# On the shoulders of giants

**Wednesday 25 March 2026 - Friday 27 March 2026**

**Archivio di Stato - Torino, Italy**

# Book of Abstracts

## Session 1: Formation of gaseous giant planets and their impact on short-period low-mass planets: from solar system to exoplanetary systems

- ***Bertram Bitsch (University College Cork, Ireland), INVITED SPEAKER***

**Title:** The big and the small: how giant planets shape their smaller neighbours

**Abstract:** Planets form in protoplanetary discs surrounding newly formed stars, where dust grains clump and form km-sized planetesimals. As the dust grains start to grow to mm-cm sized pebbles, they drift inwards very rapidly due to the gas drag within the disc. As the pebbles drift inwards towards the hotter disc regions, they can evaporate and enrich the inner disc with their vapor to largely super-stellar values. At the same time, planetary embryos (of roughly Moon size) start to form, and they can continue to grow rapidly by the accretion of the inward drifting pebbles. As the planets start to grow, they will eventually open gaps in protoplanetary discs and alter the pressure structure of the disc. In fact, once the planets reach masses of around 20 Earth masses, they cause a pressure inversion in the disc, halting the inward drift of pebbles. There are several key consequences originating from this process: 1) the planet will stop accreting pebbles and transition towards gas accretion, and 2) the system interior of the growing planet can not receive pebbles any more. Consequently, the planets interior to the growing giant planet will stop growing and at the same time, the composition of the inner disc will change, as the inward flux of pebbles - that transport volatiles - stops.
In this talk, I will discuss the physical process of planet formation and how the growth of giant planets shapes the growth and composition of inner systems at home and abroad. I will further discuss the dynamical impacts of the growing giant planets on the inner system structure. I will close this talk by pointing to test cases that can help us to constrain the formation models via observations.

- ***Claudia Danti (Center for Star and Planet Formation, University of Copenhagen, Denmark)***

**Title:** Super Earth formation in systems with cold giants

**Abstract:** Exoplanetary demographic statistics shows that super-Earths are the most abundant exoplanets, orbiting approximately every other solar-like star. In our own solar system, however, the inner terrestrial planets did not grow beyond Earth in mass. A possible explanation could be provided by the presence of gas giants in our own system, that might have influenced the growth of the inner terrestrial planets. In this project we address this hypothesis, by studying the so-called “pebble filtering” mechanism. During their formation, giant planets accrete part of the pebble disc mass budget, preventing a potentially significant amount of pebbles from drifting inwards and feeding the inner disc region. If this mechanism is very efficient, it can halt planet formation in the inner disc. We perform a parameter study based on pebble accretion simulations, where we assume pebble sizes limited by drift and fragmentation. The initial planetary seeds are taken from the top of the streaming instability

and the disc temperature profile is set both by irradiation and viscous heating. We show that one of the key uncertainty is the degree of viscous heating in the inner disc, which regulates the pebble accretion efficiency. In systems with gas-giant formation the role of mutual pebble filtering is generally limited, unless it is paired with some other mechanism that already delays the inner embryo's growth, such as strong viscous heating of the disc or the presence of an iceline that significantly reduces the available inward-drifting material. This latter point appears to be consistent with the fact that no strong suppression is seen in the occurrence rate of super-Earths in systems with known gas giants in wider orbits. We conclude that the diversity in exoplanetary systems may be due to complex, and as of yet poorly understood, disc accretion physics inside the water ice line.
I will also present preliminary results on population synthesis focused on exoplanet formation around the iceline, a population observable through microlensing techniques with the soon-to-be-launched Roman space telescope.

- ***Matthew Dotty (Rice University, USA)***

**Title:** Kepler-139: A case of Sweeping Secular Resonances leading to system non uniformity

**Abstract:** Understanding and testing possible formation mechanisms is crucial to understanding the history of planetary systems. While observationally there is a prevalence of evenly sized and spaced systems ("peas-in-a-pod" - Weiss et. al 2018), there is also an observational trend between the presence of a Cold Jupiter and inner system non-uniformity (He et. al 2023). Recent work explored in Best et. al (2024) demonstrated that such non-uniformity in spacing could be due to the influence of cold Jupiters on system formation via "sweeping secular resonances" transporting material in rather than post-formation dynamics. In this work we explore applying this mechanism to a real 5-planet system, Kepler-139. Applying the methodology of Best et. al (2024) we numerically constrain possible viscosity alpha parameters for the inner and outer disk that would lead to the observed architecture, as well as model the evolution of the disk's solid surface density. We find that such an evolutionary model could explain the non uniformity in the system architecture as well as note the importance of planetesimal size and mass in the evolution of the disk density profile due to planet/disk interaction. Finally, we note another process, "oversweeping" that could allow some material to be left behind, possibly creating a planetesimal belt between the outer Jupiter and inner system.

- ***Francesco Zagaria (Max Planck Institute for Astronomy, Germany)***

**Title:** Musing on the deepest millimetre-wavelength observations of PDS 70

**Abstract:** The study of Gyr-old cold gas giants is on the verge of a revolution: the forthcoming Gaia data releases will precipitate their detection, and, thanks to the ESA/ARIEL space mission, the number of such Jupiter-like planets with well-characterized atmospheric composition will also skyrocket in the years to come. Interpreting the results of these forefront campaigns requires a significant leap forward in our understanding of how gas giants come to be. In this regard, catching Myr-old, embedded, Jupiter-like planets in the act

of formation is our best chance of understanding how their cores are assembled and their atmospheres accreted, thus providing a highly sought-after framework for explaining the properties of their older and fully formed siblings. Although the current dearth of directly imaged embedded planets happens to be a rather arduous obstacle to this quest, such scarcity of targets in fact comes with the advantage of an unparalleled wealth of data for the few systems with planet detections. This is especially true for PDS 70, the only planet-forming disc hosting two directly imaged accreting gas giants, often considered to be a larger-scale version of the early Solar System. In fact, in less than a decade, ALMA observed such a target for approx. 24 hrs on-source, corresponding to a total of approx. 4 Tb of data, in Band 7 (0.89 mm) alone. I plan on presenting the first results of my effort of re-reducing and combining those data together with state-of-the-art calibration techniques. These include the deepest (approx. 3.5 times higher sensitivity than the well-known images that led to the detection of mm emission around PDS 70c by Benisty et al., 2021) and highest angular resolution (2 au) continuum images of this target, as well as state-of-the-art spectral line cubes of CO isotopologues, UV chemistry, ionization, and shock tracers. Such a joint dataset provides the unique opportunity of revealing with unprecedented detail how gas giants interact with their hosting disc by clearing their orbits, accreting gas, and halting material delivery to the terrestrial planet formation zone. These are all crucial aspects to understand how giant planets come to be and their impact on multi-planetary system formation and architecture.

## Session 2: Formation of gaseous giant planets and their impact on inner low-mass planets in the habitable zone: from solar system to exoplanetary systems

- *Sean Raymond (Laboratoire d'Astrophysique de Bordeaux, France), INVITED SPEAKER*

**Title:** Water delivery to inner rocky planets driven by outer giants

**Abstract:** The growth of outer gas giants naturally destabilizes the orbits of nearby planetesimals. These are scattered in all directions -- many are ejected, but some are scattered inward toward the growing rocky planets (if they exist). In the Solar System, both the C-type asteroids and water delivery to Earth can be explained as a simple byproduct of Jupiter and Saturn's growth. I will explain the dynamics at play, and extrapolate to exoplanet systems with a range of orbital architectures.

- *Jonathan Horner (University of Southern Queensland, Australia), INVITED SPEAKER*

**Title:** The impact of Jupiter-like planets on the potential habitability of exoEarths

**Abstract:** In the coming decades, the search for life beyond the Solar system will begin in earnest. But how should we choose the best targets for that search? In order to maximise our chances of success, it is important to consider the many and various factors that could render one planet more or less habitable than another. In this talk, I will describe how dynamical simulations can reveal the role that giant planets like Jupiter play in controlling the impact regimes and long-term climate stability of Earth-like planets. By using the Solar system as a template, I demonstrate how changes to the mass or orbit of a giant Jupiter-like planet can significantly alter the potential habitability of any exoEarths that orbit the same star, revealing in the process that the answer to the question "Jupiter - Friend or Foe?" is "it's complicated".

- *Nader Haghighipour (Planetary Science Institute, Institute for Astronomy-Hawaii, USA)*

**Title:** A detailed study of the effects of cold Jupiters on the formation and composition of terrestrial planets

**Abstract:** Whether or how giant planets affect the formation and orbital assembly of terrestrial planets has been a longstanding question in planetary astrophysics. In our solar system, Jupiter and Saturn have played a fundamental role in defining the extent and architecture of the asteroid belt, and have been crucial to promoting terrestrial planet formation by confining the process to interior to 1.9 (au). Among exoplanets, there are systems like GJ 876 where three cold-giant planets have created an empty inner region similar to the asteroid belt and have contributed to the formation of a super-Earth in a 2-day orbit. The existence of these systems strongly indicates that cold Jupiters play a significant part in the formation and final assembly of planets interior to their orbits. To explore the extent of the effects of these planets, we have carried out more than 1200 simulations of the last stage of terrestrial planet formation for different values of the mass, orbital elements, numbers, and migration-rate of (cold-) giant planets. Results demonstrate that in all systems, there is always an asteroid-belt analog. However, whether terrestrial-class planets can form interior to this region depends strongly on the number, mass, and orbital elements of the cold Jupiters. Our simulations show that, interestingly, terrestrial planets can also form in some systems without giant planets; however, the process is not as efficient as in systems with cold Jupiters. Finally, results indicate that while giant planets may affect the inventory of water-carrying objects, they play no role in the mechanics of the transfer and transport of water to rocky planets. Water delivery is in fact due to the successive collisions among planetary embryos, a process that occurs even when no giant planet exists. We will present the results of our study and discuss their implications.

## - *Diego Turrini (INAF-Torino, Italy)*

**Title:** Giants in the cradle - Part 1: exploring how Jupiter's birth shaped the compositional evolution of the inner Solar System

**Abstract:** Jupiter, the archetype of cold giant planets, played a key role in controlling the transport of volatile materials like water and organics between the inner and outer Solar System since its birth. While an extensive body of work highlights how its formation and migration dynamically excites the surrounding planetesimal disk, very few studies investigate the global collisional implications of this process for the inner Solar System. In this talk we will present the results of ongoing work on the interplay between the forming Jupiter and the early Solar System and discuss how this insight informs us on the evolution of systems hosting cold giant planets around other stars. We will show how Jupiter's formation injected in the asteroid belt large amounts of icy planetesimals on comet-like orbits, whose collisions with the local rocky planetesimals delivered water and volatiles inside the water snowline, and gave origin to the chondritic asteroids of which we have samples in the form of meteorites. We will show how the different classes of chondritic meteorites provide a detailed record of the compositional gradient existing at the time in the solar nebula. Finally, we will discuss how these processes can restart the pebble accretion process of the terrestrial planets, bypassing the barrier effect of Jupiter, and present lines of evidence from protoplanetary disks suggesting that these events are common in the formation histories of planetary systems with giant planets.

## - *Danae Polychroni (INAF-Torino, Italy)*

**Title:** Giants in the cradle - Part 2: exploring how forming giant planets alter the composition of inner planets with HD163296

**Abstract:** ALMA's observations of circumstellar discs highlight the wide variety of properties and morphologies of their gas and dust. In particular, the widespread presence of rings and

gaps in the dust component of discs is generally considered the direct signature of massive planets forming therein. These gaps and rings often appear at tens of au from the host star, raising the question of whether such distant planets can influence the formation of their inner counterparts. We took advantage of ALMA's detailed characterization of the HD163296 system, a 5 Myr-old massive disk orbiting an A star and considered to host at least four distant giant planets and a massive planetesimal disk, to explore in detail the impact such planets have on the natal disk and the other planetary bodies forming therein. In this talk we will present how the formation of these gas giants excited the surrounding planetesimal disk and triggered the planetesimal-mediated large-scale transport of volatile elements (N, C, O), delivering them to the inner disk regions. We will examine how this delivery of volatile elements impacts the planets forming in such regions and how this process depends on the mass of the affected planets, from Earth-like to Jupiter-like planets. Finally, we will show how and when this process can create misleading atmospheric signatures overwriting those due to the formation history of the planets.

- ***Alain Lecavelier des Etangs (Institut d'Astrophysique de Paris - CNRS, France)***

**Title:** Exocomets and Their Impact on Planets in the Habitable Zone

**Abstract:** Transiting extrasolar comets have been detected for four decades. Their gaseous components are revealed through spectroscopy, while their dusty tails produce characteristic photometric signatures - remarkably consistent with predictions made 25 years ago. Recently, automated searches for exocometary transits in Kepler and TESS datasets have led to the identification of several dozen new systems.
Exocomets offer a unique window into the role of small bodies - often driven onto eccentric orbits by massive planets - in shaping planetary systems, particularly in the delivery and redistribution of volatiles toward the habitable zone. Over the past two years, major progress has been achieved in determining their composition (Vrignaud et al. 2024a, b, 2025a, b). Through detailed analysis of archival HST data and new HST observations obtained in 2025, we can now constrain the abundances of key species, including the C/Fe ratio - a proxy for the volatile-to-dust content. These recent findings yield surprising results, and demonstrate that exocomets under the gravitational influence of massive planets can efficiently transport material throughout planetary systems down to the habitable zone.

## Session 3: Cold Jupiters OR inner low-mass planets: statistical properties

- ***Anne-Marie Lagrange (Laboratory of Space Studies and Instrumentation in Astrophysics, France), INVITED SPEAKER***

**Title:** Cold Jupiters and the Architecture of Planetary Systems: What We Know and What We Miss

**Abstract:** Giant planets are key architects of planetary systems: they sculpt protoplanetary disks, shape the formation and long-term stability of inner rocky worlds, and likely mediate the delivery of volatiles needed for habitable conditions. Yet the occurrence, architectures, and dynamical impact of cold Jupiters remain only loosely constrained. Our main detection techniques each probe a limited and biased slice of parameter space, so that mature Jupiter/Saturn analogues at several astronomical units are still markedly underrepresented in current exoplanet samples.
In this talk, I will review what we currently know about the demographics of cold Jupiters, from occurrence rates to orbital architectures, and highlight a few benchmark systems that anchor our understanding. I will discuss in turn the intrinsic limitations of individual techniques, and then show how combining methods—particularly absolute astrometry, direct imaging, and radial velocities—opens up previously unexplored regions of the (mass, separation) plane across different stellar types and ages. This multi-technique approach is beginning to reveal the true diversity of cold giant planets and will help exploring their role in shaping planetary systems.

- ***Emile Fontanet (Université de Genève, Switzerland)***

**Title:** Cold Jupiters around intermediate-mass stars: occurrence rates from a 20-year CORALIE RV survey

**Abstract:** The dependence of cold Jupiter occurrence on host-star parameters (e.g. mass or metallicity) remains a key question in giant-planet demographics. In particular, current statistics for intermediate-mass stars (1.5 - 4 $M_\odot$) can still be improved, as the number of reported planets around these targets is low (<250) and affected by stellar-variability false positives (e.g. oscillations).
I will present results from a 20-year RV survey of evolved intermediate-mass stars conducted with the CORALIE spectrograph. With more than 600 targets and an RV precision of ~5 m/s, this survey provides one of the largest homogeneous datasets for this stellar population. The sample reveals >50 previously unpublished giant-planet candidates, predominantly with Jovian masses and orbits in the 1-10 AU range. These data enable a determination of cold Jupiter occurrence rates as a function of stellar mass and metallicity in the intermediate-mass regime, and I will discuss how the resulting demographics compare with those from FGK stars and current predictions.

- ***Daniele Viganò (Institut de Ciències de l'Espai (ICE-CSIC) Barcelona, Spain)***

**Title:** Long-term evolution of cold Jupiter magnetism

**Abstract:** While we know with great detail the magnetic field of Jupiter and several works have successfully reproduced several features, including the atmospheric winds, the only studies for giant exoplanet magnetism rely on scaling laws. We present a novel approach, as shown in Elias-López et al. 2025, A&A, 696: we run 3D dynamo simulations (solving the anelastic MHD equations with MagIC) with the thermodynamical background properties related to different ages of cold Jupiters, as provided by the MESA evolutionary code. We explore different masses and dynamo numbers and get detailed solutions, being able to study the expected configuration, besides the average surface intensity. Our results on one side recover the slow decay of the average magnetic field predicted by convective flux-based scaling laws, on the other side shows an interesting transition, likely at early ages, from multipolar-dominated dynamo solutions to a dipolar-dominated ones. This has potential implications for the expected Jovian-like coherent radio emission which could be detectable by SKA-low for the closest systems.

- ***Marvin Morgan (UC Santa Barbara, USA)***

**Title:** Constraining the Migration Channels of Warm Jupiters Using Population-Level Eccentricities

**Abstract:** Giant planets are expected to predominantly form beyond the water ice line and occasionally undergo inward migration. Unlike hot Jupiters, which can result from high-eccentricity tidal migration, longer-period giant planets are in many ways more challenging to explain because they reside outside the tidal influence of their host stars. Orbital eccentricities offer important clues about the formation and dynamical history of distant giants. Based on uniform Keplerian fits of 18,561 RVs targeting 200 warm Jupiters, we use hierarchical Bayesian modeling to evaluate the impact of planet multiplicity on the reconstructed population-level eccentricity distributions. I will present results from this program and unveil what eccentricities are beginning to tell us about how, when, and under what conditions longer-period giant planets undergo inward migration.

- ***Gijs Mulders (Pontificia Universidad Católica de Chile, Chile), INVITED SPEAKER***

**Title:** Demographics of sub-Neptunes at Short Orbital Periods, and out to the Habitable Zone

**Abstract:** At least half the stars in the galaxy are orbited by planets smaller than Neptune and orbital periods less than a year. The demographics of these mini-Neptunes, super-Earths, and terrestrial exoplanets are constrained by transit and radial velocity surveys, often in synergy.

In this talk I will give an overview of the statistical properties of these inner planets and planetary systems. I will focus on the different detection limits and biases that exist in different surveys, and show how these can be corrected for to derive the intrinsic occurrence rate of planets and planetary systems, including estimates of the frequency of earth-sized planets in the habitable zone. I will highlight some of the key trends of inner planets with host star properties, in particular the anti correlation of the sub-Neptune occurrence rate with stellar mass and the weak dependence on host star metallicity. Those trends strongly contrast with the positive correlations of outer giant planets with host star properties and thus provide constraints for planet formation models and challenge our understanding of the inner small planet -- outer giant planet relation.

## Session 4: Cold Jupiters AND inner low-mass planets (individual systems and statistical analyses) - inside-out

### - *Lauren Weiss (University of Notre Dame, USA), INVITED SPEAKER*

**Title:** Results from the Kepler-Keck Giant Planet Search

**Abstract:** Humanity's search for Earth analogs is enriched by the fact that Earth-like planets do not form in isolation. The interplay between Earth-like planets and their siblings is an emerging new research topic. A prevalent pattern that represents one of the most common modes of planet formation is that planets in the same system tend to have similar sizes and regular orbital spacing, like ``peas-in-a-pod.'' However, the peas-in-a-pod pattern is not a complete description of planetary systems. In our own solar system, Jupiter, which is believed to have been instrumental to the formation of Earth and the delivery of its water, represents a clear departure from peas-in-a-pod. In this talk, I show how a decade-long survey dedicated to discovering Jupiter analogs among exoplanet systems has revealed a new pattern: Jupiter-like outer planets are most prevalent around the systems of inner transiting planets that tend to have gaps, rather than regular spacing. This result suggests that Jupiter-like planets disrupt the regular spacing of small planets. The exact mechanism of disruption---whether planets that would have been in the gaps are simply inclined or suffered collisions or ejections---is an ongoing topic of study.

### - *Judah Van Zandt (UC Santa Barbara, USA), INVITED SPEAKER*

**Title:** Results from the TESS-Keck Distant Giants Survey

**Abstract:** We learned from NASA's Kepler mission that small inner planets are common around Sun-like stars (50–100%). Separately, ground-based radial velocity (RV) surveys have shown that long-period gas giants are somewhat rare (~16%). To find the conditional occurrence of distant giants in systems with a close-in small planet, I conducted the Distant Giants Survey, a three-year RV search for giant planets in 47 systems with an inner transiting planet. I detected six giant planets, and incorporated partial orbit "trends" by combining RVs with HGCA astrometry. I accounted for missed planets with a rigorous target-by-target completeness correction procedure. I found that giants occur in ~30% of systems with an inner small planet, twice as often as they occur around a random GK star. I also found that giant planets with inner companions have lower eccentricities than average, and their inner planets likewise have shorter periods, potentially pointing to a history of dynamical interaction. Finally, I discuss Gaia DR4's potential to reveal 3D system architectures, further elucidating the relationship between distant giants and close-in small planets.

### - *Luca Naponiello (INAF-Torino, Italy), INVITED SPEAKER*

**Title:** Results from the HARPS-N Survey of Kepler, K2, and TESS small-planet systems

**Abstract:** Unveiling the architecture of planetary systems is crucial for understanding how planets form and migrate. In this talk, I investigate the occurrence rate of Cold Jupiters (CJs) in systems that host inner Small Planets (SPs), aimed at understanding if giant planets shield or disrupt their smaller inner siblings. I will present results based on an extensive dataset of over 5000 radial velocities gathered by the HARPS-N Collaboration, following up on Kepler, K2, and TESS candidates. By expanding the sample size and refining detection bias corrections, we offer new insights into the correlation between outer giants and inner super-Earths/sub-Neptunes. I will detail specific test cases, including the confirmation of CJs in systems like K2-312, and critically discuss false positives where long-period trends are actually driven by stellar activity. Finally, I will explore how these SP–CJ architectures correlate with stellar metallicity and mass, providing critical observational constraints for evolutionary models.

### - *Marta Bryan (University of Toronto, Canada), INVITED SPEAKER*

**Title:** The Jupiter/super-Earth connection from global samples: How gas giants shape the lives of small worlds

**Abstract:** The connection between outer gas giants and inner super-Earths reflects their formation and evolutionary history. Past work exploring this link has suggested a tentative positive correlation between these two populations, but these studies were limited by small sample sizes and in some cases sample biases. In this talk I will highlight my recent collaborations with Eve Lee where we take a new look at this super-Earth/gas giant connection. With a sample of 184 super-Earth hosts, we show that there is a statistically significant positive correlation between super-Earths and outer gas giants around metal-rich FGK stars, and that this correlation disappears for metal-poor hosts. We next consider how this connection evolves across stellar mass, finding that the positive correlation between super-Earths and Jupiters is nonexistent for M-dwarfs, emerges in metal-rich K-dwarfs, and strengthens with increasing stellar mass. These findings reflect the critical role that disk solid budget plays in shaping architectures of planetary systems. Finally, I will preview our current efforts to understand the active role gas giants play in shaping small planet lives by focusing on the dependence of small planet properties on the presence of an outer gas giant.

### - *Célia Desgrange (European Southern Observatory, Chile)*

**Title:** Searching for Cold Jupiters with VLT/SPHERE in planetary systems hosting close-in low-mass planets

**Abstract:** The discovery of planets orbiting at less than 1 au from their host star and less massive than Saturn in various exoplanetary systems revolutionized our theories of planetary formation. The fundamental question is whether these close-in low-mass planets could have formed in the inner disc interior to 1 au, or whether they formed further out in the

planet-forming disk and migrated inwards. Exploring the role of additional giant planet(s) in these systems may help to pinpoint their global formation and evolution. We carried out a direct imaging survey with VLT/SPHERE to look for outer giant planets and brown dwarf companions in 27 systems hosting close-in low-mass planets discovered by radial velocity. Our sample is composed of very nearby (<20pc) planetary systems, orbiting G-, K- and M-type mature stellar hosts. Our final direct imaging detection performances, ranging from 5 to 30 MJup beyond 2 au, were considered together with radial velocity and astrometric sensitivity. We recovered the emblematic very cool T-type brown dwarf GJ229B, but did not find any new bound companion among our 337 point-source detections. Our pilot study (Desgrange et al. 2023) opens the way to a multi-technique approach for the exploration of very nearby exoplanetary systems which will be prime targets for future ground-based and space observatories (ELT, HWO) and also the current JWST observatory.

## Session 5: Cold Jupiters AND inner low-mass planets (individual systems and statistical analyses) - outside-in

### - *Matteo Pinamonti (INAF-Torino, Italy), INVITED SPEAKER*

**Title:** Searching for inner low-mass companions to cold Jupiters

**Abstract:** The presence of cold Jupiters may strongly influence the formation and survival of inner low-mass companions, yet the observational evidence remains incomplete. Radial-velocity (RV) surveys provide the most direct approach to probe this connection, enabling searches for short-period sub-Neptunes and super-Earths in systems already known to host long-period giants.

Although high-precision, long-baseline RV datasets from instruments such as HARPS, HARPS-N, HIRES, and CARMENES, often complemented by Gaia astrometry, now allow simultaneous characterization of both outer and inner regions of exoplanetary systems, our knowledge remains incomplete, due to the observational difficulty to detect low-mass companions. Several surveys have revealed diverse system architectures: some cold Jupiter hosts harbor multiple compact low-mass planets, while others appear devoid of inner companions. Large-sample analyses combining recent and historical RV datasets are beginning to quantify the occurrence rate of inner low-mass planets in the presence of outer giants, probing dependencies on stellar mass, orbital separation, and eccentricity. Detection biases and observational limitations remain significant, but consistent trends are emerging, providing an empirical foundation for understanding how inner planetary systems coexist with massive outer companions.

This review will summarize current observational efforts and statistical results from RV surveys, highlighting remarkable systems detected in such surveys, and delineating the emerging picture of inner low-mass planets discovered in the shadow of giants.

### - *Diana Dragomir (University of New Mexico, Mexico)*

**Title:** JAS: a Jovian Architectures Survey to uncover the links between outer giant planets and their inner systems

**Abstract:** It is believed that Jupiter played a significant role in the history of the Solar System's terrestrial planets, likely affecting their mass, volatile budget and orbits. The detection of complete Solar System analogs around other stars is not currently within reach, yet we can still learn about the history of both ours and other systems' architecture by investigating the "outer giant planet - low-mass inner planet" connection statistically in an ensemble of exoplanetary systems. I will introduce an ongoing RV survey using Keck-KPF and EXPRES to determine the multiplicity, mass and orbital separation of inner low-mass planets in systems with a known Jovian planet in a wide orbit. I will describe the objectives, sample selection and the "outside-in" observing strategy of JAS. In conjunction with the survey, we have also undertaken a study of dynamical stability in the systems in our sample, particularly in regions of parameter space that have not yet been ruled out by existing RVs. I will present the dynamical constraints derived from these simulations, with a focus on ice giants at orbital separations between ~0.3 and 1 AU, still inner to the Jovian but outside the

typical orbits probed by transit surveys. An absence of ice giants in this region further bolsters the "peas-in-a-pod" hypothesis for the inner system, as suggested by studies of the Kepler multis. On the other hand, their presence would have direct implications for the ordering and orbital architecture of planets in the system, and indirect implications for volatile sequestration and delivery throughout the inner system. We also explore the mutual inclination evolution of inner planets relative to the outer giant. Thus, in addition to informing our observing strategy and detection sensitivity, the results of these simulations provide independent constraints on the types of planets that are dynamically stable (or not) in the inner system.

## - *Alessandro Ruggieri (INAF-Catania, Italy)*

**Title:** Occurrence rates of small close-in planets in the presence of cold Jupiters

**Abstract:** Despite the great advancements made in the exoplanetary field over the last decades, it is not yet clear whether our Solar System's architecture is common. To shed light on this topic, the GAPS team in 2012 started a program aimed at monitoring 16 systems known to host giant planets on a Jupiter-like orbit to detect potential inner smaller companions. After 13 years of observations and a few new planets detected, we are working on a statistical analysis of these systems. To expand on that, we selected a larger and homogeneous sample of Sun-like stars hosting a Jupiter-like object suited for the search for small inner planets. The target list includes 138 stars for which we gathered all the available RV data and fitted them homogeneously, finding evidence for 6 new convincing candidates. We derived completeness maps and occurrence rates of small and close-in planets, obtaining results in agreement with the literature. We also split our sample into various sub-samples to test the importance of different physical parameters in determining the link between outer gas giants and their internal low-mass companions.

## - *Etienne Lefèvre Florján (Aix-Marseille University, France)*

**Title:** Only the least massive outer-giant planets occur more frequently in the presence of inner super-Earths

**Abstract:** Studies from recent years have reached different conclusions regarding how frequently super-Earths are accompanied by long-period giant planets and vice versa. This relation has been predicted to be mass dependent by planet-formation models. We investigate that as the origin of the discrepancy using a radial velocity sample: the California Legacy Survey. We perform detection completeness corrections in order to discard detection bias as a possible explanation to our results. After bias corrections, we find that cold Jupiters are 5.65-2.57+1.08 times more massive when not in the company of an inner super-Earth, while super-Earths are not significantly more massive while in the company of an outer giant planet. We also report an occurrence enhancement for Saturns (median projected mass of 0.6MJ) while in presence of a super-Earth by a factor of ~4, and for super-Earths in the presence of Saturns by the same factor. This positive correlation disappears for super-Jupiters (median projected mass of 3.1MJ). These results show that while cold Jupiters are generally accompanied by inner super-Earths, this does not hold for the largest

giant planets, such as those that will be discovered by Gaia, which will likely not be accompanied by transiting planets. The mass dependence, in combination with the different detection limits of different surveys, may explain the discrepancies concerning occurrence relations between cold Jupiters and super-Earths.

### - *Alex Polanski (Lowell Observatory, USA)*

**Title:** Digger Deeper into Jovian-Host Systems with the Extreme Precision Spectrograph: Preliminary Survey Results

**Abstract:** A defining feature of our Solar System is the presence of multiple giant planets beyond the snowline, yet this architecture appears to be uncommon: only ~6% of stars are known to host Jupiter-like planets between 1–10 AU. Moreover, the Jovian analogs we do find are typically closer in and more eccentric than Jupiter or Saturn, raising questions about the long-term survivability of inner planets in such systems. Population-synthesis models offer conflicting predictions for the dominant outcomes of giant-planet formation, underscoring the need for improved observational constraints.
In this talk, I will present preliminary results from a radial-velocity survey with the Extreme Precision Spectrograph (EXPRES) at Lowell Observatory, targeting a sample of known Jovian-analog hosts. The instrument's high precision and long-term stability enable sensitivity to lower-mass and longer-period companions than previously achievable. I will show our progress toward reaching a target sensitivity of ~10 Earth masses at 1 AU, made possible in part by the ability of EPRV instruments to resolve stellar signals that would have been treated as white noise in lower-precision datasets. I will also discuss several candidate planetary signals emerging from the survey. This program is particularly timely, as it coincides with complementary RV efforts - such as the 100 Earths and the NEID Earth Twins surveys - which together provide an effective control sample for assessing how giant-planet formation influences the survival of inner planetary systems.

### - *Silvano Desidera (INAF-Padova, Italy)*

**Title:** A new scaled Solar-System analog around a nearby bright star

**Abstract:** We present the identification and characterization on new scaled Solar-System analog, based on intensive radial velocity monitoring performed with HARPS-N at TNG and additional literature datasets. The system includes a previously known giant planet in a moderately wide orbit, a newly discovered one in a Jupiter-like orbit, and additional low-mass planet candidates from TESS light curves and our radial velocities. The presence of an outer debris belt adds further interest and analogies with our own system.

### - *Cristina Madurga Favieres (University of Warwick, UK)*

**Title:** Evidence of a long-period giant companion around Tabby's star, and the search of similar systems

**Abstract:** Long-period planets play an important role in their systems, as they can interact with material and small mass planets, and modify their orbits. These modifications can result in dynamical instabilities within the system. One such system is that of Tabby’s star. Its Kepler light curve shows unusual dips with no clear periodicity or cause. The most plausible explanation is a family of exocomets. Our study of Tabby’s star revealed a unique, symmetric transit consistent with a long-period planet or brown dwarf. Could it be responsible for triggering internal dynamical instability in the system? Our analysis of the TESS and our new radial velocity data suggests a companion with a period of at least ~1030 days, one of the longest period transiting planets detected.
How many other systems are there like Tabby's star? What influence do these planets have on their systems? We have developed a pipeline to detect transits based on the True Inclusion Probability (TIP). We are applying this pipeline to stars in the Continuous Viewing Zone (CVZ) of TESS, that can be followed up with future radial velocity observations. This pipeline could also be used for upcoming PLATO long-period planet discoveries.

## - *Domenico Barbato (INAF-Padova, Italy)*

**Title:** Bridging discovery spaces: a multi-technique view on inner and outer worlds

**Abstract:** The growing field of comparative exoplanetology increasingly relies on the synergistic combination of detection techniques with complementary sensitivity domains to fully characterize planetary system architectures. Yet, estimates of exoplanet occurrence rates often remain constrained by the detection capabilities of individual instruments, surveys, or techniques. The resulting heterogeneity can limit our ability to construct a coherent view on exoplanetary demographics or to evaluate formation and evolution models against a uniform observational framework. For example, the frequency of inner low-mass planets in systems with outer giants is debated also because completeness is rarely evaluated in a uniform, cross-technique manner.
We present an in-development, multi-technique framework that jointly evaluates detection completeness by integrating radial velocity, transit, proper motion anomaly, and direct imaging sensitivities within a single, self-consistent analysis. We apply this approach to a selected sample of stars hosting outer massive companions and quantify the multi-technique completeness to potential inner companions. In this talk, we will present initial results from this joint completeness analysis and highlight the methodological challenges and scientific implications for planet formation and system evolution.

## - *Thomas Baycroft (Tsung-Dao Lee Institute, Shanghai Jiao Tong University, China)*

**Title:** Assessing the impact of stability on occurrence rates of inner planets with outer giant companions

**Abstract:** The dynamical stability of planets with outer giant companions depends on the parameters of the outer companion(s). The inclusion of constraints from stability in the calculation of detection limits can in principle help rule out regions of parameter space where

inner planets could not exist in individual systems. We will present preliminary results from a project where, using a synthetic planet population, we compare the use of data-driven detection limits and dynamical detection limits, quantifying the impact on occurence rates of inner planets given the presence of outer giants.

- ***Manu Stalport (University of Liège, Belgium)***

**Title:** ARDENT: including dynamical constraints in RV detection limits

**Abstract:** The exact role of outer giant planets in the formation of super-Earths and sub-Neptunes remains unclear. Observationally, measuring occurrence rates of these planet populations brings crucial insights, and RV surveys play a major role in this effort. While large sample sizes are key to obtain precise occurrence rates, strong detection limits on each system are equally important. Commonly, RV detection limits are computed based on injection-recovery tests in a data-driven approach. Dynamical viability of the injected planets is omitted. Yet, planet-planet gravitational interactions can have an important impact on the resulting detection limits. In this presentation I will introduce ARDENT, an open-source Python code for the fast and efficient computation of dynamical detection limits (i.e. detection limits that include stability constraints). It combines both analytical and numerical stability criteria to balance computation time and reliability. With ARDENT, I will demonstrate that accounting for gravitational interactions significantly strengthens the detection limits in giant planet systems.

## Session 6: Future prospects and instruments (PLATO, Gaia DR4, new high-resolution spectrographs, new imaging instruments)

- ***Juan Cabrera (German Aerospace Center, Germany), INVITED SPEAKER***

**Title:** The PLATO Space Mission planet yield

**Abstract:** PLATO, the 3rd Medium class ESA's mission, is being built to detect and characterize extrasolar planets by photometrically monitoring a large number of stars. PLATO will detect small planets around bright stars, including terrestrial planets in the habitable zone of Sun-like stars. PLATO will also study the (host) stars using asteroseismology, allowing us to determine the stellar properties with high accuracy (radius, mass, age), substantially enhancing our knowledge of stellar structure and evolution. Radial velocity observations from ground will allow characterizing planets for their radius and mass (hence density), and age with high accuracy. The mission will provide a catalogue of well-characterized exoplanets up to intermediate orbital periods, relevant for a meaningful comparison to planet formation theories and to better understand planet evolution. In addition, PLATO´s Guest Observer program will allow for a large number of complementary science cases, based on proposals from the community.
PLATO is scheduled for a launch date not earlier than end 2026 on an Ariane 6 rocket. The payload instrument consists of 26 cameras with 12cm aperture each. For at least four years, the mission will perform high-precision photometric measurements of about 150.000 stars per field, with 2 long pointings foreseen.
In this talk we will present the current status of the mission and review the expected science performance for the project, with focus on the planet yield.

- ***Joao Faria (Université de Genève, Switzerland), INVITED SPEAKER***

**Title:** Expectations from current and future radial-velocity surveys

**Abstract:** TBD

- ***Timothy Brandt (Space Telescope Science Institute, USA), INVITED SPEAKER***

**Title:** Gaia: Expectations from DR4 and beyond

**Abstract:** While Gaia DR3 itself contained limited exoplanet results, Gaia DR4 is expected to include the discovery, orbits, and masses of thousands of exoplanets. I will briefly review exoplanet results of Gaia DR3, including from its combination with Hipparcos. I will discuss the reasons for the continued value of Hipparcos measurements in the face of higher Gaia precision, and the scaling of Gaia sensitivity with observing baseline. These scalings can

inform expectations for Gaia DR4 for planets as a function of orbital period, with a peak sensitivity near the DR4 baseline of about 5.5 years. I will further describe prospects for the discovery and orbits of planets on longer periods with DR4 and with subsequent Gaia data releases.

- ***Gael Chauvin (Max Planck Institute for Astronomy, Germany), INVITED SPEAKER***

**Title:** The ELT's Promise for Planet Formation and Exoplanet Exploration

**Abstract:** In 2029, the European Extremely Large Telescope (ELT) will shine its first light on the sky. The high angular resolution and large collecting capacity, combined with the extreme sensitivity and versatility of the ELT's instruments, will allow unprecedented observations of worlds orbiting stars other than the Sun. It will provide a unique opportunity to address fundamental questions related to our understanding of the processes of planetary formation, the origin of our own Solar System, and the emergence of life in the Universe. The ELT will directly probe and characterise the stellar environment at unprecedented physical scales, from the inner regions of proto-planetary disks, through the chemistry of planet-forming zones, to the characterisation of recently formed giant planets in their birth environments. It will also come at a time when thousands of new planetary systems in the solar neighbourhood will have been discovered and characterised by a large number of instruments or space missions. The ELT will therefore provide an excellent machinery for the detailed exploration and characterisation of known planetary systems, the study of their populations of giant and rocky planets, including their internal structures and those of their atmospheres, which is directly related to the ultimate search for life on the horizon 2040. In this talk, I will briefly summarise the main characteristics, modes and synergies of the various generations of ELT instruments, their main scientific drivers in the field of exoplanets and planetary formation, and the status of their predicted performances, yields and expected breakthroughs.

- ***Eleonora Alei (NASA Goddard Space Flight Center, USA), INVITED SPEAKER***

**Title:** HWO and LIFE: future space telescopes to look for life in the universe

**Abstract:** One of the primary goals of the astronomical community in the next few decades is to characterize temperate terrestrial exoplanets to search for life. To address this challenge, the US Astro2020 Decadal survey recommended the pursuit of a technical and scientific study for the Habitable Worlds Observatory (HWO), an ultraviolet/visible/near-infrared (UV/VIS/NIR) “high-contrast direct imaging mission with a target off-axis inscribed diameter of approximately 6 meters” which shares design and technology heritage with the previous concept studies HabEx (Habitable Exoplanet Observatory) and LUVOIR (Large UV/Optical/IR Surveyor). Similarly, European scientists focus on the development of the MIR space-based nulling interferometer LIFE (Large Interferometer For Exoplanets). These observatories would focus on complementary regions of the electromagnetic

spectrum: HWO will explore the reflected light spectrum regime in the UV/VIS/NIR, while LIFE would capture the planetary thermal emission in the MIR. Both wavelength ranges provide us with their specific set of preferred information and come with specific drawbacks. Yet, the scientific yield of synergistic observations in the UV/VIS/NIR+MIR range has the potential of being greater than the sum of its parts: having access to multiple spectral windows into the atmosphere of a potentially habitable planet could be transformative for the search of life in the universe. In this talk, I will discuss the potential of LIFE and HWO in characterizing a cloud-free Earth twin at 10-parsec distance both as separate missions and in synergy with each other.

- ***Scott Gaudi (University of Hawaii, Institute for Astronomy, USA)***

**Title:** A Galactic Census of Exoplanets from the Nancy Grace Roman Space Telescope

**Abstract:** The Nancy Grace Roman Space Telescope (Roman) is NASA's next major astrophysics mission, scheduled for launch in late 2026. Roman will feature a wavelength range, aperture, and angular resolution comparable to the Hubble Space Telescope but with approximately 100 times the field of view and 1,000 times the sky-mapping speed. This capability allows it to survey large sky areas rapidly or repeatedly observe smaller areas with high frequency. A key community survey during Roman's primary mission will be the Roman Galactic Bulge Time Domain Survey (RGBTDS). This survey will monitor about 1.7 square degrees of the Galactic center with a cadence of approximately 12 minutes using a wide 1–2 micron filter, spanning six seasons of 72 days each, with a total survey duration of 440 days. The RGBTDS aims to detect thousands of cold bound and free-floating planets using microlensing, as well as about 100,000 hot and warm transiting planets. Roman's transit and microlensing data will enable the first comprehensive statistical survey of exoplanets within all the major stellar populations of the Galaxy, covering planets with radii or masses greater than twice that of Earth across all orbital distances. I will review Roman's potential for constraining the demographics of exoplanets and discuss challenges and opportunities in realizing this potential.

- ***Tristan Guillot (Observatoire de la Côte d'Azur, France)***

**Title:** Interacting temperate transiting planets from ASTEP

**Abstract:** With its location from ASTEP (Antarctic Search for Transiting Exoplanets) has been contributing to the discovery of many interacting planetary systems on long periods (tens to hundreds of days). The chopping signal from the planet-planet interactions can yield significant TTVs that can be measured with no ambiguity, allowing constraints on the planetary mass. The extremely small densities of some of these planets raise important questions about the formation of these systems. Future follow-up combining ASTEP, ExTrA and Cryoscope as part of the EXTRASTEP program will be extremely important to further characterize these systems. PLATO should also discover key systems with transiting planets on very long orbits. I will review the discoveries and proposed theories to explain the formation of these mysterious systems.

### - *Alexander Wallace (University of Southern Queensland, Australia)*

**Title:** Three-Dimensional Constraints on Planet Orbits with Radial Velocities and Gaia

**Abstract:** Radial velocity (RV) surveys have revealed a rich population of cold Jupiters and Solar System analogues, but the long-standing degeneracy between planet mass and orbital inclination continues to limit what we can infer about their true architectures. The upcoming Gaia Data Release 4 (DR4), expected within the next year, will change that by providing epoch astrometry for more than a billion stars - enabling direct measurements of orbital inclination and true planetary masses for thousands of known systems.
In this talk, I show how much we can already achieve by combining Gaia DR3 astrometry with existing RV time series, and by leveraging proper motion anomalies from the Hipparcos–Gaia baseline. These early results demonstrate that astrometric signatures are already detectable for several known RV planets. I'll also preview how DR4 will extend this capability to a much broader population, providing the first truly three-dimensional view of planetary orbits and a pathway to understanding long-period planet formation.

### - *Michael Liu (University of Hawaii, Institute for Astronomy, USA)*

**Title:** Probing the Earliest Stages of Gas Giants and Brown Dwarfs with New Adaptive Optics Capabilities at Keck

**Abstract:** Perhaps the greatest mysteries of gas giant and brown dwarf formation reside at the youngest (<few Myr) ages, when such objects are being born in their natal circumstellar disks and the corresponding theoretical models predict an enormous range of luminosities. In practice, this means that any observations of such objects help open a window into the earliest stages, and increasing the current census of the youngest imaged exoplanets would be a significant step forward. We report on a two-phase program aimed at such new discovery space in the nearby Taurus and Ophiuchus star-forming regions. Phase 1 used Keck's infrared pyramid wavefront sensor (PyWFS) to obtained diffraction-limited imaging of ~200 young stars that had previously never been imaged at high angular resolution, in part due to their optical faintness making them unsuitable for typical AO systems using optical wavefront sensing. Follow-up work has already confirmed 4 new planetary-mass companions, including the lowest-mass planets imaged to date in these 2 regions, with more candidates currently being vetted. Phase 2 is beginning in 2026 as the Keck All-Sky Precision AO (KAPA) system completes its commissioning and begins science operations. KAPA's multiple laser guide stars (LGS) and near-IR tip-tilt sensing will substantially improve upon the AO-delivered images of current single-LGS systems, and open the door to studying the youngest (most dust-enshrouded) and lowest-mass members of these regions. Together, this 2-stage program will work to confirm and characterize very young companions, build an empirical color–magnitude sequence at Myr ages to confront hot/warm/cold-start predictions, and measure the demographics of the youngest giant planets and substellar companions.

### - *Carles Cantero Mitjans (Université de Genève, Switzerland)*

**Title:** SpeckleNet: a deep learning framework to improve detection sensitivity of giant planets

**Abstract:** The atmospheric characterization of giant exoplanets has so far relied primarily on transit spectroscopy, a technique intrinsically biased toward short-period planets and therefore largely inaccessible for cold, long-period giants. High-contrast imaging (HCI) fills this gap by providing a complementary route to study the atmospheres of wide-orbit giant planets directly. However, conducting blind HCI surveys at scale remains extremely expensive in terms of telescope time, making target selection a critical bottleneck for atmospheric characterization.

The upcoming Gaia DR4, together with long-period radial-velocity surveys such as CORALIE, will fundamentally change this landscape. For the first time, we will have a well-defined and statistically significant sample of giant planets identified through RV and astrometry alone. This enables a new observational strategy: instead of broad HCI surveys, we can concentrate direct imaging efforts on golden targets, where dynamical signatures already predict the presence of giant planets at separations accessible to direct imaging. In this scenario, maximizing HCI sensitivity becomes essential.

While HCI instrumental upgrades (e.g., SAXO+) continue to improve raw performance, image post-processing techniques remain equally crucial. Among these, Principal Component Analysis (PCA) has long been the community standard due to its computational efficiency and strong mathematical foundation. Yet recent studies have revealed fundamental limitations, including its restriction to linear correlations and significant planet self-subtraction (Bonse et al. 2024).

To mitigate these issues, multiple alternatives have been proposed, ranging from PCA refinements to machine-learning based classifiers for enhanced detection (e.g., Cantero et al. 2023). More recently, developments in generative models have demonstrated particularly strong potential. For instance, the ConStruct algorithm (Wolf et al. 2024) replaces PCA with a convolutional autoencoder (AE) at modeling image noise, achieving deeper detection limits on Keck/NIRC2 data and providing a compelling proof-of-concept for deep generative approaches in HCI.

In this context, the growing availability of large-scale HCI datasets from surveys, the rapid progress in generative model architectures, and the improved understanding of speckle noise gained in recent years now converge to enable more powerful approaches for improving detection sensitivity. To harness this potential, we introduce SpeckleNet, a deep learning framework for high-fidelity, instrument-based speckle modeling. SpeckleNet explores modern generative architectures, including variational AEs, diffusion models, and others, trained on extensive HCI datasets. The framework also employs conditional learning, allowing adaptation to atmospheric conditions.

In this work, we present the first SpeckleNet release and demonstrate its ability to enhance sensitivity and recover known substellar companions in VLT/SPHERE data. Looking ahead to Gaia DR4 and ongoing CORALIE monitoring, SpeckleNet provides a powerful computational tool to fully exploit the upcoming population of dynamically identified giant planets, enabling targeted HCI follow-up and a more complete atmospheric census at wide separations.

# POSTERS

## - *Maleah Rehm (University of Kansas, USA)*

**Title:** Searching for Long-Period Giants within K2 Planetary Systems

**Abstract:** Transit and RV surveys have given us insight into the current distribution of exoplanets. Kepler revealed that short-period small planets have an occurrence rate of <1 planet per solar-type star, while RV surveys revealed that long-period giant planets near the snow line are less common, with an occurrence rate of 5-10%. A few formation models of planetary systems with both types of planets have been proposed. However, due to these planets being discovered from stellar samples with different stellar distances, the correlation between small and giant planet formation is unclear. To fix this gap, NASA repurposed the Kepler spacecraft for the K2 mission, whose primary goal was to survey thousands of nearby, bright stars hosting short-period planets. Our study analyzes RVs collected from 28 K2 systems using the High-Resolution Echelle Spectrograph (HIRES) at the W.M. Keck Observatory. Our goal is to detect long-period companions within these systems by looking for long-term RV trends from their host stars; i.e., stellar accelerations induced by larger companions. This study also seeks to measure their occurrence rate within the overall sample, which will help us determine the correlation between small and giant planet formation

## - *Adriana Barbieri (University of Padova / University of Geneva, USA)*

**Title:** Follow-up analysis of GFU25

**Abstract:** The fourth data release of the ESA mission Gaia, expected by the end of 2026, is foreseen to deliver thousands of new astrometrically identified exoplanets candidates. Astrometric detections allow us to identify massive exoplanets (Mp > 1 Mj) in long-period orbits (P > 1 yr) around nearby stars (d < 100 pc), and astrometry is complementary to other exoplanet discovery methods; for instance, combined observations with precision radial velocity constrain the three-dimensional orbit, and can yield individual component masses without the ambiguity of the orbital inclination.
In this poster I will illustrate the case of the GAPS Target GFU25, a K7 star at 50 pc from the Sun, whose Gaia DR3 astrometric solution is compatible with the presence of a substellar companion on a 687,71 d orbit. Such a companion has first been RV validated and characterized within the GAPS programme by Barbato et al. (submitted). The currently available RV timeseries obtained with HARPS-N at TNG count 57 high-precision measurements from October 2023 to November 2025, for an astrometric candidate period coverage of 112%.
This work showcases the importance of RV follow-up observational campaigns in validating and characterizing DR3 astrometric candidates, and is carried in the framework of the

HARPS-N hunt for super-Earths and Neptunes interior to outer giant planets detected by Gaia.

- ***William Brilliant (University of Cambridge, UK)***

**Title:** Target Selection for the Terra Hunting Experiment

**Abstract:** To date, the only Earth-mass planets discovered have been around M-dwarf stars. These lower-mass stars provide very different environments from our Solar System for planetary formation and evolution, including a lower occurrence rate of giant planetary companions. This limits our ability to infer very much about our own planetary system and those like it. The Terra Hunting Experiment (THE) seeks to remedy this, attempting a 10-year RV search of just 40 Sun-like stars to find a true Earth-analogue. The key to detecting the first Earth-mass, Earth-period planet around a K- or G-type star will be selecting the correct stars to observe for the 10-year mission, requiring that targets are both sufficiently solar-like and adequately well-behaved that the mission could disentangle the planetary signal from the RV jitter of the star. This poster describes my work towards determining accurate stellar parameters on which we can cut these stars, and a discussion of the sorts of cuts the THE may make to reach a final 40-star target list.