European Astronomical Society
2021 Prizes

Tycho Brahe Medal

The 2021 Tycho Brahe Medal is awarded to **Dr Frank Eisenhauer (Max Planck Institute for Extraterrestrial Physics)** *for his leadership of the SINFONI and GRAVITY instruments on the ESO VLT, which revolutionized the study of exoplanets, super-massive black holes, and star forming galaxies in the Early Universe.*

Lodewijk Woltjer Lecture

The 2021 Lodewijk Woltjer Lecture is awarded to **Prof. Amina Helmi (University of Groningen)** *for advances in the understanding of how the Milky Way assembled using dynamical simulations together with Gaia observations of the distances, velocities, ages, and chemical abundances of stars.*

Jocelyn Bell Burnell Inspiration Medal

The Inaugural Jocelyn Bell Burnell Inspiration Medal is awarded to **Prof. Mirjana Pović (Ethiopian Space Science and Technology Institute and Instituto de Astrofísica de Andalucía)** *for her work on developing astronomy, science and education as a route out of poverty and to improve the quality of life for young people in Africa.*

MERAC Prizes

The 2021 MERAC Prizes for the Best Early Career Researcher are awarded in

Theoretical Astrophysics

to **Dr Antoine Strugarek (CEA Saclay)** *for ground-breaking contributions in stellar astrophysics, including dynamo theory, predictions of solar flares and pioneering work on star-exoplanet interactions.*

Observational Astrophysics

to **Dr Cosimo Inserra (Cardiff University)** *for the investigation of the extremes of stellar explosions, providing a pioneering contribution to their understanding and their role in astronomy and astrophysics*.

New Technologies (Computational)

to **Prof. Judit Szulágyi (ETH Zürich)** *for her fundamental contribution to the study of circumplanetary disks in planet formation, and the origin of the moons of giant planets.*

All six awardees will give a plenary lecture at the European Astronomical Society Annual Meeting 2021 to be held virtually, from 28 June to 2 July 2021.

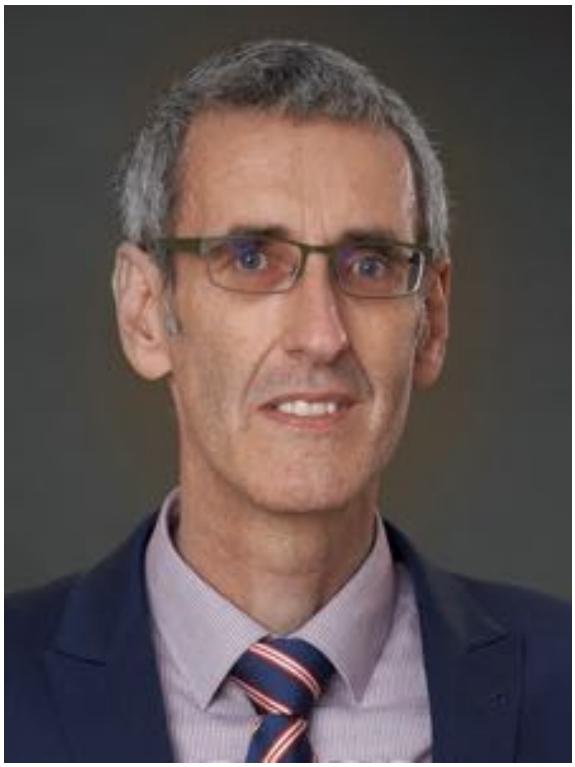
The European Astronomical Society (EAS) promotes and advances astronomy in Europe. As an independent body, the EAS can act on matters that need to be handled at a European level on behalf of the European astronomical community.

Visit the EAS website: https://eas.unige.ch/ and contact the EAS President: Prof. Roger Davies, president-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 2021 Tycho Brahe Medal is awarded to **Dr Frank Eisenhauer (Max Planck Institute for Extraterrestrial Physics, Germany)** *for his leadership of the SINFONI and GRAVITY instruments on the ESO VLT, which revolutionized the study of exoplanets, super-massive black holes, and star forming galaxies in the Early Universe.*



Dr Frank Eisenhauer studied Physics at the Technical University of Munich (TUM) and obtained his PhD in 1998 from the Ludwig Maximilian University Munich. He is currently a Senior Research Scientist at MPE, and Adjunct Teaching Professor at TUM. From 1998-2004 Dr Eisenhauer was Project Scientist and then Principal Investigator (PI) of the world's first adaptive optics (AO)-assisted, near-infrared integral field spectrometer on an 8m class telescope, SINFONI. He is now PI of the GRAVITY project which required major breakthroughs in fast-read-out imaging detectors, cryogenic operation with single mode fibers and integrated optics, laser metrology tracing the entire beam path, and phase-referenced, dual-beam operation. GRAVITY has been in operations on Paranal since 2016. Both SINFONI and GRAVITY are part of the instrument suite employed in the discovery and characterization of the Galactic Center Black Hole, which led to the Nobel Prize 2020 in Physics.

Over the last 20 years, Dr. Eisenhauer has led the development of two major, game-changing instruments for ground-based infrared astronomy, SINFONI and GRAVITY at the ESO Very Large Telescope (VLT); these have led to fundamental results on massive black holes, active galactic nuclei, galaxy and star formation. Dr Eisenhauer not only was the heart and soul of most aspects of the design and development of these complex and innovative instruments but also has been a leader of their scientific exploitation, and lead-author on several of the seminal papers.

The AO-assisted integral field spectrometer SINFONI revolutionized kinematic studies in galactic nuclei, and most importantly, in red-shifted star-forming galaxies at the peak of galaxy formation activity a few Gyrs after the Big Bang. The more than 300 papers using SINFON@VLT data since its commissioning in 2003 demonstrate the enormous scientific impact across a wide range of Galactic and extragalactic astronomy. The development of SINFONI catapulted IFUs to the leading design choice of imaging optical/IR spectroscopy at all large telescopes, including the Extremely Large Telescope, especially when combined with AO. GRAVITY combines the light of all four 8m VLT telescopes interferometrically, for an effectively 130m diameter giant telescope, with milli-arcsecond resolution. GRAVITY for the first time allows faint interferometric infrared imaging, and micro-arcsecond astrometry. It is probably fair to say that GRAVITY is the most innovative optical/near-IR instrument of the last decade. GRAVITY can image in the Galactic Center stars as faint as $K \approx 19$ mag, carry out differential spectro-astrometry at the micro-arcsecond level and do polarization sensitive astrometric imaging at the 50 micro-arcsecond scale.

After a mere 3 years of science operation, GRAVITY has already provided stunning results, such as a) Measurements of the gravitational redshift and Schwarzschild precession in the orbit of the star S2, via combining GRAVITY astrometry and SINFONI spectroscopy; b) Proof of Einstein's equivalence principle and the local invariance of position in the S2 orbit; c) Observation of gas motions (≈0.3 speed of light) close to the innermost stable orbit ISCO at ≈4-5 Schwarzschild radii around SgrA*. This measurement provides very strong support that SgrA* indeed is a Schwarzschild-Kerr massive black hole; d) Direct determination of the distance between the Sun and the Galactic Center with a precision of ≈0.3%, 10 times better than previous measurements and important for the determination of extragalactic distances and of fundamental physical data in the Milky Way; e) Direct measurement of sub-light year structure and kinematics of the Broad Line Region and the mass of the quasar 3C273, at a distance of about 1.4 billion light years from the Sun; f) Measurement of exoplanet spectra with a contrast far surpassing that of dedicated systems of extreme adaptive optics; g) First spatially resolved images of gravitational microlensing.

Dr Frank Eisenhauer is the leader and driver in all aspects of this remarkable story. He designed most elements of the complex experiment and found solutions to a number of problems that occurred during the development period. He is expert of the many challenges to extract the best scientific data. He leads the scientific interpretation of the Galactic Center project and was the corresponding author of the gravitational redshift paper. Without any doubt Dr Eisenhauer is one of the leading experimental astrophysicists worldwide of his generation. His leadership of SINFONI and GRAVITY have contributed in a significant way to making European facilities unique and world-leading. His achievements make Dr Frank Eisenhauer an outstanding awardee of the Tycho Brahe Medal.

The Lodewijk Woltjer Lecture honours astronomers of outstanding scientific distinction.

Lodewijk Woltjer Lecture

The 2021 Lodewijk Woltjer Lecture is awarded to **Prof. Amina Helmi (University of Groningen, Netherlands)** *for advances in the understanding of how the Milky Way assembled using dynamical simulations together with Gaia observations of the distances, velocities, ages, and chemical abundances of stars.*

Prof. Helmi studied astronomy with a specialization in theoretical physics at the Universidad Nacional de La Plata in Argentina, where she obtained her MSc degree in 1994. In 2000, she obtained her PhD cum laude from Leiden University in the Netherlands, for her research on the formation of the Galactic halo. After that she briefly returned to the Universidad Nacional de La Plata as a postdoc, and in 2001 she took a postdoc position at the Max Planck Institute for Astrophysics in Germany. A year later, she returned to the Netherlands as a NOVA fellow at Utrecht University. In 2003, she was appointed Assistant Professor and in 2014 promoted to Full Professor at the Kapteyn Institute of the University of Groningen, where she has been since then. Between 2007-2011 she was member of the Young Academy of the Royal Netherlands Academy of Arts and Sciences, and since 2017 is full member of the Royal Netherlands Academy of Arts and Sciences. In 2019, as a highlight of her career, Prof. Helmi received the prestigious Spinoza Prize, the highest award in Dutch science. In this same year, she was appointed Deputy Scientific director of the Dutch Research School for Astronomy (NOVA).

Prof. Amina Helmi is Professor of Dynamics, Structure and Formation of the Milky Way at the Kapteyn Institute of the University of Groningen in the Netherlands. She is one of the founders of the field of Galactic Archaeology which aims to reconstruct the history of (nearby) galaxies based on the current positions, motions and the chemical composition of stars. She is well-known for the discovery of debris from galaxies that have merged with the Milky Way, mostly recently using data from the Gaia mission, as well as for dynamical modelling of the Milky Way to understand the distribution of dark matter.

Prof. Helmi's approach to research is to develop theoretical models (analytic work and simulations), and to use them to make predictions as well as to interpret observational datasets, at the interface of galactic astronomy and cosmology. During her early career, as part of her PhD research, she discovered the remnants of a small galaxy that was absorbed into our young Milky Way billions of years ago. This collection of stars has since been known as the Helmi stream. Since then, Helmi's models and experiments have considerably expanded our knowledge about the shape, structure and history of the Milky Way and that of its satellites. She has been involved in the European Space Agency Gaia since its conception/adoption, and has been one of the leaders in the exploitation of this revolutionary mission. In 2018, Prof. Helmi used this dataset to discover and characterize the last big merger the Milky Way experienced, which took place approximately 10 billion years ago and was a true milestone in Galactic history. The debris from the merged galaxy, which she named Gaia-Enceladus, dominates the stellar halo near the Sun and the event led to the thickening of the disk present at the time and probably triggered the formation of the thick disk.

Prof. Helmi has acquired major grants for her research, such as the prestigious Vidi and Vici grants from the Netherlands Research Council, and an ERC Starting Grant. She has also received numerous prizes, including twice the Amelia Earhart Fellowship Award, the Christiaan Huygens Prize from the Royal Netherlands Academy of Arts and Sciences for her PhD thesis, and recently the Suffrage Science Award and the Spinoza prize. She is currently a member of both the Royal Holland Society of Sciences and Humanities and the Royal Netherlands Academy of Arts and Sciences. She was member of the Astronomy Working Group of ESA between 2006 and 2010, is currently the science representative for the Netherlands on the European Southern Observatory Council and member of the committee currently advising the scientific director of the European Space Agency on the Voyage 2050 program.

Prof. Helmi regularly shares her fascination for astronomy and her most recent discoveries with the general public through media and public lectures, with the hope of raising science literacy and gender equality in academia and beyond.

The Jocelyn Bell Burnell Inspiration Medal is awarded in recognition of astronomers of all career stages whose contribution beyond scientific research.

The Inaugural Jocelyn Bell Burnell Inspiration Medal is awarded to **Prof. Mirjana Pović (Ethiopian Space Science and Technology Institute, Ethiopia and Instituto de Astrofísica de Andalucía, Spain)** *for her work on developing astronomy, science and education as a route out of poverty and to improve the quality of life for young people in Africa.*

Jocelyn Bell Burnell Inspiration Medal

Photo credit: Alejandra Rueda (IAC)

Prof. Mirjana Pović is Assistant Professor at the Ethiopian Space Science and Technology Institute (ESSTI), Associate researcher at the Instituto de Astrofísica de Andalucía (IAA-CSIC, Spain), and honorary lecturer at the Mbarara University of Science and Technology (MUST, Uganda). She grew up in former Yugoslavia, now Serbia, and obtained her degree in astrophysics from the University of Belgrade. She obtained her PhD in astrophysics in 2010 at the Instituto de Astrofísica de Canarias (IAC, Spain), in the field of galaxy formation and evolution. For more than 10 years she has been working on the development of astronomy, science and education in Africa through different projects and initiatives related with research collaborations, institutional development, student supervision, training, lecturing, outreach, and girls and women in science. In 2018 she received the first Nature Research Award for Inspiring Science, for her research achievements and contribution to the society. In 2019 the Serbian government invited her to be one of their science ambassadors and she received a recognition from ESSTI for her contributions.

Prof. Mirjana Pović has been greatly contributing for the development of astronomy, science, and education in Africa over the past 10 years, and also for starting/strengthening collaborations with Europe. She has led or co-led different projects and initiatives in several African countries, participating in the IAU Office of Astronomy for Development (OAD), the East-African Regional OAD, and the African Astronomical Society (AfAS).

She has contributed to develop human capacities by supervising several MSc and PhD theses in Ethiopia, Rwanda, Uganda, and Tanzania since 2014. She has been lecturing at all academic levels in several African countries since 2011. Her activities include the

organization of several schools in astronomy, coordination of STEM for GIRLS in Ethiopia initiative, and in general astronomy and science outreach activities in East-African countries, Serbia and Spain. In 2020, the Ethiopian Space Science Society (ESSS) recognised her contribution to astronomy education and outreach in Ethiopia. She was the Secretary of the very first Committee for the Ethiopian Space Science and Technology Road Map (2016-2018), the only foreigner, and woman, among its 12 members and Coordinator of the Space Science Group of the very first committee for the Ethiopian Space Policy and Strategy (2018-2019). Currently she is participating in development of the African Strategy for Fundamental and Applied Physics (ASFAP) as one of its co-conveners of the Astrophysics and Cosmology working group.

She has contributed to the institutional development of ESSTI: after her nomination as Assistant professor of the Astronomy & Astrophysics Research and Development Department in 2016, she served as the Head of Department (2018-2020). She served as a member in the committees of Science, Research, Research Ethics, and Thematic Areas and has developed some of the first ESSTI guidelines, leading in 2019 to her recognition by the ESSTI for her contributions and performance. Together with her African colleagues she helped in setting up some of the very first research groups and joint projects in extragalactic astronomy in ESSTI and AAU in Ethiopia, University of Rwanda, Mbarara University of Science and Technology in Uganda, University of Dodoma in collaboration with the Open University of Tanzania, and she is collaborating with the SAAO and UCT in South Africa. Some of the very first publications of astronomical research in-situ in these East-African countries have resulted with the strengthening of collaborations between them, and between African countries and others, further reinforced by Prof. Pović's co-coordination of several networking and mobility proposals (Astronomy and Astrophysics Arising Across Africa - 5A, EU-RISE, 6 African and 4 European countries, and MATERNA: Mobility in Africa for Training, Education and Research, EU-H2020 network, 7 African and 2 European countries).

Prof. Mirjana Pović has further been members of Science Organisation Committee and/or organised several scientific meetings in Africa, such as the IAU Regional Meeting MEARIM, in Addis (2017), IAU Symposim 356 (the first IAU symposium ever in Ethiopia and East-Africa, third in Africa), the 1st AfAS Business-Science Meeting (Ethiopia, 2019), the 1st AfAS Annual Meeting (virtual, 2021), EAS-EWASS sessions on African-European collaborations in 2018 (UK) and in 2020 (virtual). She is also NOC member of the IAU General Assembly in Cape Town (2024).

Prof. Pović served the African Astronomical Society by contributing in defining its strategies for long-term astronomy developments across Africa. She has been Board member of the AfAS Science Committee since 2019, coordinator of the « Astronomy in Africa Survey » as a principal promoter of the project. She serves as a role model for women in astronomy and science by actively participating in STEM for GIRLS activities under the Society of Ethopian Women in Science and Technology (SEWiST); she has set up and coordinates the African Network of Women in Astronomy (AfNWA) under AfAS.

Prof. Mirjana Pović deeply believes that through education and science we can fight poverty on a long-term and make our world a better place for everyone, independently on where individual roots are.

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 Early Career Researcher in Theoretical Astrophysics

The 2021 MERAC Prize for the Best Early Career Researcher in Theoretical Astrophysics is awarded to **Dr Antoine Strugarek (CEA Saclay, France)** *for ground-breaking contributions in stellar astrophysics, including dynamo theory, predictions of solar flares and pioneering work on star-exoplanet interactions.*

After fundamental studies in ENSTA-ParisTech, Antoine Strugarek obtained an MSc in Physics and Applied Maths. He then obtained a PhD joint between CEA Astrophysics Dept. and Fusion Dept., working on turbulent plasma confinement in the Sun and in Tokamak device. The creativity and robustness of his broad work was recognized as the best PhD in 2013 by the French Astronomical Society. He then moved to Canada, where he was awarded a CITA fellowship and a fellowship from Québec. He then came back to France to prepare the exploitation of Solar Orbiter (2016-2018). In 2018, he moved as a tenured researcher to the Dept. of Astrophysics of CEA Paris-Saclay to work on the Sun, stars and their interactions with exo-planets. Dr. Strugarek, is a highly-recognized expert on several topics: turbulent plasma confinement and turbulent dynamos, evolution of magnetism in star-planet systems, solar flare prediction and evolution.

Dr Antoine Strugarek tackled the difficult problem of magnetic confinement of turbulent plasmas using ambitious giro-kinetic simulations. He performed, with Prof. Jean-Paul Zahn, the first 3D global MHD model of the Sun from deep inside the radiative zone all the way to the surface. His key results include the proof that turbulence can be controlled by acting on the temperature gradient, improving the stability of Tokamak plasmas, and the fact that magnetic fields cannot prevent the spread of the solar tachocline contrary to horizontal turbulence.

Dr Strugarek led an unprecedented study of stellar dynamos. He conducted a coherent suite of convective dynamo simulations, spanning several effective temperatures and Rossby numbers, to measure the influence of rotation and stellar mass on magnetic field generation, which allowed him to derive scaling laws for stellar magnetism, and reconciled theoretical understanding of solar and stellar magnetic cycles. He also worked on a forecasting model for solar flares, based on self-organized critical models. His research was furthermore at the heart of the preparation to exploit the ESA Solar Orbiter, focusing on the how the Sun controls heliosphere.

Dr Strugarek has developed leading simulations of stellar winds and star-planet magnetic interactions. His group performed among the first comparisons of models and data for star-planet interactions, thanks to major allocations to the largest supercomputers in Europe.

The work of Dr Antoine Strugarek has been conducted at CEA and CNES, France, and University of Montréal, Canada.

Best Early Career Researcher in Observational Astrophysics

The 2021 MERAC Prize for the Best Early Career Researcher in Observational Astrophysics is awarded to **Dr Cosimo Inserra (Cardiff University, United Kingdom)** *for the investigation of the extremes of stellar explosions, providing a pioneering contribution to their understanding and their role in astronomy and astrophysics.*

Dr Inserra obtained his PhD in 2012 from the University of Catania. He moved as Postdoc to Queen's University Belfast, United Kingdom where he was awarded the Royal Astronomical Society Winton Capital Award 2017. He moved to the University of Southampton in 2017, and then in 2018 to Cardiff University as Lecturer. Since 2019, he has been the principal investigator and survey manager of the largest worldwide spectroscopic survey in time-domain astronomy (ePESSTO+). His research strengths and cross-disciplinary skills led him to hold the Deputy Director of Research position at the School of Physics and Astronomy at Cardiff University, and that of Ambassador at the Data Intensive Research Institute in Cardiff.

Dr Cosimo Inserra's work has had a significant impact on time-domain astrophysics, cosmology and machine learning applied to astronomy. His seminal paper, that is still shaping the transient astronomy field presented the first sample analysis of a newly-discovered class of supernovae that defied previous knowledge of supernova explosions. He showed that the characteristic observational evidence of a supernova explosion could be reproduced by the energy deposition of a newborn magnetar. This investigation has been pivotal in the understanding of this new class of supernovae, which usually explode in low-metallicity, star-forming galaxies and are among the brightest explosions.

Dr Inserra has obtained pioneering work in different fields. He discovered a twin class of superluminous supernovae. The findings leading to the geometrical shape and the cosmological usefulness of superluminous supernovae have been pivotal studies expanding the frontier of cosmic explosions and opening a plethora of synergies with stellar and universe evolution over cosmic time up to $z \approx 10$.

Dr Inserra is now the lead scientist and survey director of the current extension of the largest, worldwide, spectroscopic survey in time-domain astronomy, ePESSTO+. His vision of time-domain astronomy priorities and a new observing strategy has allowed ePESSTO+ to further improve efficiency and timeliness with respect to its earlier two progenitor surveys. He is a member of the Euclid Consortium leading the science area of the extremes of the supernova population, as well as a UK Principal Investigator and UK point of contact for Transient and Variable Stars science of the LSST Consortium at the Vera Rubin Observatory.

The work of Dr Cosimo Inserra has been conducted at Queens University Belfast, the University of Southampton and Cardiff University, United Kingdom.

Best Early Career Researcher in New Technologies (Computational)

The 2021 MERAC Prize for the Best Early Career Researcher in New Technologies (Computational) is awarded to **Prof. Judit Szulágyi (ETH Zürich, Switzerland)** *for her fundamental contribution to the study of circumplanetary disks in planet formation, and the origin of the moons of giant planets.*

Prof. Judit Szulágyi obtained a Master in Astronomy from Eötvös Loránd University, Hungary and then her PhD from the University of Nice Sophia Antipolis at the Observatoire de la Côte d'Azur in 2015. Shen then moved to ETH Zürich as postdoctoral fellow. In 2017 she was awarded an Ambizione Fellowship at the University of Zürich, until she returned in 2021 to ETH Zürich with an ERC starting grant. Prof. Szulágyi was listed on Forbes Europe "30 under 30 in Science" and obtained several prizes in Hungary and the Pro Scientia Golden Medal from the Hungarian Academy of Sciences. Her main topic is the study of circumplanetary disks and exomoon formation.

Prof. Judit Szulágyi has become a leading export of the rapidly developing research field of circumplanetary disks and in-situ moon formation. She conjugates deep theoretical and computational insight with the pragmatic attitude of a phenomenologist who delivers testable predictions for circumplanetary disk observations, and to guide the new exciting endeavor of exomoon detection. The whole notion of circumplanetary disks of gas and dust being a natural outcome of the planet formation process, both in core accretion and in disk instability, is new in exoplanet theory. Its implications for understanding the growth of massive planets owes a lot to Prof. Szulágyi's work. This is one of the very few important conceptual additions to the conventional core accretion formation scenario.

Prof. Szulágyi has been among the first scientists to describe the meridional circulation in circumplanetary disks, which she discovered in her hydrodynamical simulations, and which receives now observational support. Since her PhD, she authored many first-author in which all aspects of circumplanetary disks physics and satellites/exomoons formation, from the impact of circumplanetary disks on accretion shocks and the growth of giant planets to the growth of planetesimals in dust traps in circumplanetary disks, to satellites of gas and ice giants as well as their implications for exomoon formation.

Prof. Szulágyi is also working actively with observers using mock observations of her simulations to guide observational strategies to detect such disks around young planets, and interpret information contained in the observations, e.g., with ALMA and SPHERE. Moreover, recently observations of a circumplanetary disk have matched predictions by Prof. Szulágyi, and in general her ALMA dust continuum mocks correctly guided observers to discover new circumplanetary disks.

The work of Prof. Szulágyi has been conducted at the Observatoire de la Côte d'Azur, France, ETH Zürich and University of Zürich, Switzerland.