

# Curriculum Vita — Nicholas F. Polys

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## Faculty Appointments

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**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

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**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

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- DAAD-Sponsored German Science Tour 2014 – Artificial Intelligence and Visual Computing
- ACM Service Awards for the Web3D Conference:  
                                        General Chair (2008, 2014), 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

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- Cognitive and Graphical aspects of Scientific Visualization & Medical Imaging
- Information & Interaction Architectures, especially the Web ecology
- Human Computer Interaction & Usability Engineering Methodology
- Virtual & Augmented Reality & 3D User Interfaces

## Funded Research

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- **NSF CC\*DNI: *A Campus Research Network and Distributed Science DMZ*** with Midkiff, Dingus, Barrett, Herdman \$ 489,589 (2016) responsible for 20%
- **Microsoft HoloLens** with J. Gabbard \$ 100,000 (2016) responsible for 20%
- **General Dynamics: *Computer-Human Interaction in The Analytic*** co-PI with North, Lehman, House, Ramakrishnan \$ 500,000 (2016) responsible for 20%
- **ICAT SEAD (internal): *Belle II Detector*** with Pillonen, Webster \$ 25,000 (2016-2017)
- **ICAT SEAD (internal): *Fusality for Field and Stream*** PI with Sforza, Hession, Scott, Neese, 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) responsible for 20%
- **AFRL: *APIs for Test & Evaluation to Accelerate Spectrum Sharing / Cognitive Radio Network*** co-PI with Dietrich, Fowler \$ 53,833 (2015) responsible for 20%
- **Extension Innovation Grant: *extension Geo-Citizens Design Forest Farms*** co-PI with Munsell, Sforza \$ 97,185 (2015-2016) re 33%
- **NSF IUSE: *Wireless Testbeds for Authentic STEM Learning*** with Carl Dietrich, Vuk Marojevic, Teatoung Yang, Mike Beuhrer \$626,655; (2014) responsible 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) responsible for 25%
- **NSF Research Experience for Teachers (RET) *New Dimensions in e-Learning*** with Richard Goff \$ 25,000; (2012) responsible for 50%
- **NSF Fundamental Research: *Visual Interfaces for Engineering Innovation*** (2011-present) PI w/ Sundar Krishnamurty, UMass Amherst; \$ 165,000; responsible for 50%
- **NSF IUCRC National Center for eDesign** Co-Director (2010-2012), with Janis Terpenney and Richard Goff \$ 563,000; responsible for 50%
- **NSF *Virtual Environments to Enhance Structures Understanding of Architects*** (2009-2012) co-PI with Medhi Setareh, Brett Jones \$ 500,000; responsible for 35%
- **The U.S. Department of Energy Hub: *Energy Efficient Buildings*** (2010-2013); John Burns, Jeff Borggaard, Herdman \$ 5,000,000; responsible for 5%
- **CISCO *Tel e-Design*** (2011) \$ 30,000; responsible for 100%
- **ICTAS (internal) *A Visual Interface for Smart Vehicle Networks*** (2008); \$ 65,000; responsible for 100%
- **Center for Community Security and Resilience** (2010-2011 w/ IBM Research) co-PI with Peter Sforza \$ 15,000; responsible 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%

## Professional & Community Activities

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### Director

- Web3D Consortium (501c6; web3d.org)
  - President (elected 2010-2016),
  - 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 Richard Goff

## Chairs

- Web3D Consortium Working Group Chair:
  - User Interface (2006-present)
  - Medical (2010-present)
- Conferences
  - Steering Committee ACM SIGGRAPH Web3D Conference (2009-present)
  - General Chair: ACM Web3D 2008, Web3D 2014
  - 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

## Workshop Organizer

- *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)
- Birds-Of-A-Feather (BOF) Sessions: *Medical, CAD, AR/MR, Cultural Heritage, GIS* (SIGGRAPH 2008-2016)
- *Medical Virtual Environments* (IEEE VR 2010; Web3D Tutorials 2012, 2013)
- *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)

## Key Contributor

- NIH 3D Print Exchange Initiative – Senior Advisory Board (2013-2016)
- ISO/IEC Reference Model for Mixed Reality Continuum (JTSC1) (2013-2015)
- ISO/IEC Extensible 3D (X3D) Specification, esp. Volume rendering and Event Utilities Components (2000-present)
- Web3D Medical Working Group (2006-present)
- Virginia Tech 3D Interaction Research Group (2003-present)
- Web3D Software Development Kit (SDK) (2000-2002)

## Member

- Editorial Board: Springer Virtual Reality Journal
- Web3D Consortium (2000-present)
- ACM (2003-present); ACM SIGGRAPH Special Conferences Committee (2016)
- 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

### 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)

## Invited Speaker, Juror, Panelist

- Panelist: The Future of VR Web (Web3D 2016)
- Invited Talk: “*High-Performance Visualization and Human Design*” ITAM invited lecturer, MX City 2016
- Invited Talk: “Real and Virtual Spaces” Federal In-Service Training, The Hirschorn Museum Washington, DC 2016
- Invited Talk: “Reproducibility in the Digital Age: Challenges and Opportunities for Progress” *Science in 3D* NIH/NIAID Bioinformatics Festival 2015
- Invited Talk: 1<sup>st</sup> Annual Maker Faire, The White House Washington, DC
- 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: OSEHRA: Veteran’s Administration Opensource Health Record Summit 2014
- Invited Talk: VisTech Workshop @ Supercomputing 2014: “*High-Performance Visualization*”
- Judge: VR Hackathon @ Gray Area, San Francisco 2014
- Invited Talk: 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 students “*Making a Career in VR*” IEEE VR 2006
- Invited Talk: ACM SIGGRAPH Local Chapters Speaker: Boston, NY, DC, San Francisco (2001-present)
- Judge: VR Art: Stuttgarter Filmwinter MultiMedia Festival (2000)

## Publications

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### Book Chapters

**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.

**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

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).

**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.

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.

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).

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.

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).

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.

**Polys, N.** and A. Wood (2012). "New Platforms for Health Hypermedia." Issues in Information Systems **13**(1): 40-50.

**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.

**Polys, Nicholas** and Brutzman, Don and Steed, Anthony and Behr, Johannes. (2008). *Future Standards for Immersive: Report on the IEEE VR 2007 Workshop*. IEEE Computers Graphics & Applications Vol. 28, Number 2, IEEE Computer Society, 2008.

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.

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.

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.

**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.

**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**

**Polys, N.F.**, Mohammed, A., Iyer, J., et al. (2016). "Immersive analytics: Crossing the gulf with high-performance visualization". *IEEE VR Workshop on Immersive Analytics (IA)*. *IEEE* (to appear).

**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.

**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.

**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.

Brown, **Polys** Bevan, and Mohammed (2016). "Insights into Alzheimer's Disease: Molecular Dynamics (MD) Simulations of Peptide-Membrane Interactions ". Scientific Visualization Showcase: The 5th Annual Extreme Science Engineering Discovery Environment Conference 2016 (XSEDE'16),

Ji-Sun Kim, **Nicholas Polys**, and Peter Sforza. (2015). "Preparing and evaluating geospatial data models using X3D encodings for web 3D geovisualization services". In *Proceedings of the 20th International Conference on 3D Web Technology (Web3D '15)*. ACM, New York, NY, USA, 55-63. DOI=<http://dx.doi.org/10.1145/2775292.2775304>

**Nicholas F. Polys**, Benjamin Knapp, Matthew Bock, Christina Lidwin, Dane Webster, Nathan Waggoner, and Ivica Bukvic. (2015). "Fusality: an open framework for cross-platform mirror world installations". In *Proceedings of the 20th International Conference on 3D Web Technology (Web3D '15)*. ACM, New York, NY, USA, 171-179. DOI=<http://dx.doi.org/10.1145/2775292.2775317>

Marojevic, V., & Goff, R. M., & Dietrich, C. B., & Yang, T., & Hearn, C. W., & Polys, N. F., & Buehrer, R. M. (2015, June), *Wireless Communication Testbed and Tools for Authentic STEM Learning* Paper presented at 2015 ASEE Annual Conference and Exposition, Seattle, Washington. 10.18260/p.25079

Peter J. Radics, **Nicholas F. Polys**, Shawn P. Neuman, and William H. Lund. (2015). "OSNAP! Introducing the open semantic network analysis platform", Proc. SPIE 9397, Visualization and Data Analysis 2015, 939707 (February 8, 2015); doi:10.1117/12.2077834;

Nikita Sharakhov, Vuk Marojevic, Ferdinando Romano, **Nicholas Polys**, and Carl Dietrich. (2014). "Visualizing real-time radio spectrum access with CORNET3D". In *Proceedings of the Nineteenth International ACM Conference on 3D Web Technologies (Web3D '14)*. ACM, New York, NY, USA, 109-116.

Apostolellis, P., Bortz, B., Peng, M., **Polys, N.**, Hoegh, A. (2014). "Exploring the Integrality and Separability of the Leap Motion Controller for Direct Manipulation 3D Interaction". *IEEE Symposium on 3D User Interfaces (3DUI) 2014*, 153-154.

Zetiz, K., Zeitz R., Tao, C., **Polys, N.** (2014). "A Comparative Study of Metaphors for Investigating Augmented Reality Artifacts". *IEEE Symposium on 3D User Interfaces (3DUI)*, 179-180.

Sharakhov, Nikita, **Polys, Nicholas**, and Sforza, Peter. (2013) "GeoSpy: a Web3D Platform for Geospatial Visualization" *MapInteract*, ACM SIGSPATIAL, Orlando, Fl.

Hyungil Kim, Xuefang Wu, Joseph L. Gabbard, and **Nicholas F. Polys**. (2013). "Exploring head-up augmented reality interfaces for crash warning systems." In *Proceedings of the 5th International Conference on Automotive User Interfaces and Interactive Vehicular Applications*, pp. 224-227. ACM.

**Nicholas F. Polys**, Felipe Bacim, Mehdi Setareh, and Brett Jones. (2013). "Building novel Web3D user interfaces: a case study from architecture and structural engineering". In *Proceedings of the*

18th International Conference on 3D Web Technology (Web3D '13). ACM, San Sebastian ES, 135-138.

F. Bacim, E. Ragan, S. Serbo, M. Setareh, B. D. Jones, **N. Polys**. (2013). "The Effects of Display Fidelity, Visual Complexity, and Task Scope on Spatial Understanding of 3D Graphs." *Proceedings of Graphics Interface*, Regina, 2013. ISBN: 9781482216806.

**Polys, N.** (2012). "Publishing the Greatest Common Denominator." *CEUR-WS 869 Proceedings of the 1st International Workshop on Declarative 3D for the Web Architecture (Dec3D @ WWW 2012)*.

Nikita Sharakhov, **Nicholas Polys**, and Peter Sforza. (2013). "SpeedSpy: a mobile Web3D platform for visualizing broadband data". In *Proceedings of the 18th International Conference on 3D Web Technology (Web3D '13)*. ACM, New York, NY, USA, pg. 208.

Tilden, D., A. Singh, **N. F. Polys**, and P. Sforza. (2011). "Multimedia mashups for mirror worlds", *Web3D '11 Proceedings of the 16th International Conference on 3D Web Technology*, Paris, ACM.

Ullrich, S., T. Kuhlen, **N. F. Polys**, D. Evestedt, M. Aratow, and N. W. John, (2011). "Quantizing the Void: Extending Web3D for Space-Filling Haptic Meshes", *Medicine Meets Virtual Reality (MMVR)*, vol. 163, Newport Beach CA, USA, IOS Press, pp. 670-676.

Bacim, F., **Polys, N.**, Chen, J., Setareh, M., Li, J., and Ma, L. (2010). "Cognitive scaffolding in Web3D learning systems: a case study for form and structure". In *Proceedings of the 15th international Conference on Web 3D Technology* (Los Angeles, California, July 24 - 25, 2010). Web3D '10. ACM.

Henry, James A.G. and **Polys, Nicholas**. (2010). "The Effects of Immersion and Navigation on the Acquisition of Spatial Knowledge of Abstract Data Networks". *Proceedings of the International Conference on Computational Science*. *Procedia Computer Science*, Volume 1, Issue 1, pp. 1737-1746, Elsevier.

Hossain, S., Akbar, M., **Polys, N.** (2009) "Storytelling and Clustering for Cellular Signaling Pathways". *Proceedings of International Conference on Information and Knowledge Engineering (IKE)*, Las Vegas, NV. 2 Volumes. CSREA Press 2009, ISBN 1-60132-116-3

**Polys, Nicholas F.**, Visamsetty, S., Battarechee, P. Tilevich, E. (2009). "The Value of Patterns in Deep Media Scenegraphs". SEARIS Workshop, *IEEE Virtual Reality 2009*, Shaker-Verlag. ISBN 978-3-8322-8393-3

**Polys, Nicholas F.**, Visamsetty, S., Battarechee, P., Tilevich, E. (2009). "Design Patterns in Componentized Scenegraphs". SEARIS Workshop, *IEEE Virtual Reality 2009*, Shaker-Verlag. ISBN 978-3-8322-8393-3

Shyam Visamsetty, Puranjay Bhattacharjee, and **Nicholas Polys**. (2008). "Design patterns in X3D toolkits". In *Proceedings of the 13th international symposium on 3D web technology (Web3D '08)*. ACM, New York, NY, USA, 101-104.

N.W. John, M. Aratow, J. Couch, D. Evestedt, A.D. Hudson, **N. Polys**, R.F. Puk, A. Ray, K. Victor, Q. Wang. (2008). "MedX3D: Standards Enabled Desktop Medical 3D." *Medicine Meets VR (MMVR)*.

**Polys, Nicholas F.**, Shapiro, Michael, Duca, Karen. (2007). "IRVE-Serve: A Visualization Framework for Spatially-Registered TimeSeries Data". *The Web3D 2007 Symposium*, ACM SIGGRAPH.

**Polys, Nicholas F.**, & Ray, Andrew, (2006). "Supporting Mixed-Reality Interfaces through X3D Specification". Workshop on Mixed-Reality Interface Specification, *Proceedings of IEEE Virtual Reality*, IEEE Press.

Murthy, U., Burbey, I., Kwon, G., **Polys, N.**, Vincent, P., and Pérez-Quiñones, M. (2006). "Re-finding from a Human Information Processing Perspective". *SIGIR Workshop on Personal Information Management*, Seattle. <http://pim.ischool.washington.edu/pim06>

**Polys, Nicholas F.**, Kim, S., Bowman, D.A. (2005). "Effects of Information Layout, Screen Size, and Field of View on User Performance in Information-Rich Virtual Environments." *Proceedings of ACM Virtual Reality Software and Technology 2005*. Monterey, CA: ACM SIGGRAPH.

McCrickard, S., Wahid, S., Lee, J., **Polys, N.** (2005). "Use and Reuse in Information and Interaction Design." *Proceedings of HCI-International 2005*, Las Vegas, Nevada. LEA Associates.

**Polys, Nicholas F.**, Bowman, Doug A., North, Chris. (2004). "Information-Rich Virtual Environments: Challenges and Outlook". *Proceedings of NASA Virtual Iron Bird Workshop (Day 2, paper, ppt & video)*, NASA Ames. <http://ic.arc.nasa.gov/vib/>

**Polys, Nicholas F.**, Bowman, D., North, C., Laubenbacher, R., Duca, K. (2004). "PathSim Visualizer: An Information-Rich Virtual Environment for Systems Biology". *Proceedings of the Web3D 2004 Symposium*, ACM SIGGRAPH.

**Polys, Nicholas F.**, North, C., Bowman, D., Ray, A., Moldenhauer, M., Dandekar, C. (2004). Snap2Diverse: Coordinating Information Visualizations and Virtual Environments". *Proceedings of Visualization and Data Analysis*, International Society for Optical Engineering (SPIE).

Bowman, D., North, C., Chen, J., **Polys, N.**, Pyla, P., and Yilmaz, U. (2003). "Information-Rich Virtual Environments: Theory, Tools, and Research Agenda". In *Proceedings of ACM Virtual Reality Software and Technology*. 2003. Osaka, Japan: ACM SIGGRAPH.

**Polys, Nicholas F.** (2003). "Stylesheet Transformations for Interactive Visualization: Towards a Web3D Chemistry Curricula". *Proceedings of the Web3D 2003 Symposium*, ACM SIGGRAPH.

Brutzman, Don, Kass, Michael, **Polys, Nicholas F.** (2001). "X3D Content Examples, Editing, Conformance Suite and Software Development Kit". *Sketches and Applications*, ACM SIGGRAPH.

## Posters

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

**Polys, N.F.**, Duca, K.A., North, C., Bowman, D., Laubenbacher, R. (2005). "Information-Rich Virtual Environments for Biomedicine." Poster. *Computational Cell Biology*, Lennox MA.

**Polys, N. F.**, Duca, K. A., Laubenbacher, R., Bowman, D. A., North, C. (2003). "Interactive Visualization of Biological Databases using Information-Rich Virtual Environments", Poster. *Digital Biology: The Emerging Paradigm*, NIH.

## Other Publications



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.

**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.

**Polys, N. F.**, A. Singh, P. Sforza (2012). "Extended LOD Concept for X3D, 3DBlackburg". 3D Portrayal Interoperability Experiment (3DPIE) Final Report, Eds. Schilling, Hagedorn & Coors. OGC Public Engineering Reports. <http://www.opengeospatial.org/standards/per>

**Polys, Nicholas F.**, Shupp, Lauren, Volpe, J., Glina, V. and North, Chris. (2006). "The Effects of Task, Task Mapping, and Layout Space on User Performance in Information-Rich Virtual Environments". Technical Report TR-06-12, Computer Science, VT.

Burbey, I., Kwon, G., Murthy, U., **Polys, N.** and Vincent, P. (2005). "Human Information Processing with the Personal Memex", CORR-the Computing Research Repository: <http://arxiv.org/abs/cs.HC/0606107>.

Harris, Sally. (2004). "PathSim: Scientists model interaction of viruses and immune system", Virginia Tech Research Magazine Fall. <http://www.research.vt.edu/resmag/fall2004/PathSim.html>.

**Polys, Nicholas F.** "Techniques of Perception in VRML", "European Web3D- Company Profiles" "The X3D Initiative". 3DeZine, 2000-2001.

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

## Teaching Experience

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### Courses Taught

#### Virginia Polytechnic Institute and State University Instructor:

- 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 Level)
- 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: TA for CS 2204 *UNIX* for sophomore CS majors

### Short Courses

- *Web3D Master Class* World Bank Land and Poverty Conference (2015)
- AOE 5984, *Introduction to Parallel Computing* (Team taught, 2014)
- *High Performance Visualization, Deep Media, Web3D Publishing* Virginia Tech Faculty Development Institute (FDI 2006-2016)
- *New Dimensions in eLearning* NSF Research Experience for Teachers (RET 2012)
- *High Performance Computing 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), Peter Radics (2016, Chair), Jessie Mann, Ayat Mohammed (Chair)
- 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)
- Numerous graduate and undergraduate interns and independent study students in the Visionarium Lab [vis.arc.vt.edu]

## Professional and Research Experience

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### 2008-present Virginia Polytechnic Institute and State University – Blacksburg, VA

#### *Director of Visual Computing*

- 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
- 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: 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, presence

*References Available Upon Request*