Todd Zickler

William and Ami Kuan Danoff Professor
of Electrical Engineering and Computer Science
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Education

2004   Ph. D.   **Yale University**, New Haven, CT
Electrical Engineering
Thesis: *Image-based Modeling with Complex Reflectance*
Advisor: Peter N. Belhumeur

2004   M. Phil.   **Yale University**, New Haven, CT
Electrical Engineering

2001   M. S.   **Yale University**, New Haven, CT
Electrical Engineering

1997   B. Eng.   **McGill University**, Montreal, Canada
Honours Electrical Engineering

Professional Experience

Jul 2011–present   **Professor of Electrical Engineering and Computer Science**
School of Engineering and Applied Sciences,
Harvard University, Cambridge, MA.

Sep 2011–Jun 2012   **Visiting Scientist**
Department of Computer Science and Applied Mathematics,
Weizmann Institute of Science, Rehovot, Israel.

Jul 2008–Jun 2011   **Associate Professor**
School of Engineering and Applied Sciences,
Harvard University, Cambridge, MA.

Jul 2004–Jun 2008   **Assistant Professor**
School of Engineering and Applied Sciences,
Harvard University, Cambridge, MA.

Jun 2003–May 2004   **Senior Research Engineer**
Kriegman-Belhumeur Vision Technologies LLC., La Jolla, CA.

May 1997–Jun 1998   **Elementary School Teacher**
Honour International School, Vientiane, Lao PDR.

Awards and Honors

Sep 2011	Feinberg Foundation Visiting Faculty Program Fellowship, Weizmann Institute of Science.
Sep 2008	Sloan Research Fellowship, Alfred P. Sloan Foundation.
Jun 2008	Best Paper Award, First International Workshop on Internet Vision.
Jan 2006	CAREER Award, National Science Foundation.
Sep 2000–May 2002	Connecticut Infotech Scholarship.
Sep 1992–May 1994	Canada Scholarship.

Professional Service

Program Chair, International Conference on Computational Photography (ICCP) 2013.

Area Chair, International Conference on Computer Vision (ICCV) 2011.

Area Chair, Conference on Computer Vision and Pattern Recognition (CVPR) 2010, 2011, 2013.

Tutorial Chair, International Conference on Computer Vision (ICCV) 2011.

Program Chair, Workshop on Color and Photometry in Computer Vision (CPCV) 2011, 2012.

Session Chair, Conference on Computer Vision and Pattern Recognition (CVPR) 2010.

Editorial board member, Encyclopedia of Computer Vision, Springer Inc., forthcoming.

Program Chair, Workshop on Color and Reflectance in Computer Vision (CRICV) 2009, 2010.

Program Committee, International Conference on Computational Photography (ICCP) 2011.

Program Committee, International Conference on Computer Vision (ICCV) 2007, 2009.

Program Committee, European Conference on Computer Vision (ECCV) 2006, 2008, 2010.

Program Committee, Computer Vision and Pattern Recognition (CVPR) 2005–07.

Program Committee, Canadian Conference on Computer and Robot Vision (CRV) 2005–09.

Organizer and Lecturer, SIGGRAPH 2008 Class on Principles of Appearance Acquisition and Representation. Los Angeles, CA. August, 2008.

Program Committee, 6th International Conference on 3D Digital Imaging and Modeling (3DIM) 2007.

Program Committee, Pacific Graphics (PG) 2007.

Program Committee, Workshop on Photometric Analysis for Computer Vision (PACV) 2007.

Program Committee, IEEE Workshop on Beyond Multiple View Geometry 2007.

Organizer and Lecturer, ICCV 2007 Short Course on Principles of Appearance Acquisition and Representation. Rio de Janeiro, Brazil. October, 2007.

Panel member, US National Science Foundation, IIS and CRI.

Journal reviews: IEEE Trans. Pattern Recognition and Machine Intelligence; International Journal of Computer Vision; ACM Transactions on Graphics; IEEE Trans. Image Processing; Image and Vision Computing; Computer Graphics Forum; Machine Vision and Applications Journal.

Member, Institute of Electrical and Electronics Engineers, Association for Computing Machinery.

Grants and Gifts

NSF, $3,000,000, 2010–2015, "Beyond Flat Images: Acquiring, Processing, and Fabricating Visually Rich Material Appearance," co-PI. With Steve Marschner (PI, Cornell University) and four others at UC Berkeley, Princeton University, and the University of Virginia. Harvard component is $500,000.

Adobe Systems Inc., $10,000, 2010, research collaboration funding.

NSF, $9,301,955, 2009–2014, "Robobees: A Convergence of Body, Brain and Colony," senior personnel member. With Robert Wood (PI) and ten others at Harvard, Northeastern University, and Centeye Inc.

NSF, $480,000, 2009–2012, "Technological and Educational Foundations for Understanding and Improving Large-classroom Learning", PI. With Eric Mazur and Rachel Scherr (University of Maryland). Harvard component is $317,000.

ONR, $360,000, 2009–2012, "Foundations for the physics-based analysis of natural visual scenes," PI.

NSF, $1,133,844, 2009–2013, "Computer Vision and Online Communities: A Symbiosis," PI. With Marshall Tappen (University of Central Florida) and Trevor Darrell (UC Berkeley). Harvard component is $334,695.

Amazon Web Services, education research grants, $6,000 (2009), $5,000 (2011), $10,000 (2012).

ARO, $262,013, 2008–2011, "Physics-based Approaches to Visual Scene Analysis," PI.

Alfred P. Sloan Foundation, $50,000, 2008–2010, Research Fellowship (Computer Science).

NSF, $500,000, 2007–2012, "Public web-based photo-collections as a research testbed," PI. With Gregory Morrisett and Jyanta Sircar.

NSF, $380,000, 2007–2010, "Toward Shape from Specular Reflections under Real-world Illumination," PI. With Ohad Ben-Shahar (Ben Gurion University of the Negev).

NSF CAREER Award, $457,372, 2006–2011, "Foundations for Ubiquitous Image-based Appearance Capture," PI.

NSF, $95,064, 2005–2006, "Decomposing Reflectance for Vision-based Tracking," PI.

University Activities

Teaching

ES1 *Introduction to Engineering Sciences*, 2009–11.

ES50 *Introduction to Electrical Engineering*, 2005–08.

CS283 *Computer Vision*, 2004–07, 2009–10.

Post-doctoral Advising

Sanjeev Koppal, 2009–present

Ayan Chakrabarti, 2011–present

Ruonan Li 2011–present

Stanley Chan 2011-present (co-advised with Yue Lu)

Brian Lukoff, 2010–present (co-advised with Eric Mazur)

Laura Tucker, 2010–present (co-advised with Eric Mazur)

PhD Thesis Advising

Ioannis Gkioulekas (Engineering Sciences), 2009–present

Ying Xiong (Engineering Sciences), 2010–present

Zachary Stone (Computer Science), 2006–2012. "Face Identification in the Internet Era."

Ayan Chakrabarti (Engineering Sciences), 2006–2011. "Visual Inference with Statistical Models for Color and Texture."

Yuriy Vasilyev (Computer Science), 2005–2011. "Foundations of Shape from Specular Flow."

Fabiano Romeiro (Computer Science), 2005–2010. "Efficient reflectance models for vision and graphics."

PhD Thesis Committees

Kalyan Sunkavalli (Computer Science, PhD 2012)

Yuhang Wang (Engineering Sciences, PhD 2011)

Frank Tompkins (Engineering Sciences, PhD 2011)

Michael Holroyd (external; Computer Science, University of Virginia, PhD 2011)

Ruonan Li (external; Computer Science, University of Maryland, PhD 2011)

Jing Gu (Engineering Sciences, PhD 2010)

Guillermo Diez-Canas (Computer Science, PhD 2010)

Hamilton Chong (Computer Science, PhD 2008)

Petr Jordan (Engineering Sciences, PhD 2008)

Paul Novotny (Engineering Sciences, PhD 2007)

Geetika Tewari (Computer Science, PhD 2007)

Undergraduate Senior Thesis Advising

Hyunho Richard Li (Computer Science), 2011.

Brad Seiler (Computer Science), 2010. Hoopes Prize winner.

John Carlsson (Mathematics and Music), 2005. Co-advised with Joshua Fineberg.

Invited Seminars, Colloquia, and Keynote Lectures

"Toward computer vision on a tight budget." Vision Seminar, Ben-Gurion University of the Negev, Ber-Sheva, Israel. May, 2012.

——— Computer Vision Seminar, Hebrew University, Jerusalem, Israel. January, 2012.

——— Pixel Club, Technion-Israel Institute of Technology, Haifa, Israel. November, 2011.

——— Mathematical Vision Perception Seminar, Tel Aviv University, Tel Aviv, Israel. December, 2011.

"Spatio-spectral image statistics (for vision?)" 2011 Israel Computer Vision Day, Interdisciplinary Center (IDC), Herzliya, Israel. December, 2011.

"Inferring shape and materials under real-world lighting." University of Maryland College Park. May, 2011.

"Emerging opportunities in computer vision." BBN Technologies, Cambridge, MA. June, 2011.

"Inferring shape and materials under real-world lighting." Berkeley University, September 2010.

——— Google Research Redmond, September 2010.

——— California Institute of Technology, September 2010.

——— University of California Los Angeles, September 2010.

——— Yale University, November 2010.

——— Brown University, November 2010.

——— University of Illinois, Urbana-Champaign, November 2010.

——— Columbia University, December 2010.

"Physics-based computer vision, again." Vision Seminar Series, Microsoft Research New England. July, 2010.

"Physics-based computer vision, reconsidered." Computer Science Colloquium, Dartmouth University. November, 2009.

"Socially-aware Computer Vision." BIRS 2009 Workshop on Computer Vision and the Internet. Banff, Canada. August, 2009.

"Shiny shapes under natural lighting." MIT Media Lab, May 2009.

"Physics-based computer vision, reconsidered." GRASP Seminar Series, University of Pennsylvania, February 2009.

"Physics-based approaches to material recognition." Workshop on Perception of Material Properties in 3D Scenes. University of Pennsylvania, October 2008.

"Physics-based approaches to visual scene analysis." Computer Science Colloquium, University of Virginia, February, 2008.

——— Keynote lecture at the Workshop on Photometric Analysis for Computer Vision. Rio de Janeiro, Brazil, October 2007.

"Reflectance modeling for vision and graphics." Brown University. September, 2007.

——— VASC Seminar Series, Carnegie Mellon University. November, 2006.

"Photometric invariants from color subspaces." University of Toronto. September, 2006.

"Appearance decomposition for image-based reconstruction." BIRS 2006 Workshop on Mathematical Methods in Computer Vision. Banff, Canada. October, 2006.

———— Computer Science Colloquium, Tufts University. September, 2005.

"Computer Vision in (September of) 2005," Department of Information Technology, Thimphu, Bhutan, September, 2005.

"Appearance decomposition for image-based reconstruction," Machine Vision Colloquium, Massachusetts Institute of Technology. May, 2005.

———— ISS Seminar, Princeton University. April, 2005.

Patents

S. P. Mallick, D. J. Kriegman, T. E. Zickler, and P. N. Belhumeur, "Methods for identifying, separating and editing reflection components in multi-channel images and videos." U. S. Patent No. 7,689,035, filed June 19, 2006, issued March 30, 2010.

S. P. Mallick, D. J. Kriegman, T. E. Zickler, and P. N. Belhumeur, "Method for Editing Multichannel Images." U. S. Patent No. 7,860,306, filed February 12, 2010, issued December 28, 2010.

Publications

Journal papers

1. A. Chakrabarti, K. Hirakawa, and T. Zickler. Color constancy with spatio-spectral statistics. *IEEE Transactions on Pattern Analysis and Machine Intelligence*, 34(8):1509–1519, 2012.

2. P. Tan, T. Zickler, and L. Quan. The geometry of reflectance symmetries. *IEEE Transactions on Pattern Analysis and Machine Intelligence*, 33(12), 2011.

3. Y. Adato, Y. Vasilyev, T. Zickler, and O. Ben-Shahar. Shape from specular flow. *IEEE Transactions on Pattern Analysis and Machine Intelligence*, 2010.

4. Z. Stone, T. Zickler, and T. Darrell. Toward large-scale face recognition using social network context. *Proceedings of the IEEE*, 98(8):1408–1415, 2010.

5. M. Holroyd, J. Lawrence, and T. Zickler. A coaxial optical scanner for synchronous acquisition of 3D geometry and surface reflectance. *ACM Transactions on Graphics (Proc. ACM SIGGRAPH)*, 2010.

6. P. Jordan, S. Socrate, T. Zickler, and R. D. Howe. Constitutive modeling of porcine liver in indentation using 3D ultrasound imaging. *Journal of the Mechanical Behavior of Biomedical Materials*, 2:192–201, 2009.

7. T. Weyrich, J. Lawrence, H. P. A. Lensch, S. Rusinkiewicz, and T. Zickler. Principles of appearance acquisition and representation. *Foundations and Trends in Computer Graphics and Vision*, 4(2):75–191, 2008.

8. M. Holroyd, J. Lawrence, G. Humphreys, and T. Zickler. A photometric approach for estimating normals and tangents. *ACM Transactions on Graphics (Proc. ACM SIGGRAPH Asia)*, 27(5), 2008.

9. H. Y. Chong, S. J. Gortler, and T. Zickler. A perception-based color space for illumination-invariant image processing. *ACM Transactions on Graphics (Proc. ACM SIGGRAPH)*, 27(3), 2008.

10. T. Zickler, S. P. Mallick, D. J. Kriegman, and P. N. Belhumeur. Color subspaces as photometric invariants. *International Journal of Computer Vision*, 79(1):13–30, August 2008.

11. P. M. Novotny, J. A. Stoll, N. V. Vasilyev, P. J. Del Nido, P. E. Dupont, T. Zickler, and R. D. Howe. GPU based real-time instrument tracking with three dimensional ultrasound. *Medical Image Analysis*, 11:458–464, 2007.

12. T. Zickler, R. Ramamoorthi, S. Enrique, and P. Belhumeur. Reflectance sharing: Predicting appearance from a sparse set of images of a known shape. *IEEE Transactions on Pattern Analysis and Machine Intelligence*, 28(8):1287–1302, 2006.

13. T. Zickler, P.N. Belhumeur, and D.J. Kriegman. Helmholtz stereopsis: Exploiting reciprocity for surface reconstruction. *International Journal of Computer Vision*, 49(2/3):215–227, 2002.

Rigorously reviewed conference proceedings

14. A. Chakrabarti and T. Zickler. Depth and deblurring from a spectrally-varying depth-of-field. In *Proc. European Conference on Computer Vision (ECCV)*, 2012.

15. Y. Xiong, K. Saenko, T. Darrell, and T. Zickler. From pixels to physics: Probabilistic color de-rendering. In *Proc. IEEE Conf. Computer Vision and Pattern Recognition (CVPR)*, 2012.

16. R. Li and T. Zickler. Discriminative virtual views for cross-view action recognition. In *Proc. IEEE Conf. Computer Vision and Pattern Recognition (CVPR)*, 2012.

17. I. Gkioulekas and T. Zickler. Dimensionality reduction using the sparse linear model. In *Proc. Advanced Neural Information Processing Systems (NIPS)*, 2011.

18. Y. Vasilyev, T. Zickler, S. J. Gortler, and O. Ben-Shahar. Shape from specular flow: Is one flow enough? In *Proc. IEEE Conf. Computer Vision and Pattern Recognition (CVPR)*, 2011.

19. S. J. Koppal, I. Gkioulekas, T. Zickler, and G. L. Barrows. Wide-angle micro sensors for vision on a tight budget. In *Proc. IEEE Conf. Computer Vision and Pattern Recognition (CVPR)*, 2011.

20. A. Chakrabarti and T. Zickler. Statistics of real-world hyperspectral images. In *Proc. IEEE Conf. Computer Vision and Pattern Recognition (CVPR)*, 2011.

21. T. Owens, K. Saenko, T. Darrell, A. Chakrabarti, and T. Zickler. Learning object color models from multi-view constraints. In *Proc. IEEE Conf. Computer Vision and Pattern Recognition (CVPR)*, 2011.

22. Y. Adato, T. Zickler, and O. Ben-Shahar. A polar representation of motion and implications for optical flow. In *Proc. IEEE Conf. Computer Vision and Pattern Recognition (CVPR)*, 2011.

23. F. Romeiro and T. Zickler. Blind reflectometry. In *Proc. European Conference on Computer Vision (ECCV)*, 2010.

24. K. Sunkavalli, T. Zickler, and H. Pfister. Visibility subspaces: Uncalibrated photometric stereo with shadows. In *Proc. European Conference on Computer Vision (ECCV)*, 2010.

25. A. Chakrabarti, T. Zickler, and W. T. Freeman. Analyzing spatially-varying blur. In *Proc. IEEE Conf. Computer Vision and Pattern Recognition (CVPR)*, 2010.

26. Y. Adato, T. Zickler, and O. Ben-Shahar. Toward robust estimation of specular flow. In *Proc. British Machine Vision Conference (BMVC)*, 2010.

27. P. Sitthi-Amorn, F. Romeiro, T. Zickler, and J. Lawrence. Interactive editing of lighting and materials using a bivariate brdf representation. In *Proc. Eurographics Symposium on Rendering (EGSR)*. 2010.

28. P. Tan and T. Zickler. A projective framework for radiometric image analysis. In *Proc. IEEE Conf. Computer Vision and Pattern Recognition (CVPR)*, 2009.

29. G. Diez-Cañas, Y. Vasilyev, Y. Adato, T. Zickler, S. J. Gortler, and O. Ben-Shahar. A linear formulation of shape from specular flow. In *Proc. IEEE International Conference on Computer Vision (ICCV)*, 2009.

30. A. Chakrabarti, D. Scharstein, and T. Zickler. An empirical camera model for Internet color vision. In *Proc. British Machine Vision Conference (BMVC)*, 2009.

31. F. Romeiro, Y. Vasilyev, and T. Zickler. Passive reflectometry. In *Proc. European Conference on Computer Vision (ECCV)*. 2008.

32. P. Jordan, T. Zickler, S. Socrate, and R.D. Howe. A nonrigid image registration framework for identification of tissue mechanical parameters. In *Proc. Medical Image Computing and Computer Assisted Intervention (MICCAI)*. 2008.

33. K. Sunkavalli, F. Romeiro, W. Matusik, T. Zickler, and H. Pfister. What do color changes reveal about an outdoor scene? In *Proc. IEEE Conf. Computer Vision and Pattern Recognition (CVPR)*, 2008.

34. Y. Vasilyev, Y. Adato, T. Zickler, and O. Ben-Shahar. Dense specular shape from multiple specular flows. In *Proc. IEEE Conf. Computer Vision and Pattern Recognition (CVPR)*, 2008.

35. N. Alldrin, T. Zickler, and D. Kriegman. Photometric stereo with non-parametric and spatially-varying reflectance. In *Proc. IEEE Conf. Computer Vision and Pattern Recognition (CVPR)*, 2008.

36. A. Chakrabarti, K. Hirakawa, and T. Zickler. Color constancy beyond bags of pixels. In *Proc. IEEE Conf. Computer Vision and Pattern Recognition (CVPR)*, 2008.

37. Y. Adato, Y. Vasilyev, O. Ben-Shahar, and T. Zickler. Toward a theory of shape from specular flow. In *Proc. IEEE International Conference on Computer Vision (ICCV)*, 2007.

38. H. Y. Chong, S. J. Gortler, and T. Zickler. The von Kries hypothesis and a basis for color constancy. In *Proc. IEEE International Conference on Computer Vision (ICCV)*, 2007.

39. P. Tan, S. M. Mallick, L. Quan, D. J. Kriegman, and T. Zickler. Isotropy, reciprocity and the generalized bas-relief ambiguity. In *Proc. IEEE Conf. Computer Vision and Pattern Recognition (CVPR)*, 2007.

40. T. Zickler. Reciprocal image features for uncalibrated Helmholtz stereopsis. In *Proc. IEEE Conf. Computer Vision and Pattern Recognition (CVPR)*, 2006.

41. T. Zickler, S. P. Mallick, D. J. Kriegman, and P. N. Belhumeur. Color subspaces as photometric invariants. In *Proc. IEEE Conf. Computer Vision and Pattern Recognition (CVPR)*, 2006.

42. S. P. Mallick, T. Zickler, D. J. Kriegman, and P. N. Belhumeur. Specularity removal in images and videos: A PDE approach. In *Proc. European Conference on Computer Vision (ECCV)*. 2006.

43. S. P. Mallick, T. Zickler, D. J. Kriegman, and P. N. Belhumeur. Beyond Lambert: Reconstructing specular surfaces using color. In *Proc. IEEE Conf. Computer Vision and Pattern Recognition (CVPR)*, 2005.

44. T. Zickler, S. Enrique, R. Ramamoorthi, and P. Belhumeur. Reflectance sharing: Image-based rendering from a sparse set of images. In *Proc. Eurographics Symposium on Rendering (EGSR)*, 2005.

45. T. Zickler, P.N. Belhumeur, and D.J. Kriegman. Toward a stratification of Helmholtz stereopsis. In *Proc. IEEE Conf. Computer Vision and Pattern Recognition (CVPR)*, 2003.

46. T. Zickler, J. Ho, D.J. Kriegman, J. Ponce, and Belhumeur P.N. Binocular Helmholtz stereopsis. In *Proc. IEEE International Conference on Computer Vision (ICCV)*, 2003.

47. T. Zickler, P.N. Belhumeur, and D.J. Kriegman. Helmholtz stereopsis: Exploiting reciprocity for surface reconstruction. In *Proc. European Conference on Computer Vision (ECCV)*. 2002.

48. S. Magda, D.J. Kriegman, T. Zickler, and P.N. Belhumeur. Beyond Lambert: Reconstructing surfaces with arbitrary BRDFs. In *Proc. IEEE International Conference on Computer Vision (ICCV)*, 2001.

Workshop papers and abstracts

49. Z. Stone, T. Zickler, and T. Darrell. Autotagging Facebook: Social network context improves photo annotation. In *Proc. First IEEE Workshop on Internet Vision*, June 2008. (**Best Paper Award**).

50. F. Romeiro and T. Zickler. Model-based stereo with occlusions. In *Proc. IEEE Int. Workshop on Automatic Face and Gesture Analysis*, volume 4778 of *Lecture Notes in Computer Science*, pages 31–45. Series, 2007.

51. S. P. Mallick, T. Zickler, P. Belhumeur, and D. Kriegman. Dichromatic separation: specularity removal and editing. In *SIGGRAPH '06: ACM SIGGRAPH 2006 Sketches*, page 166, 2006.

52. T. Zickler, S. Enrique, R. Ramamoorthi, and P. Belhumeur. Image-based rendering from a sparse set of images. In *SIGGRAPH '05: ACM SIGGRAPH 2005 Sketches*, page 147, 2005.