

Concluding Remarks

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This is the end of our wonderful conference devoted to accretion processes in cosmic sources. All speakers demonstrated their high creative potential. Today I want to remember the time half a century ago when there was practically no understanding of accretion processes as such

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1. Concluding Remarks

In 1966, Academician Yakov Borisovich Zeldovich began giving his course for 4th-year students of the Faculty of Physics, at the M. V. Lomonosov Moscow State University. The course of lectures was devoted to the structure and evolution of stars. After the first lecture, he proposed that students who wish to complete their coursework under his leadership remain. Several people, including me, stayed. When the turn came to me, he offered me a task to calculate the structure and emission spectrum of a shock waves that should occur near a neutron star as a result of gas falling on its surface. In 1962, a group of American scientists lead by Prof. Riccardo Giacconi discovered the first cosmic X-ray sources. For a long time, the nature of these sources was a puzzle. Simple estimations showed that a shock wave that occurs near the surface of a neutron star should radiate energy predominantly in the X-ray spectrum. I began more detail calculations.

Two weeks later, the scientific secretary of the department of astrophysics approached me and told me that academician Zeldovich had set me the task of investigating the problem of the accretion of gas onto a neutron star. So I first heard this mysterious term “accretion” and answered that there is something wrong here! Academician Zeldovich told me nothing about accretion. Then the scientific secretary proposed to me to that I look in the Latin dictionary. So my work on accretion processes in astrophysics was begun. And this work continues to this day.

In 1969, the article with the calculation and description of the shock wave structure was published in “Astronomicheskii Zhurnal”, It was my diploma! That year I became a postgraduate student at the Faculty of Physics of MSU, and Academician Zeldovich became my scientific advisor.

As a postgraduate student, I investigated the structure and spectra of accretion discs formed around accreting neutron stars or black holes in close binary systems due to mass flow from the surface of the ordinary stellar companion (that is, the optical star).

The foundations of the theory of disc accretion were published in “Astronomicheskii Zhurnal” in 1972, also. Due to academician Zeldovch’s suggestion, it seems that fate itself brought me to a collaboration with Rashid Sunyaev. The main part of the work was done in collaboration with him. We were young and full of enthusiasm. Together we developed the so-called standard model of disc accretion. The work was presented at the 55th Symposium of the IAU in Madrid in 1972. It was there that the first observational results from the UHURU satellite were presented, and there that the first theoretical models of compact X-ray sources in stellar binaries discovered by UHURU were reported. Our report in Madrid was an introduction to the article published in “Astronomy and Astrophysics” in 1973.

The pioneering work I completed with R. A. Sunyaev is still topical today. According to NASA ADS data system, the number of references to this article exceeds 8950 (as of March 2019). Now at the beginning of the 21st century, accretion literally penetrates in all sections of modern astrophysics, both experimental and theoretical. Here, paying tribute to our Workshop, I also want to mention the International Conference Zeldovich-3, organized by Prof. Remo Ruffini in Minsk in April 2019, and Symposium No 346, organized under the auspices of the General Assembly IAU by Prof. Lida Oskinova in August of 2019. In general, one can now say without fear of contradiction: Accretion is here! Accretion is there! Accretion is everywhere!

Thank you, Franco! Thank you and goodbye to the glorious city of Peter the Great!