# Curriculum Vitae

Georg Zotti

| | |
|---|---|
| Name: | Dipl.-Ing. Dr. techn. Georg Zotti, Bakk. rer. nat. |
| Date of birth: | May 14, 1972, in Vienna, Austria |
| Nationality: | Austria |
| Languages: | German, English, Latin (school), Old Greek (school, decayed), Czech (basics, decayed), French (basics, decayed) |
| ORCID: | `https://orcid.org/0000-0002-8152-0408` |
| Homepage: | `https://homepage.univie.ac.at/Georg.Zotti` |
| Affiliation: | Ludwig Boltzmann Institute for Archaeological Prospection and Virtual Archaeology (LBI ArchPro) |
| Staff page: | `https://archpro.lbg.ac.at/team/georg-zotti/` |

## Education

| | |
|---|---|
| 1996–2001 | TU Wien, study of Computer Sciences |
| Dec.10., 2001 | Graduation (with distinction) to "Diplom-Ingenieur". Diploma thesis: "A Multi-Purpose Virtual Model of the Solar System (VRMoSS)" |
| 2004–2007 | Vienna University, study of astronomy (Bakkalaureatsstudium) |
| March 22, 2007 | Vienna University, Graduation to "Bakkalaureus der Naturwissenschaften (Bakk.rer.nat.=B.Sc.)" with "Das Astrolabium – Konstruktion und Gebrauch" (The Astrolabe – Construction and Use) |
| 2005–2007 | TU Wien, doctoral studies (computer science) |
| November 27, 2007 | TU Wien, final exam (*Rigorosum*; with distinction), defense of dissertation "Computer Graphics in Historical and Modern Sky Observations". |

## Jobs and Projects

| | |
|---|---|
| 2000–2002 | Working in EU IST project ASH (Access to Scientific Space Heritage). Development of a Virtual Reality Model of the Solar System for Imagination Computer Services, Vienna (as practical part of diploma) |
| 04/2002–08/2007 | Research Assistant at the Institute of Computer Graphics and Algorithms, Vienna University of Technology. |
| 2003–2005 | First investigation of Neolithic circular ditch systems of Lower Austria w.r.t. astronomical orientation. |
| 2008–2012 | Project Assistant at VIAS–Vienna Institute for Archaeological Science |
| 2008–2012 | FWF project ASTROSIM (P 21208-G19): Simulation of Astronomical Aspects of Middle Neolithic Circular Ditch Systems `https://astrosim.univie.ac.at` |
| 2009 | Exhibition "Die Himmel rühmen die Herrlichkeit Gottes (Psalm 19,2)", 1000 years of astronomical literature in the library of Melk Abbey (with Paul Beck, Vienna University) |
| 2010– | Core Developer, Stellarium project |
| 2012 | LOC member, IMCoS Symposium "500 years Mercator", Austr. Acad. of Sciences. |
| 2012–23 | Researcher and software developer (3D visualisation, GIS, exhibition development ...) at LBI ArchPro |
| 2013 | Lecture on Archaeoastronomy, Vienna University (also 2017, 2019, 2022) |
| 2013– | 2nd chair & Treasurer, Gesellschaft für Archäoastronomie e.V. |
| 2014–23 | Vice President, European Society for Astronomy in Culture (SEAC) |
| 2015–16 | Work in exhibition team for "Stonehenge. Verborgene Landschaft." of LBI ArchPro, MAMUZ museum Mistelbach, Austria |
| 2016 | LOC, Tagung der Gesellschaft für Archäoastronomie, Vienna |
| 2016– | Member, IAU WGAAC - Working Group for Archaeoastronomy and Astronomy in Culture |

| | |
|---|---|
| 2019 | SOC, SEAC 2019, Bern. |
| 2020– | Editorial Board member, Studies in Digital Heritage |
| 2020– | Editorial Board member, Journal for Skyscape Archaeology |
| 2020– | Lead author, editor of the annual "Astronomischer Almanach für Österreich" |
| 2020-06-12 | Member, International Astronomical Union (IAU) |
| 2022– | Council Member, International Society for Archaeoastronomy and Astronomy in Culture (ISAAC) |
| 2023– | Treasurer, European Society for Astronomy in Culture (SEAC) |

# Main areas of research

- Software for astronomical simulation, esp. the free open-source desktop planetarium Stellarium `https://stellarium.org`. My focus of participation in this project lies in increasing computational accuracy to make the simulation applicable to historical research, but also extending functionality for research and applications in Cultural Astronomy. A series of student projects co-supervised at TU Wien (2012-17) added hitherto unique functionality for *Virtual Archaeoastronomy*, allowing the simulation of an astronomically accurate sky over a virtual reconstruction of archaeological landscapes, in a first-person perspective (virtual walkthrough) mode similar to moving in a computer game, including light-and-shadow simulation. The model can have temporally variable parts to simulate monument phases. In a large exhibition on Stonehenge we could utilize the software on a $25 \times 4\,\mathrm{m}$ screen. *In October 2022, Stellarium has finally seen its 1.0 milestone release, signalling completion of accuracy goals and code updates to modern standards.* However, there is still room for functional improvement and addition of yet more features. Stellarium is popular also in the astronomical community and is downloaded more than a million times per year.
- Development of GIS-based workflows to create georeferenced virtual landscape models for use with Stellarium.
- A related workflow allowed the creation of 3D-printed landscapes including pixel perfect projection mapping for LBI ArchPro's exhibitions about Birka (on display in Schallaburg 2015 and Rosenheim 2016, and an additional "Projectoporama" tabletop installation for science fairs), Stonehenge (MAMUZ Mistelbach 2015-17 and Herne 2021-22), Feldkirch (2018), and Schwarzenbach (since 2019).
- Research in archaeo- and ethnoastronomy, history of astronomy, astronomical instruments, sundials, etc., esp.
  - Virtual reconstruction of astronomically related cultural heritage. Together with S. M. Mozaffari I found interesting new details about the medieval observatory of Samarqand.
  - Serious Gaming approach to using digital reconstructions of historical astronomical instruments.
  - Virtual Globes (`https://homepage.univie.ac.at/Georg.Zotti/virtual_globes/`). In January 2023 I gave an invited talk on globes at the Peter Anich 300-year symposium at Innsbruck University.
  - PostScript programming of astrolabes and other astronomical instruments. These have been used in exhibitions and events about historical astronomy (e.g., Melk 2009, Communale Peuerbach 2023). See `https://homepage.univie.ac.at/Georg.Zotti/astro/astrolabe/index.html`
- Photography (landscape, astrophotography, High Dynamic Range, panoramas, stereophotogrammetry). During ASTROSIM I developed a workflow for accurate panoramas to be used with Stellarium. In 2019 I participated in a field work campaign in Tibet (FWF project Tibet Tumulus Tradition 2, P 30393-G25), where I documented the visited sites, often with panoramas. I have also created and used photo-based 3D models with Stellarium, where I could demonstrate how the day of Solar Zenith passage can be identified in a structure of the Inca sanctuary of Ollantaytambo, and how modern Tibetans use a reconstructed Solar observatory to calibrate their calendar.
- Drone operator in LBI ArchPro's Aerial Laser Scanning with a Riegl Ricopter drone and Riegl VUX-Sys LiDAR.
- Modelling (esp. spacecraft, but also electronic gadgets for LBI ArchPro's exhibitions), ...

# Publication List (since 2018)

So far, over 70 publications (Papers, book chapters, conference papers) on various topics in Cultural Astronomy. (See full list.) Most relevant (since 2018):

## Quality assured

- Georg Zotti, Florian Schaukowitsch, and Michael Wimmer (2018). "Beyond 3D Models: Simulation of Temporally Evolving Models in Stellarium". In: *Mediterranean Archaeology and Archaeometry* 18.4, pages 523–528. DOI: 10.5281/zenodo.1477972. URL: http://maajournal.com/Issues/2018/Vol18-4/63_Zotti%20et%20al%2018(4).pdf
- Georg Zotti, Bernard Frischer, Florian Schaukowitsch, et al. (2019). "Virtual Archaeoastronomy: Stellarium for Research and Outreach". In: *Archaeoastronomy in the Roman World*. Edited by Giulio Magli et al. Historical & Cultural Astronomy. Springer International Publishing AG. chapter 12, pages 187–205. ISBN: 978-3-319-97006-6. DOI: 10.1007/978-3-319-97007-3_12
- Georg Zotti (2019c). "Visualising skyscapes: GIS-based 3-D modelling and astronomical simulation". In: *Visualising Skyscapes: Material Forms of Cultural Engagement with the Heavens*. Edited by Liz Henty and Daniel Brown. Routledge Studies in Archaeology. Routledge, pages 35–54. ISBN: 978-1-13-830361-4. URL: https://www.routledge.com/Visualising-Skyscapes-Material-Forms-of-Cultural-Engagement-with-the-Heavens/Henty-Brown/p/book/9781138303614
- Frédéric Heller, Frédéric Broes, and Georg Zotti (2019). "Linsmeau Early Bronze Age structure showing a possible astronomical intent". In: *Visualising Skyscapes: Material Forms of Cultural Engagement with the Heavens*. Edited by Liz Henty and Daniel Brown. Routledge Studies in Archaeology. Routledge, pages 135–157. ISBN: 978-1-13-830361-4
- Vincent Gaffney et al. (2018). "Durrington walls and the Stonehenge Hidden Landscape Project 2010-2016". In: *Archaeological Prospection*, pages 1–15. DOI: 10.1002/arp.1707. URL: https://dx.doi.org/10.1002/arp.1707
- Georg Zotti and Wolfgang Neubauer (2019). "Beyond the Landscape: Analysis of Neolithic Circular Ditch Systems of Lower Austria with Advanced Virtual Archaeoastronomy". In: *Virtual Archaeology Review* 10.21, pages 90–102. DOI: https://doi.org/10.4995/var.2019.10772. URL: https://polipapers.upv.es/index.php/var/article/view/10772/11076
- Georg Zotti (2019b). "Das Astrolabium: das astronomische Rechengerät des Mittelalters". German. In: *Orientierung, Navigation und Zeitbestimmung – Wie der Himmel den Lebensraum des Menschen prägt (Tagung der Gesellschaft für Archäoastronomie in Hamburg 2017)*. Edited by Gudrun Wolfschmidt. Volume 42. Nuncius Hamburgensis: Beiträge zur Geschichte der Naturwissenschaften. Hamburg: tredition. Chapter 24, pages 362–378
- Georg Zotti, Florian Schaukowitsch, and Michael Wimmer (2019). "3D und mehr: Zeitlich veränderliche 3D-Landschaften in Stellarium". German. In: *Orientierung, Navigation und Zeitbestimmung – Wie der Himmel den Lebensraum des Menschen prägt (Tagung der Gesellschaft für Archäoastronomie in Hamburg 2017)*. Edited by Gudrun Wolfschmidt. Volume 42. Nuncius Hamburgensis: Beiträge zur Geschichte der Naturwissenschaften. Hamburg: tredition. Chapter 6, pages 74–83
- Georg Zotti (2021a). "A Virtual Park of Astronomical Instruments". In: *Harmony and Symmetry (Proc. SEAC2018)*. Edited by Sonja Draxler, Max E. Lippitsch, and Gudrun Wolfschmidt. Volume 1. SEAC Publications. Hamburg: tredition. Chapter 10.1, pages 420–429
- Georg Zotti, Bernard Frischer, and John Fillwalk (Oct. 2020). "Serious Gaming for Virtual Archaeoastronomy". In: *Studies in Digital Heritage* 4.1, pages 51–74. DOI: 10.14434/sdh.v4i1.31041
- Georg Zotti and S. Mohammad Muzaffari (Aug. 2020). "New Light on the Main Instrument of the Samarqand Observatory". In: *Journal for the History of Astronomy* 51.3, pages 255–271. DOI: 10.1177/0021828620943986
- Georg Zotti and Alexander Wolf (Mar. 2020). "Changes in the Unchangeable: Simulation of Transient Astronomical Phenomena with Stellarium". In: *Astronomy in Focus: As presented at the IAU XXX General Assembly, 2018*. Edited by Maria Teresa Lago. International Astronomical Union. Cambridge University Press, pages 184–186. ISBN: 9781108488730. DOI: 10.1017/S1743921319004046

- Georg Zotti, Susanne Hoffmann, et al. (Mar. 2021). "The Simulated Sky: Stellarium for Cultural Astronomy Research". In: *Journal for Skyscape Archaeology* 6.2, pages 221–258. ISSN: 2055-3498. DOI: 10.1558/jsa.38690
- Georg Zotti (2021b). "Exploring skies remote in time and culture with Stellarium". In: *Applied and Computational Historical Astronomy (Proceedings of the Splinter Meeting in the Astronomische Gesellschaft, Sept. 25, 2020)*. Edited by Gudrun Wolfschmidt and Susanne M. Hoffmann. Volume 55. Nuncius Hamburgensis: Beiträge zur Geschichte der Naturwissenschaften. Hamburg: tredition. Chapter 2, pages 20–29. ISBN: 978-3-347-27106-7
- Georg Zotti (2021c). "Stellarium: Simulation for Research and Outreach". In: *Education and Heritage in the era of Big Data in Astronomy*. Edited by R. M. Ros et al. Proc. IAU Symposium 367, 2020. International Astronomical Union. Cambridge University Press, pages 95–104. DOI: 10.1017/S1743921321000752
- Antonio César González-García et al., editors (2021). *Beyond Paradigms in Cultural Astronomy (Proceedings of the 27th SEAC conference held together with the EAA)*. BAR International 3033
- Georg Zotti (2021d). "Virtual Archaeoastronomy with Stellarium: An Overview". In: *Beyond Paradigms in Cultural Astronomy (Proceedings of the 27th SEAC conference held together with the EAA)*. edited by Antonio César González-García et al. BAR International 3033. BAR Publishing. Chapter 12, pages 87–91
- Georg Zotti and Alexander Wolf (2021). "Some Thoughts on the Skycultures in Stellarium". In: *Beyond Paradigms in Cultural Astronomy (Proceedings of the 27th SEAC conference held together with the EAA)*. edited by Antonio César González-García et al. BAR International 3033. BAR Publishing. Chapter 11, pages 81–85
- Simon Banton and Georg Zotti (2021). "Stonehenge und Astronomie". In: *Stonehenge - Von Menschen und Landschaften*. Michael Imhof Verlag: LWL-Museum für Archäologie, pages 218–225
- Georg Zotti, Alexander Wolf, and Susanne M. Hoffmann (2022). "Stellarium Approaching Maturity". In: *Astronomy in Culture - Cultures of Astronomy (Featuring the Proceedings of the Splinter Meeting at the Annual Conference of the Astronomische Gesellschaft, Sept. 14-16, 2021)*. Edited by Susanne M. Hoffmann and Gudrun Wolfschmidt. Volume 57. Nuncius Hamburgensis: Beiträge zur Geschichte der Naturwissenschaften. Hamburg: tredition. Chapter 2, pages 581–591. ISBN: 978-3-347-71294-2
- Doris Vickers et al. (2022). "Ancient Skies und Stellarium". In: *Astronomy in Culture - Cultures of Astronomy (Featuring the Proceedings of the Splinter Meeting at the Annual Conference of the Astronomische Gesellschaft, Sept. 14-16, 2021)*. Edited by Susanne M. Hoffmann and Gudrun Wolfschmidt. Volume 57. Nuncius Hamburgensis: Beiträge zur Geschichte der Naturwissenschaften. Hamburg: tredition. Chapter 2, pages 560–578. ISBN: 978-3-347-71294-2
- Roland Filzwieser et al. (2022). "History and Archaeology in Discourse on the Dernberg – Reconstructing the Historical Landscape of a Medieval Motte-and-Bailey Castle and Deserted Village". In: *Heritage* 5.3. Edited by Arlen F. Chase, pages 2123–2141. DOI: 10.3390/heritage5030111
- Georg Zotti, Susanne M. Hoffmann, et al. (2023). "Revisiting Star Names: Stellarium and the Ancient Skies Database". In: *Cultural Astronomy & Ancient Skywatching: Proceeding of the 28th Annual Meeting of the European Society for Astronomy in Culture (SEAC), 6-10 September 2021, Stara Zagora, Bulgaria*. Edited by Penka Maglova and Alexey Stoev. Plovdiv: TOTEM Studio, pages 131–138. ISBN: 978-619-91961-2-0
- Georg Zotti and Wolfgang Neubauer (2023 (submitted)). "Advanced Virtual Archaeoastronomy". In: *(Proc. ISAAC Oxford-XII, Oct. 31-Nov. 4, 2022)*. Edited by Alexandro Lopez. Volume 4. SIA
- Georg Zotti, Guntram Hazod, et al. (2023 (submitted)). "A Calendar Observatory in Tibet". In: *(Proc. SEAC 2022, Sept. 4-9, 2022)*. Edited by Marc Frincu


## Other


- Georg Zotti and Alexander Wolf (June 2018). "Stellarium v.0.18.0". In: *Journal of Skyscape Archaeology* 4.1, pages 154–158. ISSN: 2055-3498. DOI: 10.1558/jsa.36102
- Georg Zotti (June 2019a). ""Harmony and Symmetry". European Society for Astronomy in Culture (SEAC) 26, Graz 27th August–1st September 2018". In: *Journal of Skyscape Archaeology* 5.1. ISSN: 2055-3498. DOI: 10.1558/jsa.38829

- Georg Zotti (2018a). "Computerbasierte Methoden zur kulturastronomischen Landschaftsanalyse". German. In: *Baudenkmäler des Himmels – Astronomie in gebautem Raum und gestalteter Landschaft (Tagungen der Gesellschaft für Archäoastronomie 2013-16)*. Edited by Gudrun Wolfschmidt. Volume 35. Nuncius Hamburgensis: Beiträge zur Geschichte der Naturwissenschaften. Hamburg: tredition. Chapter 11, pages 202–231. ISBN: 978-3-7482-1147-1
- Georg Zotti (Aug. 2018b). "The state of virtual archaeoastronomy with Stellarium". In: *IAU C3 SCIENCE (Commission 3 Science Meetings)*. International Astronomical Union, XXX General Assembly. International Astronomical Union. Vienna, page 10
- Georg Zotti (2020a). "Die Himmlische Tierwelt – Sternbildkulturen in Stellarium". German. In: *Himmelswelten und Kosmovisionen – Imaginationen, Modelle, Weltanschauungen (Tagung der Gesellschaft für Archäoastronomie in Gilching 2019)*. Edited by Gudrun Wolfschmidt. Volume 51. Nuncius Hamburgensis: Beiträge zur Geschichte der Naturwissenschaften. Hamburg: tredition. Chapter 2, pages 20–29. ISBN: 978-3-347-02430-4
- Georg Zotti (2020b). "GIS, Landschaft, 3D-Modelle und Himmelssimulation". German. In: *Maß und Mythos, Zahl und Zauber: Die Vermessung von Himmel und Erde (Tagung der Gesellschaft für Archäoastronomie in Dortmund 2018)*. Edited by Gudrun Wolfschmidt. Volume 48. Nuncius Hamburgensis: Beiträge zur Geschichte der Naturwissenschaften. Hamburg: tredition. Chapter 18, pages 296–305. ISBN: 978-3-7482-2191-3
- Georg Zotti and Alexander Wolf (Dec. 2022). "Stellarium: Finally at 1.0! And Beyond". In: *Journal of Skyscape Archaeology* 8.2, pages 332–334. ISSN: 2055-3498. DOI: `10.1558/jsa.25608`
- Since 2015, the official Stellarium User Guide. Latest version: Georg Zotti and Alexander Wolf (eds.) (Sept. 2023). *Stellarium 23.3 User Guide*. `https://stellarium.org`
- Since 2020, the annual astronomical almanach for Austria. Latest: Georg Zotti, Wolfgang Vollmann, et al. (Sept. 2023). *Astronomischer Almanach für Österreich 2024*. German. Österreichischer Astronomischer Verein. DOI: `10.5281/zenodo.8373945`