Yuri N. Gnedin

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Astrophysics, black holes, neutron stars. dark matter, polarimetric observations

Basic Information

Name: Yuri N. Gnedin
(Aug 1935–Mar 2018)

Birth Location:	Tula, Russia
Title:	Professor Doctor
Affiliation:	Pulkovo Observatory of the Russian Academy of Sciences
Honors:	Academician of the Russian Academy of Natural Sciences In his honor, the small planet N 5084 was named "Gnedin".

1. Introduction

Prof. Dr. Yuri N. Gnedin was an outstanding astrophysicist whose scientific interests and expertise were extraordinarily wide. He was an expert in theoretical investigation of the polarized radiation transfer, generation of high-energy radiation in close binary star systems and galactic nuclei, and cyclotron lines in spectra of accreting neutron stars. Prof. Dr. Yuri N. Gnedin developed the pioneer method for determination of magnetic fields of cosmic sources from polarimetric observations, contributed a lot to physics of intermediate-mass and supermassive black holes, neutron stars and magnetic white dwarfs, supernovae, exoplanets and dark satellites of stars, cosmic gamma-ray bursts, dark matter and dark energy.

Yuri Gnedin was born on August 13, 1935 in the Russian city of Tula. After graduation in 1959 from the Physico-Mechanical Department of Leningrad Polytechnic Institute (presently Peter the Great Saint Petersburg Polytechnic University), he was employed by the famous A. F. Ioffe Physico-Technical Institute of the Russian Academy of Sciences where he worked during 25 years in the field of theoretical physics and astrophysics. In 1966 Yu. N. Gnedin obtained his PhD and in 1979, after defending the Doctorate dissertation entitled "Propagation of polarized radiation in cosmic conditions", obtained the degree of Doctor of Physical and Mathematical Sciences (which is the

second scientific degree in Russia similar to Habilitation in Germany which is significantly higher than PhD). In parallel with the research activity at A. F. Ioffe Physico-Technical Institute, Yu. N. Gnedin delivered lectures in astrophysics for students of Leningrad Polytechnic Institute. In 1981 he obtained the academic status of Full Professor. In 2003 he became the Academician of the Russian Academy of Natural Sciences.

2. Notable Contributions

In 1984 Prof. Dr. Yu. Gnedin was invited to create the Department of Astrophysics and to lead the research work in Central Astronomical Observatory at Pulkovo of the Russian Academy of Sciences in the positions of the Head of Department and the Deputy Director of the Observatory on Science. It should be noted that Pulkovo Observatory was created in 1839. It is one of the oldest Institutions in Russia intended especially for research. It is famous all over the world by many outstanding results in the field of observational astronomy. However, in the end of 20th century, due to the great discoveries made in astrophysics and cosmology, astronomy already could not be further developed basing mostly on the methods of mathematics as it was before.

Because of this, the mission suggested to Prof. Gnedin was extremely complicated. He ought to enter the old and well established Institution, to create the new Department consisting of researchers with quite different background in physics and astrophysics, to organize the research activity in new scientific directions, and to convince everybody that the observational astronomy and astrophysics are not the hostile competitors but useful complements in obtaining new knowledge about our Universe. In order to cope with this task, one must be not only a brilliant scientist, but also an outstanding organizer. Prof. Dr. Yu. N. Gnedin accepted the offer and successfully solved all scientific and organizational problems during more than 30 years.

Now we briefly mention the research fields where important contributions by Prof. Dr. Yu. N. Gnedin are well known and recognized by the scientific community (in Fig. 1 he is working in his office at Pulkovo Observatory). The development of modern astrophysics is inextricably linked with his pioneering work on the theory of polarized radiation transfer and investigation of generation of high-energy radiation in close binary systems and active galactic nuclei. He made a lot in X-rays and gamma-rays astronomy, physics of neutron stars and black holes. Specifically, Prof. Yu. N. Gnedin elaborated new method for investigation of supermassive black holes based on polarimetric observations of active galactic nuclei. In collaboration with Prof. R. A. Sunyaev, Prof. Yu. N. Gnedin predicted the existence of cyclotron lines in the spectrum of X-ray radiation of accreting neutron stars. Using this discovery, he developed the fundamentally new method for measuring magnetic fields of neutron stars. Furthermore, Prof. Yu. N. Gnedin developed the novel method for measuring magnetic fields of hot stars. This method is based on the phenomenon of Faraday rotation of the polarization plane of electromagnetic radiation scattered in their atmospheres. Prof. Yu. N. Gnedin initiated important investigations of several unusual cosmic phenomena using RT-32 radio telescope of the Institute of Applied Astronomy of the Russian Academy of Sciences. These include cosmic gamma-ray bursts, compact astrophysical objects, and active galactic nuclei. Together with Prof. G. G. Pavlov, he calculated quantum electrodynamic effects of vacuum polarization in the fields of neutron stars and magnetic white dwarfs. In recent years Prof. Yu. N. Gnedin predicted and calculated polarimetric effects associated with axions and arions as hypothetical constituents of dark matter. It turned out

possible to constrain the parameters of axions and arions by measuring these effects in different astrophysical processes. Prof. Yu. N. Gnedin is the author of 340 scientific papers and 4 monographs [1][2][3][4].

The activity of Prof. Yu. N. Gnedin as an outstanding organizer of science extended far beyond the Pulkovo Observatory. He took part in many International research projects, was the member of International Astronomical Union, headed the Program Committee of the 6-meter telescope of Special Astrophysical Observatory of the Russian Academy of Sciences, was the member of Bureau of the Scientific Council on Astronomy of the Russian Academy of Sciences. Prof. Yu. N. Gnedin was one of the main organizers and active participant of Alexander Friedmann International Seminars on Gravitation and Cosmology during the years 1993-2016. In his honor, the small planet N 5084 was named "Gnedin".

3. Implications for Sciences, Humanities

Prof. Yu. N. Gnedin was a talented teacher whose lectures always created great interest among students. During several decades he elaborated and delivered the original lecture courses on modern problems of astrophysics, relativistic astrophysics, radiation processes in astrophysics, and general relativity theory for students of the Peter the Great Saint Petersburg Polytechnic University, was the supervisor for a lot of master and 16 PhD theses.

Prof. Dr. Yu. N. Gnedin passed away on March 28, 2018 in Saint Petersburg.

Further Reading

1. Advances in the Physics of Stars - in Memory of Prof. Yuri N. Gnedin, Editors Nazar R. Ikhsanov, Galina. L. Klimchitskaya, Vladimir M. Mostepanenko, ISBN 978-3-0365-4074-0 (Hbk) ISBN 978-3-0365-4073-3 (PDF) https://doi.org/10.3390/books978-3-0365-4073-3, Pages: 222, Published: May, 2022, MDPI, Basel. 2. Special issue Advances in the Physics of Stars - in Memory of Prof. Yuri N. Gnedin, Guest Editors Nazar R. Ikhsanov, Galina L Klimchitskaya, Vladimir M. Mostepanenko, Universe, https://www.mdpi.com/journal/universe/special_issues/star_memory

References

1. Долгинов, А.З.; Гнедин, Ю.Н.; Силантьев, Н.А. Распространение и поляризация излучения в космической среде; Наука: Москва, СССР, 1979 (in Russian).
2. Dolginov, A.Z.; Gnedin, Yu.N.; Silant'ev, N.A. Propagation and Polarization of Radiation in Cosmic Media; Gordon and Breach: Williston, ND, USA, 1995 (completely revised and updated version of the original Russian edition).

3. Gnedin, Yu.N.; Silant’ev, N.A. Basic Mechanisms of Light Polarization in Cosmic Media; Taylor & Francis: Cleveland, OH, USA, 1997.
4. Gnedin, Yu.N.; Natsvlishvili, T.M. Magnetic Fields of Stars: The Interaction Between Observations and Theory; Harwood Academic Publishers: Reading, UK, 2000.