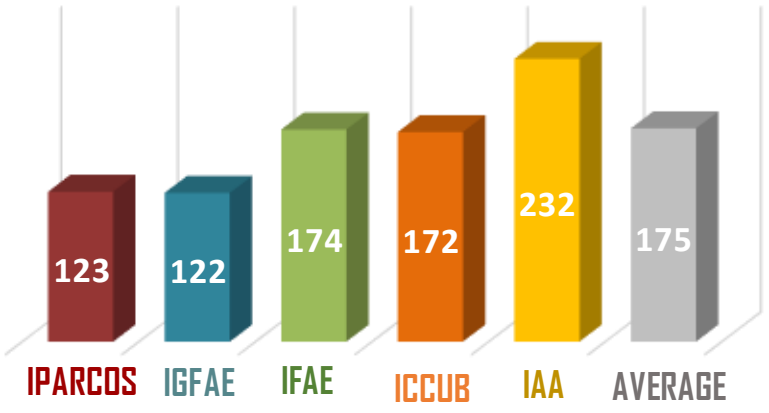
EXCELENCIA SEVERO OCHOA

IGFAE

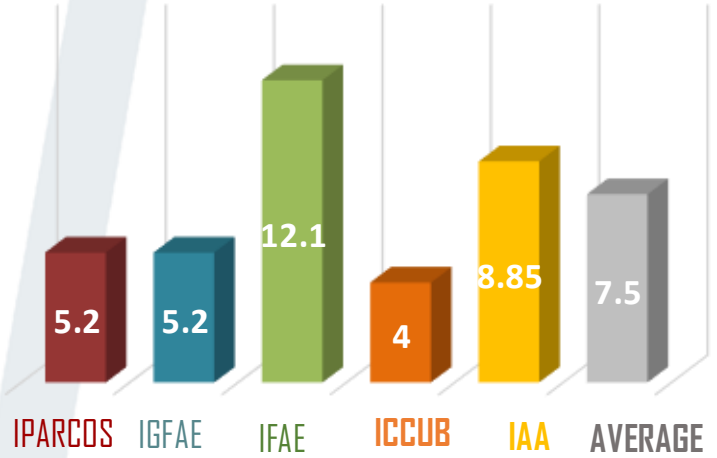
ICCUB Institut de Ciències del Cosmos UNIVERSITAT DE BARCELONA

EXCELENCIA MARÍA DE MAEZTU

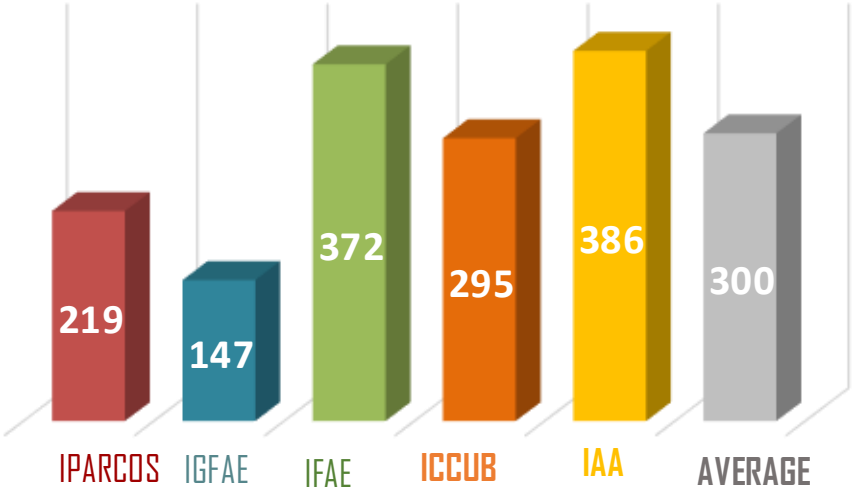
RESEARCHERS



FUNDING [M€]



PUBLICATIONS



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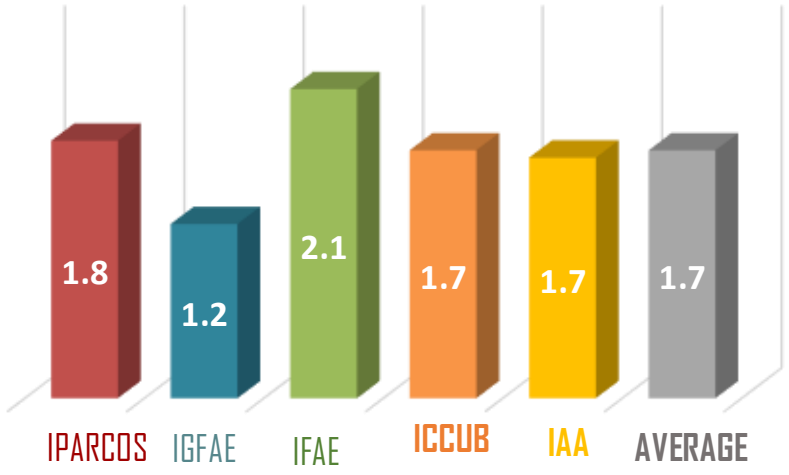
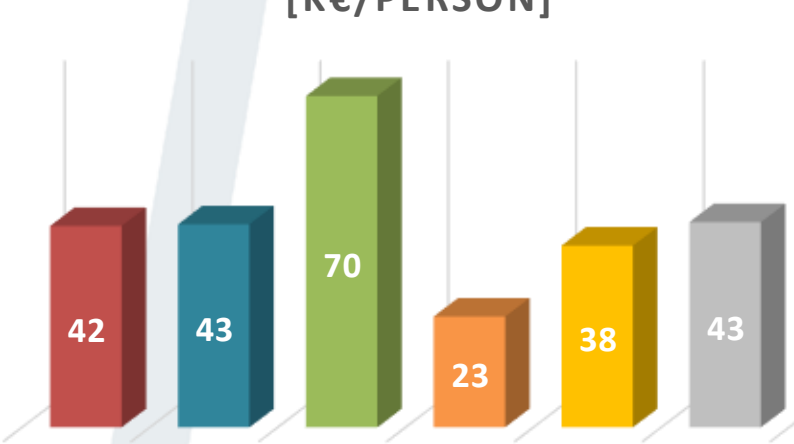
BENCHMARK

PUBLICATIONS / RESEARCHERS



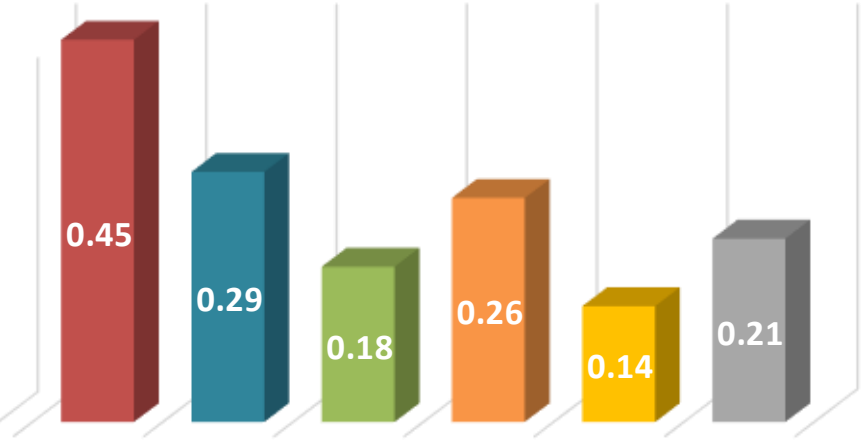
IPARCOS number of publications per researcher is above 3 of the 4 benchmark centers analysed.

FUNDING / RESEARCHERS [K€/PERSON]



The funding per researcher is above the ICCUB and the IAA, and similar to the IGFAE

THESES / RESEARCHERS



The number of PhD thesis defended by IPARCOS students is well above other centers.

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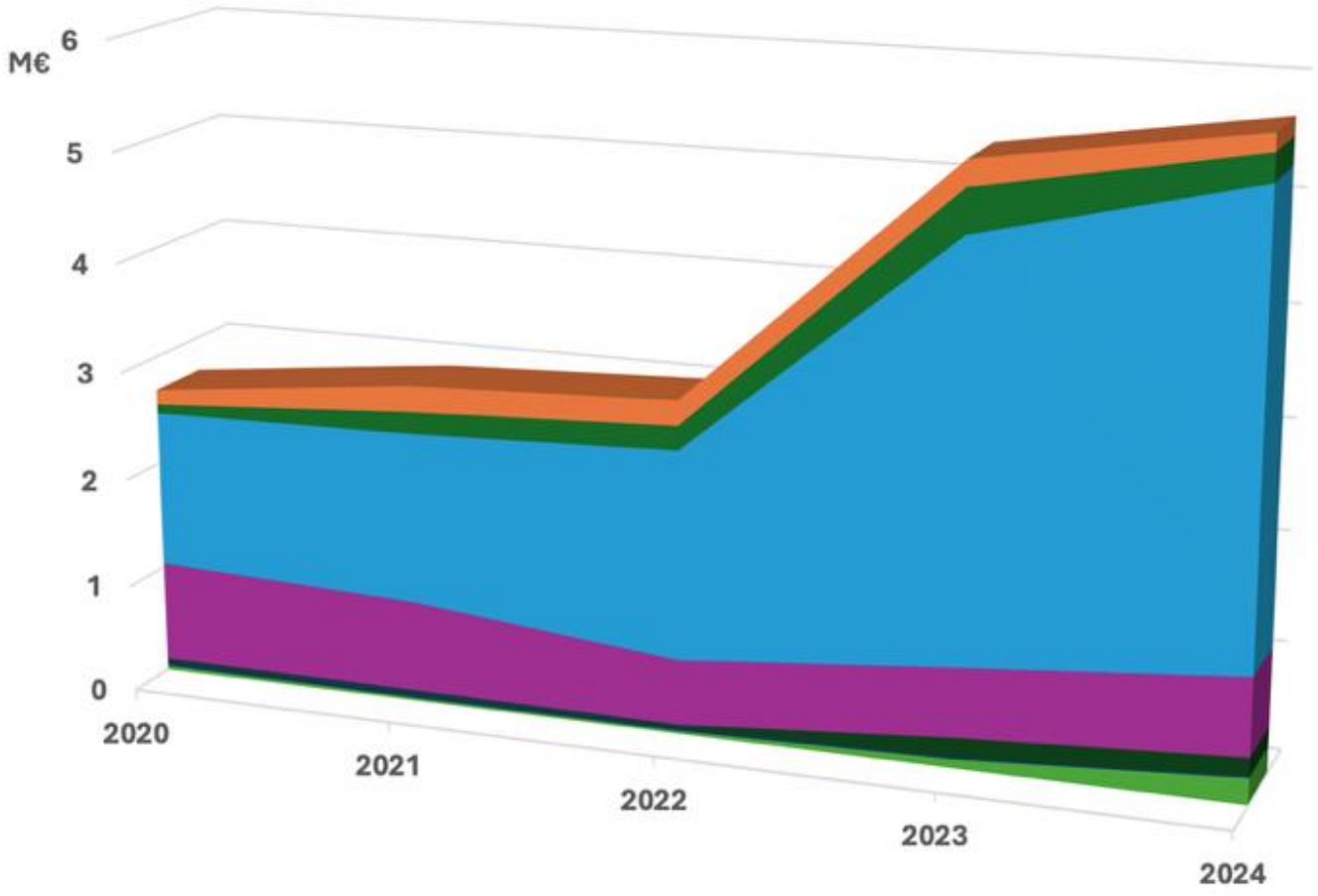
FUNDING EVOLUTION (2021-2024)



- PUB. H2020 - Horizon Europe
- PUB. International sources (competitive, excl. H2020-HE)
- PUB. National (competitive)
- PUB. Regional (competitive)
- PUB. Others
- PRIV. International (competitive)
- PRIV. National (non-comp.)
- PRIV. National (competitive)

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SWTO ANALYSIS

STRENGTHS:

- Sustained growth in publications, funding, and student training
- Advantage attracting high performing students
- Combination of theorists, experimentalists and technical experts
- Dual scientific and technical development focus in the different areas
- Existing experience in industrial transfer

WEAKNESSES:

- Limited sense of community within the Institute.
- Insufficient collaboration across research areas.
- Fragmented and inadequate physical space across groups
- Limited availability of internal funding
- High teaching and administrative workload, with limited research incentives
- Insufficient mechanisms for hiring technical and administrative personnel

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SWTO ANALYSIS

THREATS:

- Lack of clear policies by the UCM for recruitment and stabilization of talent.
- Reduction in internal funding due to the University's financial constraints

OPORTUNITIES:

- Leadership or major role in major international consortia (ICTS, ESFRI)
- Strong potential for technology transfer and industry collaboration
- Alignment with regional priorities (Particle Physics & Astrophysics)
- Recruitment of internationally recognised researchers enabling new lines and cross-area synergies

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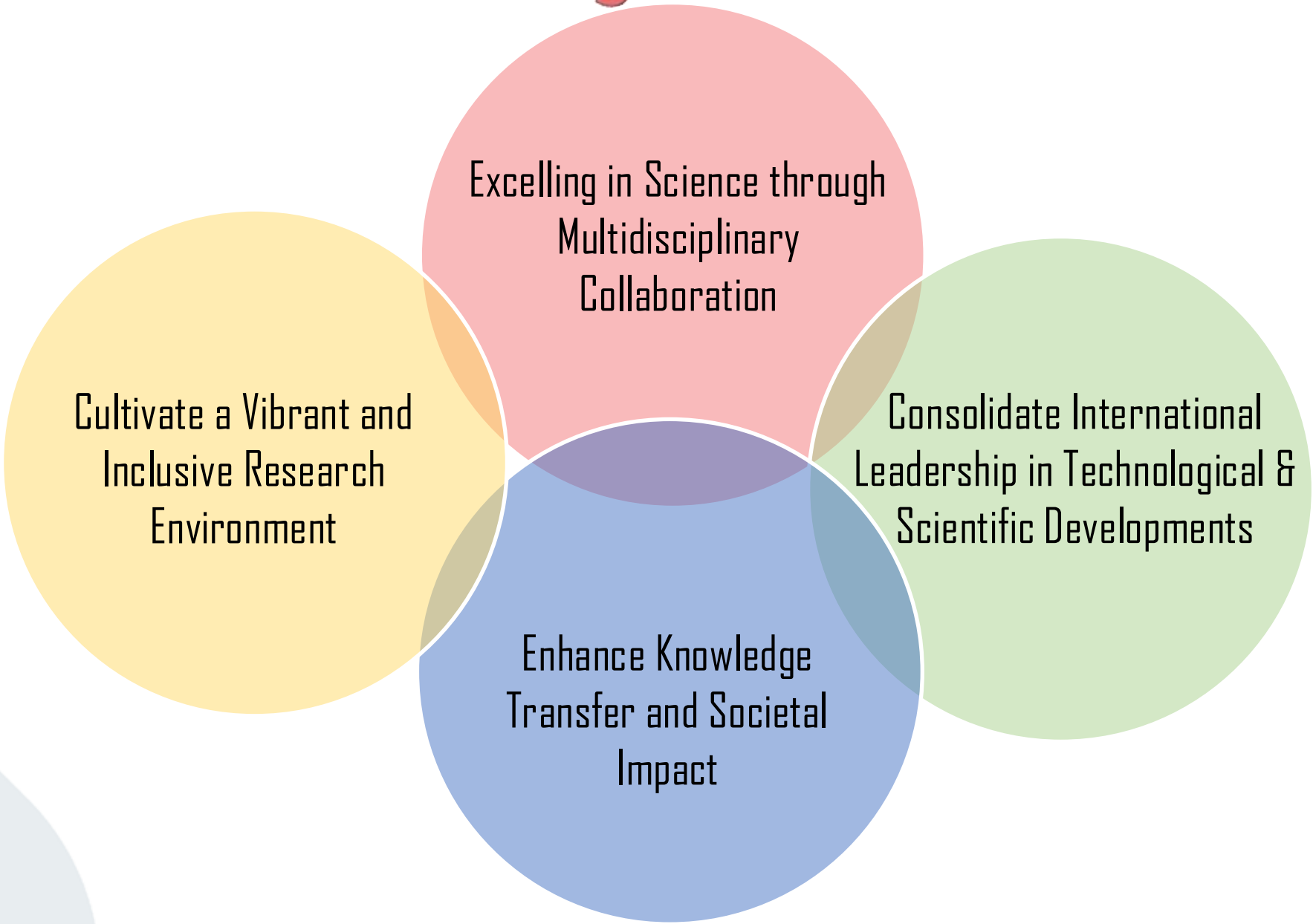
Strategic Priorities



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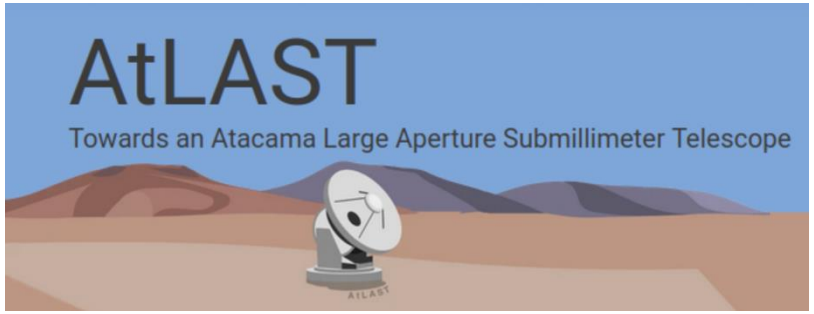
STRATEGIC Lines: Technological development for science and society

MOSAIC

ARRAKIHS



cta
cherenkov telescope array

CERN ISOLDE

TARSIS

RETIMAGER

Funded by the European Union

European Innovation Council

IPARCOS

Strategic Areas: instrumentation for science and society

Ensure the scientific explotation of the technological developments

- Ensure the effective scientific exploitation of technological developments
- Support the consolidation of IPARCOS's role and promote developments with strong knowledge transfer potential

Actions

- Investment in research personnel to fully exploit the scientific potential of infrastructures.
- Targeted investment to fill critical gaps not covered by external funding (especially administrative support)

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Strategic Areas: Cosmology and the dark section

Foster multidisciplinary approach to fundamental physical problems

- Dark matter searches predictions & observations
- Dark matter properties using magnetic fields
- Dark matter properties using large scale structrure and tidal tails
- Observational cosmology with gamma rays
- Observatonal cosmology with large-scale surveys and Arrakhis

Actions

- Recruiting trainees and postdocs to work on these multidisciplinary approaches

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Strategic Areas: Artificial Intelligence

Promote collaboration and transfer of knowledge

- CTAO trigger systems using FPGA and edge machine learning
- HISTARS fast-timing nuclear instrumentation at CERN
- To reduce the energy cost associated with astronomical data processing and reduction pipelines using cloud/edge technologies, in the context of the distributed operation of astronomical observatories such as AtLAST.
- Artificial intelligence and data mining algorithms in the fields of astrophysics and high-energy physics (both experimental and theoretical).
- AI-enhanced digital signal processing and detector technologies
- Industrial transfer opportunities in imaging and real-time analytics

ACTIONS

- Enhance hardware capabilities through infrastructure investment
- Strengthen technical support for maintenance and administration
- Establish a regular AI forum for knowledge sharing

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Strategic Actions: Support to young tenure track researchers

IPARCOS has 9 Tenure Track Advance fellows in the different areas.

Most of these young researchers are already doing research in strategic areas with strong potential for group collaborations.

Many of them play mayor roles in international projects

Actions

- Prioritize the recruitment of trainees with shared supervisors between areas.
- Promote the participation in decision-making committees and leadership positions within the institute.

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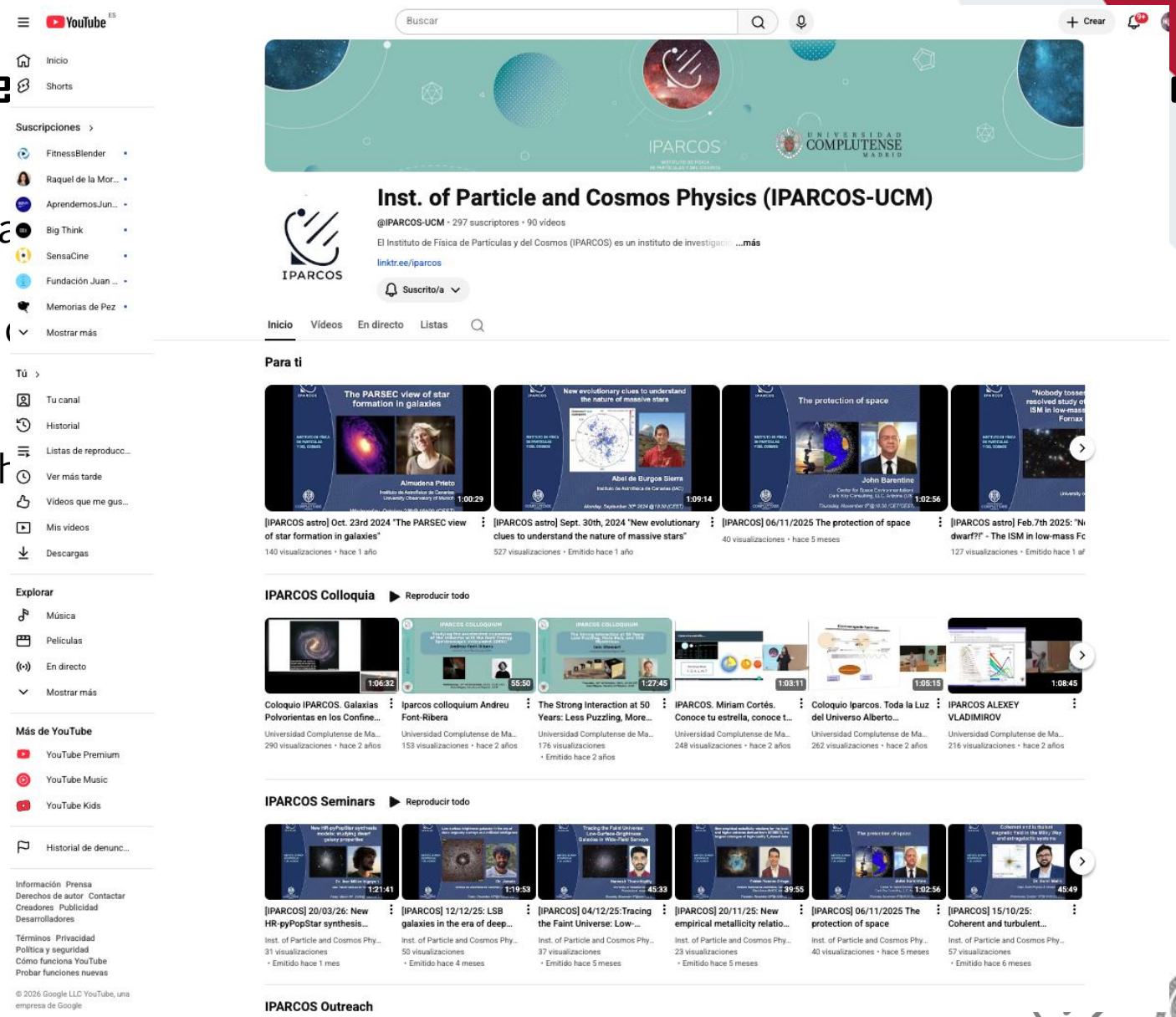
Actions to promote collaboration and ge

1. Organization of the IPARCOS Annua

2. Organization of monthly colloquia
https://www.youtube.com/@IPARCOS-UCM

3. Oganization of the Young Researcher



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Equality, Diversity, Inclusion & Well Being Action Plan

Monitoring & Evaluation
Annual collection and analysis of diversity data (gender, age, nationality, role). Progress reviewed yearly by the Equality & Diversity Committee.

Equal Recruitment & Hiring
Ensure equal opportunities in recruitment, gender-balanced selection panels, and positive action measures.

Training & Awareness
Mandatory training on equality, unconscious bias, and inclusive culture.

Work–Life Balance & Shared Responsibility
Implement flexible schedules, remote work options, and policies ensuring caregiving or parental leave does not negatively affect careers.

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Summary of Funding

Our strategic plan mainly focus in reinforcement of HR:

- 9 postocs
- 7 technicians
- 8 students

Small funding needed for

- Hardware adquisition
- Visiting program

Summary

- A strategic plan aligned with scientific excellence and societal impact
- Combines frontier science, advanced technology, and AI innovation
- Strengthens IPARCOS as a leading international multidisciplinary institute
- Positions IPARCOS at the forefront of future research infrastructures

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