DESCRIPTION FOR THE GENERAL PUBLIC

Astronomers first knew they had a mystery on their hands in the 1960's when they turned their first radio telescopes to the sky. They saw blobs of radio light whose sources were unknown since the early radio antennae had poor resolution. With improvements in observations astronomers finally caught a break during an occultation with object number 273 in the brand new 3rd Cambridge Radio Catalog – 3C 273. Astronomers turned their optical telescopes onto this strange star and split the light into a spectrum. It looked nothing like the spectrum of any star ever seen. Hence the name quasi-stellar radio source was coined, later to become quasar.

Now we know that most of quasars (~90%) are Radio Quiet (RQ) and 10% are Radio Loud (RL), but the nature of both is associated with the same phenomenon, with matter falling onto the black hole (BH). And they don't just have a black hole, but a supermassive black hole millions to billions times more massive than our Sun. Such black holes sit in galaxy centers and are occasionally fed by the matter which forms a solar system sized whirlpool of super-heated plasma and shines brighter than an entire galaxy. Sometimes this is accompanied by production of narrow streams/jets of almost light-speed particles filling the surrounding space with giant radio plumes and therefore making the quasar RL.

The primary goal of the proposed research is to establish differences between the radiative features of RL and RQ quasars in spectral bands other than radio. In order to accomplish that we will use data from catalogs of massive optical, radio and other spectral band surveys. Comparison will be done between RL and RQ quasars having similar black hole masses and similar accretion rates. Such studies are crucial to understand jet production diversity. Finding statistically no significant differences of optical and infrared properties will indicate that geometrical and physical structure of matter falling onto black hole is identical in RL and RQ quasars. This in turn would strongly support a model suggested by Blandford and Znajek in 1977, according to which jets are powered by rotating black holes immersed in the externally supported magnetic fields. Efficiency of the jet production in such a model increases with increasing BH spin and increasing magnetic flux threading the BH. Then, having the BH spin and magnetic flux fixed by processes taking place prior to the quasar activity phase, the actual jet production efficiency is not expected to depend on properties of the accretion flows at distances at which effects of the BH spin and magnetic flux accumulated in the central region are negligible. In order to explore eventual effects of the latter, we plan to use data from the far UV and hard X-ray surveys. These studies may help also to decide whether production of hard X-rays is dominated by the jet base or by the hot coronae of accretion flows.