

Marat Ravil'evich Gil'fanov (on his 60th birthday)

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July 18, 2022 was the 60th birthday of the well-known astrophysicist and academician of the Russian Academy of Sciences (RAS), Professor Marat Ravil'evich Gil'fanov.

M R Gil'fanov was born in the city of Kazan' into a family of engineers—a laureate of the USSR State Prize, Ravil' Suleimanovich Gil'fanov, and Farida Khabibovna Gil'fanova. In 1979, he graduated from the Kazan' physico-mathematical school no. 131 with a gold medal and entered the Moscow Institute of Physics and Technology (MIPT). Together with his parents' influence, a great role in the formation of Gil'fanov's interests and his decision to enter Fiztekh (MIPT) was played by his mathematics teacher, Tamara Ivanovna Sharonova. In 1985, he graduated from the Department of Problems of Physics and Energetics (DPPE) at MIPT and defended his candidate (1989) and then doctoral (1996) theses.

In 1983, on the advice of Professor V I Shevchenko, who was then teaching plasma physics in the DPPE section of Cosmic Physics, Gil'fanov, then a fourth-year student at Fiztekh, came to the Department of Theoretical Astrophysics at the Space Research Institute (SRI) of RAS (better known as IKI RAN). After the interview and exam, R A Sunyaev agreed to become his research supervisor. Soon after this, the Department of Theoretical Astrophysics, founded by Ya B Zel'dovich and headed by R A Sunyaev, was renamed the Department of High-Energy Astrophysics and began working actively in the field of X-ray astronomy.

The scientific biography of Gil'fanov is inseparably linked with SRI and with the Department of High-Energy Astrophysics. The main projects of the department were then the Rentgen observatory on the Kvant module on the space station Mir and the international gamma-ray observatory GRANAT. The scientific data obtained by the X-ray telescopes of these observatories were processed and analyzed at the department, and M R Gil'fanov took an active part in this work. Together with E M Churazov, he developed the software for analyzing the data of coded mask telescopes TTM aboard the Kvant module and SIGMA aboard the GRANAT observatory. They obtained unique data on the X-ray spectrum of supernova 1987A in the Large Magellanic Cloud (LMC), built maps of the LMC and the Galactic Center and Ridge in the standard and hard X-ray bands, and discovered one of the most rapidly rotating (524 Hz) neutron stars—a Kvant source, KS1731-26—and the accreting black hole in the Galactic Center region—a GRANAT source, GRS1758-258—which turned out to be one of the first microquasars discovered in our Galaxy.

M R Gil'fanov made a remarkable journey from theoretical astrophysicist, MIPT graduate specializing in the theory



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of accretion into black holes and neutron stars and the physics of intergalactic gas in clusters of galaxies, to well-known expert in X-ray astrophysics and the analysis and interpretation of data of cosmic experiments. His theoretical predictions are widely used to interpret observations from the orbital X-ray observatories XMM-Newton (European Space Agency) and Chandra (NASA). His work on observational manifestations of accretion into neutron stars and black holes, physical processes in the vicinity of compact objects, analyses of their variability at kilohertz to nanohertz frequencies, and diagnostics of the boundary layer near a neutron star surface is widely recognized.

Using the data from the Chandra and XMM-Newton observatories, Gil'fanov was the first to construct the luminosity functions of X-ray sources in external galaxies and demonstrate their universality. He also showed that these functions are different in spiral and elliptic galaxies. He pioneered obtaining scaling relations for X-ray luminosity of star-forming galaxies. Using the Chandra data, he showed that the Supernovae Ia in elliptic galaxies cannot result from accretion of matter onto white dwarfs in binary systems and that the explosions, so important now for measuring cosmological distances, are likely due to the mergers of white dwarfs in close binary systems. Gil'fanov is one of

the pioneers of studying fluctuations of cosmic X-ray background for the purpose of cosmology.

M R Gil'fanov is one of the leaders of the scientific program of the Russian orbital X-ray observatory SPEKTR-RG (SRG) launched in 2019. He leads the key science working group of the Russian consortium of the SRG/eROSITA telescope for building a catalogue of X-ray sources and is a co-leader of the groups for building X-ray sky maps and studying active galactic nuclei and quasars and tidal disruption events of stars by supermassive black holes.

At SRI RAS, the eROSITA data are being productively used by a large group of scientists under Gil'fanov's leadership, including young students and postdocs and well-known astrophysicists, observers, and theoreticians. Together with colleagues, he built the eROSITA source catalogue, which includes over a million of active galactic nuclei and quasars, nearly half a million stars active in the X-ray band, and over 20 thousand clusters of galaxies, most of which were observed for the first time. All these objects are discovered in the half of the sky, where Russian scientists are responsible for data processing. Extremely distant high redshift quasars and tidal disruption events are being searched for, and the variability of X-ray sources of various origins is being examined. Gil'fanov and his pupil demonstrated that the sample of millions of quasars to be obtained by eROSITA during the all-sky survey will make it possible to detect 'baryonic acoustic oscillations' in the distribution of supermassive black holes in the Universe and to measure its most important parameters in the epoch of 'dark energy' dominance.

Using data on the energies and arrival directions of two hundred million X-ray photons registered by the SRG/eROSITA telescope with grazing-incidence optics in the half-sky, academicians Gil'fanov and Churazov built the half of the unique X-ray map of the sky released in summer 2020 using the data of the first eROSITA all-sky survey. The second half of the map was obtained by the German scientists Brunner and Sanders. This X-ray RGB map became the best in the world both in angular (several arc minutes) and energy resolution. It allowed the discovery and detailed investigation of giant structures in the hot interstellar gas in our Galaxy — 'eROSITA bubbles' — probably produced by activity of the supermassive black hole or a powerful burst of star-formation in the center of our Galaxy several ten million years ago.

Gil'fanov is a member of the Russian scientific committee of the SRG observatory, a member of the international coordination committee of the eROSITA telescope, and a member of the Russian-German calibration group of the eROSITA telescope. He is chair of the scientific editorial board of the eROSITA telescope Russian consortium and is responsible for internal reviews of papers published by the Russian consortium.

M R Gil'fanov plays a very important role in the consolidation of optical astronomers in Russia, who perform observations of the most interesting variable objects, distant quasars, and other unique objects discovered by eROSITA using Russian and the largest American optical telescopes.

M R Gil'fanov is one of the most prominent Russian scientists of worldwide authority in high-energy astrophysics. According to NASA ADS data, his works have over 14,000 citations and a Hirsch index $h = 57$, and 34 of his papers have over 100 citations each. Seventeen theses have been defended under his supervision. As a token of recognition of his scientific advances, he was elected an honorary member of the Tatarstan Academy of Sciences in 2010, the University of

Amsterdam elected him an extraordinary professor (2014–2019), and the Max Planck Society gave him a position equivalent to a professor's position at German universities. In 2010, the Academic Council of SRI RAS and Russian Higher Attestation Commission (VAK) conferred him the rank of professor.

He was awarded the Ya B Zel'dovich Medal for young scientists, instituted by COSPAR and the Russian Academy of Sciences, and the A A Belopol'skii RAS Prize in astrophysics. Gil'fanov is member of the SRI Academic Council, the qualification doctoral council in astrophysics, and the editorial board of the international journal *Journal of Cosmology and Astroparticle Physics*. He was an associate member of the team of the cosmological Planck satellite and is now member of the Strong Gravity working group of the prospective orbital observatory Athena+ of the European Space Agency.

Regular invitations to work in the time allocation committees of leading X-ray observatories, such as the Rossi X-ray Timing Explorer (NASA), INTEGRAL (Europe–Russia), and Chandra (NASA), show the international recognition of Gil'fanov's scientific contributions. He chaired various topical panels of the Chandra time allocation committee. On the invitation of NASA he served as pundit and a chair of the big project panel of Chandra observatory which allocated times to large programs of duration over 300,000 seconds.

In 2016, M R Gil'fanov was elected a corresponding member and, in 2022, a full member of RAS. In 2022 he was elected a member of Academia Europaea. He is chief researcher at SRI RAS, research group leader at the Max Planck Institute for Astrophysics (Garching, Germany), and a member of the Bureau of the Scientific Council on Astronomy of the Department of Physical Sciences of RAS.

Colleagues, friends, and disciples are happy to wish Marat Ravil'evich health, happiness, many years of fruitful work in science, and many happy returns of the day!

*I F Bikmaev, V V Zheleznyakov, A A Lutovinov,
P S Medvedev, A V Meshcheryakov, A A Petrukovich,
K A Postnov, S Yu Sazonov, A A Starobinskii,
R A Sunyaev, A M Cherepashchuk, E M Churazov*