

Curriculum Vitae — Nicholas F. Polys

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Faculty Appointments

Director of Visual Computing: Advanced Research Computing [<http://www.arc.vt.edu>]
Virginia Polytechnic Institute and State University (2007-present)

Affiliate Professor: Department of Computer Science
Virginia Polytechnic Institute and State University (2007-present)

Catalyst Fellow: Institute for Creativity, Arts and Technology (ICAT)
Virginia Polytechnic Institute and State University

Member: Interdisciplinary Center for Applied Mathematics (ICAM),
Center for Human-Computer Interaction (CHCI),
Faculty of Health Sciences
Virginia Polytechnic Institute and State University

Education

Ph.D., Computer Science – 2002-2006 **Virginia Polytechnic Institute and State University**

- Dissertation: Display Techniques in Information-Rich Virtual Environments
- Advisors: Dr. Doug A. Bowman, Dr. Chris North
- Committee: Dr. Scott McCrickard, Dr. Ken Livingston, Dr. Don Brutzman
- GPA: 3.88

B.A., Cognitive Science – 1992-1996 **Vassar College**

- Thesis: The Universal Shaman and the Modern Mental Ontology
- Advisor: Dr. Ken Livingston

Honors and Awards

- 2019 *SIGGRAPH Featured Member*
- 2018 *SEGD Global Design Award*, Installation: **Wing It!** (w/ K. Meaney)
- DAAD-Sponsored *German Science Tour 2014* – Artificial Intelligence and Visual Computing
- *ACM Service Awards* for the Web3D Conference:
General Chair (2008, 2014, 2019), Program Chair (2007, 2010)
- *Outstanding Graduate Research Award*, VT Computer Science Department: 2006
- *Gamma Beta Phi* Honor Society, inducted 2005
- *Upsilon Pi Epsilon* Computer Science Honor Society, inducted 2004
- Universal Media, Winner “*World Altering Contest*,” 1998
- Advanced Placement Scholar with Distinction, 1992

Research Interests

- Cognitive and Graphical aspects of Scientific Visualization & Medical Imaging
- Information & Interaction Architectures, especially the Web ecology
- Human Computer Interaction & Usability Engineering in Virtual & Augmented Reality

Professional & Community Activities

Director

- Web3D Consortium (501c6; web3d.org)
 - President (elected 2010-2019)
 - Secretary (elected 2007-2009)
 - Board of Directors (elected 2000-2015)
- NSF IUCRC Center for e-Design (2011-2013); VT Site (2011-2014)
 - Co-Director with Prof. Richard Goff, Engineering Education

Chairs

- Web3D Consortium Working Groups
 - Medical (2010-present)
 - Extensible 3D (X3D) (2017-present)
 - User Interface (2006-2009)
- Conferences
 - Steering Committee ACM SIGGRAPH Web3D Conference (2009-present)
 - General Chair: ACM Web3D 2008, Web3D 2014, Web3D 2019
 - Program Chair: ACM Web3D 2007, 2010, 2011
 - Workshops / Tutorials Chair: IEEE Virtual Reality 2007, Web3D 2006 & 2013
 - Publicity Chair: IEEE Virtual Reality 2008
 - Finance Chair: IEEE Virtual Reality 2009, 2010; Web3D 2016

International Workshop Organizer & Facilitator

- *3D Visualization for Medical Applications* (Web3D 2019)
- *Birds-Of-A-Feather (BOF) Sessions on Web3D topics: Web-wide Interactive 3D, Medical, CAD, AR/MR, Cultural Heritage, GIS* (SIGGRAPH 2008-2018)
- *Image Segmentation and Visualization Tools* (Web3D 2016)
- *Web3D Cultural & Natural Heritage* (Web3D 2014, 2015)
- *Extending Extensible 3D (X3D) from Haptic-based Medical Training to Clinical Applications* (Medicine Meets Virtual Reality (MMVR) 2014)
- *Medical Virtual Environments* (IEEE VR 2010; Web3D Tutorials 2012, 2013)
- *Parallel Realities? The Requirements of Web3D and Immersive VR, and Future Standards for Immersive VR* (IEEE VR 2007, 2008)
- *X3D User Interfaces* (ACM Web3D 2004, 2005)
- *Medical X3D* (ACM Web3D 2005)
- *Portable Information Spaces* (HCI International 2004)

Member

- **Editorial Board:** Virtual Reality Journal (Springer)
- **Center for Nuclear Femtography Steering Committee**
- ACM SIGGRAPH **Special Conferences Committee** (2016-present)
- Web3D Consortium (2000-present)
- ACM (2003-present)

- IEEE (2004-present)
- ASEE (2013-present)
- SIGGRAPH Online Committee (2000, 2001)

Reviewer

Conferences

(2002-present): Web3D, VIS, VAST, InfoVis, 3DUI, VR, VRST, SVR, Pacific Vis, SIGGRAPH, CHI, Graphics Interface, AMIA 2019

Journals

(2004-present): International Journal of Human-Computer Studies, Virtual Reality journal, Computer Graphics and Applications, Computers & Graphics, Computer Graphics Forum, Information Visualization, Computer-Aided Civil and Infrastructure Engineering (Special Issue), Transactions on Applied Perception

Official Liaison

- DICOM medical imaging standards (WGs 11, 17, 23): 2006-2016
- Health Level 7 (HL7) : 2017-present

Invited (Speaker, Juror, Panelist)

- **SIGGRAPH** July, 2019 - Birds of a Feather (BOF) organizer, presenter: Web Publishing with 3D in HTML5; Carto (-graphic visualization); Immersive Visualization
- Invited Talk: *"Perspectives on Visualization and Science: Communication and Discovery"*. **Jefferson National Lab** (June 2019)
- Keynote: *"Fulfilling the Mandate of Durability and Access"* Born to Be 3D: **Library of Congress** (Nov 2018)
- Keynote: *"Interactive 3D Visualization in the Wide Web of Health"*, **32nd Annual HL7 Plenary Meeting** (October 2018)
- Invited Talk: *"Immersive Visualization at Virginia Tech"* **SIGGRAPH** 2017, 2018, 2019 Immersive Visualization in Research, Science, and Art BOF
- Invited Talk: *"Visualizing Place across Data and Platforms with X3D"* **SIGGRAPH** 2017, 2018, 2019 Carto BOF
- Panelist: "The Future of Web3D" (**Web3D** 2018)
- Invited Talk: *"Lidar Pipelines for Immersive and Web3D Visualization"* **Silvilaser** 2017
- Invited Talk: *"Immersive Analytics: New Approaches to Scaling High-Performance Visualization"* **Los Alamos National Laboratory** (August 2017)
- Panelist: The Future of the VR Web (**Web3D** 2016)
- Invited Talk: *"High-Performance Visualization and Human Design"* **ITAM University** invited lecturer, Mexico City March 2016
- Invited Talk: *"Real and Virtual Spaces"* Federal In-Service Training, **The Hirschorn Museum Smithsonian** Washington, DC 2016
- Invited Talk: *"Reproducibility in the Digital Age: Challenges and Opportunities for Progress"* **Science in 3D NIH/NIAID** Bioinformatics Festival 2015
- Panelist: ACM Web3D 2015: *"Trends and Future of 3D on the Web"*
- Judge: VR Hackathon (San Francisco, 2015)
- Invited Talk: *"My Take on Villareal"* **Moss Art Center** (2015)

- Invited Talk: **1st Annual Maker Faire, The White House** Washington, DC 2014
- Invited Talk: OSEHRA: **Veteran's Administration** Opensource Health Record Summit 2014
- Invited Talk: VisTech Workshop @ **Supercomputing** 2014: "*High-Performance Visualization*"
- Judge: Bay Area **VR Hackathon** @ Gray Area, San Francisco 2014
- Invited Talks: **Web3D** Conference (2010-2014): "*Virtual Worlds on the Web*", "*Volume Visualization and Medical Applications*", "*Scientific Visualization*", "*Augmented and Mixed Reality*"
- Invited Talk: **TERATEC** 2011: "*High-Performance Visualization*" (Paris, France)
- Invited Talk & Panelist: **Supercomputing** 2009: "*3D Internet*"
- Panelist: NSF- sponsored panel "*Making a Career in VR*" **IEEE VR** 2006
- Invited Talks: **ACM SIGGRAPH** Local Chapters Speaker: Boston, NY, DC, San Francisco (2001-present)
- Invited Talk, Judge: VR Art: **Stuttgarter Filmwinter MultiMedia Festival** (2000)

Key Contributor

- 2018 ARC project highlight videos: <https://vimeo.com/visionarium2018>
- VTR-Net (NSF) grant author and Co-PI bringing 10 Gig to 12 buildings on campus
- NIH 3D Print Exchange 3dprint.nih.gov – Senior Advisory Board (2013-2017)
- NSF MirrorWorlds Human-Building Interface at Moss Arts Center
- 3D Graphics: Virginia Tech Football Half-Time Commercials 2012, 2016
- 3D Graphics: 2015 Microsoft Azure International Commercial w/ Wu Feng short , long
- ISO/IEC Reference Model for Mixed Reality Continuum (JTSC1) (2013-2015)
- ISO/IEC Extensible 3D (X3D) Specification, esp. the Volume rendering and Event Utilities Components. www.web3d.org (2000-present)
- Web3D Medical Working Group (2006-present)
- Virginia Tech 3D Interaction Research Group (2003-present)
- Web3D Software Development Kit (SDK) (2000-2002)

Teaching Experience

Courses Taught

Virginia Polytechnic Institute and State University, Instructor:

- 2019 : CS 5764, *Information Visualization* (CS Graduate Level)
- 2016: CS 5754, *Virtual Environments* (CS Graduate Level),
CS 4784, *HCI Capstone* (CS Seniors)
- 2013: CS 5754, *Virtual Environments* (CS Graduate Level)
- 2010: CS 3724, *GUI & Graphics Programming* (CS Junior/Senior)
- 2008: CS 5784, *Information Visualization* (CS Graduate Level)
- 2007: CS 2984, *Media Computation* (CS Freshman/Sophomore Level)
- 2006: CS 3724, *Introduction to Human-Computer Interaction*
(CS Junior/Senior Level)

- 2002: Teaching Assistant for CS 2204 *UNIX* for sophomore CS majors

Short Courses (Instructor)

- *Web3D Quickstart: IEEE VR 2017, AMIA 2018, Web3D 2019*
- *Web3D Master Class, World Bank Land and Poverty Conference (2015)*
- *AOE 5984, Introduction to Parallel Computing (Team taught, 2014)*
- *High Performance Visualization, Visualization Zoo, Virtual Reality Zoo, Deep Media, Web3D Publishing Virginia Tech Faculty Development Institute (FDI 2006-2018)*
- *New Dimensions in eLearning NSF Research Experience for Teachers (RET 2012)*
- *High Performance Computing Summer Bootcamp (w/ UVa 2008-2010)*
- Graduate short course (GEDI): *Introduction to Computational Science (2007)*
- *Web3D & SIGGRAPH: Engineering Virtual Environments with X3D, Techniques of Perception with X3D_(2003-2005); X3D Architecture & Overview, Web3D Graphics Publishing with X3D (2000-2002); Introducing X3D (2000)*

Mentoring

Student Mentoring (as VT CS Faculty)

- **Ph.D.:** Ryan McMahon (2012), Kriti Sensharma (2013), Bireswar Laha (2014), Felipe Bacim (2015), Patrick Butler (2015), Mahdi Nabiyoumi (2016), Peter Radics (2016, *Chair*), Mohammed Seyam (2016), Jessie Mann, Ayat Mohammed (2017, *Chair*), Andrew Reach (2017), Wallace Lages (2018), Run Yu (est 2019), Mai Dashan (est. 2021, *Chair*), Michael Rhodes (est 2021)
- **Masters:** Ankit Singh (*Chair*, 2012), Shyam Visamsetty (2010), Andy Wood, Nikhita Sharakhov (2014), Jacob Dennis (2014), Sai Mallampati (2015), Adam Binford (2016), Xin Chen (2016), Siddarth Narayan (2016), Faiz Abidi (2016, *Chair*), Lawrence Warren (2018), Cedrick Illo (2019, *Chair*), Jooyoung Whang, Yanshen Sun, Tom Phan (2020)
- Dozens of graduate and undergraduate interns and independent study students in the Visionarium Lab [vis.arc.vt.edu]; NIH summer interns to Burgess Lab

Funded Research _____ over \$ 6.4 million to date _____

- **ICAT SEAD (internal): *Translating a Smithsonian Exhibit for Learning*; \$3,000 (2019) with Meaney, Nguyen, Commer responsible for 45 %**
- **Center for Nuclear Femtography (VA) *Visualizing Femtoscale Dynamics; New Workspaces for Nuclear Femtography* \$ 75,000 (2019); responsible for 100%**
- **ONR *STEM training for Dynamic Spectrum Access* \$1.5 million (2018-2021) with Allen, Dietrich, Goff; responsible for 25%**
- **ICAT SEAD (internal): *Visualizing Global Health and Policy*; \$3,000 (2018) with Kraak, Coupey, Meaney; responsible for 85%**
- **MITRE *Designing EM Visualizations* \$ 40,000 with Dietrich (2017-2018) responsible for 75 %**
- **VT-CSC (internal): *Seasonal Drone-based Lidar Acquisition and Analysis* with Hession, Taylor, Munsell, Sforza \$ 10,000 (2017, 2018) responsible for 20 %**

- **VT-Cider** (internal): *Immersive Design for Public Exhibits* with Meaney
\$ 2,000 (2017) responsible for 75 %
- **NSF CC*DNI: A Campus Research Network and Distributed Science DMZ** (lead author) with Midkiff, Dingus, Barrett, Herdman \$ 489,589 (2016) re for 20%
- **Microsoft HoloLens Site** with J. Gabbard \$ 100,000 (2016) re for 20%
- **General Dynamics: Computer-Human Interaction in The Analytic** co-PI with North, Lehman, House, Ramakrishnan \$ 500,000 (2016, 2017) res for 20%
- **ICAT SEAD** (internal): *Belle II Detector* with Pillionen, Webster \$ 25,000 (2016-2017)
- **ICAT SEAD** (internal): *Fusality for Field and Stream* PI with Sforza, Hession, Kim, Munsell \$ 25,000 (2015-2016) re 33%
- **ISCE** (internal) *Visualizing Water Services for Decision Making* co-PI with Hall, Sforza, Wenzel, Burbey \$ 30,000 (2015) re for 20%
- **AFRL: APIs for Test & Evaluation to Accelerate Spectrum Sharing / Cognitive Radio Network** co-PI with Dietrich, Fowler \$ 53,833 (2015) re for 20%
- **Extension Innovation Grant: extension Geo-Citizens Design Forest Farms** co-PI with Munsell, Sforza \$ 97,185 (2015-2016) re 33%
- **NSF IUUSE: Wireless Testbeds for Authentic STEM Learning** with Carl Dietrich, Vuk Marojevic, Teayoung Yang, Mike Beuhrer \$ 626,655; (2014) re for 20%
- **NSF Computing Research Infrastructure (CRI II-New): Living Lab for Asynchronous and Synchronous Investigation of Virtual and Real Environments** with Ben Knapp, Yong Cao, James Ivory, and Doug Bowman \$ 585,510; (2013) re for 25%
- **NSF Research Experience for Teachers (RET) New Dimensions in e-Learning** with Richard Goff \$ 25,000; (2012) re for 50%
- **NSF Fundamental Research: Visual Interfaces for Engineering Innovation** (2011-present) PI w/ Sundar Krishnamurty, UMass Amherst; \$ 165,000; re 50%
- **NSF IUCRC National Center for eDesign** Co-Director (2010-2012), with Janis Terpenney and Richard Goff \$ 563,000; re 50%
- **NSF Virtual Environments to Enhance Structures Understanding of Architects** (2009-2012) co-PI with Medhi Setareh, Brett Jones \$ 500,000; re for 35%
- **The U.S. Department of Energy Hub: Energy Efficient Buildings** (2010-2013); John Burns, Jeff Borggaard, Herdman \$ 5,000,000; re for 5%
- **CISCO Tele e-Design** (2011) \$ 30,000; re for 100%
- **ICTAS** (internal) *A Visual Interface for Smart Vehicle Networks* (2008); \$ 65,000; re for 100%
- **Center for Community Security and Resilience** (2010-2011 w/ IBM Research) co-PI with Peter Sforza \$ 15,000; re for 30%
- **US ARMY TATRC: Medical X3D** (2007) \$ 120,000; responsible for 10%
- **Naval Postgraduate School: An X3D Loader for OpenSceneGraph** (2007) \$ 6,000; responsible for 100%

Book Chapters

- 3] **Polys, Nicholas F., Sforza, Peter, Munsell, John** "PlantShoe: Botanical Detectives". In: *The HCI of Technology on The Trail*, (eds) McCrickard et al. 2020 (*In preparation*)
- 2] **Polys, Nicholas F.** "Information Visualization in Virtual Environments: Tradeoffs and Guidelines". In: *Handbook of Virtual Environments, Second Edition* (eds.) Kelly Hale and Kay Stanney. CRC Press, 2014.
- 1] **Polys, Nicholas F.** "Publishing Paradigms with X3D". In: *Information Visualization with SVG and X3D*, (eds.) Chanomei Chen and Vladimir Geroimenko, Springer-Verlag, 2005.

Peer-Reviewed Journals

- 27] Hasanzadeh, Sogand; **Polys, Nicholas**, et al (*under review*). "Presence, Mixed Reality, and Risk-Taking Behavior: A Study in Safety Interventions". *Transactions on Visualization and Computer Graphics*
- 26] Zhou, Kraak, Rajamohan, **Polys** (*under review*). "Marketing of Foods and Beverages: Impact and Potential Solutions for Children and Young People's Health". *International Journal of Environmental Research and Public Health*
- 25] Dashan, **Polys**, Pollyea, Jayne (*to appear*). "Making Sense of Scientific Simulation Ensembles with Semantic Interaction" *Computer Graphics Forum*.
- 24] Richard Skarbez, **Nicholas F. Polys**, J. Todd Ogle, Chris North, Doug A. Bowman. "Immersive Analytics: Theory and Research Agenda". *Frontiers in Robotics and AI* 6, 82.
- 23] Dowling, M., Wycoff, N., Mayer, B., Wenskovitch, J., House, L., **Polys, N.**, North, C. and Hauck, P., 2019. "Interactive Visual Analytics for Sensemaking with Big Text". *Big Data Research*, 16, pp.49-58.
- 22] Tabor, K.M., Marquart, G.D., Hurt, C., Smith, T.S., Geoca, A.K., Bhandiwad, A.A., Subedi, A., Sinclair, J.L., Rose, H.M., **Polys, N.F.** and Burgess, H.A., 2019. "Brain-wide cellular resolution imaging of Cre transgenic zebrafish lines for functional circuit-mapping". *eLife*, 8, p.e42687.
- 21] Narayanan, S., **Polys, N.** and Bukvic, I.I., 2018. "Cinemacraft: exploring fidelity cues in collaborative virtual world interactions". *Virtual Reality*, pp.1-21.
- 20] Dowling M, Wenskovitch J, Hauck P, Binford A, Polys N, North C. A Bidirectional Pipeline for Semantic Interaction. In: *Proceedings of the Workshop on Machine Learning from User Interaction for Visualization and Analytics (IEEE VIS 2018)* 2018 (Vol. 11).
- 19] **Polys, N. F.** (2017). "Of Standards and Herrings: Tales of Technology and Tumult". *MMTC Communications – Frontiers*. Vol. 12, No. 1. IEEE.
- 18] Mike Meyer, **Nick Polys**, Humza Yaqoob, Linda Hinnov, Shuhai Xiao (2017). "Beyond the stony veil: Reconstructing the Earth's earliest large animal traces via computed tomography X-ray imaging". *Precambrian Research*, Volume 298, Pages 341-350, ISSN 0301-9268, <https://doi.org/10.1016/j.precamres.2017.05.010>.

- 17] Marquart, G. D., Tabor, K. M., Horstick, E. J., Brown, M., Geoca, A. K., **Polys, N. F.**, ... & Burgess, H. A. (2017). "High precision registration between zebrafish brain atlases using symmetric diffeomorphic normalization". *GigaScience* 6 (8).
- 16] Setareh, M., Jones, B., Ma L., Bacim, F., **Polys, N.** (2015). "Application and Evaluation of Double-Layer Grid Spatial Structures for the Engineering Education of Architects". *Journal of Architectural Engineering* 21 (3).
- 15] **Polys, N.**, Setareh, M., Bacim, F., Jones, B. (2015). "SAFAS: Unifying Form and Structure with Interactive 3D Simulation". *Engineering Design Graphics Journal*, 79 (2); ASEE.
- 14] Xiao, S., A. Muscente, L. Chen, C. Zhou, J. D. Schiffbauer, A. D. Wood, **N. F. Polys** and X. Yuan (2014). "The Weng'an biota and the Ediacaran radiation of multicellular eukaryotes." *National Science Review* 1 (4): 498-520.
- 13] Jones, B. D., M. Setareh, **N. F. Polys** and F. Bacim (2014). "Application of an Online Interactive Simulation Tool to Teach Engineering Concepts Using 3D Spatial Structures." *International Journal of Web-Based Learning and Teaching Technologies (IJWLTT)* 9(3).
- 12] Michael Bruce Meyer, David Elliott, Andrew D Wood, **Nicholas F Polys**, Matthew Colbert, Jessica A Maisano, Patricia Vickers-Rich, Michael Hall, Karl H Hoffman, Gabi Schneider, Shuhai Xiao. (2014). "Three-dimensional microCT analysis of the Ediacara fossil Pteridinium simplex sheds new light on its ecology and phylogenetic affinity." *Journal of Precambrian Research*, 249: 79-87.
- 11] Setareh, M., Bacim, F., Jones, B.D., **Polys, N. F.**, Geng, T., Orsa, B. (2012). "Integrating Web-based Visualization with Structural System Understanding to Improve the Technical Education of Architects." *Journal of Online Engineering Education* 3(2).
- 10] Hossain, S., Akbar, M., and **Polys, N.** (2012). "Narratives in the Network: Interactive Methods for Mining Cell Signaling Networks." *Journal of Computational Biology* 19(9): 1043-1059.
- 9] **Polys, N.** and A. Wood (2012). "New Platforms for Health Hypermedia." *Issues in Information Systems* 13(1): 40-50.
- 8] **Polys, Nicholas F.**, Bowman, D.A., and North, C., (2011). "The Role of Depth and Gestalt Cues in Information-Rich Virtual Environments." *International Journal of Human-Computer Studies*, Volume 69, pp. 30-51, Elsevier.
- 7] **Polys, N. F.** (2011). "Recall the Lost Frontiers of Virtual Worlds". *Communications of the ACM*, 54(5).
- 6] **Polys, Nicholas** and Brutzman, Don and Steed, Anthony and Behr, Johannes. (2008). *Future Standards for Immersive VR: Report on the IEEE VR 2007 Workshop*. *IEEE Computers Graphics & Applications* Vol. 28, Number 2, IEEE Computer Society, 2008.
- 5] D.A. Thorley-Lawson, V. H., K. Luzuriaga, A.S. Jarrah, R. Laubenbacher, K. Lee, **N.F. Polys**, E. Delgado-Eckert, M. Shapiro, K.A. Duca (2007). "A Virtual Look at Epstein-Barr Virus Infection: Biological Interpretations." *PLOS Pathogens* 3(10): e137.

- 4] Shapiro, M., K. A. Duca, K. Lee, E. Delgado-Eckert, A.S. Jarrah, R. Laubenbacher, **N.F. Polys**, V. Hadinoto, D. Thorley-Lawson, (2008). "A Virtual Look at Epstein-Barr Virus Infection: Simulation Mechanism." Journal of Theoretical Biology **252**(4): 633-648.
- 3] Bowman, D., Chen, J., Wingrave, C., Lucas, J., Ray, A., **Polys, N.**, Li, Q., Haciahmetoglu, Y., Kim, J., Kim, S., Boehringer, R., and Ni, T. (2006). "New Directions in 3D User Interfaces". International Journal of Virtual Reality **5**, 3-14.
- 2] **Polys, N. F.**, Kim, S., and Bowman, D. A. (2007). "Effects of Information Layout, Screen Size, and Field of View on User Performance in Information-Rich Virtual Environments." Computer Animation and Virtual Worlds **18**(1): 19-38.
- 1] **Polys, Nicholas F.** and Bowman, Doug A. (2004). "Desktop Information-Rich Virtual Environments: Challenges and Techniques." Virtual Reality **8**(1): 41-54.

Peer-Reviewed Conference Proceedings

- 51] Valerio Mascolino, Alireza Haghghat, **Nicholas Polys**, Nathan J. Roskoff, and Srijith Rajamohan. 2019. A Collaborative Virtual Reality System (VRS) with X3D Visualization for RAPID. In The 24th International Conference on 3D Web Technology (Web3D '19). ACM, New York, NY, USA, 1-8. DOI: <https://doi.org/10.1145/3329714.3338135>
- 50] Dietrich, C., Goff, R., Dessources, D., Gomez, X., Garcia-Sheridan, J., **Polys, N.**, Buehrer, R.M., Kim, S., Marojevic, V. and Hearn, C., 2018, October. Remote laboratory exercises and tutorials for spectrum-agile radio frequency systems. In *2018 IEEE Frontiers in Education Conference (FIE)* (pp. 1-2). IEEE.
- 49] **Nicholas Polys**, Cecile Newcomb, Todd Schenk, Thomas Skuzinski, and Donna Dunay. (2018). The value of 3D models and immersive technology in planning urban density. In Proceedings of the 23rd International ACM Conference on 3D Web Technology (Web3D '18). ACM, New York, NY, USA, Article 13, 4 pages. DOI: <https://doi.org/10.1145/3208806.3208824>
- 48] Garcia-Sheridan, Joshua, Marojevic, Vuk, Goff, Richard, **Polys, Nicholas**, & Dietrich, Carl B. (2018). Lessons Learned from a Radio Spectrum Coexistence Competition: A Road Map to Engagement in Informal Education of Wireless Communication. *ASEE Annual Conference Proceedings*. Retrieved from <http://par.nsf.gov/biblio/10057256>
- 47] Dowling, M., Wenskovitch, J., Hauck, P., Binford, A., Polys, N. and North, C., 2018. A Bidirectional Pipeline for Semantic Interaction. In *Proceedings of the Workshop on Machine Learning from User Interaction for Visualization and Analytics (IEEE VIS 2018)* (Vol. 11).
- 46] Faiz Abidi, **Nicholas Polys**, Srijith Rajamohan, Lance Arsenault, and Ayat Mohammed. (2018). Remote high performance visualization of big data for immersive science. In Proceedings of the High Performance Computing Symposium (HPC '18). Society for Computer Simulation International, San Diego, CA, USA, Article 5, 12 pages.
- 45] **Nicholas Polys**, Jessica Hotter, Laura Purcell, Madison Lanier, Jordan Wolf, Cully Hession, Peter Sforza and James Ivory (2017). "Finding Frogs: Using Game-Based Learning to Increase Environmental Awareness". In *Proceedings of the 22nd International Conference on 3D Web Technology (Web3D '17)*. ACM, New York, NY, USA.

- 44] Haitao Wang, Xiaoyu Chen, **Nicholas Polys** and Peter Sforza (2017). "A Web3D Forest Geo-Visualization and User Interface Evaluation". In *Proceedings of the 22nd International Conference on 3D Web Technology (Web3D '17)*. ACM, New York, NY, USA.
- 43] Ander Arbelaz, Aitor Moreno, Luis Kabongo, **Nicholas Polys** and Alejandro García-Alonso (2017). "Community-driven Extensions to the X3D Volume Rendering Component". In *Proceedings of the 22nd International Conference on 3D Web Technology (Web3D '17)*. ACM, New York, NY, USA.
- 42] Ayat Mohammed, **Nicholas Polys**, Vuk Marojevic, Richard Goff and Carl Dietrich (2017). "Evaluating Multi-View Representations of a Web3D Streaming Server". In *Proceedings of the 22nd International Conference on 3D Web Technology (Web3D '17)*. ACM, New York, NY, USA.
- 41] Jagathshree Iyer, **Nicholas Polys** and Lance Arsenault (2017). "Text Density and Display Bandwidth: Evaluating Scalability by Model and Experiment". In *Proceedings of the 22nd International Conference on 3D Web Technology (Web3D '17)*. ACM, New York, NY, USA.
- 40] Jessie Mann, **Nicholas Polys**, Rachel Diana, Manasa Ananth, Brad Herald, Sweetuben Platel. "Virginia tech's study hall: A virtual method of loci mnemotechnic study using a neurologically-based, mechanism-driven, approach to immersive learning research", 2017 IEEE Virtual Reality (VR). 383-384, 2017.
- 39] **Polys, N.**, Mohammed, A., Iyer, J., Radics, P., Abidi, F., Arsenault, L., & Rajamohan, S. (2016, March). Immersive analytics: Crossing the gulfs with high-performance visualization. In *2016 Workshop on Immersive Analytics (IA)* (pp. 13-18). IEEE.
- 38] **Polys**, Sforza, Hession, Munsell (2016) "Extensible Experiences: Fusality for Stream and Field". In *Proceedings of the 21th International Conference on 3D Web Technology (Web3D '16)*. ACM, New York, NY, USA.
- 37] **Polys, N.** and Gurjarpadhye, A. (2016). "Tradeoffs in Multi-Channel Microscopy Volume Visualization: An Initial Evaluation". In *Proceedings of the 21th International Conference on 3D Web Technology (Web3D '16)*. ACM, New York, NY, USA.
- 36] **Polys**, Sforza, & Singh (2016). "A Novel level-Of-Detail Technique for Virtual City Environments". In *Proceedings of the 21th International Conference on 3D Web Technology (Web3D '16)*. ACM, New York, NY, USA.
- 35] Brown, **Polys**, Bevan, and Mohammed (2016). "Insights into Alzheimer's Disease: Molecular Dynamics (MD) Simulations of Peptide-Membrane Interactions". In: *Proceedings of the 5th Annual Extreme Science Engineering Discovery Environment (XSEDE'16)*,
- 34] Ayat Mohammed, Faiz Abidi, Srijiith Rajamohan, **Nicholas Polys**, (2016). "High Performance Visualization Pipeline for LiDAR Point Cloud Data". In: *Proceedings of the 5th Annual Extreme Science Engineering Discovery Environment (XSEDE'16)*,(p. 59). ACM.
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Posters

- 5] Dashan, Mai & **Polys, Nicholas F.** (2018) Making Sense of Scientific Simulation Ensembles. SuperComputing
- 4] Rincón-Gallardo Patiño S, Kraak V, Rajamohan S, **Polys N**, Ramesh A, Meaney K, Coupey E. *Development of a Responsible Food and Beverage Marketing Index for National Governments to Implement and Evaluate Policies to Restrict the Marketing of Unhealthy Food and Beverage Products to Children*. International Society for Behavioral Nutrition and Physical Activity (ISBNPA). Hong Kong, China, 3-6 June 2018. Abstract 013949.
- 3] Peter Radics, Peter Sforza, Brian Farrell, Joseph Newman, **Nicholas Polys**, Azam Mosaavi, Bethany Sutherland, Haitao Wang, Laura Roghair, Matthew Pierson and Matthew Bock (2015) "Vineyard Site Assessment and Simulation of Grape Varieties in the Eastern U.S." The 4th Annual Extreme Science Engineering Discovery Environment Conference 2015 (XSEDE'15), At St. Louis, MO
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Other Publications

8] Schutt, K., **Polys, N.** and Sforza, P. (2013). "Accessing Parallel Computing Resources from ArcGIS 10.0". Processing Large Datasets session. *ESRI International User Conference*, San Diego, CA.

7] **Polys, N. F.**, Wood, A., Ullrich, S., Evestedt, D., & Aratow, M. (2013). A fresh look at Immersive Volume Rendering: Challenges and Capabilities, in IEEE VR Workshop on Immersive Volume Rendering 2013: Orlando.

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1] **Polys, Nicholas F.** (1999). "Supplying your XML Toolkit" – IBM DeveloperWorks online feature.

Professional and Research Experience

2008-present **Virginia Polytechnic Institute and State University** – Blacksburg, VA
Director of Visual Computing, Advanced Research Computing (IT),
Affiliate Professor of Computer Science

- Conduct research to improve visual analysis methods and informatics services for high-performance computing (see Funded Research above)
- Develop Visual Computing solutions with faculty across the university
- Design, build, manage and develop cutting-edge visualization hardware and software stack (The Visionarium Lab; Viscube upgraded 2010, 2016)
- Manage projects, staff, and budgets for ARC's **Visionarium Lab**
- Build partnerships to improve the competency and impact of High Performance Computing and Visualization through immersive and Web3D technologies

Selected Projects

- Wireless Spectrum Visualization: Web3D visualization interfaces for students

- Fusality / Mirror Worlds: Sensors and Web3D visualization used for environmental monitoring and planning; flipped labs
- Network visualization: cell-signaling pathways, ontologies
- Scientific visualization: medical imaging, molecular dynamics, fluid dynamics, geospatial data, cluster and remote rendering
- Structural engineering: Web3D-based architectural design

2006 – 2007 Virginia Polytechnic Institute and State University – Blacksburg, VA

Postdoctoral Associate: Research Computing

- Developed Visual Computing solutions for computational scientists
- Ran faculty and graduate development workshops for 3D visualization

Selected Projects

- Mathematics - generated VR, images, and movies of large space structure energetics simulations
- Biochemistry - generated VR, images, and movies of Myoglobin Oxygen transport mechanism (molecular dynamics simulations, published in PNAS)

2005 – 2006 Virginia Polytechnic Institute and State University – Blacksburg, VA

Graduate Research Assistant

- Virtual Reality Assessment of Independent Living Skills and Mild Cognitive Impairment in Elderly Populations - Interface and Content Developer: built stimuli and testbed system for immersive CAVE assessment tool (Carilion Biomedical Institute funding)

Selected Projects

- Personal Memex – expert interviews and prototype for personal digital memory system for high-functioning and disabled populations
- Intelligent Document Filtering - implemented multiple AI evaluators for machine learning in text retrieval

2003 – 2005 Virginia Bioinformatics Institute – Blacksburg, VA

Graduate Research Assistant

- PathSim project - Visualization and Deployment Lead: designed and developed data processing and information-rich virtual environment interfaces for a large, agent-based immunological simulation (NIH funding)
- Mblast – Software Engineer: analyzed and optimized a Formal Concept Lattice Algorithm for gene expression analysis

Selected Projects

- STKE Cellular Signaling – Project Lead, Interface Programmer: designed and developed graphical interface for direct manipulation of Boolean queries using Java Swing and MySQL database populated by web crawler agent
- Usability Engineering project for design of an online notification system; highest user subjective evaluations among class projects

1999-2002 VirtuWorlds LLC – New York, NY; Amsterdam, NL

Chief Technical Officer, Founder

- Designed and implemented content management and delivery systems for Web3D assets and environments
- Technology adapted and used by Merck, Pfizer, and Georgia State U.
- Editor-In-Chief the 3D-eZine online Web3D industry portal

2000-2001 Yoe Studio – Peekskill, NY

Web Programmer, Designer

- Implemented and maintained commercial, data-driven, personalized websites

1996-1999 Transcendent Recordings – Poughkeepsie, NY

Vice-President of Production, Webmaster

- Led digital productions for numerous artists w/ independent record label

1992-1996 Vassar College Computer Center – Poughkeepsie, NY

Information Technology Consultant

- Worked with faculty, staff, and students to support computing and networking

Technical skills _____

- **Certified by:** VT IRB board for Human Subjects Research and Ethics
- **Fluent in:** X3D, VRML, Java, C++, Perl, UNIX/Linux, SQL, OpenGL/WebGL XML & XSLT, (x)HTML, PHP, Python, ECMA/Javascript, **numerous** commercial and open-source applications for modeling and visualization

Personal Information _____

- Happily married to Katherine Mills Polys since 1996
- Performing musician and songwriter since 1992: guitar, banjo, vocals
- Hobbies: fly-fishing, canoeing, hiking, camping
- Other Interests: mathematics of natural forms, evolutionary computation, the neuroscience of presence

References Available Upon Request