

# PARTICLE ASTROPHYSICS\* IN POLAND

## Community Discussion

Leszek Roszkowski

AstroCeNT, CAMK PAN and NCBJ



PAP, aka astroparticle physics (APP)

Leszek Roszkowski, PAiP-2025, Warsaw,  
22/02/2025

# Points for discussion:

- **PAiP community**

  - meetings every other year

  - ...

- **APPEC**

- **Astrocent and new opportunities for PAiP**

- **need more action**

- **other news:**

- **AOB?**

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## ➤ APPEC

- news

- surveys of the community

- PAiP report

- EUCAPT (theorists)

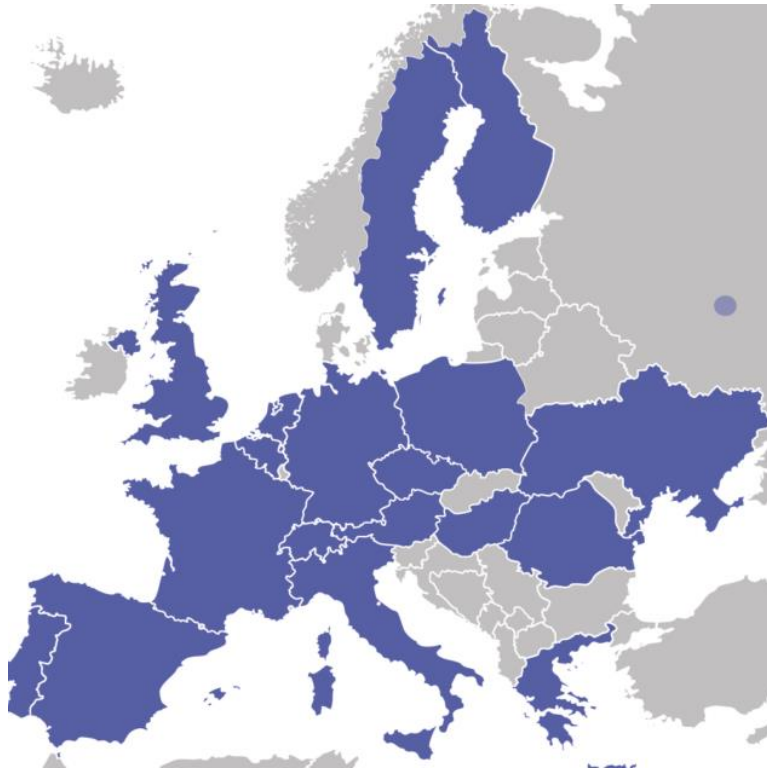
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# APPEC: Astroparticle Physics European Consortium



- cooperation and coordination
- common strategy
- 10-year roadmaps
  - next one in prep (2027-36)
- 2019: Poland rejoined
- Dec. 2024: deputy chair from Poland

- Marcin Kuźniak: member of SAC
- Masayuki Wada: replacement for LR



deputy:  
**Antoine  
Kouchner  
(France)**



chair:  
**Carlos  
Peña Garay  
(Spain)**

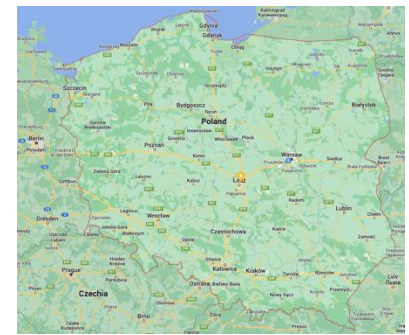


deputy:  
**Leszek  
Roszkowski  
(Poland)**

# **Community surveys and roadmaps**

# Astroparticle physics in Poland

## Survey of 2023/24



### List of institutions involved in Astro/cosmo:

- Jagiellonian University, Kraków (UJ)
- Institute of Nuclear Physics Polish Academy of Sciences, Kraków (IFJ PAN)
- Nicolaus Copernicus Astronomical Center Polish Academy of Sciences, Warszawa (CAMK PAN)
- AstroCeNT - Particle Astrophysics Science and Technology Centre (AC) (autonomous centre at CAMK PAN)
- National Centre for Nuclear Research, Otwock (NCBJ)
- Space Research Centre Polish Academy of Sciences, Warszawa (CBK PAN)
- University of Warsaw, Warszawa (UW)
- Warsaw University of Technology, Warszawa (PW)
- AGH University of Science and Technology, Kraków (AGH)
- Academic Computer Centre Cyfronet AGH, Kraków (Cyfronet)
- University of Silesia, Katowice (US)
- University of Lodz, Łódź (UŁ)
- Nicolaus Copernicus University, Toruń (UMK)
- University of Białystok, Białystok (UwB)
- University of Zielona Góra, Zielona Góra (UZ)
- Jan Kochanowski University, Kielce (JKU)

# APP in Poland – main activities

## “Core” and related to APP:

- **Gravitational waves**
- **Dark matter**
- **Neutrinos**
- **Cosmic rays**
- **Gamma ray astronomy**
- **X-rays**
- **CMB**
- **Dark energy**
- **Observational cosmology**
- **0nu2beta**
- **APP theory**

## Plus, other related:

- **astronomy**
- **astrophysics**
- **collider and non-collider physics**
- **...**

# APP in Poland – main activities

## Core APP:

### Gravitational waves

- LIGO-Virgo-Kagra: large consortium: AO UW, NCBJ, IM PAN, CAMK, AC
- Einstein Telescope: AO UW, CAMK, AC
- LISA: AO UW
- TORES: NCBJ
- WERA: UJ

Polgraw Consortium

### Dark matter

- DarkSide: AC, UJ
  - DEAP-3600: AC
- Major growth since 2019, when Astrocent started.

### Neutrinos

- Hyper-Kamiokande: large consortium of 9 institutions:  
NCBJ, U Silesia, IFJ, WUT, UW, Uwr, AGH, UJ, CAMK, AC  
(Super-Kamiokande)
- KM3Net: NCBJ, UJ, AC (observer), since 2020
- GRAND: UW
- ~~Lake Baikal~~: IFJ PAN – terminated 2022
- PONE: IFJ PAN
- T2K: NCBJ
- Borexino
- DUNE
- Neutrino Platform@CERN



## Cosmic rays

- Pierre Auger: IFJ
- CREDO: IFJ
- JEM-EUSO: NCBJ
- GRAND: UW

## Gamma ray astronomy

- CTA: Polish CTA Consortium of 13: UJ, NCBJ, ...
- SST-1M: Polish CTA Consortium (currently active: UJ, IFJ, CAMK, AGH, UW, UwB, CBK)
- H.E.S.S.: 5 institutions: CAMK, UJ, IFJ, UW, UMK
- POLAR-2: NCBJ, IFJ
- MAGIC: UŁ
- HAWC: IFJ

## ➤ X-rays

- Athena: CAMK

**POLAR-2 - gamma-ray spectrometer to be launched on the Chinese space station (Tiangong-2 Space Lab)**

## **CMB**

- PLANCK: NCBJ
- (LiteBird: AO UW)

## **Dark energy/observational cosmology**

- Vera Rubin Observatory (LSST): NCBJ, UW, UW<sub>r</sub>, UJ, UMK, CAMK, CFT
- VIPERS: NCBJ, UJ, JKU

VIPERS: VIMOS Public Extragalactic Redshift Survey

## **Onu2beta**

- LEGEND: UJ
- GERDA: UJ

## **APP theory**

diverse range of activities and interests by many groups:

- dark matter: AC, NCBJ, UW, ...
- GWs: NCBJ, UW, CAMK, ...
- Neutrinos: UW, UW<sub>r</sub>, NCBJ, ...
- Early Universe: UW, AC, NCBJ, ...
- New physics: UW, AC, NCBJ,

# Update of the survey & report

- **as part of preparations for APPEC's next roadmap, prepare our community survey and report**
- **report: some 10 pages, to prepare over the next 6 months**

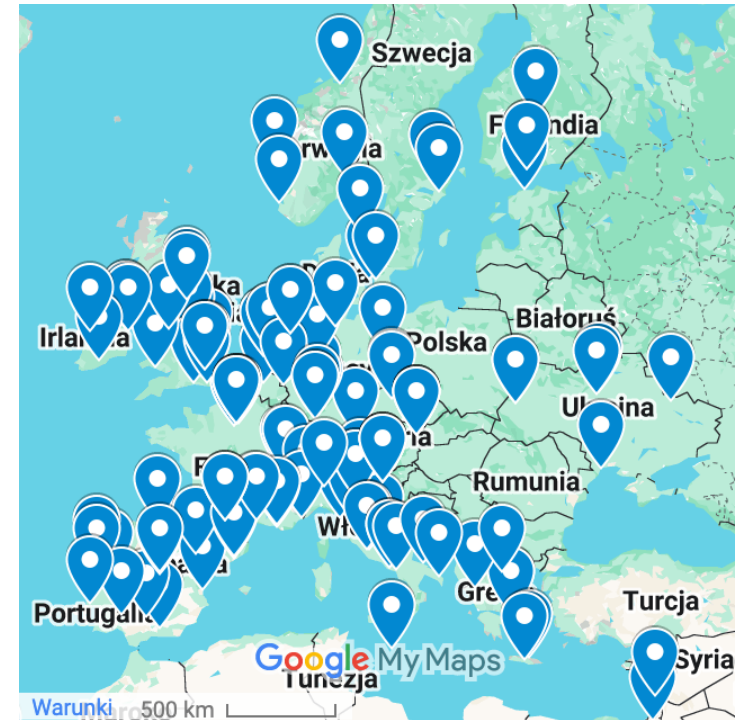
# EUCAPT: The European Consortium for Astroparticle Theory

<https://www.eucapt.org/>

(EuCAPT) aims to bring together the European community of theoretical astroparticle physicists and cosmologists.

Our goals are:

- *to increase the exchange of ideas and knowledge;*
- *to coordinate scientific and training activities;*
- *to help scientists attract adequate resources for their projects;*
- *to promote a stimulating, fair and open environment in which young scientists can thrive.*



- next deadline to apply to join: May 2025  
<https://www.eucapt.org/joining>
- institutions with more than 20 active members  
(or groups of institutions with more than 20 members in total)

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# Teaming for Excellence project Astrocent Plus

## prime objective: transform ASTROCENT into a new interdisciplinary institute

**1 January 2025 – 31 December 2030, 15 MEuro (EC) + 15 MEuro (co-funding: Ministry + FNP)**

<u>Consortium Members:</u>	Country
Nicolaus Copernicus Astronomical Centre Polish Academy of Sciences (NCAC) – initial coordinator	Poland
Łukasiewicz Center (LC)	Poland
Centre National De La Recherche Scientifique (CNRS)	France
Universite Paris Cite (UPC) -- <i>Affiliated Partner</i>	France
Gran Sasso Science Institute (GSSI)	Italy
Deutsches Elektronen-Synchrotron Desy (DESY)	Germany
Arthur B. McDonald Canadian Astroparticle Physics Research Institute (MI) -- <i>Associated Partner</i>	Canada

# Astrocent Plus and the PAiP community

- **Objective 5: Young researcher education and training**
  - grow new generations of professionals, train juniors and seniors
  
- **Objective 6: Raising interest in APP and ensuing benefits**
  - communication and outreach: educate the general public and target groups

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## ➤ other news:

- community email list (under construction): [paiplist@gmail.com](mailto:paiplist@gmail.com)
- webpage?
- Initiative to build in Poland underground laboratory

## ➤ AOB?

**Thank you**



## Points for discussion:

### ➤ PAiP community meetings



"Particle Astrophysics in Poland 2023" is the 5<sup>th</sup> edition of a gathering of the researchers from various institutes and research facilities in Poland, working on a broad interdisciplinary field encompassing theoretical and observational cosmology, dark matter studies, neutrino astrophysics, as well as multi-messenger astronomy including gravitational waves, cosmic rays, and high-energy astrophysics. The main goal of the meeting is to provide a comprehensive update on the recent progress in the field, and to facilitate fruitful discussions and exchange of views between participants.

### ➤ Big thanks to Łukasz Stawarz and the whole LOC!

### ➤ Keep biennial frequency? Or make it annual?

### ➤ Next meeting?

- 2025? Which quarter of the year?
- Or Autumn/Winter 2024?

### ➤ Where? Warsaw? Any volunteers?

### ➤ Who are we in PAP community?

- **Interdisciplinary:** from particle physics to astronomy, (classical) astrophysics, cosmology, nuclear physics, geophysics, ...
- **Multimessenger:** explore the Universe through as many windows as one can

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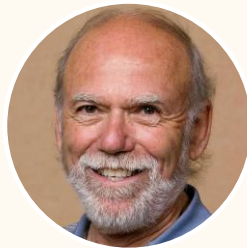
## **APPEC General Assembly to visit Poland in late June**

- **Prepare report on our community, activities, plans**
  - **Working group:**
    - **Łukasz Stawarz**
    - **Jacek Niemiec**
    - **Ewa Rondio**
    - **Dorota Rosińska**
    - **Krzysztof Turzyński**
    - **Leszek Roszkowski**
  - **Will be contacting you and collecting info**
  - **Report to be ready by the end of May**



# EXPLORING THE HIDDEN UNIVERSE

PUBLIC TALKS BY NOBEL LAUREATES IN PHYSICS



**Prof. Barry C. Barish**  
University of California at Riverside, USA  
**Nobel Prize 2017**



**Prof. Arthur B. McDonald**  
Queen's University, Kingston, Canada  
**Nobel Prize 2015**

**22nd of February, 2023 | 13:00-15:00**  
**Rektorska 4, CZIiTT**  
**Warsaw**

**Organised by AstroCeNT**  
**Nicolaus Copernicus Astronomical Centre**  
**of the Polish Academy of Sciences**



THE NUMBER OF  
PLACES IS LIMITED.  
PLEASE REGISTER BY  
**21.02.2023**  
[events.camk.edu.pl/event/65/](https://events.camk.edu.pl/event/65/)

**PARTNERS:**

- NATIONAL CENTRE FOR NUCLEAR RESEARCH
- POLISH ASTRONOMICAL SOCIETY
- POLISH PHYSICAL SOCIETY
- UNIVERSITY OF WARSAW
- WARSAW UNIVERSITY OF TECHNOLOGY

**HONORARY PATRONAGE:**

- NATIONAL CENTRE FOR RESEARCH AND DEVELOPMENT



Leszek Roszkowski, PAiP-2025, Warsaw,  
22/02/2025