European Astronomical Society
2024 Prizes

Tycho Brahe Medal

The 2024 Tycho Brahe Medal is awarded to **Prof. Francesco Pepe (University of Geneva, Switzerland)** *for the development and exploitation of ultra-stable high-resolution spectrographs which revolutionised the detection and characterisation of small-mass exoplanets.*

Lodewijk Woltjer Lecture

The 2024 Lodewijk Woltjer Lecture is awarded to **Prof. Roland Bacon (CRAL/CNRS/ENS de Lyon/Claude Bernard Lyon 1 University, France)** *for the development of integral field spectroscopy as a core technique in observational astrophysics and its application to a wide range of problems, in particular galaxy evolution.*

Fritz Zwicky Prize for Astrophysics & Cosmology

The 2024 Fritz Zwicky Prize for Astrophysics & Cosmology is awarded to **Dr Catherine Cesarsky (CEA Saclay, France)** *for outstanding contributions to the understanding of the evolution of galaxies via space infrared observations and for her leadership in shaping the observational infrastructure of contemporary astronomy.*

MERAC Prizes

The 2024 MERAC Prizes for the Best Doctoral Thesis are awarded in

Theoretical Astrophysics

to **Dr Lorenzo Gavassino (Vanderbilt University, United States of America)** *for his thermodynamics-based formulation of relativistic viscous hydrodynamics for multi-messenger and gravitational astronomy.*

Observational Astrophysics

to **Dr Julia V. Seidel (European Southern Observatory)** *for her work on climate and atmospheric circulation regimes of exoplanets from high-resolution spectroscopic observations.*

New Technologies (Computational)

to **Dr Johannes Heyl (University College London, United Kingdom)** *for his work on machine learning-based techniques to understand astrochemical processes in the interstellar medium.*

All six awardees will give a plenary lecture at the European Astronomical Society Annual Meeting 2024 to be held in Padova, Italy, from 1 to 5 July 2024.

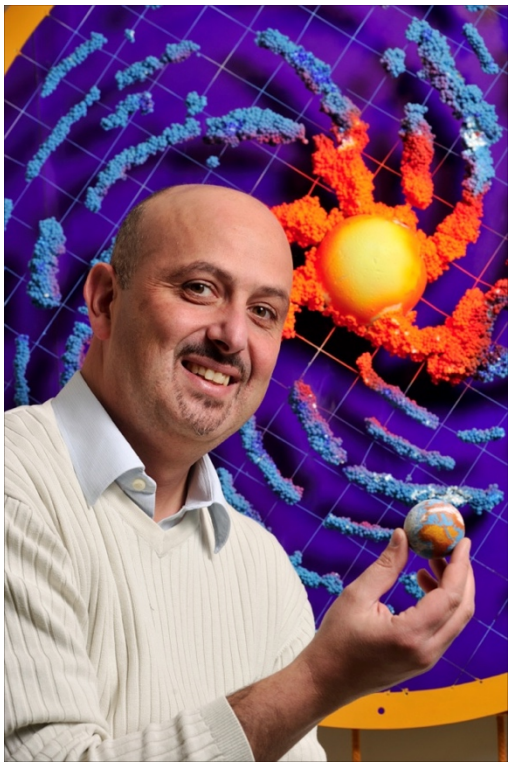
The European Astronomical Society (EAS) promotes and advances astronomy in Europe. As an independent body, the EAS can act on matters that need to be handled at a European level on behalf of the European astronomical community.

Visit the EAS website: https://eas.unige.ch/ and contact the EAS President: Prof. Roger Davies, eas@unige.ch

The Tycho Brahe Medal is awarded in recognition of the development or exploitation of European instruments or major discoveries based largely on such instruments.

Tycho Brahe Medal

The 2024 Tycho Brahe Medal is awarded to **Prof. Francesco Pepe (University of Geneva, Switzerland)** *for the development and exploitation of ultra-stable high-resolution spectrographs which revolutionised the detection and characterisation of small-mass exoplanets.*



Prof. Francesco Pepe obtained his diploma in physics and his PhD in astrophysics at the Swiss Institute of Technology (ETHZ), developing an infrared imaging spectrometer to fly under stratospheric balloons. He then moved to the department of astronomy of the University of Geneva where his skills and instrumental competences proved to be decisive for the development of the HARPS spectrograph for ESO, of the sister instrument HARPS-North on the Telescopio Nazionale Galileo (TNG) at La Palma, and of ESPRESSO on the VLT. Since 2018, Francesco Pepe has been full professor and director of the Department of Astronomy. His main research topics are the detection of small-mass exoplanets via the measurements of extreme precision radial velocities and the characterisation of planetary atmospheres via transmission spectroscopy at high resolution.

The discovery by Swiss astronomers in 1995 of the first giant planet outside our solar system, rewarded by the Nobel Prize in Physics 2019, spawned a revolution in astronomy in terms of understanding planet formation and evolution. There followed a rapid push to develop the observational capabilities needed to study them in more detail. Prof. Francesco Pepe has led the development of the next generation of ultra-stable spectrographs for extremely precise radial velocity measurements (1 m/s precision and below), including e.g. HARPS on the ESO 3.6m telescope, HARPS-North on the Telescopio Nazionale Galileo (TNG) on La Palma, and ESPRESSO on the ESO Very Large Telescope.

These instruments are central in the activities of astronomers studying exoplanets. HARPS observations led to the discovery of an unexpectedly large population of small planets, super-Earths and Neptune-like planets close to their stars, that are not found in our Solar System. To confirm and measure the mass of the planet candidates detected by the Kepler

satellite, a copy of HARPS was developed and installed in the northern hemisphere on the TNG on La Palma by an international consortium led by Prof. Pepe. HARPS-North has been since then a key instrument for the study of the internal composition of small-mass planets. ESPRESSO on the VLT has made exquisite radial-velocity measurements of unrivalled precision (at 3σ level of 25 cm/s) which has enabled mass measurements for even lower-mass planets, reaching less than the mass of the Earth for planets on close-in orbits.

High-resolution, ultra-stable spectrographs developed for extreme precision radial velocity measurements have also proven to be perfect instruments for the analysis of the atmospheres of exoplanets via transit spectroscopy. The stability and spectral fidelity of the new generation of spectrographs is such that it has made possible the separation of the spectral information coming from the planet itself, e.g., through ground-based transmission spectroscopy, thus enabling the study of planetary atmospheres.

Through the development of ultra-stable high-resolution spectrographs, the contribution of Prof. Francesco Pepe to the field of exoplanets and to astrophysics in general has been outstanding.

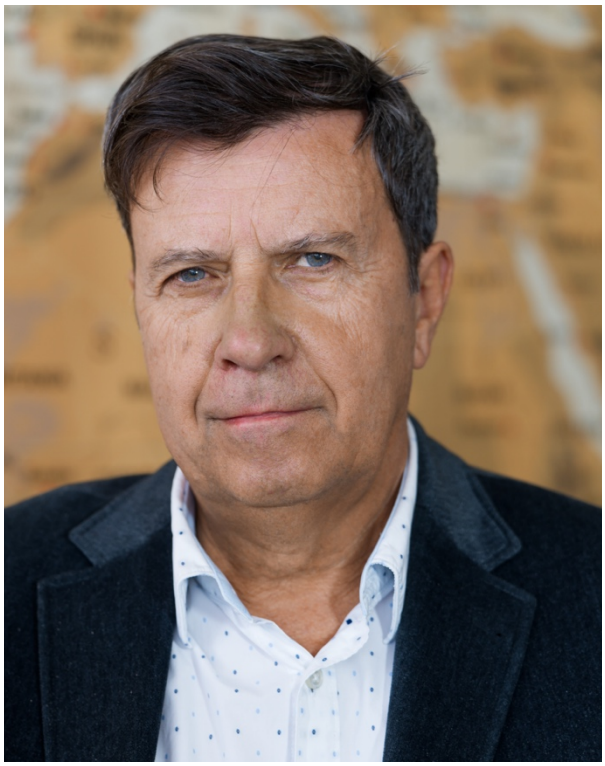
The European Astronomical Society is pleased to award Prof. Francesco Pepe the 2024 Tycho Brahe Medal.

Photo credit: Charly Rappo

The Lodewijk Woltjer Lecture honours astronomers of outstanding scientific distinction.

Lodewijk Woltjer Lecture

The 2024 Lodewijk Woltjer Lecture is awarded to **Prof. Roland Bacon (CRAL/CNRS/ENS de Lyon/Claude Bernard Lyon 1 University, France)** *for the development of integral field spectroscopy as a core technique in observational astrophysics and its application to a wide range of problems, in particular galaxy evolution.*



Prof. Roland Bacon obtained his PhD in 1984 from the Université Paul Sabatier Toulouse III. He then moved to the Observatoire de Lyon in where he eventually became the Director from 1995 to 2005. He has played a pioneering role in the development of integral field spectroscopy. His research focusing on instrumentation for large optical telescopes and extragalactic astronomy. He led the construction of the TIGER and OASIS instruments at the 3.6m Canada France Hawaii telescope, of SAURON at the 4.2m William Herschel telescope and MUSE at the 8m ESO Very Large Telescope.. He received several prizes and awards from France, Netherlands, UK, Sweden, and Germany celebrating his achievements in the development of integral field spectroscopy.

Prof. Roland Bacon started his career in extragalactic astronomy developing kinematic models of elliptical galaxies. The necessity to resolve galaxies both spatially and spectrally stimulated him to develop the concept for the TIGER instrument. This established integral field spectroscopy in the scientific community and produced many new results in fields ranging from planetary surfaces to distant quasars during its 10 years operation at Canada-France-Hawaii Telescope (CFHT). He then commissioned OASIS, the first IFU coupled with an Adaptive Optics (AO) system (PUEO). The instrument was used for several years at CFHT before moving to the William Herschel Telescope (WHT) on La Palma to be used with the NAOMI AO system.

Together with Tim de Zeeuw and Roger Davies, Bacon built and operated the wide field IFU SAURON at the WHT. Designed and optimized for the study of nearby galaxies, SAURON

conducted the first large survey of galaxies using an IFU, focusing on early-type galaxies. SAURON changed our view about the formation and evolution of these galaxies, demonstrating, for example, that the stellar kinematics rather than the morphology is the key parameter for understanding these galaxies. SAURON has left a high impact in the field.

Prof. Bacon has been the Principal Investigator of MUSE, a highly innovative VLT panoramic integral-field spectrograph since 2001. MUSE combines a large field of view with excellent angular resolution, assisted by ground layer adaptive optics using four laser guide stars. Since its first light in 2014, MUSE has been the most in-demand instrument at the VLT. Prof. Bacon has been involved in several instrument projects internationally, and he has been the originator of BlueMUSE, the complement of MUSE, optimised for blue wavelengths (350-580 nm), and to be part of the VLT instrumentation, and is now leading a community effort to develop the Wide Field Spectroscopic Telescope, an innovative 10-m class telescope with simultaneous operation of a large field-of-view and high multiplex multi-object spectrograph facility with both medium and high resolution modes, and a giant panoramic integral field spectrograph. Together with Guy Monnet, he published a textbook in optical 3D-spectroscopy for astronomy.

The European Astronomical Society is pleased to award Prof. Roland Bacon the 2024 Lodewijk Woltjer Lecture.

The Fritz Zwicky Prize for Astrophysics & Cosmology honours scientists who have obtained fundamental and outstanding results related to astrophysics and/or cosmology. The Fritz Zwicky Prize is awarded biennially, for the first time in 2020, by the European Astronomical Society on behalf of the Fritz Zwicky Foundation, located in Glarus, Switzerland.

The 2024 Fritz Zwicky Prize for Astrophysics & Cosmology is awarded to **Dr Catherine Cesarsky (CEA Saclay, France)** *for outstanding contributions to the understanding of the evolution of galaxies via space infrared observations and for her leadership in shaping the observational infrastructure of contemporary astronomy.*

Fritz Zwicky Prize for Astrophysics & Cosmology

Dr Catherine Cesarsky obtained a Physics degree from the University of Buenos Aires, and a PhD in 1971 in astronomy from Harvard University. She then moved to the California Institute of Technology before joining the Commissariat à l'Energie Atomique (CEA) in 1974, where she eventually became Head of Astrophysics (1985-1993), and then Director of CEA basic research in physics and chemistry (1994-1999). Dr Cesarsky was the PI of Isocam, the infrared camera on the European satellite ISO (Infrared Space Observatory). She became then the Director General of the European Southern Observatory (1999 to 2007), and then President of the International Astronomical Union (2006-2009). Dr Cesarsky received several prizes and awards for her achievements and is member of several renowned national and international Science Academies. From 2009 to 2012, she was High Commissioner for Atomic Energy in France, advisor to the French government for science and energy issues. She is now Chairperson of the SKA Observatory Council. Dr Cesarsky has worked in several central areas of modern astrophysics, initially in high-energy astrophysics, then focusing to infrared astronomy in several fields from interstellar medium to galaxy evolution.

Dr Catherine Cesarsky started her career in the high-energy domain. She first gained international recognition through her theoretical work on the propagation and acceleration of cosmic rays. Her interests then shifted toward infrared astronomy where she made pioneering research in several fields of astrophysics exploiting advances in infrared astronomy. While at CEA she led the development and construction of the infrared camera ISOCAM onboard ESA's ISO satellite. This led to numerous pioneering studies in particular galaxy evolution. Dr Cesarsky organized the ISOCAM Central programme, which provided

new insights into infrared emission from the diffuse interstellar medium and normal galaxies, star formation in molecular clouds, dust formation in supernovae and dust embedded star formation in colliding galaxies. She led the ITGES collaboration that conducted deep highly sensitive surveys with ISOCAM which led to the discovery of the individual galaxies responsible for the bulk of the Cosmic Infrared Background.

As Director General of the European Southern Observatory, Dr Cesarsky was the driving force towards the realisation of the full potential of ESO's unique Very Large Telescope (VLT) and its associated interferometer (VLTI). She made pivotal contributions towards the European-North American agreement on the Atacama Large Millimeter/submillimeter Array (ALMA), later extended to Japan, and oversaw the early years of ALMA's construction. Under her leadership the La Silla Observatory transitioned into a highly productive and competitive observatory working in parallel to the VLT. Further, Dr. Cesarsky's leadership was instrumental into channeling the astronomy community towards the development of an extremely large telescope. During her final years as ESO Director General she oversaw the development and selection of the revolutionary five mirror design for ESO's Extremely Large Telescope, which paved the way for further design studies of this telescope.

As IAU President Dr Cesarsky played a leading role in the coordination of the word-wide effort toward the International Year of Astronomy in 2009, proclaimed by the United Nations and endorsed by UNESCO. IYA2009 marked the 400th anniversary of the first astronomical observation through a telescope by Galileo Galilei. IYA2009 celebrated astronomy and its contributions to society and culture, with events at all levels, from national, regional to global. Dr Cesarsky further held several high-level positions in France and international. She chaired the High-level committee on large scale science infrastructures for the French ministry of research and higher education in the period 2013-2018 and from 2014 to 2016 she was the Chair of ESA's Space Science Advisory Committee. From November 2017 to February 2021, Dr Cesarsky chaired the Board of Directors of the SKA Organization, and since then she chairs the Council of the Square Kilometer Array Observatory.

These extensive achievements make Dr Catherine Cesarsky an outstanding awardee of the 2024 Fritz Zwicky Prize for Astrophysics and Cosmology.

MERAC Prizes

FONDATION MERAC (Mobilising European Research in Astrophysics and Cosmology) is a non-profit foundation started in 2012 with headquarters in Switzerland to recognise and support young European astronomers.

There are yearly three MERAC Prizes awarded by the European Astronomical Society. The prizes of 25'000 € are for each of the three categories:

- ★ Theoretical Astrophysics
- ★ Observational Astrophysics
- ★ New Technologies (Instrumental/Computational/Multi-Messenger)

The prizes alternate by year for:

- ★ Best Early Career Researcher Prizes (on odd years)
- ★ Best Doctoral Thesis Prizes (on even years)

The awardees are also eligible for further support from the FONDATION MERAC.

Best Doctoral Thesis in Theoretical Astrophysics

The 2024 MERAC Prize for the Best Doctoral Thesis in Theoretical Astrophysics is awarded to **Dr Lorenzo Gavassino (Vanderbilt University, United States of America)** *for his thermodynamics-based formulation of relativistic viscous hydrodynamics for multi-messenger and gravitational astronomy.*

Dr Lorenzo Gavassino received his Master's degree (cum laude) in Physics from the University of Milano "La Statale" in Milan, Italy, and moved to the Nicolaus Copernicus Astronomical Center of the Polish Academy of Science in Warsaw, Poland, for his doctoral studies (initially with a Della Riccia scholarship). He graduated in June 2022 and obtained his PhD (with distinction) in astronomy and astrophysics with a thesis on "Thermodynamic methods for relativistic hydrodynamics". He is currently a postdoctoral scholar at the department of mathematics of Vanderbilt University, in Nashville, USA, and member of the Vanderbilt Initiative for Gravity, Waves, and Fluids (VandyGRAF).

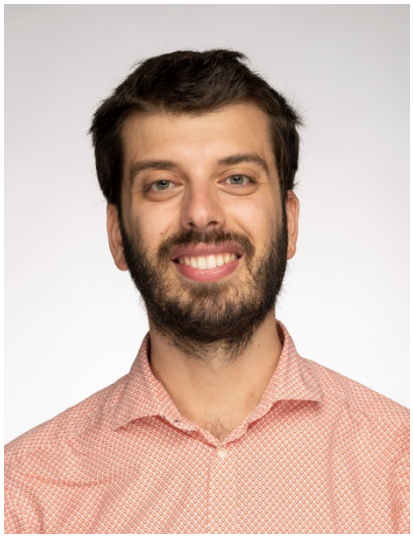


Photo credit: William H. McClary (Vanderbilt University)

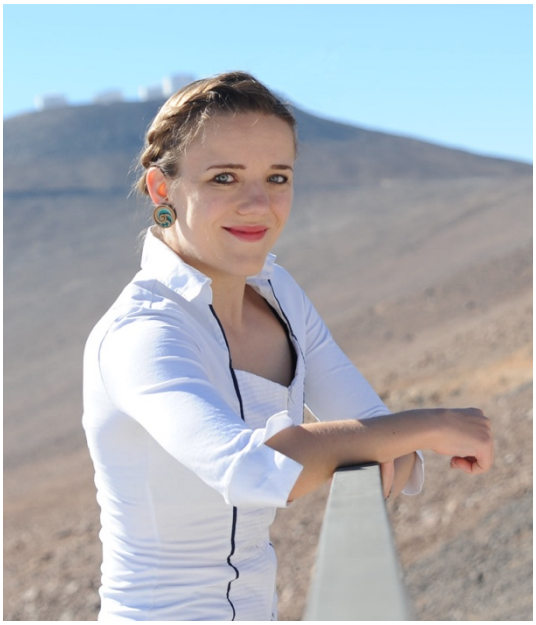
Dr Gavassino's thesis focuses on how to develop a formulation of viscous hydrodynamics in general relativity. The topic has become of importance for multi-messenger astronomy, given the detection of gravitational waves created during the final stages of inspiral and coalescence of two neutron stars (GW170817A). Events like this are very energetic and require the use of relativistic, dissipative fluid dynamics for modeling and data extraction. However, the theoretical foundations of relativistic dissipative fluid dynamics are not completely settled, with troubling issues dealing with causality and stability still debated.

His work approaches these issues of causality and stability in a modern and original way, namely, to start the discussion of a many-particle system with well-established conservation laws, such as energy, baryon number, and momentum, to build a manifold of possible thermodynamic states. Dr Gavassino clarified several outstanding questions concerning the role played by the second law of thermodynamics in the determination of the stability properties of relativistic fluids. He explained why several fluid dynamic formulations are inconsistent with relativity, even though they formally satisfy the second law of thermodynamics. Furthermore, he created a quick systematic technique to construct a quadratic Lyapunov-like functional that can be used to investigate the stability properties of relativistic viscous fluid dynamic theories with an entropy current that exactly satisfies the second law of thermodynamics. His work provided for the first time both a systematic method for constructing such a functional and also the physics reasoning behind it. In a separate paper, he showed that relativistic fluids, which possess a well-defined entropy that is maximized in equilibrium according to the second law of thermodynamics, cannot possess superluminal perturbations that would violate relativistic causality.

The PhD thesis of Dr Lorenzo Gavassino was conducted at the Nicolaus Copernicus Astronomical Center of the Polish Academy of Sciences in Warsaw, Poland, under the supervision of Professor Brynmor Haskell.

Best Doctoral Thesis in Observational Astrophysics

The 2024 MERAC Prize for the Best Doctoral Thesis in Observational Astrophysics is awarded to **Dr Julia V. Seidel (European Southern Observatory)** *for her work on climate and atmospheric circulation regimes of exoplanets from high-resolution spectroscopic observations.*



Dr Julia Victoria Seidel obtained an MSc in Physics from Imperial College London in 2017 and a PhD in astronomy and astrophysics from the University of Geneva in 2021, For this work, she was awarded the 2022 Edith A. Müller award for the best Swiss PhD thesis in astronomy. Since 2021, Dr Seidel is a Research Fellow at the European Southern Observatory (ESO) based in Santiago and at Paranal Observatory in Chile. She dedicates half of her work as a support astronomer at ESO while conducting observational and theoretical research about the atmospheric dynamics of planets, from the extreme climates of ultrahot gas giants to the Earth's climate and its impact on future astronomical observations.

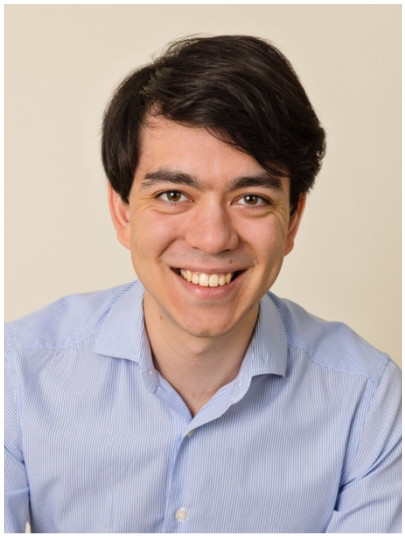
Dr Seidel is pioneering new observational and theoretical approaches to understand the climates of exoplanets. Her research participates to the characterisation of the physical & chemical properties of exoplanets and their atmospheric evolution. During her PhD thesis she aimed at unveiling the climates & atmospheric circulation regimes of the most extreme exoplanets, exploiting the potential of high-resolution spectroscopy from the ground to study the upper atmospheres of "hot Jupiters".

Dr Seidel used high-resolution spectrographs such as HARPS at ESO 3.6m telescope or ESPRESSO at the VLT to characterise the atmospheres of known exoplanets. She could resolve a broadened line profile of atomic sodium in the upper atmospheres of a hot gas giant She developed a new model to interpret this signature herself, and used it as diagnostic for high-altitude winds blowing in the thermospheres, i.e., the upper atmospheres heated by the deposition of high-energy radiation from the star. With her new model, Dr Seidel showed for the first time that a combination of super-rotation and vertical thermospheric winds could explain the line shape of the sodium signature. She is carrying out world-class research while serving as a support astronomer and instrument scientist at ESO. She used her background in Earth atmosphere studies to conduct an original study about the impact of climate change and the El Niño phenomenon on telescope sites in Northern hemisphere, with strong implication for the long-term scheduling of telescopes.

The PhD thesis of Dr Julia Seidel was conducted at at the Department of Astronomy of the University of Geneva, under the supervision of Professors David Ehrenreich and Vincent Bourrier.

Best Doctoral Thesis in New Technologies (Computational)

The 2024 MERAC Prize for the Best Doctoral Thesis in New Technologies (Computational) is awarded to **Dr Johannes Heyl (University College London, United Kingdom)** *for his work on machine learning-based techniques to understand astrochemical processes in the interstellar medium.*



Dr Johannes Heyl has obtained a MSci in Physics with Theoretical Physics at Imperial College London and a PhD in 2023 in Data Intensive Science at University College London (UCL). His interdisciplinary PhD project was at the intersect of Astronomy, Chemistry and Computer Sciences. His work revolved around developing novel statistical as well as machine learning methods to better understand astrochemical processes. These processes are often underpinned by coupled systems of ordinary differential equations making the relationship between the inputs and outputs non-linear and difficult to understand. Cutting-edge machine learning interpretability techniques were able to provide interpretations to the relationships between physical parameters. Dr Heyl is now postdoctoral research associate at UCL.

Dr Heyl embarked on a PhD thesis project aimed to link astrochemistry and statistical and machine learning techniques, a completely novel approach for astrochemistry that traditionally had stayed away from these techniques. During his PhD, he demonstrated high levels of curiosity, interests and independence that allowed him to explore different new techniques or methods to aid astrochemical studies. His skills allowed him to publish 6 papers including one in a field completely different from astronomy (Data Science in Health), a remarkable achievement considering the requirement of a 6-month industry secondment in addition of taught courses.

Each article led by Dr Heyl has already had a high impact in the field. For example, his work on Bayesian Inference of reaction rate parameters as well as on the study of network topology. When modelling and predicting molecular abundances in the dense gas of the interstellar medium, one of the biggest challenges is the completeness and accuracy of the used chemical networks. The combination of techniques has opened up a completely new avenue for sensitivity analyses as well as reduction networks. He also laid out work on interpretable machine learning and showed a very novel and quick way to perform sensitivity analyses, allowing a real potential and rigour that traditional sensitivity analyses methodologies do not have. This was the first time that the concept of machine learning interpretability has been adopted in astrochemistry.

The PhD thesis of Dr Johannes Heyl was conducted at at the Department of Physics and Astronomy and the Centre for Doctoral Training in Data-Intensive Science at University College London, under the supervision of Professor Serena Viti.