

Overview of theoretical research in Poland in astrophysics and cosmology

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Theoretical research areas

1. Astrophysics:
 - the Sun and the Solar System
 - stars and galaxies
 - “exotica” (pulsars, quasars, gamma ray bursts, neutron stars, black holes...)
 - astroparticles - cosmic rays, neutrinos, X and γ backgrounds, gravitational waves...

2. Cosmology:

- CMB - theory of perturbations, primordial fluctuations, cosmological parameters, correlations with large structures...
- history of the Universe - very early Universe (quantum gravity, inflation), phase transitions, baryon and leptogenesis, nucleosynthesis, decoupling, recombination, growth of structures...
- dark matter and dark energy – supersymmetry and supergravity, cosmological constant...
- other theoretical models...

Centers + people + research areas

Distinction between experimental and theoretical research often more difficult than in HEP – hence possible double-counting of researchers...

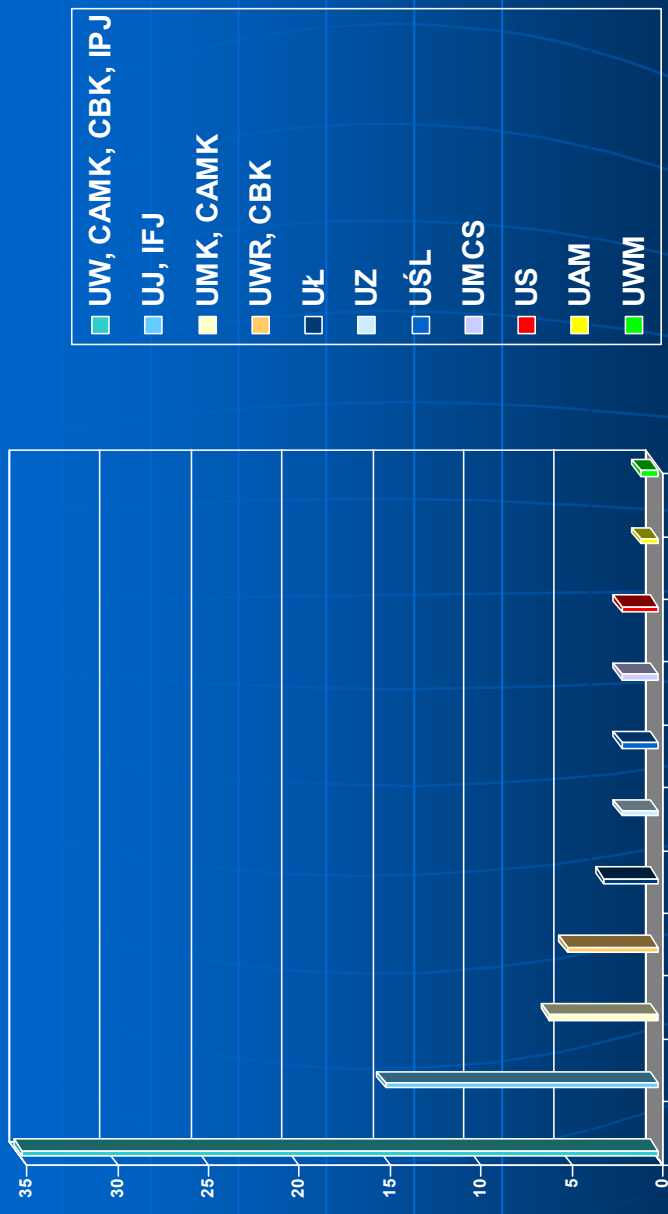
- Warszawa (UW, CAMK, CBK, IPJ, PW) 34
the Sun and the Solar System, stars and galaxies, “exotica”, astroparticles, CMB, very early Universe, dark matter and dark energy, other models
- Kraków (UJ, IFJ) 17
the Sun and the Solar System, stars and galaxies, “exotica”, astroparticles, very early Universe, dark matter and dark energy, other models
- Wrocław (UWr, CBK) 4
Sun, Solar System, astroparticles, other models
- Zielona Góra (UZ) 4
CMB, “exotica”

- **Katowice (UŚI) 4**
dark matter and dark energy
- **Szczecin (US) 4**
dark energy
- **Toruń (CAMK) 2**
Sun and the Solar System, stars and galaxies
- **Łódź (UŁ, IPJ) 2**
neutrinos and cosmic rays
- **Lublin (UMCS) 2**
dark matter
- **Olsztyn (UWM) 2**
dark energy
- **Płock (PW) 2**
astroparticles

- **Poznań (UAM) 1**
neutron stars
- **Białystok (UwB) 1**
neutron stars
- **Kielce (AŚ) 1**
neutron stars
- **Opole (UO) 1**
stars and galaxies

Theoretical Astro-Particle Physics in Poland

RESEARCHERS
IN EACH CENTER



RESEARCH CENTERS

- UW, CAMK, CBK, IPJ
- UJ, IFJ
- UMK, CAMK
- UWR, CBK
- UŁ
- UZ
- UŚL
- UMCS
- US
- UAM
- UWM

Kraków

- Astrophysics Center UJ
 - magnetohydrodynamics of galaxies
 - gamma rays,
 - accretion and critical phenomena in gravitational collapse,
 - gravitational waves in cosmological backgrounds,
- Institute of Nuclear Physics IFJ
 - Gamma-ray Astrophysics Group (with OA UJ and CAMK Warsaw)
 - neutrinos, cosmic rays

Warszawa

- Copernicus Astronomical Center (CAMK)
 - star formation and evolution,
 - neutron stars and black holes,
 - CMB,
 - Gamma-Ray Astrophysics Group,
- Space Research Center (CBK) – Sun, Solar System
- Institute for Nuclear Studies (IPJ) – astroparticles
- Warsaw University (UW)
 - magnetohydrodynamic activity of stars
(OA)

Dept. of Physics

- dark matter – supersymmetry and supergravity
- neutrino physics
- inflation and cosmological solutions
- classical and quantum gravity

Summary of the theoretical research in Poland

- 45 researchers in astrophysics,
- 36 in cosmology
- \sim 200 theoretical papers per year (in)directly related to astrophysics and/or cosmology