Observations and physics of NLS1 galaxies:
AGN at their extreme

Book of Abstracts

Santiago, Chile
26-28 November 2025

Name: Anne Lähteenmäki
Affiliation: Aalto University Metsähovi Radio Observatory, Finland
Title: Radio monitoring of NLS1 galaxies: The Next Generation
Abstract: In this talk I give a short overview of radio monitoring of NLS1 galaxies so far, and then focus on the possibilities offered by the new triple-band receiver (3BR) that will be installed at Metsahovi Radio Observatory in late 2025. The receiver is expected to be operational during 2026. The three frequencies 22, 43, and 86 GHz can be used simultaneously to produce a high radio frequency spectrum, and polarization capability is included. The new receiver enables an order of magnitude increase in sensitivity compared to the current system, therefore enhancing the ongoing NLS1 monitoring campaign at Metsahovi in many significant ways. Finally, I present examples of work so far done plus how to exploit the forthcoming improvements.

Name: Eleonora Sani
Affiliation: European Southern Observatory, Chile
Title: NLS1 Galaxies Between Nature and Nurture: Insights from Advanced Instrumentation
Abstract: Are NLS1 intrinsically young AGN, or are their properties shaped by external factors in their host environments? In this talk, I will explore the "nature versus nurture" paradigm as a framework to interpret the multi-faceted characteristics of NLS1s. On the "nature" side, I will discuss intrinsic features such as low black hole masses, high Eddington ratios, and compact emission-line regions—interpreted by many as signatures of early AGN evolution. On the "nurture" side, I will show how spatially resolved spectroscopy with MUSE and near-infrared data from JWST and ALMA reveal the influence of host galaxy kinematics, secular processes, and feedback. These observations highlight the importance of coupling ionized and molecular gas diagnostics to capture the full picture of AGN-galaxy co-evolution. I will also present prospects for the ELT era, where instruments like HARMONI, MICADO and METIS will provide unprecedented resolution to disentangle nuclear fueling and feedback processes.

Name: Marco Berton
Affiliation: European Southern Observatory, Chile
Talk title: How similar are narrow-line Seyfert 1 galaxies and high redshift AGN?
Talk abstract: The recent observation of highly accreting supermassive black holes (SMBH) at very high redshift (>4) with the James Webb Space Telescope (JWST) allowed us to shed light for the very first time on the early evolutionary phases of active galactic nuclei (AGN). Perhaps unsurprisingly, several of the physical properties observed in these new objects, especially those known as little red dots (LRDs), are closely reminiscent of the low-mass and high-Eddington AGN in the local Universe, and in particular of the class of narrow-line Seyfert 1 (NLS1) galaxies. However, some differences also emerged, likely due to the radically different environment where LRDs and NLS1s live. In this talk, I will review the multiwavelength properties of local NLS1s, and compare them with those found at high-z, showing that despite some differences the study of NLS1s can be extremely useful to better understand the physics of high-z quasars and the early-stages of AGN evolution.

Name: Luigi Foschini
Affiliation: Brera Astronomical Observatory - INAF, Italy
Talk title: The growing family of gamma-ray narrow-line Seyfert 1 galaxies
Talk abstract: I will review the main features of the gamma-ray emission from the narrow-line Seyfert 1 galaxies discovered so far by the Large Area Telescope on board the Fermi Gamma-Ray Space Telescope.

Name: S. Komossa
Affiliation: MPIfR, Germany
Talk title: A historic introduction, and recent highlights on Narrow-line Seyfert 1 galaxies: giant outbursts, changing-looks, and MWL properties
Talk abstract: NLS1 galaxies are an AGN population with extreme and remarkable properties at all wavebands. After a brief historical introduction into the early development, discoveries, and major open questions, I present selected recent results and discoveries on NLS1 galaxies. Focus is on huge-amplitude outbursts, rare changing-look events in NLS1 galaxies, radio and MWL properties of individual exceptional NLS1 galaxies, and an outlook into the study of NLS1 galaxies with the recently launched space mission SVOM.

Name: Jian-Min Wang
Affiliation: Institute of High Energy Physics, China
Talk title: Super-Eddington AGNs: the shrinking BLRs
Talk abstract: The R-L relation, which serves as the benchmark for the BLR scale, has been extensively utilized for estimating SMBH masses in AGNs. However, our decade-long observational campaigns reveal that super-Eddington AGNs exhibit significantly shrinking BLRs compared to AGNs of the same luminosity. In this presentation, I will report the latest findings on more extreme cases and explore the underlying nature of these intriguing objects.

Name: Chichuan Jin
Affiliation: National Astronomical Observatories, Chinese Academy of Sciences, China
Talk title: Understanding the Intriguing "Weak-Line" Seyfert Population
Talk abstract: Super-Eddington AGNs are the most powerful accretion systems in the Universe. There are super-Eddington NLS1s with masses less than 1.E7 Msun, which are well-known for exhibiting weak [O III], strong Fe II, and a significant soft X-ray excess. Besides, there are weak-line quasars (WLQs) with masses bigger than 1.E8 Msun, which are characterized by notably weak high-ionization UV emission lines, such as C IV and N V. Both types of systems also exhibit strong X-ray variability. In this talk, I will present a unique NLS1 population that possesses properties similar to both NLS1s and WLQs, including NLS1-like optical emission lines, WLQ-like UV emission lines, and drastic X-ray variability. This a representative population of super-Eddington AGNs, which we termed "Weak-Line" Seyferts. I will discuss how the evolution of the super-Eddington accretion flow, in terms of black hole mass and accretion rate, can help us understand these three types of super-Eddington AGNs.

Name: Emilia Järvelä
Affiliation: Texas Tech University, USA
Talk title: Introducing NOCTURNE

Talk abstract: NOCTURNE (NLS1s Over Cosmic Time: Unification, Reclassification, Nature, and Evolution, nls1.space) is a recently established project aiming to address some of the most essential questions regarding NLS1s. The long-term goal is to improve our understanding of the local NLS1 population, and consequently benefit the investigation of the early evolutionary stages of AGN, in the local Universe and at high redshifts. In this talk, I will give an overview of NOCTURNE, summarise our ongoing work, and describe our near future directions.

Name: Krisztina Gabányi
Affiliation: HUN-REN-ELTE Extragalactic Research Group, Hungary
Talk title: Radio properties of a large sample of narrow-line Seyfert 1 galaxies
Talk abstract: Narrow-line Seyfert 1 galaxies (NLS1) are thought to contain highly-accreting but lower-mass supermassive black hole. Their radio properties are quite diverse, ranging from extremely bright, relativistically-beamed compact jetted sources to those having extended kpc-scale emission. Recently, a large catalog of SDSS-observed NLS1 and a companion database of broad-line Seyfert 1 galaxies (BLS1) were published by Paliya et al. (2024). To study the radio properties of the sample, we cross-matched these with the Faint Images of the Radio Sky at Twenty-Centimeters (FIRST) survey and the Very Large Array Sky Survey (VLASS) databases. For the objects detected in both radio surveys, we calculated their spectral index between 1.4 and 3 GHz. We found that the distribution of spectral indices differ for the two groups with BLS1 having on average flatter radio spectra than NLS1. We further analysed radio power and radio loudness distributions to ascertain the origin of the radio emission.

Name: Sagarika Paul
Affiliation: Texas Tech University, USA
Talk title: Building the Largest Pure Sample of Narrow-Line Seyfert 1 Galaxies with FORS2 Spectroscopy
Talk abstract: NLS1 galaxies exhibit narrow permitted Hβ lines (FWHM < 2000 km/s) and strong Fe II multiplets with low BH masses($< 10^8$ M$_\odot$)and high Eddington ratio indicating that they are early-stage AGN. They host the lowest mass SMBHs that can launch relativistic jets and offer insight into the conditions necessary for jet formation. But classifying NLS1s in large samples is challenging due to low S/N ratio. We use FORS2 observations of $\sim$100 candidate NLS1s to classify the sources and perform detailed spectral modelling of Hβ, [OIII], and the Fe II pseudo-continuum using the Voigt profile. We found 16 Changing-look AGN and a contamination factor of $\sim$28% in our data. We study how the line profile of the broad Hβ line changes from Lorentzian to Keplerian motion-dominated Gaussian with the BH mass to determine if the changing line profile is an essential part of intraclass evolution. Studying NLS1s in the local universe, which resembles high-z, AGN allows us to explore BH growth in the early universe.

Name: Philip Edwards
Affiliation: CSIRO Space and Astronomy, Australia
Talk title: Radio monitoring of southern NLS1 galaxies
Talk abstract: Recent results from mutli-frequency radio monitoring of southern NLS1

galaxies will be described, and an overview of recent upgrades to ATNF (Australia Telescope National Facility) telescopes to help consider options for monitoring of NLS1s into the future.

Name: Alessia Tortosa
Affiliation: INAF - Observatory of Rome, Italy
Talk title: X-ray insights into local Hyper-Eddington Narrow-Line Seyfert 1 galaxies
Talk abstract: Narrow-Line Seyfert 1 galaxies (NLS1s) are among the best local laboratories for studying super-Eddington (S-E) accretion onto supermassive black holes (SMBHs). I present recent results from a systematic broad-band X-ray campaign on eight bona fide S-E AGN from the SEAMBH sample, observed with simultaneous XMM–Newton and NuSTAR (plus Swift for some targets). These sources, with Eddington ratios up to $\lambda_{Edd} \approx$ 426, exhibit steep primary continua, strong relativistic reflection, and, in several cases, low coronal temperatures. A particularly remarkable case is IRAS 04416+1215, a hyper-Eddington NLS1 ($\lambda_{Edd} \approx 426$), which shows multiphase ionized winds, a prominent soft excess, and the lowest coronal temperature ever measured in an AGN ($kT_e \approx 3$ keV), consistent with a hybrid pair-dominated plasma. Our analysis reveals a positive correlation between photon index and Eddington ratio, supporting the scenario in which intense disc radiation enhances Compton cooling of the corona in S-E systems.

Name: Benedetta Dalla Barba
Affiliation: University of Insubria / INAF-OAB, Italy
Talk title: Optical traces of jet-NLR interaction: the case of PMN J0948+0022
Talk abstract: PMN J0948+0022, historically classified as a jetted Narrow-Line Seyfert 1 galaxy, exhibits marked multiwavelength variability that sheds new light on AGN structure. Recent observations reveal an Hβ profile more typical of Intermediate Seyfert galaxies. Optical spectroscopy from SDSS, X-Shooter, and MUSE shows significant changes in the narrow-line region, including the narrow Hβ component and [O III] outflow, likely driven by jet-NLR interactions. These results provide fresh insights into changing-look AGN phenomena and the links between different AGN classes, contributing to a more unified view of their evolution.

Name: Swayamtrupta Panda
Affiliation: International Gemini Observatory, NSF NOIRLab, USA
Talk title: From Local Quasars to Cosmic Dawn: Linking AGN emission, variability, and BH masses in the Rubin era
Talk abstract: I will present a unified view of AGN that links emission-line physics, accretion dynamics, and black hole mass measurements from the nearby universe to z $\sim$ 3. In the first part, I will demonstrate findings from our joint optical and near-infrared spectroscopy and spectral modeling of the prototypical iron emitter IZw1. Incorporating updated atomic datasets, we reveal that both optical and NIR FeII emissions arise under nearly similar conditions but are powered by different mechanisms - Lya fluorescence dominates in the NIR, while collisional excitation shapes the optical. O I and Ca II triplet emissions trace the same stratified BLR regions, offering improved proxies for optical Fe II. I will also discuss inferences drawn from super-Eddington accreting sources in this context. In the second part, I will highlight two AGN variability studies giving rise to two novel scaling relations as we

enter the Rubin era, enabling efficient BH mass and Eddington ratio estimates, extending to $z \sim 3$

Name: Luca Crepaldi
Affiliation: University of Padova, Italy
Talk title: Optical multi-epoch and spectral analysis of NLS1s with extreme high-frequency radio variability
Talk abstract: A few decades have passed since the identification of narrow-line Seyfert 1 (NLS1) galaxies as a subclass of active galactic nuclei (AGN). NLS1s show a Seyfert 1-like spectrum, but with emission line widths similar to Seyfert 2. Their observational properties suggest a combination of high accretion rates near the Eddington limit and low-mass black holes, indicating an early AGN stage. Although rare, jetted NLS1s have been discovered. Recently, seven sources with inverted radio spectra and extreme radio variability were identified among radio-quiet and radio-silent NLS1s. They show rapid flares at 37 GHz, increasing flux up to 9000-fold (Jy level) with e-folding timescales of a few hours. In quiescence and at lower frequencies, they reach only mJy levels. Relativistic jets would be the most likely cause, yet no jet traits were detected. So far, only their radio spectra are a common feature. I present these sources and a multi-epoch analysis to search for optical variability and periodicities using public data. A long-term comparison between radio and optical light curves and an optical spectral analysis were also conducted, revealing a scenario completely different from the radio band. The results show no strong optical variability and accretion at a few percent of the Eddington limit. Such radio variability has never been observed in any AGN, making this work key to understanding the phenomenon and possibly unveiling a new AGN population.

Name: Jeremiah Paul
Affiliation: Texas Tech University, USA
Talk title: Seeking Multiwavelength Signs of Slim-Disk Accretion in Narrow-Line Seyfert 1 Galaxies
Talk abstract: To understand how supermassive black holes may have grown through episodes of near/super-Eddington accretion, we need observational constraints on how such episodes affect the physics of AGN central engines. At Eddington ratios above $\sim 30\%$, the accretion disk is believed to transition at small radii into a geometrically thick and radiatively inefficient 'slim' disk state, altering the appearance and output of the central engine. NLS1 galaxies appear to be young, high-Eddington AGNs with extreme properties, offering unique and critical opportunities to examine slim-disk accretion. Here, I summarize observational support we have found for slim-disk accretion in nearby samples of both supermassive and intermediate-mass AGNs via tests across radio, optical, ultraviolet, and X-ray bands. I explore applying our results to NLS1 populations and discuss some future prospects to learn how much accretion power may be advected directly into the black hole vs. radiated away or ejected by outflows.

Name: Luigi Gallo
Affiliation: Saint Mary's University, Canada
Talk title: X-raying Narrow-line Seyfert 1 galaxies

Talk abstract: Since the 1990s, Narrow-line Seyfert 1 galaxies (NLS1s) have been known for their extreme X-ray behaviour. They exhibit the largest amplitude variations, biggest soft-excesses, strongest signatures of relativistic reflection, and potentially powerful outflows. However, the origin of such behavior and how NLS1s fit in the broader context of Seyferts are still debated. Here, we will highlight recent X-ray works of NLS1s, examining both sample studies and deep investigations of individual sources. In combination, we attempt to draw a picture of Seyfert unification including NLS1s. We will further consider what is in store for NLS1 research in the era of high-resolution spectroscopy with XRISM and ATHENA.

Name: Gabriel Oio
Affiliation: CONICET, Argentina
Talk title: NLS1 Galaxies in Context: Environment, Metallicity, and AGN Activity **(cancelled)**
Talk abstract: The large-scale environment is one of the main external factors influencing the evolution of galaxies, while the active galactic nucleus (AGN) is a key internal driver. Both play a fundamental role in regulating star formation and chemical evolution in galaxies, with metallicity serving as a key tracer. We investigate whether the mass–metallicity relation (MZR) in AGN hosts depends on environment, focusing on narrow-line Seyfert 1 galaxies (NLS1). Using a statistically significant sample, we compare the environments of NLS1 with those of broad-line Seyfert 1, type 2 AGN, and star-forming galaxies, and explore trends within the NLS1 population to probe the connection between environment, metallicity, and AGN activity.

Name: Patricia Arevalo
Affiliation: Universidad de Valparaíso, Chile
Talk title: Characterizing optical variability of NLS1 with ZTF
Talk abstract: Large variability surveys, such as the Zwicky Transient Facility enable us to study AGN variability on timescales of weeks to several years, for hundreds of thousands of objects with very homogeneous data. This huge data set allows us to probe the parameter space in detail, showing how the variability properties depend on several parameters independently, which will help to constrain the physical models of their variability. In this talk I will show the variability features we have obtained from carefully constructed ligthcurves from ZTF images, optimized to constrain the nuclear flux variability in extended galaxies. These, matched to the spectroscopic properties measured by DESI QSO-related value-added catalogs reveal how the variability amplitudes and timescales of NLS1 compare to BLS1 controlling simultaneously for magnitude and redshift. We also show how our random forest approach to AGN selection sometimes fails to recognize nearby NLS1 and propose ideas to remedy this.

Name: Francesco Di Mille
Affiliation: Las Campanas Observatory - Carnegie Institution for Science
Talk title: Instrumentation, Operations, and Science at Las Campanas Observatory
Talk abstract: Las Campanas Observatory (LCO), operated by the Carnegie Institution for Science, continues to provide world-class facilities for optical and infrared astronomy from its site in northern Chile. Carnegie operates the 1-m Swope and 2.5-m du Pont telescopes, and on behalf of its partners, the twin 6.5-m Magellan telescopes. In addition to its long-standing

instrumentation suite, LCO also hosts two Sloan Digital Sky Survey V facilities: the Fiber Positioner System (FPS) at the du Pont telescope and the Local Volume Mapper (LVM). This presentation will review the current status of observatory operations, instrumentation performance, and the challenges of sustaining continuous scientific productivity. We will also highlight selected science areas, including ongoing investigations of active galactic nuclei such as narrow-line Seyfert 1 galaxies, using this as one illustration of the wide range of science pursued at LCO. Finally, we will outline future developments, including new instrumentation.

Name: Francisco Pozo Nunez
Affiliation: Heidelberg Institute for Theoretical Studies
Talk title: Mapping High-z Accretion Disks from La Silla to Rubin: Medium-Band PRM Results and LSST Prospects
Talk abstract: I use photometric reverberation mapping to measure quasar accretion-disk sizes from interband delays and to test the disk size–luminosity link. For Rubin's Deep Drilling Fields I analyze simulated light curves with realistic cadences, assessing how broad-line and diffuse-continuum leakage and survey sampling impact lag recovery and the standardization of quasars for cosmology. In parallel I lead a medium-band campaign with the MPG/ESO La Silla telescope on high-redshift quasars, tying disks to the broad-line region where CIV lags exist. I highlight a direct disk-size estimate for J0455-4216, consistent with a thin disk around a roughly billion-solar-mass black hole, and a target with a GRAVITY-plus BLR size that enables an interferometry–reverberation cross-check.

Name: Carolina Finlez
Affiliation: ESO
Talk title: Extended emission line regions in X-ray selected AGN
Talk abstract: Voorwerpjes (VPs) are a unique kind of AGN, characterized by the presence of very extended (tens of kpc) ionized clouds, that appear to be primarily ionized by a once-powerful quasar. In sharp contrast, the central engine currently hosts a very dim AGN. These "light echoes" are able to preserve the AGN luminosity history, suggesting that these AGN have faded 2–5 orders of magnitude within the past 10^{4-5} years. We have examined a sample of hard X-ray selected AGNs that are VP candidates with VLT/MUSE observations. This sample has expanded our understanding of VPs: we find that their incidence is higher than previously thought. Among this sample we observe that a large fraction of the VPs are hosted in Sy 1 galaxies and thus we are able to obtain a glimpse into these source's past histories.