

International conference “Physics of neutron stars – 2017. 50 years after”

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The conference

This was the 11th gathering on neutron star physics in Saint Petersburg since 1988. The 2017 Conference was organized by the Theoretical Astrophysics Department of the Ioffe Institute and the Relativistic Astrophysics Department of the Sternberg Astronomical Institute. It commemorated the semicentenary of the discovery of pulsars.

During these 50 years, the field of astrophysics of neutron stars has become a broad field covering all ranges of physical scales, from microscales characteristic of strong interactions to macroscales of neutron star sizes strongly affected by General Relativity. All branches of contemporary physics are involved in the research of astrophysical phenomena related to neutron stars, and observations throughout the entire range of electromagnetic spectra have been used to constrain fundamental physical theories. Towards the end of the 20th century, electromagnetic observations were joined by direct neutrino detections from a newly born neutron star (Supernova 1987a) and, between the end of the Conference and the publication of this volume, a long-awaited gravitational wave signal from a binary neutron star merger was detected for the first time, thus promoting neutron stars to the first class of astrophysical sources observed in the electromagnetic band, neutrinos, and gravitational waves. With many more detections of binary neutron star mergers to come, the next decade of the neutron star research is expected to be developing under great influence of the gravitational wave astronomy. In addition, the launch of telescopes of the next generation (proposed, planned and already operating) will shed light on many of the current mysteries, but surely it will also unveil new ones, making the near future even more stimulating than the previous five decades.

In this conference, 130 participants from 24 countries presented their contributions on various topics related to observations and theory of neutron stars. These included, among others, observations of neutron stars as radio pulsars or high energy emitters, studies of pulsar wind nebulae, supernovae and supernova remnants, theory of pulsar magnetospheres, the neutron star equation of state, structure and evolution of neutron stars, or gravitational wave emission from neutron stars and black holes. Many manifestations of neutron stars were discussed: magnetars and high magnetic field pulsars, central compact objects in supernova remnants, accreting X-ray pulsars (including millisecond pulsars), neutron stars in low-mass X-ray binaries, X-ray bursters, and more. A significant part of the Conference contributions resulted in 54 proceedings papers collected in this volume. We hope that the volume will bring pleasant memories to the participants and become a useful reference for many astrophysicists and physicists who would like to learn the current state-of-the-art in the field.



Acknowledgments

We thank all the participants for the wonderful atmosphere during the Conference. We are especially grateful to those who prepared high-quality publications. We are deeply indebted to the 48 referees who thoroughly reviewed all the contributions collected in this volume. We also thank all the SOC members for their expert scientific advice which allowed the organizers to configure the fruitful scientific programme of the Conference, and all the LOC members for fulfilling their numerous organization duties. We particularly wish to thank Dick Manchester for giving the after-dinner talk that drove the audience through the 50 years of the pulsar investigations. We thank the official conference operator INNO-MIR (www.inno-mir.com) and personally I E Zemlyanskaya and E A Lifshits for handling the financial part of the event. We acknowledge the financial support of the Russian Foundation for Basic Research under project # 17-02-20307, Saint Petersburg Polytechnic University and the Government of Saint Petersburg.

Organizing committees

SOC

- V S Beskin *Lebedev Physical Institute, Moscow, Russia*
- C O Heinke *University of Alberta, Edmonton, Canada*
- M R Gilfanov *MPI, Germany; IKI, Moscow, Russia*
- V M Kaspi *McGill University, Montreal, Canada*
- D R Lorimer *West Virginia University, Morgantown, USA*
- S Mereghetti *INAF IASF, Milan, Italy*
- G G Pavlov *Pennsylvania State University, USA, co-chair*
- J A Pons *University of Alicante, Spain*
- S B Popov *Sternberg Astronomical Institute, Moscow, Russia*
- J Poutanen *University of Turku, Finland*
- N Rea *University of Amsterdam, the Netherlands*
- R W Romani *Stanford University, USA*
- M van der Klis *University of Amsterdam, the Netherlands*
- D G Yakovlev *Ioffe Institute, Saint Petersburg, Russia, co-chair*

LOC

- R L Aptekar *Ioffe Institute*
- D A Baiko *Ioffe Institute*
- S A Balashev *Ioffe Institute*
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- Yu A Shibanov *Ioffe Institute*
- P S Shternin *Ioffe Institute, co-chair*
- Yu A Uvarov *Ioffe Institute*
- D A Varshalovich *Ioffe Institute*
- I E Zemlyanskaya *INNO-MIR*
- D A Zyuzin *Ioffe Institute*

Invited speakers

- **Andrea De Luca** (*INAF, Italy*)
Central compact objects in supernova remnants and the slow magnetar in RCW 103
- **Pawel Haensel** (*CAMK, Poland*)
Equation of state of neutron stars: Recent developments
- **Jason Hessels** (*Anton Pannekoek Institute for Astronomy, the Netherlands*)
Fast Radio Bursts
- **Oleg Kargaltsev** (*The George Washington University, USA*)
Observations of pulsar-wind nebulae in X-rays and other wavelengths: outstanding questions
- **Martin Obergaulinger** (*Universidad de Valencia, Spain*)
Magnetic field amplification during core collapse
- **Alessandro Patruno** (*Leiden Observatory, the Netherlands*)
Observations of accreting millisecond X-ray pulsars
- **Alexander Philippov** (*Princeton University, USA*)
How do pulsars shine?
- **Juri Poutanen** (*Tuorla Observatory, Finland*)
Ultraluminous X-ray pulsars
- **Samar Safi-Harb** (*University of Manitoba, Canada*)
Observational diversity and evolution of neutron stars
- **Patrick Slane** (*Harvard-Smithsonian Center for Astrophysics, USA*)
The neutron star – supernova remnant connection
- **Roberto Turolla** (*Department of Physics and Astronomy, University of Padova, Italy*)
Polarization of neutron star emission and future X-ray missions

Conference photo



Figure 1. Photo taken by M Beznogov on July 13, 2017 in front of the Academic University