

## Curriculum Vitae

Name: Silvano Fineschi  
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 Born: 19<sup>th</sup> July, 1958  
 Position: Senior Associate Astronomer, INAF-Astronomical Observatory of Torino

### Education

1994 Ph.D. in Astronomy, University of Firenze, Firenze, Italy; Harvard University, Cambridge, MA, USA  
 1988 Doctor degree in Physics (*Laurea in Fisica*), University of Firenze, Firenze, Italy

### Positions Held

2002-pres. Associate Astronomer, Nat. Institute for Astrophysics (INAF) - Turin Astrophysical. Obs., Torino, Italy,  
 1997-2002 Assistant Astronomer, Nat. Institute for Astrophysics (INAF) - Turin Astrophysical. Obs., Torino, Italy,  
 1995-2001 Astrophysicist, Smithsonian Astrophysical Observatory, Cambridge, MA; NASA/GSFC Greenbelt, MD  
 1994-1995 Research Associate, University of Firenze, Firenze, Italy  
 1991-1995 Visiting Scientist, Harvard-Smithsonian Center for Astrophysics, Cambridge, MA  
 1989-1991 Research Associate, NAS-NRC, NASA Marshall Space Flight Center, Huntsville, AL

### Scientific Programs and Projects

2016-pres. Principal Investigator ESCAPE-CorMag, Antarctic Coronal-Magnetograph, National Plan for Research in Antarctica (PNRA), Italian-French Concordia base in Antarctica.  
 2012-present Principal Investigator, SCORE II on HERSCHEL II sounding-rocket, US Naval Research Laboratory (NRL), Washington, DC and INAF - Torino, Italy  
 2011-present Project Scientist, Metis coronagraph, ESA Solar Orbiter mission, INAF - Torino, Italy  
 2010-present Lead Co-I of Italian contribution to ESA PROBA-3 mission, Co-I ASPIICS Formation-Flying Proba Coronagraph, INAF - Torino, Italy, and CSL, Liege (Belgium);  
 2010-present, Chair of the INAF-ALTEC Managing Committee of the Optical Payload Systems – OPSys – facility.  
 2006, 2010 Eclipse Expedition Leader, Eclipse Expeditions, K-Corona & E-Corona Liquid Crystal Spectropolarimeter Waw-al-Namus, Libya (2006), Tatakoto, French Polynesia (2010);  
 2006-2010 – Co-PI Development of the Optical Payload Systems – OPSys – facility, Applied Research Grant from the Piedmont Region. INAF Turin Astrophysical Observatory – ALTEC Turin, Italy  
 2003-12 Co-PI, Project Scientist, “Sounding-rocket Coronagraphic Experiment” (SCORE) on the HERSCHEL sounding-rocket payload, INAF - Torino, Italy, and US NRL, Washington, DC  
 1995-98 Mission Operations Lead Scientist, Co-I of the Ultraviolet Coronagraph and Spectrometer on SOHO.  
 1992-99 Associate scientist of the UV Coronal Spectrometer for the Space Shuttle Sub-satellite SPARTAN.  
 1994 Co-I Smithsonian Inst. Scholarly Study on a “New Method for Measuring Magnetic Fields in the Solar Corona”.  
 1989-91 NRC Research Associate, Solar Maximum Mission: “Impact Polarization in Solar Ultraviolet Lines”.

### Honors and Awards

1997 Special Achievement Award, Smithsonian Institution (Outstanding Scientific Research).  
 1996 Special Achievement Award, Smithsonian Institution (UVCS/SOHO Science Operations).  
 1995 Special Act Group Award, NASA (UVCS/SOHO Refurbishment).  
 1995 European Space Agency Award, ESA (Valuable Contribution to SOHO).  
 1995 “Gratton Prize” - biannual award for the best Italian Ph.D. thesis in Astronomy - Special Mention, Italy.  
 1989 Research Associateship, National Academy of Sciences/National Research Council (NRC), USA.

### Review Panels Membership/Participation

2016-NASA-Heliophysics Technology and Instrument Development for Science (H-TIDeS) Review Panel.  
 2016 NASA Interdisciplinary Science For Eclipse (ISE) 2017 Review Panel.  
 2015-NASA Heliophysics Mission Senior Review Panel.  
 2012-2015 EU, Managing Committee "Polarization as a tool to study the Solar system and beyond" (COST 1104).  
 2012-US High-Altitude Observatory. Scientific Steering Committee of the Coronal Solar Magnetism Observatory.  
 2010 NASA, "Solar and Heliospheric Physics" (NNH09ZDA001N-SHP) Review Panel.  
 2005 NASA, “Science & Technology Definition Team”, Solar Probe mission 2003 ESA, “Remote-Sensing Payload Working Group”, Solar Orbiter mission 2003 NASA, “Solar and Heliospheric Physics” (NRA 02-OSS-01 SHP).  
 1998 NASA, “Sun-Earth Connection Guest Investigator, and Education Program” (ROSS-98) Review Panel.  
 1996 NASA, “Sun-Earth Connection Supporting Research and Technology, Suborbital, Guest Investigator, and Education Programs” (NRA 96-OSS-09) Review Panel.

### Fields of Research

- UV Spectroscopy and Polarimetry of the solar corona
- Development of theoretical techniques based on UV polarimetry for the diagnostics of solar coronal magnetic fields;
- Analysis of imaging, spectroscopic and polarimetric data to derive physical parameters of the solar corona;
- Space instrumentation: UV, visible-light coronagraphs, polarimeters and spectrographs: design and calibration;
- Ground-based instrumentation for spectro-polarimetric observations of the solar corona: design and operations;
- Methodologies, techniques and facilities development for cali
- Development of novel electro-optic polarimeters based on liquid crystals (European Patent No. 16382241.4 - N-REF PSC-EP-1347);
- Development of novel multilayer coatings for UV polarizer.

Fineschi has more than 25 years of experience in the development and operation of space instrumentation for spectroscopy and polarimetry in the visible and UV wavelength bands. His scientific interests include the application of atomic spectroscopy and polarimetry to UV and visible-light remote-sensing techniques for the study of the solar wind and the coronal magnetic field. He has been involved in several solar space missions of NASA and ESA (SMM, Spartan/Space-Shuttle, SOHO, Solar Orbiter), sounding-rocket solar experiments (SCORE), and eclipse campaigns. He is currently the Project Scientist for the METIS coronagraph on the ESA Solar Orbiter mission and the Principal Investigator of the sounding-rocket coronagraphic experiment (SCORE) for the NASA sub-orbital mission of the HERSCHEL payload. He is the Lead Scientist for the Italian contribution to the formation-flying coronagraph onboard the ESA PROBA-3 mission.

He built up his experience starting his research first at NASA Marshall Space Flight Center, where, besides being involved with the analysis of the data from the Solar Maximum Mission, he was involved with the sub-orbital mission “Multi-Spectral Solar Telescope Array” (MSSTA). He moved to the Harvard-Smithsonian Center for Astrophysics where he was first involved with the development of the visible-light polarimeter of the Ultraviolet Coronagraph and Spectrograph (UVCS) for the SOHO mission. He then participated to the UVCS calibration campaign and was responsible for the UVCS/SOHO Mission Operations at NASA Goddard Space Flight Center.

Upon his return to Italy, at the Osservatorio Astronomico di Torino (OATo), Fineschi designed the “Sounding-rocket Coronagraphic Experiment” (SCORE) that is part of the HERSCHEL sounding-rocket payload, of the US Naval Research Laboratory (NRL), Washington DC (USA). This NASA sub-orbital mission flew successfully in 2009 acquiring the first image ever of the singly-ionized helium line-emission from the corona. NASA has approved a second HERSCHEL launch with SCORE onboard that is scheduled for 2018.

At OATo, Fineschi worked on an innovative design for the “*Metis*” visible-light and ultraviolet coronagraph for the challenging Solar Orbiter mission. He designed an “inverted externally-occulted coronagraph” that reduced by an order of magnitude, with respect to classical externally-occulted coronagraphs, the thermal load generated when the Solar Orbiter is at perihelion, at 0.3 AU. This made possible the inclusion of a multi-wavelength coronagraph on Solar Orbiter.

In order to integrate and calibrate coronagraphic instrumentation, he proposed and developed the *Optical Payload Systems – OPSys* – in collaboration with aerospace industry – ALTEC Turin, in Italy. The OPSys facility was successfully used for the integration and calibration campaign of Metis in 2016-2017. This INAF facility will be used for the integration for extremely sensitive astronomical space- and ground-based instrumentation.

In the field of space coronagraphy, Fineschi is now involved in the ESA PROBA-3 mission. Scheduled for launch in 2010, this is a technological mission to test formation-flying technologies. The two Earth orbiting PROBA-3 satellites will maintain a 150-m separation and a very stringent co-alignment while pointing at the Sun. The occulting satellites will cast a shadow on the second satellite hosting the ASPIICS coronagraph. This will allow eclipse-like observations of the solar corona. The Italian contribution, led by OATo, to the ASPIICS coronagraph of PROBA-3 comprises the formation-flying metrology and critical optical elements (i.e., edge of the external occulter and spectral filters).

Fineschi continued his research on the physics of the solar corona through ground-based coronagraphic observations. He has led two eclipse expeditions (Waw-al-Namus, Libya, 2006; Tatakoto, French Polynesia, 2010) where a new spectro-polarimeter based on an electro-optical (liquid crystal) Lyot filter was tested. This spectro-polarimeter will now be used as focal-plane instrumentation of the ASPIICS engineering model for the diagnostics of coronal magnetic fields from the French-Italian Concordia base in Antarctica. The deployment in Concordia of this “Coronal Magnetograph” (*CorMag*) is scheduled for the Antarctic summer of 2018-2019.

### Management Experience of Large Science Projects

- 2010-2019 ASI-INAF contract for “Solar Orbiter - Supporto Scientifico per la Realizzazione degli Strumenti METIS e SWA/DPU nelle Fasi B2-C1”
- 2016-2020 ESA-INAF contract “PROBA 3 Coronagraph System Optical Analyses, Formation-flying Metrology & Calibration”.
- 2016-2018 PNRA-INAF contract “Piano Nazionale Ricerche Antartide”, ESCAPE – CorMag
- 2006-2010 Piedmont Region – INAF contract for “Development of the Optical Payload Systems – OPSys – facility”.

### Teaching Experience

2011-present – Lecturer for the “Laboratory for Astrophysics” graduate course at the University of Torino

Thesis Tutorship:

PhD theses (Dottorato di Ricerca)

2016 – Marta Casti, Università di Torino (advisor)

2011 – Alexander Kahn, Università di Firenze (co-advisor)

2010 – Maurizio Pancrazzi, Università di Firenze (co-advisor)

2008 – Huw Morgan, Aberystwyth University, Wales UK (co-advisor)

2002 – Federico Landini, Università di Firenze (co-advisor)

Master theses (Laurea Magistrale)

2014 – Jessica Girella, Università di Torino

2009 – Emanuele Balboni, Università di Torino

Bachelor theses (Laurea Triennale)

2011 – Mattia Levi, Università di Torino

2008 – Filippo Crudelini, Università di Torino

2006 – Francesca Schiavon, Università di Torino

### Selected Publications Representative of the Research Interests

- Sandri, P., Fineschi, S., et al., 2017, “*Stray-light analysis of the METIS coronagraph on Solar Orbiter*”, Opt. Eng., in press.
- Jejčič, S., Heinzel, P., Labrosse, N., Zhukov, A., Bemporad, A., Fineschi, S., 2017, “*Visibility of prominences using the He I D3 line filter on PROBA-3/ASPIICS coronagraph*”, Solar Physics, in press.
- Larruquert, J.; Malvezzi, A.M.; Rodríguez-de Marcos, L.; Giglia, A.; Gutiérrez-Luna, N.; Espinosa-Yáñez; L., Honrado-Benítez; C., Aznárez; J.A., Massone; M., Capobianco; G., Fineschi, S.; Nannarone, S., 2017, “*Polarizers tuned at key far-UV spectral lines for space instrumentation*”, Proc. SPIE 10235, EUV and X-ray Optics: Synergy between Laboratory and Space V, 102350K.
- Raouafi, N. E., Riley, P., Gibson S., Fineschi, S., and Solanki, S. K., 2016, “*Diagnostics of Coronal Magnetic Fields Through the Hanle Effect in UV and IR Lines*”, Front. Astron. Space Sci., 22
- Fineschi, S. et al., 2015, “*Stray-light analysis of the METIS coronagraph on Solar Orbiter*”, SPIE 9604, 94040K.
- Fineschi, S. et al., 2013 “*METIS: a novel coronagraph design for the Solar Orbiter Mission*”, Proc. of SPIE 8443-127.
- Capobianco, G., Fineschi, S., et al., 2012, “*Electro-optical polarimeters for ground-based and space-based observations of the solar K-corona*”, SPIE 8450, 845040.
- Crescenzo, G., Fineschi, S., et al., 2012, “*Imaging polarimetry with the METIS coronagraph of the Solar Orbiter Mission*”, SPIE 8443 84433J-1.
- Fineschi, S. (editor), 2011 “*Solar Physics and Space Weather Instrumentation IV*”, SPIE 8148. Fineschi, S., et al. 2011 “*Liquid Crystals Lyot Filter for Solar Coronagraphy*”, SPIE 8148, 814808.
- Uribe-Patarroyo, N. et al. Fineschi, S., 2011, “*Space-qualified liquid-crystal variable retarders for wide-field-of-view coronagraphs*”, SPIE 8148, 814810.
- Fineschi, S. and Baur, T., et al., 2010 “*Imaging Spectro-polarimeter with a Liquid Crystals Lyot Filter for Proba-3 Formation-Flying Coronagraph*”, ICSO – 8th International Conference on Space Optics.
- Khan, A., Belluzzi, L., Landi Degl’Innocenti, E., Fineschi, S., Romoli, M., 2011, “*Spectropolarimetric forward modelling of the lines of the Lyman-series using a self-consistent, global, solar coronal model*”, A&A 529, A12.
- Morgan, H., Fineschi, S., Habbal, S.R., Li, Bo, 2008, “*In Situ Spectroscopy of the Solar Corona*”, A&A., 482, 981.
- Fineschi, S. et al., 2005 “*KPol: liquid crystal polarimeter for K-corona observations from the SCORE coronagraph*”, SPIE, 5901,389.
- Fineschi, S. et al., “*Ultraviolet and Visible-light Coronagraphic Imager (UVCI)*”, Proc. SPIE, 4853,162, 2003.
- Fineschi, S., et al., 2001, “*Extended UV Corona Imaging from the Solar Orbiter: the Ultraviolet and Visible-light Coronagraph (UVC)*”, ESA SP-493,217.
- Fineschi, S., 2001, “*Space-based Instrumentation for Magnetic Field Studies in Solar and Stellar Atmospheres*”, in “*Magnetic Field across the H-R Diagram*”, Astr. Soc. Pacif. Confer. Series, 248, 597.
- Fineschi, S., et al., 1993, “*Polarimetry of the HI Lyman- $\alpha$  Line for Coronal Magnetic Fields Diagnostics*”, SPIE, 1742, 423.