

Brief Curriculum Vitae

Thomas Schildknecht

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Education

Professor, University of Bern, 2009

Habilitation Habilitation in Astronomy, University of Bern, 2004

Ph.D. PhD in Astronomy, University of Bern 1994

M.S. Diploma in Astronomy, University of Bern, 1986

Research

My research combines an interest in astrodynamics and optical survey observations, with particular emphasis on space debris, space safety, and space sustainability. During the past 30 years I focused on space debris research and established a research group which asserts a world-leading position in optical space debris surveillance and characterization. Scientific highlights include the detection of decimeter-size debris in geostationary orbits and the discovery of an unexpected population of debris objects with extremely high area-to-mass ratios. These discoveries dominated the interest of the scientific community during the past years.

Professional Experience

*2009-2025: Director of Swiss Optical Ground Station and Geodynamics Observatory
Zimmerwald*

2009-2025: Vice-Director of the Astronomical Institute (AIUB)

1989-present: Head of Optical Astronomy and Space Sustainability Group of the AIUB

1989-2001: Project for high precision GPS time transfer using geodetic techniques

1985-1988: Research work in GPS

1983-1990: Satellite Laser Ranging (SLR)

1980-1994: Optical supernova and minor planet search

- Discovery of 5 supernova and 3 minor planets

Academic Experience

- Supervise and guide master's and doctoral students' thesis work (currently 3 Ph.D. students, and 2 PostDoc)
- Lectures in astronomy and astrophysics curriculum
 - Regular courses: Astronomie I, Astronomie II, Cosmic Distance Scales, Fundamental Astronomy I, II
 - Special course: Introduction into Space Science and Astronomy
- Acquisition of funds: SNSF 250 kCHF/year, third party > 500 kCHF/year; Principal Investigator of the SNSF research grant for the Zimmerwald observatory
- Member of several faculty commissions

Industrial Experience

- Project Manager of numerous ESA studies in particular studies related to space debris and Space Situational Awareness / Space Safety

- Consultancy in the domains of SSA using passive and active optical system and of space safety and sustainability for private companies

Memberships/Services

- Chair of ESA Space Situational Awareness Advisory Group advising the ESA Director responsible for the SSA program (2013 – 2016; 2019 –)
- Chair and Main Scientific Organizer of the COSPAR "Panel on Potential Environmentally Detrimental Activities in Space" (2010 – 2018)
- Editorial Board of Advances in Space Research, Co-Editor Astrodynamics and Space Debris (2014 –)
- President of the Swiss National Committee of the IAU (delegate of the Swiss Academy of Sciences to the IAU) (2009 –)
- International Academy of Astronautics IAA Full Member
- Member of IAU, EAS, COSPAR, Swiss Society of Astrophysics and Astronomy
- Swiss Academy of Sciences, Astronomy Commission (1997 – 2007, 2010 –)
- Swiss Academy of Sciences, Commission for Space Research (2013 –)
- Swiss Federal Commission for Space Affairs, which is advising the Federal Council, the Executive of the Swiss government (2020 –)
- Member of Swiss delegation to UNCOPUOS Scientific and Technical Subcommittee (2010 –)
- Member of the American Astronautical Society (AAS) Space Surveillance Committee (2009 – 2019)
- Member of IAA Space Debris Commission and IAA Study Group 5.14, 5.17, 4.23 (2012 –)
- Member IAF Space Traffic Management Committee (2019 –)
- Member of the ESA delegation in the Inter-Agency Space Debris Coordination Committee (IADC) (1996 –)
- ESA-delegate to US-Russian Space Surveillance Workshops (2003 –)
- Member of ESA Space Situational Awareness expert group for “surveillance and tracking” and expert group for “Near-Earth Objects (NEO)” (2008 –)

Invited Presentations (Selected)

- United Nations / Portugal Conference “Management and Sustainability of Outer Space Activities Conference”, Technical Symposium Nov 2023 (invited panelist)
- United Nations Event Series “Awareness-raising and capacity-building related to the implementation of the Guidelines for the Long-term Sustainability of Outer Space Activities”, Moderator of Event #4
- AMOS 2018, 2019, 2021, 2024 International SSA Data Operator Exchange Workshop (invitation only, Chatham House Rules)
- Wilton Park Conference “Operating in space: towards developing protocols”, 31.3. – 2.4.2019 (invitation only, Chatham House Rules)
- ESA-ECSL Space Debris Workshop: Regulation, Standards and Tools 19 –21 March, 2019, ESA ESOC
- United Nations/Germany High Level Forum: The way forward after UNISPACE+50 and on Space2030, 13 – 16 November 2018 in Bonn, Germany
- Short Course on Observing and Characterizing Space Debris, AMOS Conference, Maui, Hawaii, USA 2016, 2018, 2019, 2020, 2021, 2022, 2023.
- Military Space Situational Awareness Conference, London, 25th-26th April 2018.
- Keynote 7th European Conference on Space Debris, ESA ESOC, Germany, April 18th to 21st, 2017.

Recent Publications (Selected)

1. Book Chapter: "Die unkontrollierte Zunahme von Weltraumschrott verhindern". In: Jeanneret, Roland (ed.) 50 Jahre Mondlandung. Ein grosser Sprung für die Menschheit? (pp. 122-131). Weltbild Verlag, 2019.

2. Book Chapter in: Our Space Environment, Opportunities, Stakes and Dangers, Claude Nicollier, Volker Gass, Eds., ISBN 978-2-940222-88-9, 2015.
3. Schildknecht, T., P. Pessev, J. Rodriguez, P. Patole, A. Vananti, J. Siminski, T. Flohrer, Statistical Analysis of Space Debris Surveys in High-Altitude Orbital Regions, Proceedings of the 2023 AMOS Technical Conference, 19-22 September, 2023, Maui, Hawaii, USA, 2023
4. Vananti, A., J. Lu, T. Schildknecht, Attitude Estimation of H2A Rocket Body from Light Curve Measurements, International Journal of Astrophysics and Space Science, 11(2), pp. 15-22, 2023
doi: 10.11648/j.ijass.20231102.11
5. Vananti, A., M. Meyer zu Westram, T. Schildknecht, Metrics on space of closed orbits for near-Earth object identification, Celestial Mechanics and Dynamical Astronomy, (2023) 135:51
<https://doi.org/10.1007/s10569-023-10165-0>
6. Rodriguez, J., T. Schildknecht, Daylight Measurement Acquisition of Defunct Resident Space Objects Combining Active and Passive Electro-Optical Systems, IEEE Transactions on Geoscience and Remote Sensing 60, 2022.
<https://doi.org/10.1109/TGRS.2022.3179719>
7. Rodriguez, J., E. Cordelli, T. Schildknecht, The stare and chase observation strategy at the Swiss Optical Ground Station and Geodynamics Observatory Zimmerwald: From concept to implementation, Acta Astronautica 189, pp 352 - 367, 2021.
<https://doi.org/10.1016/j.actaastro.2021.08.032>
8. Reihs, Benedikt, Alessandro Vananti, Thomas Schildknecht, Jan Siminski, Tim Flohrer, Application of attributable to the correlation of surveillance radar measurements, Acta Astronautica 182, pp 399 - 415, 2021.
<https://doi.org/10.1016/j.actaastro.2021.01.059>
9. Reihs, Benedikt, Alessandro Vananti, Thomas Schildknecht, A Method for Perturbed Initial Orbit Determination and Correlation of Radar Measurements, Advances in Space Research, 66, Issue 2, pp 426 – 443, 2020.
<https://doi.org/10.1016/j.asr.2020.04.006>
10. Cordelli, E., A. Vananti, and T. Schildknecht, Analysis of laser ranges and angular measurements data fusion for space debris orbit determination, Advances in Space Research, 65, Issue 8, 15 April 2020, Pages 2018-2035,
<https://doi.org/10.1016/j.asr.2019.11.009>
11. Vananti, A., K. Schild, T. Schildknecht, Improved detection of faint streaks based on a streak-like spatial filter, Advances in Space Research, 65, Issue 1, 1 January 2020, Pages 364-378,
<https://doi.org/10.1016/j.asr.2019.10.006>
12. Šilha, J., Krajčovič, S., Zigo, M., Tóth, J., Žilková, D., Zigo, P., Koroň, L., Šimon, J., Schildknecht, T., Cordelli, E., Vananti, A., Mann, H.K., Rachman, A., Paccolat, C., Flohrer, T., Space debris observations with the Slovak AGO70 telescope: astrometry and light curves, Advances in Space Research, 65, Issue 1, 1 January 2020, Pages 419-434,
doi: <https://doi.org/10.1016/j.asr.2020.01.038>
13. Schildknecht, T., A. Vananti, E. Cordelli, T. Flohrer, ESA optical surveys to characterize recent fragmentation events in GEO and HEO. Proceedings of AMOS Conference, Maui, Hawaii, 2019.
14. Reihs, B., A. Vananti, T. Schildknecht, Tracklet-based correlation of combined radar and optical measurements. Proceedings of ESA NEO SST Conference, Darmstadt, Germany, 2019.
15. Cordelli, E., J. Rodriguez, P. Schlatter, P. Lauber, T. Schildknecht, Real time improvement of orbits of space debris by fusing SLR and astrometric data acquired by a night-tracking camera. Proceedings of 21st International Workshop on Laser Ranging, Canberra, Australia, 2018.

16. Šilha, Jiří, J.-N. Pittet, T. Schildknecht, M. Hamara, Apparent rotation properties of space debris extracted from photometric measurements, *Advances in Space Research*, 61, 2018, pp. 844-861.
<https://doi.org/10.1016/j.asr.2017.10.048>
17. Pittet, Jean-Noël, Jiří Šilha, Thomas Schildknecht, Spin motion determination of the Envisat satellite through laser ranging measurements from a single pass measured by a single station, *Advances in Space Research*, 61, 2018, pp. 1121-1131.
<https://doi.org/10.1016/j.asr.2017.11.035>
18. Mokhnatkin, A., I. Molotov, E.G. Perez Tijerina, J.E. Perez Leon, T. Kokina, T. Schildknecht, Implementing of the ISON project in Northern Mexico. *Open Astronomy*, 27, 2018, pp. 167-174.
19. Cordelli, E., P. Schlatter, T. Schildknecht, Simultaneous multi-filter photometric characterization of space debris at the Swiss Optical Ground Station and Geodynamics Observatory Zimmerwald. *Proceedings of AMOS Conference*, Maui, Hawaii, 2018.
20. Flohrer, T., B. Jilete, T. Schildknecht, E. Cordelli, First results from the deployment of Expert Centres supporting optical and laser observations in a European Space Surveillance and Tracking System. *Proceedings of AMOS Conference*, Maui, Hawaii, 2018.
21. Šilha, J., T. Schildknecht, A. Hinze, T. Flohrer, A. Vananti, An optical survey for space debris on highly eccentric and inclined MEO orbits, *Advances in Space Research*, 59, Issue 1, 1 January 2017, Pages 181-192.
<https://doi.org/10.1016/j.asr.2016.08.027>
22. Vananti, A., T. Schildknecht, H. Krag, Reflectance spectroscopy characterization of space debris, *Advances in Space Research*, 59(10), 2017, 2488-2500.
<https://doi.org/10.1016/j.asr.2017.02.033>