PRAGUE AGN SEMINAR SERIES
September – December 2021

Astronomical Institute of the Czech Academy of Sciences

– Next talk –

1st November
13:00 CET

– ***Dirty Dancing: piercing the dusty environment of merging supermassive black holes***

– Presenter: **Dr. Matteo Guainazzi**
(ESA/ESTEC, Netherlands)

– www.cosmos.esa.int/web/personal-profiles/matteo-guainazzi

– ***Abstract:***
It is a posit of modern astrophysics that most galaxies host a super-massive black hole (millions to billions of times more massive than the Sun). These black holes affect the evolution of galaxies well beyond their gravitational sphere of influence (which does not extend wider than 1/1000th of a typical galaxy linear size). In turn, the evolution of galaxies affects the growth of black holes through, e.g., galaxy merging. Interacting galaxies, or galaxies with a multiple (active) nuclei are key laboratories to investigate these processes.
While the extragalactic astrophysical community share a broad consensus on each of the above statements taken individually, how these feed-back loops work in the Universe, and the relative importance of various feed-back channels remain largely not understood. Furthermore, the existing samples of dual/binary/multiple active galaxies are remarkably scarce and incomplete. My talk will offer a glimpse of the recent efforts that a group of scientists in the MAGNA ("Multiple AGN Activity"; "Eat" in Roman dialect) collaboration have been undertaking to acquire large observational samples of dual/binary AGN, and to use them to inform the cosmological and "local" simulations aiming at predicting the concurrent galaxy/black hole evolution. This talk will allow you to pierce your (X-ray) view through the dusty environment of these systems.

Parental guidance not needed.

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10th November
16:00 CET

– ***Bayesian techniques to search for binary/dual accreting supermassive black holes***
– Presenter: **Dr. Adi Foord**
(KIPAC/Stanford University, USA)
– www.adifoord.com

15th November
13:00 CET

- ***Extreme physics in AGN: jets, shocks, flickering and the highest energy particles in nature***
- Presenter: **Dr. James Matthews**
  (University of Cambridge, UK)
- jhmatthews.github.io
- ***Abstract:***
  Both cosmic rays and AGN jets were discovered over a century ago, and, despite spectacular progress in that period, we are still far from a complete understanding of either of these extreme phenomena. In this talk, I will explore the links between the two, focusing particularly on particle acceleration in astrophysical jets and the origin of ultrahigh energy cosmic rays (UHECRs); UHECRs are protons and nuclei striking our atmosphere with energies extending beyond 1e20 eV. I will discuss ways in which particles can be accelerated to such extreme energies, focusing particularly on diffusive shock acceleration and the self-regulated cosmic ray acceleration process. Aided by hydrodynamic simulations, I will show that shocks can be formed in backflows in radio galaxies and that these shocks can accelerate particles to ultrahigh energy. I will then discuss a model in which 'dormant' radio galaxies such as Centaurus A and Fornax A act as slowly-leaking UHECR reservoirs. These sources may also be able to explain the observed UHECR arrival directions, particularly if we allow for time-dependence in their jet power and scattering off nearby magnetic structures; in fact, the UHECR signal we observe may merely be an "echo" of past AGN jet activity within ∼20 Mpc. Finally, I will describe a new work in which we study how a flickering jet power affects the particles accelerated by the jet and the morphology of the kpc-scale radio lobe. I will also discuss observational applications, highlighting the importance of flickering for jet power inference, the radio-loud/radio-quiet dichotomy and our understanding of radio emission in optically bright quasars.

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6th December
13:00 CET

– ***Do massive black holes in nearby galaxies come in pairs? – An observer's tale***
– Presenter: **Dr. Sabine Thater**
(University of Vienna, Austria)
– ucris.univie.ac.at/portal/en/persons/sabine-thater(8c59f4bc-7e30-477b-894c-e1680aa62b2f)/publications.html

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– Completed talks –

18th October
15:00 CEST

– ***Obscured AGN Growth in Mid-IR Dual AGNs and Beyond***

– Presenter: **Ryan Pfeifle**
(George Mason University, USA)

– bgc.physics.gmu.edu/black-hole-experts/

– ***Abstract:***

Galaxy collisions, a ubiquitous phenomenon in the Universe, are predicted to be a critical avenue for galaxy and black hole growth and evolution. During a merger event, gravitational torques drive reservoirs of gas and dust toward the galactic cores, and these inflows are consequently accreted by the central supermassive black holes, which then manifest as active galactic nuclei (AGNs). Dual AGNs are expected to occur in late-stage mergers, where the black holes are predicted to experience their most rapid period of growth. In our *Chandra* investigation of 15 late-stage mergers preselected with *WISE*, we found dual AGNs or candidate duals in 8 out of 15 mergers, many of which show no evidence for AGNs in the optical. Our multiwavelength observations suggest that the AGNs in these mergers are highly absorbed, with intrinsic column densities in excess of $N_{\rm H} > 10^{23}$ – 10^{24} cm^{-2}, consistent with hydrodynamic simulations. One of these mergers, SDSS J0849+1114, was in fact a triple galaxy merger, and exhibited three nuclear X-ray sources detected by *Chandra*. Through a multiwavelength follow-up program, we demonstrated that SDSS J0849+1114 represents the most compelling case for a triple AGN in the literature and has since been confirmed by two further studies. We will also discuss more recent work related to obscured AGN growth more generally, highlighting a new X-ray/mid-IR diagnostic for AGN obscuration identified in our study of Swift/BAT AGNs. This diagnostic relies upon the well-known $L_{\rm X,Obs.}/L_{12\,\mu{\rm m}}$ luminosity ratio as well as mid-IR colors to select heavily obscured Swift/BAT AGNs ($\log[N_{\rm H}] > 23.5$) with high completeness and reliability. Our new obscuration diagnostic could be used to differentiate between unobscured and heavily obscured AGNs in future, large samples of AGNs, such as those now being detected by the eROSITA all-sky survey.