European Astronomical Society
2015 Prizes

Tycho Brahe Prize

The 2015 Tycho Brahe Prize is awarded to ***Prof. Michel Mayor*** in recognition of the development of instrumentation, which led to his discovery of the first extra-solar planet orbiting a solar-type star and to his leading role in this domain during the last twenty years.

Lodewijk Woltjer Lecture

The 2015 Lodewijk Woltjer Lecture is awarded to ***Prof. Ewine van Dishoeck*** for her outstanding career in molecular astrophysics, in particular in the domain of star and planet formation.

MERAC Prizes

The 2015 MERAC Prizes for the Best Early Career Researcher are awarded in

Theoretical Astrophysics

to ***Dr. Michela Mapelli*** for her theoretical and computational contributions to the dynamics of star clusters and galaxies, the reionization epoch, the Galactic centre, and the formation of massive stellar black holes.

Observational Astrophysics

to ***Dr. Saskia Hekker*** for her ground-breaking contributions to the understanding of the internal structure of red-giant stars based on stellar oscillations measured by the CoRoT and Kepler satellites.

New Technologies

to ***Dr. Sylvestre Lacour*** for his development of pupil masking and pupil remapping observing techniques, which provide a unique combination of high contrast and high angular resolution to study the immediate environment of stars.

The awardees are invited to give a plenary lecture at the European Week of Astronomy and Space Science (EWASS) to be held in Tenerife, Spain on 22 – 26 June 2015.

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

For further information, please contact the EAS President:

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and visit the EAS website: http://eas.unige.ch/

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

The Tycho Brahe Prize is funded by the Klaus Tschira Stiftung, a German foundation, which was established by the physicist Klaus Tschira in 1995 as a non-profit organization. The Klaus Tschira Stiftung promotes the advancement of the natural sciences, mathematics, and computer science, and wants to raise appreciation for these fields.

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KTS

Tycho Brahe Prize

The 2015 Tycho Brahe Prize is awarded to **Prof. Michel Mayor** in recognition of the development of instrumentation, which led to his discovery of the first extra-solar planet orbiting a solar-type star and to his leading role in this domain during the last twenty years.

The European Astronomical Society awards its 2015 Tycho Brahe Prize to Professor Michel Mayor in recognition of his lifelong quest to advance the precision, efficiency and scientific value of stellar radial velocity observations. His series of ground-breaking instruments have reduced velocity errors by an unprecedented ~3 orders of magnitude, down to 1 m/sec or lower. The vast scientific rewards include fundamental breakthroughs in binary and pulsating star properties, star cluster dynamics and Galactic evolution, culminating in the discovery of the first extra-solar planet 20 years ago and the birth of a new scientific discipline – with European leadership throughout. The exponential growth of exoplanetary science continues today with new theory and observations from the ground and space.

With his background in Galactic evolution, Michel Mayor realized the need for drastic improvements in the efficiency and accuracy of stellar radial-velocity observations. Cross-correlation of an observed spectrum with a suitable template, first proposed by Fellgett in the 1950s and demonstrated in practice by Griffin in the 1960s, seemed to be the answer. However, an instrument was needed that would pack optical efficiency, mechanical stability and state-of-the-art computer control into the limited space available inside the fork of the 1-m Geneva telescope at the Observatoire de Haute-Provence (OHP). The result was CORAVEL, which functioned flawlessly from 1977 through 20 years of service (a second CORAVEL was commissioned on La Silla in 1981) – a tribute to the thorough analysis and superb engineering behind this instrument. The huge gains in precision, zero-point stability and efficiency of the CORAVELs led to breakthroughs on fundamental studies of Solar-type binary stars, globular cluster dynamics, and local Galactic kinematics, structure and evolution. But also studies of the membership and binary populations of open clusters, precise mass and radius determinations of eclipsing binaries, the motions of field stars and Cepheids in both Magellanic Clouds, among many other topics received an enormous boost from these productive instruments.

At the end of the 1980's, Michel Mayor's interests moved towards the search of substellar companions of solar type stars. The completion in 1994 of the fibre-fed bench-mounted spectrograph ELODIE at the 2-m telescope at OHP, another joint French-Swiss achievement, was at the basis of the seminal discovery of the first exoplanet in 1995. The totally unexpected properties of this Jupiter-sized planet orbiting the star 51 Peg every 4 days overturned all theories on the formation of planetary systems overnight. Sceptics

concerning the planetary origin of the observed velocity variations were silenced by the 2000 discovery of the first transiting exoplanet and the demonstration of the Rossiter-McLaughlin effect by this planet with ELODIE. The rest is history, and the exponential growth of exoplanet science – with new theory and observations from the ground and space – continues with no end in sight.

To remove the last source of instability in ELODIE – a variable atmospheric pressure – Michel Mayor initiated the construction of the ultimate instrument, HARPS, mounted in a vacuum vessel with temperature controlled at the mK level. The two HARPS instruments still hold the world record for velocity errors – an unprecedented 1 m/s or lower – and the goal of finding Earth-mass exoplanets is finally within reach. In summary, Michel Mayor's relentless pursuit of instrumental perfection and constantly vigilant eye for opportunities in a broad range of scientific fields led to the birth of a new scientific area with sustained European leadership exactly twenty years ago.

Michel Mayor is a Swiss astronomer born in 1942. He completed his studies at the University of Geneva in 1971 with a PhD on the kinematical and dynamical properties of stars in the solar vicinity. He has remained at this University ever since, rising to the rank of Professor and Director of the Observatory. He is first author or co-author of over 400 refereed papers on a wide range of subjects, with over 30'000 citations, and has received numerous honorary doctorates and prizes, including the Shaw, Balzan, and BBVA prizes.

The Lodewijk Woltjer Lecture honours astronomers of outstanding scientific distinction.

Lodewijk Woltjer Lecture

The 2015 Lodewijk Woltjer Lecture is awarded to **Prof. Ewine van Dishoeck** for her outstanding career in molecular astrophysics, in particular in the domain of star and planet formation.

Ewine F. van Dishoeck's research is at the boundary of astronomy, laboratory astrophysics and chemistry and uses ground- and space-based observatories in the infrared and sub-millimetre range. Her current scientific focus is on the physical and chemical evolution of material from interstellar clouds to planet-forming disks and the importance of molecules as diagnostics of the star-formation process.

The launch of ESA's Infrared Space Observatory (ISO) in 1995 offered Ewine van Dishoeck a first opportunity to detect from space – away from the contamination by Earth's atmosphere – the presence of water, carbon dioxide, methane and formic acids in the interstellar medium. By being part of a legacy programme of the Spitzer Space Telescope – NASA's successor to ISO launched in 2003 – she participated to the discovery of new-born stars enshrouded in dark molecular clouds.

The Spitzer observations of dusty disks rotating around nascent stars yielded discoveries of water, ammonium, and methane ices in these planet-forming disks. More interestingly, her research group found hydrogen cyanide (HCN) and acetylene (C_2H_2) gases, which are prebiotic molecules. The study of such building blocks for amino and nucleic acids became easier with the launch of ESA's Herschel Space Telescope in 2009, which is particularly suited for the study of water and its key role in interstellar chemistry. The recent completion by ESO of the Atacama Large Millimetre Array (ALMA) in Chile enables now Ewine van Dishoeck's group to study the subtle chemistry of proto-planetary disks with unprecedented angular resolution and sensitivity.

[Partly based on the article 'Profile of Ewine F. van Dishoeck'
*by Nick Zagorski 2006 PNAS **103**,12229]*

Ewine F. van Dishoeck is a Dutch astronomer and chemist born in 1955 in Leiden. Graduated at Leiden University, she held positions in the United States at Harvard, Princeton and Caltech from 1984 to 1990. She returned to the University of Leiden in 1990, where she became professor of molecular astrophysics in 1995. She is also an external scientific member of the Max Planck Institute for Extraterrestrial Physics in Garching. She authored or co-authored more than 450 refereed publications with over 25'000 citations and holds many national and international science policy functions, including scientific director of the Netherlands Research School for Astronomy (NOVA), president of Division H of the International Astronomical Union, former member of the Board of the Atacama Large Millimeter/submillimeter Array (ALMA), co-PI of the MIRI instrument on the James Webb Space Telescope (JWST) and co-I of the HIFI instrument on the Herschel Space Observatory. She has been fortunate to receive the Dutch Spinoza award, an ERC Advanced grant, and the Dutch Academy Prize. She is a Member of the Dutch Royal Academy of Sciences and the Leopoldina German Academy of Sciences, Foreign Associate of the US National Academy of Sciences, and Foreign Member of the American Academy of Arts and Sciences.

MERAC Prizes

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

There are yearly three MERAC Prizes awarded by the European Astronomical Society. The prizes of 20'000 € are for each of the three categories:

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

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.

The MERAC Prize Committee was impressed by the high quality of the nominated candidates for the three MERAC Prizes of 2015.

Best Early Career Researcher in Theoretical Astrophysics

The 2015 MERAC Prize for the Best Early Career Researcher in Theoretical Astrophysics is awarded to **Dr. Michela Mapelli** for her eclectic theoretical and computational contributions to the dynamics of star clusters and galaxies, the reionization epoch, star formation in the Galactic centre, and the formation of massive stellar black holes from the collapse of metal-poor stars.

Michela Mapelli studied Physics at the University of Milano Bicocca (1998-2002), where she received her Master degree in February 2003, with a Thesis on 'Four-body interactions in globular clusters'. In October 2006, she received her PhD at SISSA, with a Thesis on 'Relic signatures of reionization sources', for which she was awarded both the Gratton Prize 2007 and the Tacchini prize 2007. In 2007, she became postdoctoral fellow at the Institute for Theoretical Physics of the University of Zurich, Switzerland, where she studied the formation of giant low-surface brightness galaxies. She was awarded there the prestigious 'Forschungskredit' fellowship in 2008 before receiving an independent postdoctoral fellowship at the University of Milano Bicocca in 2009. In August 2011, she started a permanent research position at INAF – Padova Astronomical Observatory, where she created her independent research team.

Michela Mapelli's main scientific achievements of the last five years are her studies on the formation of massive stellar black holes from the collapse of metal-poor stars and her contribution to understanding star formation in the Galactic centre. In 2009, she proposed that black holes of more than 20 and up to 80 solar masses can form in the local universe from the direct collapse of metal-poor stars. This can explain why ultra-luminous X-ray sources (ULXs) occur more frequently in galaxies of low-metallicity, with considerable implications for high-energy astrophysics and the search of gravitational waves. In 2012, she simulated the disruption of a molecular cloud by the tidal shear of the super-massive black hole in the Galactic centre and showed that a gaseous disc forms and then fragments into proto-stellar clumps, thus explaining the presence of young, massive stars at the centre of our Galaxy.

The work of Michela Mapelli has been conducted entirely in Europe. After graduating in 2006 at SISSA (Trieste), she developed the model of massive stellar black holes during the post-doctoral fellowship at the University of Zurich, Switzerland, and then at the University of Milano Bicocca, Milan, Italy (2009–2011). Since 2011 she is Researcher at INAF – Padova Astronomical Observatory, Italy, where she has continued investigating massive stellar black holes, and started working on the Galactic centre.

Best Early Career Researcher in Observational Astrophysics

The 2015 MERAC Prize for the Best Early Career Researcher in Observational Astrophysics is awarded to **Dr. Saskia Hekker** for her ground-breaking contributions to the understanding of the internal structure of red-giant stars. She was first to establish non-radial oscillations in high-precision time-resolved spectroscopy of such stars and played a key role to confirm such modes in CoRoT space data. She also developed innovative techniques used to analyse and interpret Kepler observations of red giants.

After receiving her PhD from the University of Leiden in the Netherlands in Sept. 2007, Saskia Hekker worked at the Royal Observatory of Belgium and the University of Birmingham. In 2011 she was awarded a personal 3-year Veni Fellowship from the Netherlands Organization for Scientific Research to conduct research at the Astronomical Institute 'Anton Pannekoek', University of Amsterdam. Since September 2013, she works in Göttingen at the Max Planck Institute for Solar System Research (MPS). In 2013 she obtained a European Research Council (ERC) Starting Grant to determine Stellar Ages through asteroseismology. In 2014, she was awarded a Max Planck Independent Research Group focusing on 'Asteroseismology and Galactic Evolution', which is an international node of the 'Stellar Astrophysics Centre', a Centre of excellence in research of the Sun, Stars and Extra-solar planets. Her career path and mobility is outstanding, particularly since Saskia is also a mother.


Credits: Jan Willem Steenmeijer

Saskia Hekker announced, already during her PhD, non-expected, non-radial oscillations in red-giant stars which she then confirmed using data of the CoRoT satellite. She was also heavily involved in the discovery, identification, and analysis of mixed oscillation modes, which allow to probe the core region of the stars, in particular to disentangle hydrogen-shell- from helium-core-burning red giants. She discovered the first red giant in an eclipsing binary and developed methods to determine global asteroseismic parameters, which she then applied to Kepler data of planet-hosting stars.

Saskia Hekker performed her work at the School of Physics and Astronomy, University of Birmingham, United Kingdom (2009–2011); Astronomical Institute ‘Anton Pannekoek’, University of Amsterdam, the Netherlands (2011–2013) and the Max Planck Institute for Solar System Research, Göttingen, Germany (2013–present).

Best Early Career Researcher in New Technologies

The 2015 MERAC Prize for the Best Early Career Researcher in New Technologies is awarded to **Dr. Sylvestre Lacour** for his development of pupil masking and pupil remapping observing techniques, which provide a unique combination of high contrast and high angular resolution to study the immediate environment of stars.

After his graduation from Ecole Normale Supérieure in electrical engineering, Sylvestre Lacour worked at The Johns Hopkins University from 2000 to 2002 as software engineer for the FUSE satellite. He pursued with a PhD in astrophysics on a project combining pupil remapping and long-baseline optical interferometry. It consisted partly in building a single-mode pupil remapping prototype instrument (FIRST), and partly in acquiring and interpreting observations from the IOTA interferometric array (Mount Hopkins, Arizona). After the successful defence of his PhD in 2007, he obtained a Lavoisier fellowship to pursue his research in high angular resolution instrumentation at the University of Sydney. He developed there a strong expertise in the emerging technique of pupil masking. Over the last years, he benefits from a CNRS tenured position at the Observatory of Paris, allowing him to work on the application of the pupil masking technique to the study of young stellar objects. As an expert in high precision astrometry, he is also deeply involved in the GRAVITY instrument for the VLT Interferometer.

Sylvestre Lacour is the leading European specialist in the pupil masking and pupil remapping observing techniques. These two techniques provide a unique combination of high contrast and high angular resolution that is key to studying the immediate environment of stars in all evolutionary stages. He also developed a complete pipeline to reduce this kind of observations, which are now performed by major astronomical facilities. This effort lead to an important result on scattering dust around evolved stars and opened a new observational window on the inner structure of transition disks, where extrasolar planets are expected to form.

Sylvestre Lacour started working in the field of interferometry since his PhD at the Observatoire de Paris. He then fully developed the field aperture masking during the Lavoisier Fellowship at Sydney University and a second post-doctoral position at the Observatoire de Grenoble. Since 2009 he is affiliated with the Observatoire de Paris, France.