# Curriculum Vitae

**Name.** Herbert Edelsbrunner
**Rank.** Professor

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## Education

- Ph. D. in Technical Mathematics, Graz University of Technology, Austria, June 1982.
- M. S. in Technical Mathematics, Graz University of Technology, Austria, June 1980.

## Main Appointments

- Professor, IST Austria (Institute of Science and Technology Austria), Fall 2009–present.
- Founder, Director, and Principal, Geomagic, Inc., 1996–2013.
- Professor of Mathematics, Duke University, 2004–2012.
- Arts and Sciences Professor of Computer Science, Department of Computer Science, Duke University, 1999–2012.
- Professor, Department of Computer Science, University of Illinois at Urbana-Champaign, 1990–99.
- Associate Professor, Department of Computer Science, University of Illinois at Urbana-Champaign, 1987–90.
- Assistant Professor, Department of Computer Science, University of Illinois at Urbana-Champaign, 1985–87.
- Assistent, Institut für Informationsverarbeitung, Graz University of Technology, Austria, 1981–85.

## Fields of Research

Topological data analysis, computational topology, discrete and computational geometry, Data structures and algorithms, geometric modeling and mesh generation.

## Honors and Awards

- Wittgenstein Prize, Austrian Science Foundation, 2018.
- Fellow of the European Association for Theoretical Computer Science, 2014.
- Corresponding and full member of the Austrian Academy of Science, 2012 and 2014.
- Member of the Academia Europaea, 2009.
- Member of the German Academy of Sciences (Deutsche Akademie der Wissenschaften, Leopoldina), 2008.
- Dean's Award for Excellence in Mentoring, 2007.
- Honorary Doctorate (Dr.h.c.) from the Graz University of Technology, 2006.
- Member of the American Academy of Arts and Sciences, 2005.
- Sir Edward Youde Memorial Fund Visiting Professorship 1999–2000, Spring 1999.
- Beckman Fellow in Center of Advanced Study, Fall 1997.
- Burlington Northern Faculty Achievement Award, 1992.
- Alan T. Waterman Award from the National Science Foundation, 1991.
- University Scholar Award from the University of Illinois Foundation, 1990.
- Senior Xerox Award for Faculty Research, 1989.

## Grants

- ERC 788 183, "Alpha shape theory extended", 2018-2023.
- ONR N62909-18-1-2038, "Toward computational information topology", 2017-2020.
- Royal Society, IES-R2-170039, "Topological data analysis for a faster discovery of new materials", 2017-2019.
- FWF/DFG SFB-Transregio Programme 109, "Discretization in geometry and dynamics", 2016-2020.
- Marie Curie, FP7-PEOPLE-2013-IEF, #622033, "Persistent homology – images, data and maps", 2014-2016.
- EC FP7-ICT-318493-STREP, "Topological complex systems", 2012-2015.

- Mega, 2011-220-01-252, “Discrete and computational geometry”, 2011-2013.
- ESF Research Networking Programme, “Applied computational algebraic topology”, 2011-2015.
- NSF DBI-08-20624. “GEPR: genome-wide analysis of root traits”, 2008-2012.
- NIH, “Duke Center for Systems Biology”, 2007–2012.
- NSF DBI-06-06873, “TRPGR: genomic approaches to identify genes for root system architecture traits”, 2006–2008.
- CNRS PICS-3416, “Geometry and topology for complex shapes”, 2006–2008.
- DARPA HR0011-05-1-0057. “Microstates to macrodynamics: a new mathematics of biology”, 2005–2009.
- DARPA HR0011-05-1-0007. “Algebraic topological tools for high-dimensional data analysis”, 2005–2008.
- LLNL B543154. “Discrete methods for comparing continuous functions”, 2005–2006.
- NIH R01-GM61822-04S1. “Administrative supplement for the study of complex biological systems”, 2003–2005.
- LLNL B519702. “Mathematical work and algorithm development”, 2002.
- Duke University, BGT Postdoc Program, “Comput. geometry study of protein-protein interaction”, 2001–2004.
- NSF CCR-00-86013, “Computational geometry for structural biology and bioinformatics”, 2000–2005.
- NSF EIA-99-72879, “Data-intensive computing for spatial models”, 1999–2004.
- NSF-DARPA DMS-98-73945, “Simulation and computation of casting and extrusion processes”, 1998–2001.
- ARO DAAG55-98-0177, “Shape and surface reconstruction, quantification and deformation”, 1998–2002.
- DOE B341494. “Center for simulation of advanced rockets”, 1997–2002.
- DuPont educational aid program, 1997–98.
- NSF CCR-97-12088, “Computational geometry and biomolecular docking”, 1997–2002.
- NSF CCR-96-19542, “Deformable smooth surface and volume design”, 1997–2000.
- ONR N00014-95-1-0691, “Modeling with simplicial complexes”, 1995–97.
- General Motors Grant NA AFC773040, “GEOWRAP”, 1994–95.
- NSF ASC-94-04900, “Computation of shape and topology in proteins”, 1994–96.
- DEC alpha innovators equipment grant, “Planar and spatial geometric software”, 1993.
- NSF ASC-92-00301, “Shapes for modeling and visualization”, 1992–94.
- NSF CCR-91-18874, “Alan T. Waterman award”, 1991–95.
- NSF CCR-89-21421, “Triangulations in the plane and in space”, 1990–92.
- NSF CCR-87-14565, “Degeneracy in geometric computation”, 1988–90.
- Amoco. “Foundation for faculty development in Computer Science”, 1985–88.

**Dissemination of Research and Software**

- Publication of over two hundred research articles in mathematics and computer science, and occasionally in biology and other application domains.
- Development of publically available software systems for triangulations and shapes in two and three dimensions.
- Development of commercial software system for three-dimensional shape reconstruction, manipulation, and display.

**Published Textbooks**

1. *A Short Course in Computational Geometry and Topology.* SpringerBriefs in Mathematical Methods, Heidelberg, Germany, 2014.
2. *Computational Topology: an Introduction* (with J. Harer). Amer. Math. Soc., Providence, Rhode Island, 2010.
3. *Geometry and Topology for Mesh Generation.* Cambridge Univ. Press, England, 2001.
4. *Algorithms in Combinatorial Geometry.* Springer-Verlag, Heidelberg, Germany, 1987. Translated into Japanese by Hiroshi Imai and Keiko Imai, Kyoritsu Shuppan, Japan, 1995.

**Advising**

*Postdoctoral Advisees*
- Mathijs Wintraecken: Riemannian geometry and comptutional topology, 2019–present.
- Ranita Biswas: Algorithms in geometry and topology, 2019–present.
- Anton Nikitenko: Stochastic geometry, 2018–present.
- Grzegorz Jabłoński: Sampled dynamical systems, 2016–18.
- Hubert Wagner: Topological data analysis in high dimensions, 2015–present.

- Arseniy Akopyan: Discrete and classical geometry, 2015–present.
- Žiga Virk: Point-set topology and applications, 2015–17.
- Mirko Klukas: Topology and natural language learning, 2015–17.
- Pawel Pilarczyk: Persistence for dynamical systems, 2014–16.
- Stefan Huber: Medial structures in geometry and topology, 2013–15.
- Jan Reininghaus: Computational topology in visualization, 2012–14.
- Ulrich Bauer: Simplification in computational topology, 2012–14.
- Olga Symonova: Applied topology in image processing, 2011–15.
- Michael Kerber: Algorithms in algebraic geometry and topology, 2009–12.
- Paul Bendich: Computational algebraic topology, 2009–10.
- Chao Chen: Computational topology and computer vision, 2009–12.
- Yuriy Mileyko: Computational topology and biology applications, 2005–08.
- David Cohen-Steiner: Computational algebraic topology, 2003–04.
- Vicky Choi: Computational structural biology, 2002–04.
- Alper Üngör: Mesh generation, 2002–04.
- Sergei Bespamyatnikh: Protein-protein interaction, 2001–02.
- Jie Liang: Biomolecular modeling and computation, 1993–96.
- Ernst P. Mücke: Alpha shapes, 1993–94.
- Tamal R. Dey: Discrete geometry, 1991–92.

*Current Ph. D. Students*
- Teresa Heiss: Intrinsic persistence.
- Georg Osang: Multi-covers and lattice configurations.
- Katharina Ölsböck: Holey shape reconstruction and meshing.
- Zuzane Masárová: Planar graphs and triangulations.

*Completed Ph. D. Students*
- Mabel Iglesias-Ham, 2018: Multiple covers with balls.
- Anton Nikitenko, 2017: Discrete Morse theory for random complexes.
- Florian Pausinger, 2015: On the approximation of intrinsic volumes.
- Salman Parsa, 2014: Algorithms for the Reeb graph and related concepts.
- Brittany Fasy, 2012: Modes of Gaussian mixtures and an inequality for the distance between curves in space.
- Ying Zheng, 2012: Shape reconstruction with topological priors.
- Bei Wang, 2010: Separating features from noise with persistence and statistics.
- Amit Patel, 2010: Reeb spaces and the robustness of preimages.
- Dmitriy Morozov, 2008: Homological illusions of persistence and stability.
- Andrew Ban, 2005 (co-adv. J. Rudolph): Protein-protein interfaces and protein packing.
- Vijay Natarajan, 2004: Topological analysis of scalar functions for scientific visualization.
- Yusu Wang (co-adv. P. Agarwal), 2004: Geometric and topological methods in protein structure analysis.
- Ho-Lun Cheng, 2001: Algorithms for smooth and deformable surfaces in 3D.
- Afra Zomorodian, 2001: Computing and comprehending topology: persistence and hierarchical Morse complexes.
- Damrong Guoy, 2001: Tetrahedral mesh improvement, algorithms and experiments.
- Camille Goudeseune, 2001: Computer composition.
- Ulrike Axen, 1998: Discrete topology, sound, and virtual reality.
- Michael A. Facello, 1996: Geometric techniques for molecular shape analysis.
- Roman Waupotitsch, 1996: Simplifying and deforming through hierarchies of simplicial grids.
- Patrick J. Moran, 1996: Visualization and modeling with shapes.
- Nataraj Akkiraju, 1996: Molecule surface triangulation from alpha shapes.
- Edgar Ramos, 1995: Results in combinatorial and computational geometry.
- Nimish R. Shah, 1994: Topological modeling with simplicial complexes.
- Ernst P. Mücke, 1993: Shapes and implementation in three-dimensional geometry.
- Tiow Seng Tan, 1992: Optimal two-dimensional triangulations.
- Peter L. Williams (co-adv. D. Gannon), 1992: Interactive direct volume rendering of unstructured data.
- Harald Rosenberger, 1990: Degeneracy control in geometric programming.
- Xiaojun Shen (co-adv. C. L. Liu, E. Reingold), 1989: Combinatorics, computational geometry and search algorithms.
- Steven S. Skiena, 1988: Geometric probing.
- Franz Aurenhammer (co-adv. H. Maurer), 1984: Gewichtete Voronoi Diagramme.