

Peter Belhumeur

Computer Science Department
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Education

Harvard University, Ph.D., Engineering Sciences, June 1993.
Thesis Advisor: David Mumford

Harvard University, S.M., Engineering Sciences, March 1991.

Brown University, Sc.B., with *Highest Honors*, Computer and Information Engineering, June 1985.

Research Experience

Professor, Columbia University, Computer Science
January 2002—.

Professor, Yale University, Electrical Engineering (joint appt. in Computer Science)
July 2001—December 2001.

Associate Professor, Yale University, Electrical Engineering (joint appt. in Computer Science)
May 1999—July 2001.

Assistant Professor, Yale University, Electrical Engineering (joint appt. in Computer Science)
July 1994—May 1999.

Visiting Professor, New York University, Courant Institute
September 1997.

Visiting Scientist, NEC Research Institute, Princeton, NJ
June—August 1997.

Visiting Research Faculty, Brown University, Division of Engineering
September 1993.

Post-doctoral Fellow, University of Cambridge, Isaac Newton Institute for Mathematical Sciences
July 1993—December 1993.

Paper Citations: 35,000+ as recorded on Google Scholar, April 2018. **13,500+** since 2014.

Industrial Experience

Machine Learning Senior Technical Advisor, Intelligence Group, Dropbox, 2017—2018.

Technical Lead, Machine Learning Team, Dropbox, 2014—2016.

Founder and CTO, Kriegman Belhumeur Vision Technologies, San Diego, CA
2002—2014. Company acquired by Dropbox, September 2014.

Engineering Consultant, JEN Associates, Cambridge, MA
1988—1989.

Engineering Consultant, American Telegraph and Telephone, Summit, NJ
1986—1987.

Research and Development Engineer, Analog Devices, Norwood, MA
1985—1986.

Awards and Honors

1. Part of **Dropbox IPO**, March 2018.
2. Best Poster Award, FGVC Workshop at CVPR, June 2013.
3. Gold Medal, The Pennsylvania Horticultural Society, Philadelphia Flower Show, March 2013.
4. Everingham Prize, BMVC, September 2012.
5. Scientific American, 10 Apps for Your Smartphone or Tablet. December 2012.
6. Plenary Lecture, ICVGIP 2012.
7. Information Week, 10 Cool Apps from Uncle Sam, November 2011.
8. **E. O. Wilson Biodiversity Pioneer Award, 2011.**
9. Best iPhone Apps: Leafsnap. Wired, December 2011.
10. Best iPhone Apps: Leafsnap, Gizmodo, May 2011.
11. Invited Organizer for National Academy of Engineering GAFOE OC Meeting, 2008.
12. Invited Speaker, Symposium to Honor David Mumford, 2007.
13. Speaker, the National Academy of Sciences Symposium on Frontiers of Science, 2005.
14. Best Paper Honorable Mention Award for IEEE Conf. on CVPR, 2000.
15. Invited to the National Academy of Sciences 1st Annual Symp. on Frontiers of Science, 1998.
16. Olympus Prize: Best Paper Award, European Conference on Computer Vision, 1998.
17. **Presidential Early Career Award for Scientists and Engineers (PECASE), 1997.**
18. National Science Foundation Career Award, 1997.
19. Yale University Junior Faculty Fellowship for the Natural Sciences, 1997.
20. Best Paper Award, IEEE Conference of Computer Vision and Pattern Recognition, 1996.
21. Invited to Isaac Newton Institute for Mathematical Sciences, Fall Semester 1993.
22. Harvard Fellowship, 1989—1993.
23. Elected to Sigma Xi, 1985.
24. Tau Beta Pi, 1984.
25. Graduated from Brown University with "*Highest Honors.*"

Somewhat Recent News Coverage

New York Times (as hyperlinks)

1. <https://well.blogs.nytimes.com/2016/07/21/the-intentional-summer-challenge-name-that-plant/>
2. <https://www.nytimes.com/2015/06/21/magazine/identification-please.html>
3. https://www.nytimes.com/2015/10/08/technology/personaltech/help-in-identifying-trees-for-a-more-colorful-autumn.html?_r=0

4. <http://www.nytimes.com/2013/10/10/technology/personaltech/cheat-sheets-for-your-walk-in-the-woods.html>
5. <http://www.nytimes.com/2011/03/17/arts/design/smithsonian-expands-its-reach-through-social-media-and-the-public.html>
6. <http://www.nytimes.com/2011/05/29/nyregion/immersed-in-nature-eyes-on-the-screen-app-city.html>
7. <http://www.nytimes.com/2011/09/01/technology/personaltech/mobile-apps-make-it-easy-to-point-and-identify.html?pagewanted=all>
8. http://www.nytimes.com/2012/04/05/garden/new-gardening-apps.html?pagewanted=2&_r=2
9. <http://www.nytimes.com/2011/08/14/fashion/this-life-a-plugged-in-summer.html?pagewanted=all>
10. <http://intransit.blogs.nytimes.com/2011/10/05/leaf-peeping-theres-an-app-for-that/>
11. <http://query.nytimes.com/gst/fullpage.html?res=9504E4DB143EF934A25750C0A9679D8B63&pagewanted=all>
12. <http://www.nytimes.com/2011/06/09/technology/personaltech/09PHONES.html?pagewanted=all>
13. <http://query.nytimes.com/gst/fullpage.html?res=9B01E2DF1530F93AA35753C1A9679D8B63>

Other Selected Media Outlets:

1. The Gazette — Tips for Getting your Family Outside this Summer, April 18, 2018.
2. The Christian Science Monitor: Top Picks, August 2017.
3. Nature – Natural Decline – April 2, 2014.
4. Gardenista – Trend Alert: Ten Essential Gardening Apps – March 24, 2014.
5. National Wildlife Federation – Apps that Will Revolutionize Your Walk in the Woods – January 22, 2014.
6. Mashable – Five Apps for Nature Nerds – January, 2014.
7. Engadget - Gratis-App Leafsnap identifiziert Bäume - May 04, 2011
8. Science - A Tree Expert in Your Back Pocket - May 06, 2011
9. The Guardian - The mobile phone app that can identify a tree by its leaf - May 06, 2011
10. CrunchGear - For The High-Tech Naturalist: Leafsnap Identifies Leaves Using Your iPhone's Camera - May 06, 2011
11. TechCrunch - For The High-Tech Naturalist: Leafsnap Identifies Leaves Using Your iPhone's Camera - May 08, 2011
12. Wired UK - LeafSnap iPhone app identifies trees by their leaves - May 09, 2011
13. Business Insider - LeafSnap: Identify Tree Species In Just One Click - May 10, 2011
14. NY 1 - App Wrap: Leafsnap - May 10, 2011
15. The Washington Post - Leafsnap app; best visual illusion of the year - May 23, 2011

16. Gizmodo - Leafsnap for iPhone and iPad - May 23, 2011
17. CBS News - iPhone app Leafsnap identifies trees with picture of leaf - June 08, 2011
18. Marketplace - Marketplace tech report: Facebook will learn your face unless you tell it to stop + Leafsnap app - June 09, 2011
19. NBC - The Tonight Show - June 10, 2011
20. USA Today (AP article) - What's that tree? Try Smithsonian's new app to see - June 11, 2011
21. NPR (AP article) - What's That Tree? Try Smithsonian's New App To See - June 10, 2011
22. CBS Baltimore (AP article) - Scientists Unveil New Mobile App To Identify Trees - June 08, 2011
23. NASATalk - LeafSnap - the Ultimate Green App - June 23, 2011
24. Reuters - Instant Identification of Trees Is Possible Using Smartphone App - June 15, 2011
25. ABC News - Mobile tree identification app, Leafsnap, already downloaded 150,000 times - June 08, 2011
26. The Washington Times (AP article) - ID a tree with a quick pic - June 12, 2011
27. Popular Mechanics - LeafSnap, the Field Guide on Your iPhone - July 13, 2011
28. Chicago Tribune - Quick! What's that plant? - September 12, 2011
29. The Wall Street Journal - How Tech Is Changing Museums - September 14, 2011.
30. Information Week, 10 Cool Apps from Uncle Sam, November 2011.
31. InformationWeek - 10 Cool iPad Apps From Uncle Sam - December 13, 2011
32. Detroit Free Press - Put technology to work in the garden - April 17, 2012
33. Scientific American - [Scientific American Staff Picks: 10 Apps for Your Smart Phone or Tablet](#) - December 25, 2012.

Published Mobile Apps:

1. *Leafsnap*, iTunes App Store, May 2011. This award winning iPhone app has been installed on more than **2,000,000** iPhones worldwide and covered by media outlets around the world.
2. *Dogsnap*, iTunes App Store, June 2012. This iPhone app recognizes AKC dog breeds from photographs.
3. *Birdsnap*, iTunes App Store, January 2014. This iPhone app has been installed on more than **500,000** iPhones worldwide.

Teaching

Columbia University

1. *Deep Learning for Computer Vision (COMS E4995)*. Spring 2017, 2018.
2. *Advanced Topics in Deep Learning (COMS E6998)*. Fall 2017.
3. *Computer Vision on Mobile Platforms (COMS E6998)*. Spring 2012—2014.
4. *Computational Photography (COMS E6734)*. Spring 2007—2011.

5. *Biometrics* (COMS W4737, E6737). Fall 2005—2013.
6. *Computational Photography* (COMS E6734). Spring 2007—2011.
7. *Rendering: Appearance Modeling* (COMS E6161). Fall 2006.
8. *Digital Logic* (COMS W3823), Fall 2003 and Spring 2004.
9. *Advanced Topics in Vision and Graphics* (COMS E6998), Spring 2004.
10. *Advanced Image-based Vision and Graphics* (COMS E6998), Spring 2002—2003.

Yale University

1. *Computer Vision*, Computer Science 476b and Electrical Engineering 455b, Spring 1995—1997, 1999, 2000.
2. *Signals and Systems*, Electrical Engineering 310a, Fall 1994—1996.
3. *Probability and Stochastic Processes*, Engineering and Applied Science 496b, Spring 1999—2001.
4. *Pattern and Object Recognition*, Electrical Engineering 458b, Spring 1995 and 1997.

Harvard University

1. *Computer Vision*, Computer Science 283, Spring 1993 and 1992.
2. *Statistical and Neural Net Techniques in AI*, Computer Science 181, Fall 1992.
3. *Advanced Introduction to Robotics*, Engineering Sciences 259, Fall 1991.

Patents

1. P1331US1 - "Image Search and Browse," submitted April 2019.
2. P1166US1- "AutoOCR," submitted August 2018.
3. "Generating and Utilizing Normalized Scores for Classifying Digital." US Patent No. 9,846,822, which issued on December 19, 2017.
4. "Navigating Digital Content Using Visual Characteristics of the Digital Content," Inventors: Belhumeur, Peter; Kriegman, David; Berg, Thomas; U.S. Patent No. 9,448,704 B1, Dropbox Inc., awarded September 2016.
5. "Method and System for Localizing Parts of an Object in an Image for Computer Vision Applications," Inventors: Belhumeur, Peter; Jacobs, David; Kriegman, David; Kumar, Neeraj; US Patent No. 9,275,273, awarded March 2016.
6. "Methods, Systems, and Media for Automatically Classifying Face Images," Inventors: Kumar, Neeraj; Belhumeur, Peter N.; Nayar, Shree K.; Berg, Alexander C.; U.S. Patent 8,571,332, Columbia University, awarded October 2013.
7. "Methods, Systems, and Media for Swapping Faces in Images," Inventors: Nayar, Shree K.; Belhumeur, Peter N.; Bitouk, Dimitri; Kumar, Neeraj; U.S. Patent 8,472,722, Columbia University, awarded June 2013.
8. "Methods for Editing Multi-Channel Images," Inventors: Mallick, Satya P.; Kriegman, David J.; Zickler, Todd E.; Belhumeur, Peter N.; U.S. Patent No. 7,360,806 B2, 035, University of California at San Diego, awarded on March 30, 2010.
9. "Methods for Identifying, Separating and Editing Reflection Components in Multi-Channel Images and Videos," Inventors: Mallick, Satya P.; Kriegman, David J.; Zickler, Todd E.; Belhumeur, Peter N.; U.S. Patent No. 7,689,035, University of California at San Diego, awarded on March 30, 2010.
10. "Methods and systems for compensating an image projected onto a surface having spatially varying photometric properties," Inventors: Nayar, Shree K.; Grossberg, Michael; Peri, Harish; Belhumeur, Peter N.; U.S. Patent 7,663,640, Columbia University, awarded on February 16, 2010.

11. "Illumination Based Image Synthesis," inventors: P. Belhumeur, D. Kriegman, and A. Georghiades, U.S. patent 6,697,518, Yale University, awarded February 24, 2004.
12. "Lighting Sensitive Displays or Patent titled Method and apparatus for Displaying Images," patent pending, inventors: S. Nayar, P. Belhumeur, and T. Boult.

Recent and Notable Research Grants

1. **IARPA**, "Janus Program: Sparse Heterogenous Representations and Domain Adaptive Matching for Unconstrained Face Recognition," \$1,000,000, 04/01/2014—03/31/2018.
2. **National Science Foundation**, "RI: Small: Collaborative Research: Describable Visual Attributes for Identification, Search, and Image Exploration," \$249,349, 7/01/2011—6/30/2014.
3. **The Gordon and Betty Moore Foundation**, "Citizen Science Data Platform: A Pilot Project With Recreational Fishermen," \$685,587, 1/01/2012—12/31/2017.
4. **Google**, "Google Master Software Development, Software License, and Content License Agreement: Leaf Recognition in North America," \$132,667, 9/30/2010—n/a.
5. **DARPA**, BAA-11-05, Mixed Initiative Multiple Cue Image Geolocalization, \$451,213, 1/01/2012—3/31/2016.
6. **IARPA**, "Datasets, 3D Alignment, a Hierarchy of Attributes for Face Verification," \$832,841, 2009—2011. (Lead PI, one co-PI.)
7. **Office of Naval Research**, "Remote Multi-modal Biometrics for the Maritime Domain," \$1,393,500, awarded, 2008—2012. (One of two co-PIs.)
8. **National Science Foundation**, "Computational Tools for the Monitoring and Discovery of Neotropical Plant Species," \$900,000, pending, 2008. (One of two co-PIs.)
9. **National Science Foundation**, "An Electronic Field Guide: Plant Exploration and Discovery in the 21st Century," 2004—2009. \$3,500,000. (PI, 4 co-PIs)
10. **National Science Foundation**, "Modeling Objects with Complex Reflectance," 439,877, awarded, 2003—2006. (PI)
11. **National Science Foundation**, "Instrumentation for Empirical Studies of Objects with Complex Reflectance," \$115,000, awarded, 2002—2005.
12. **Presidential Early Career Award for Scientists and Engineers**, "Image Variability Decomposition for Object Recognition, Reconstruction, and Tracking," \$500,000, 1997—2002
13. **National Science Foundation**, ITR, "Complex Visual Interactions with Real Scenes," \$3,500,000, 2000—2005. (One of six co-PIs.)
14. **National Science Foundation**, KDI-LIS, "Coordinated Motion of Natural and Man-Made Groups," \$2,600,000, 1999—2004. (One of six co-PIs.)

Postdoctoral Fellows

1. Alexander Berg, September 2008—August 2010.
2. Francesc Moreno Noguera, 2006.
3. Tolga Eren, 2003—2005.

Graduate Students

1. Parita Pooj, Expected Ph.D. 2021.
2. Robert Colgan, Expected Ph.D. 2020, switched advisors.
3. Jiongxin Liu, Ph.D. 2017.
4. Thomas Berg, Ph.D. 2017.
5. Neeraj Kumar, Ph.D. 2013.
6. Vinay Kumar, M.S. 2010.
7. Dhruv Mahajan, M.S. 2006. Ph.D. 2009. (Co-advised.)
8. Jinwei Gu, M.S. 2007. Ph.D. 2010. (Co-advised.)
9. Nandan Dixit, M.S. 2007.
10. Kalyan Sunkavalli, M.S. 2006. (Co-advised.)
11. Todd Zickler (M.S. 2001, Ph.D. 2004)
12. Melissa Koudelka (M.S. 2001, Ph.D. 2004)
13. Athinodoros Georghiades (M.S. 1997, Ph.D. 2003)
14. Tolga Eren (M.S. 2000, Ph.D. 2003)
15. Hansen Chen (Ph.D. 2001)
16. Jie Lu (M.S. 1999)
17. Elena Dotsenko (M.S. 1997)

Selected Columbia Activities

- Faculty Recruiting Committee, 2017.
- Department Beautification Committee, chair and sole member, 2012—2014.
- Co-chair, MS Admissions Committee, 2012.
- MS Track Advisor, 2007—.
- Chair, MS Admissions Committee, 2008—2011.
- Faculty Recruiting Committee, Spring 2009—2011.
- Dean's Ad Hoc Committee.
- Member MS Admissions Committee, 2005—2008.
- Member Visibility Committee, 2006—2008.
- Chair, CS Visibility Committee, 2004.
- Member, CS Space Committee, 2003—2004.
- Member, CS Faculty Search Committee, 2003—2004.
- Member/Chair, Dean's Ad hoc Committee, 2004, 2006, 2007. (Confidential).
- Member, Provost's Committee, 2003, 2004. (Confidential).
- Departmental Presenter, Gateway Laboratory, 2003—2004.

Selected Yale Activities

- Designed and taught *Probability and Stochastic Processes* course with Andrew Barron (Statistics) and John Rust (Economics). This course became the basis for the latest version of ENAS496b.
- Founded and financially supported the Graduate Student Round Table, May 2000—2002. This 20 member group of graduate students in Electrical Engineering, Computer Science and Bio-Medical Engineering meets each week with one of the members presenting a talk on his/her research.
- Member of FoE Graduate Admissions Committee, 1995, 1996, 2001.
- Member of Yale ITS Ad Hoc Committee, 2000—2002.
- Chaired EE Committee on Boosting Graduate Applications. Designed, printed, and distributed promotional information for graduate study in Electrical Engineering and Computer Science, 1999—2000.
- Edited *International Journal of Computer Vision* article on “Computational Vision at Yale,” 1999.
- Member of Yale Fulbright Scholarship Committee, 1998, 1999.
- Co-organizer of the Vision Lunch Seminar Series, 1995—2000.
- Volunteered to postpone leave scheduled for Spring 2000 to teach *Probability and Stochastic Processes* (ENA496b) once it became required.
- Member of EE Committee on Mathematics in the Curriculum, 1996, 1997.

Yale Ph.D. Committees

Control: Stephen J. Brown, Osvaldo Driollet, Nicholas Oleng, Jie Lin, Joao B. D. Cabrera, J. Balakrishnan, Joao Hespanha, Ling-Ji Chen, Cheng Xiang, Sai-Ming Li.

Vision, AI, and Robotics: Jonas August, Patrick Huggins, Ohad ben-Shahar, Zachary Dodds, Christopher Rasmussen, B. Vijayakumar, Erliang Yeh, Dejing Dou.

Bio-Medical Engineering: Oskar Skinjar, Xenophon Papademetris, Xiaolan Zeng, Yongmei Wang, Shawn Walker, Ning Lin, James Beaty, Haili Chui, Jing Yang, Xiaoning Qian, Ning Lin, Gang Li.

Yale Senior Theses

Daniel Snow (Applied Math), Helen Sun (Applied Math), David Anjelly (EE), Mathew McClure (CS), Alan Suen (Applied Math), Susan Whettstone (EE), Shakya Rinendra (CS), David Caputo (CS), Nicholas Jitkoff (Digital Media/CS).

Professional Activities

- Program Committee, AMFG, 2013.
- Area Chair, *IEEE Conference on Computer Vision and Pattern Recognition*, 2012.
- Area Chair, *IEEE Conference on Computer Vision and Pattern Recognition*, 2011.
- Senior Editor, *Encyclopedia of Computer Vision*, 2009—.
- Area Chair, *IEEE Conference on Computer Vision and Pattern Recognition*, 2010.
- Program Committee for *IEEE Conference on Computer Vision and Pattern Recognition*, 2009.
- Program Committee for *International Conference on Computer Vision*, 2009.

- Organizing Committee for the National Academy of Engineering's 2008 German-American Frontiers of Engineering Meeting.
- Invited Speaker, *Symposium to Honor David Mumford*, 2007.
- Program Committee for *IEEE Conference for on Computer Vision and Pattern Recognition*, 2007.
- Program Committee for *IEEE International Conference on Computer Vision*, 2007.
- Organizing Committee for *IEEE Workshop on Photometric Analysis for Computer Vision*, 2007.
- Associate Editor for *IEEE Transactions of Pattern Analysis and Machine Intelligence*, 2000—5.
- Area Chair for *IEEE Conference on Computer Vision and Pattern Recognition*, 2005.
- Area Chair for *IEEE International on Conference on Computer Vision*, 2005.
- Area Chair for *IEEE Conference on Computer Vision and Pattern Recognition*, 2003.
- Area Chair for *International Conference on Computer Vision*, 2001.
- Associate Editor for *IEEE Transactions of Pattern Analysis and Machine Intelligence*, 2000— .
- Program Committee for *International Conference on Face and Gesture Recognition*, 2002.
- Symposium Organizer, “*NSF Symposium on Visual Appearance*,” April 2002.
- Workshop Organizer, “*Recognizing Objects Across Variation in Lighting*,” CVPR, 2001.
- Program Committee for *International Conference on Computer Vision*, 2001.
- Organizer and Special Technical Program Chair for *IEEE Conf. on CVPR*, 2000.
- Program Committee for *International Conference on Face and Gesture Recognition*, 2000.
- National Science Foundation Review Panel, 2000.
- Editor for *Int. Journal of Computer Vision's* Special Issue on Computer Vision at Yale, 1999.
- National Science Foundation Review Panel, 1997.
- National Science Foundation Career Award Reviewer, 1998.
- Program Committee for *IEEE Conference on Computer Vision and Pattern Recognition*, 1997.
- Reviewer:
Nature, *Science*, *IEEE Trans. on Pattern Analysis and Machine Intelligence*, *IEEE Trans. on Image Processing*, *International Journal of Computer Vision*, *Journal of the Optical Society of America – A*, *Perception*, *National Science Foundation*, *Army Research Office*, *Swedish Government*, *IEEE Conf. on CVPR*, *European Conf. on Computer Vision*, *Int. Conference on Computer Vision*, *IEEE Workshop on Statistics in Vision*, *IEEE Workshop on Multi-View Modeling and Analysis of Visual Scenes*, *Computer Vision and Image Understanding*, MIT Press, Prentice Hall.

Journal Articles and Book Chapters

1. “Citizen Science in the Age of Climate Change: Mapping Range Expansions of Native and Exotic Plants with the Mobile App Leafsnap,” *tBioScience*, Oxford University Press, 2018.

2. "Compressive Structured Light for Recovering Inhomogenous Participating Media," J. Gu, S.K. Nayar, E. Grinspun, P. Belhumeur, R. Ramamoorthi, *IEEE Transactions on Pattern Analysis and Machine Intelligence (PAMI)*, Vol. 355, No. 3, 2013.
3. "Localizing Parts of Faces Using a Consensus of Exemplars," Peter N. Belhumeur, David W. Jacobs, David J. Kriegman, and Neeraj Kumar, to appear in **Best Papers of CVPR 2012** special issue of *IEEE Transactions on Pattern Analysis and Machine Intelligence (PAMI)*, May 2012.
4. "Tom vs. Pete Classifiers and Identity Preserving Alignment for Face Verification and Identification," Thomas Berg and Peter N. Belhumeur, **Everingham Prize**, selected for publication in *International Journal on Computer Vision*, June 2012.
5. "Describable Visual Attributes for Face Verification and Search," *IEEE Transactions on PAMI*, October 2010. (N. Kumar, A. Berg, P. N. Belhumeur)
6. "Moving Gradients: Automatically Replacing Faces in Photographs," *ACM Trans. on Graphics (SIGGRAPH)*, August 2009. (D. Bitouk, N. Kumar. P. N. Belhumeur, S. K. Nayar)
7. "Removing Artifacts Due to Dirty Camera Lenses and Thin Occluders," *ACM Trans. on Graphics (SIGGRAPH ASIA)*, March 2010. (J. Gu, P. N. Belhumeur, S. K. Nayar, R. Ramamoorthi)
8. "Face Swapping: Automatically Replacing Faces in Photographs," *ACM Trans. on Graphics (SIGGRAPH)*, August 2008. (D. Bitouk, N. Kumar. P. N. Belhumeur, S. K. Nayar)
9. "Rigid Multi-Robot Formations with Leader-Follower Architecture," under review in *IEEE Trans. on Robotics*, 2010. (T. Eren, W. Whiteley, and P. N. Belhumeur)
10. "Editorial for the Special Issue on Photometric Analysis for Computer Vision," in *International Journal of Computer Vision*, 2009. (P. Belhumeur, K. Ikeuchi, E. Prados, S. Soatto, P. Sturm)
11. "Active Refocusing of Images and Video," *ACM Trans. on Graphics (SIGGRAPH)*, August 2007. (F. Moreno-Noguer, S. K. Nayar, and P. N. Belhumeur)
12. "A Theory of Locally Low Dimensional Light Transport," *ACM Trans. on Graphics (SIGGRAPH)*, August 2007. (D. K. Mahajan, R. Ramamoorthi, I. Kemelmacher, P. N. Belhumeur)
13. "Color Subspaces as Photometric Invariants," in *International Journal of Computer Vision*, 2008. (T. Zickler, S. Mallick, P. N. Belhumeur, and D. Kriegman)
14. "Photometric Depth Ranging of Non-Lambertian Surfaces," submitted to *International Journal of Computer Vision*, 2007. (S. Magda, D. Kriegman, P. N. Belhumeur)
15. "Graphical Properties of Easily Localizable Sensor Networks," *Wireless Networks*, 2007. (B. Anderson, R. Yang, D. Goldberg, A. S. Morse, W. Whiteley, T. Eren, P. Belhumeur)
16. "Time Varying BRDFs," *IEEE Trans. on Visualization and Computer Graphics*, pp. 595—609, May/June 2007. (B. Sun, K. Sunkavalli, R. Ramamoorthi, P. N. Belhumeur, S. Nayar.)
17. "Time-Varying Surface Appearance: Acquisition, Modeling and Rendering," *ACM Trans. on Graphics (SIGGRAPH)*, August 2006. (J. Gu, R. Ramamoorthi, P. N. Belhumeur, and S. Nayar)
18. "Ongoing Challenges in Face Recognition," *Frontiers of Engineering: Reports on Leading-Edge Engineering, National Academy of Engineering*, National Academy Press, pp. 5—14, 2006.
19. "First Steps Toward an Electronic Field Guide for Plants," *Taxon*, 2006. G. Agarwal, H. Ling, D. Jacobs, S. Shirdhonkar, W. Kress, R. Russell, P. Belhumeur, N. Dixit, S. Feiner, D. Mahajan, K. Sunkavalli, and S. White)

20. "A First Order Analysis of Lighting, Shading, and Shadows," to appear in *ACM Trans. of Graphics*, 2007. (R. Ramamoorthi, D. K. Mahajan, and P. N. Belhumeur)
21. "Multiplexing for Optimal Lighting," *IEEE Trans. on Pattern Analysis and Machine Intelligence*, 2006. (Y. Schechner, S. Nayar, and P. N. Belhumeur)
22. "Reflectance Sharing: Predicting Appearance from a Sparse Set of Images of a Known Shape," *IEEE Trans. on Pattern Analysis and Machine Intelligence*, 2006. (T. Zickler, R. Ramamoorthi, S. Enrique and P. N. Belhumeur)
23. "Rigid Formations with Leader Follower Architecture," submitted to *IEEE Transactions on Robotics*, January 2006. (T. Eren, W. Whiteley, and P. N. Belhumeur)
24. "A Theory of Network Localization, to appear in *IEEE Transactions on Mobile Computing*, 2006. (J. Aspnes, T. Eren, D. K. Goldenberg, A. S. Morse, W. Whiteley, Y. R. Yang, B. D. O. Anderson, and P. N. Belhumeur)
25. "Graphical Properties of Easily Localizable Sensor Networks," submitted to *Wireless Networks, Journal of Mobile Communication, Computation and Information*, Springer, December 2005. (B. D. O. Anderson, P. N. Belhumeur, T. Eren, D. K. Goldenberg, A. S. Morse, W. Whiteley, and Y. R. Yang)
26. "Lighting Sensitive Displays," *ACM Transactions on Graphics* 23, 4 (2004), pp. 963–979. (S. Nayar, P. Belhumeur, and T. Boult)
27. "Operations on Rigid Formations of Autonomous Agents," *Communications in Information and Systems*, September 2004, pp. 223-258. 2004. (T. Eren, W. Whiteley, A. S. Morse, B. D. O. Anderson, and P. N. Belhumeur)
28. "In Search of Illumination Invariants," *Int. Journal of Computer Vision*, under revision. (H. Chen, P. Belhumeur and D. Jacobs) [\[PS\]](#) [\[PDF\]](#)
29. "Helmholtz Stereopsis: Exploiting Reciprocity for Surface Reconstruction," *Int. Journal of Computer Vision*, Vol. 49 No. 2/3, pp. 215-227. September/October, 2002. (T. Zickler, P. Belhumeur and D. Kriegman) [\[PS\]](#) [\[PDF\]](#)
30. "From Few to Many: Illumination Cone Models for Face Recognition Under Variable Lighting and Pose," *IEEE Trans. PAMI*, 23(6), pp. 643–60, 2001. (A. Georghiadis, P. Belhumeur and D. Kriegman)
31. "What Shadows Reveal About Object Structure," *Journal of the Optical Society of America – A*, pp. 1804–1813, August, 2001, (D. Kriegman and P. Belhumeur) [\[PDF\]](#)
32. "Determining Generative Models of Objects Under Varying Illumination: Shape and Albedo from Multiple Images Using SVD and Integrability," *Int. Journal of Computer Vision*, 35(3), pp. 203–22, 1999. (A. Yuille, D. Snow, R. Epstein and P. Belhumeur)
33. "The Bas-Relief Ambiguity," *Int. Journal of Computer Vision*, 35(1), pp. 33–44, 1999. (P. Belhumeur, D. Kriegman and A. Yuille) [\[PS\]](#) [\[PDF\]](#)
34. "Computational Vision at Yale," *Int. Journal of Computer Vision*, 35(1), pp. 5–12, 1999. (P. Belhumeur, J. Duncan, G. Hager, D. McDermott, A. S. Morse and S. Zucker)
35. "Tracking in 3D: Image Variability Decomposition for Recovering Object Pose and Illumination," *Pattern Analysis and Applications*, 2(1), pp. 82–91, 1999. (P. Belhumeur and G. Hager) [\[PS\]](#) [\[PDF\]](#)
36. "Shadows, Shading, and Projective Ambiguity," *Shape, Contour, and Grouping in Computer Vision*, D. Forsyth, J. Mundy, V. Gesu, R. Cipolla, (Eds.), Springer-Verlag, pp. 132–51, 1999. (P. Belhumeur, D. Kriegman and A. Yuille)
37. "Representations for Recognition Under Variable Illumination," *Shape, Contour, and Grouping in Computer Vision*, D. Forsyth, J. Mundy, V. Gesu, R. Cipolla, (Eds.), Springer-Verlag, pp. 95–131, 1999. (D. Kriegman, P. Belhumeur and A. Georghiadis)

38. "What Is the Set of Images of an Object Under All Possible Illumination Conditions?" *Int. Journal of Computer Vision*, 28(3), pp. 245—60, 1998. (P. Belhumeur and D. Kriegman) [\[PS\]](#) [\[PDF\]](#)
39. "Efficient Region Tracking with Parametric Models of Geometry and Illumination," *IEEE Trans. PAMI*, 20(10), pp. 1025—39, October 1998. (G. Hager and P. Belhumeur) [\[PS\]](#) [\[PDF\]](#)
40. "Eigenfaces vs. Fisherfaces: Recognition Using Class Specific Linear Projection," *IEEE Trans. PAMI*, Special Issue on Face Recognition, 19(7), pp. 711—20, July 1997. (P. Belhumeur, J. Hespanha and D. Kriegman) [\[PS\]](#) [\[PDF\]](#)
41. "A Bayesian Approach to Binocular Stereopsis," *Int. Journal of Computer Vision*, 19(3), pp. 237—60, 1996. (P. Belhumeur) [\[PS\]](#)
42. "A Computational Theory for Binocular Stereopsis," D. Knill and W. Richards (Eds.), *Perception as Bayesian Inference*, Cambridge University Press, pp. 323—64, 1996. (P. Belhumeur)
43. "Toward a Model-based Bayesian Theory for Estimating and Recognizing Parameterized 3-D Objects Using Two or More Images Taken from Different Positions," *IEEE Trans. PAMI*, 11(10), pp. 1028—52, October 1989. (B. Cernuschi-Frias, D. Cooper, Y. Hung and P. Belhumeur)

Selected Invited Papers

44. "Shape and Enlightenment: Reconstruction and Recognition under Variable Illumination," *Int. Symposium on Robotics Research*, pp. 79—88, October 1999. (D. Kriegman, P. Belhumeur and A. Georghiades)
45. "Shadows, Shading, and Projective Ambiguity," *Int. Joint Workshop on Shape, Contour, and Grouping, Palermo, Italy*, May 1998. Paper also later appeared in *Shape, Contour, and Grouping in Computer Vision*, D. Forsyth, J. Mundy, V. Gesu, R. Cipolla, (Eds.), Springer-Verlag, pp. 132—51, 1999. (P. Belhumeur, D. Kriegman and A. Yuille)
46. "Representations for Recognition Under Variable Illumination," *Int. Joint Workshop on Shape, Contour, and Grouping, Palermo, Italy*, May 1998. Paper also later appeared in *Shape, Contour, and Grouping in Computer Vision*, D. Forsyth, J. Mundy, V. Gesu, R. Cipolla, (Eds.), Springer-Verlag, pp. 95—131, 1999. (D. Kriegman, P. Belhumeur and A. Georghiades)
47. "Bayesian Models for Reconstructing the Scene Geometry in a Pair of Stereo Images," *Proc. IEEE Conf. Info. Sciences and Systems*, Johns Hopkins University, Baltimore, 1993. (P. Belhumeur) [\[PS\]](#)

Refereed Conference Papers

48. "The Minimalist Camera," British Machine Vision Conference, 2018. (P. Pooj, M. Grossberg, P. Belhumeur, S. Nayar)
49. "Articulated pose estimation using hierarchical exemplar-based models," *AAAI'16 Proceedings of the Thirtieth AAAI Conference on Artificial Intelligence*, 2016. (J. Liu, Y. Li, P. Allen, P. Belhumeur)
50. "Part-pair representation for part localization," *European Conference on Computer Vision*, 2014. (J. Liu, Y. Li, P.N. Belhumeur)
51. "Birdsnap: Large-scale Fine-grained Visual Categorization of Birds," T. Berg, S. W. Lee, M. L. Alexander, D. W. Jacobs, and P. N. Belhumeur. *Proc. IEEE Conference on Computer Vision and Pattern Recognition*, June 2014.
52. "How do you tell a Backbird from a Raven?" Thomas Berg and Peter N. Belhumeur, *Proceedings of the IEEE International Conference on Computer Vision (ICCV 2013)*, pp. 1-8, Sydney, December 2013.

53. "Bird Part Localization Using Exemplar-Based Models with Enforced Pose and Subcategory Consistency," Jiongxin Liu and Peter N. Belhumeur, Proceedings of the *IEEE International Conference on Computer Vision (ICCV 2013)*, Sydney, December 2013.
54. "Social Cues from Group Photos," Ijung Kwak, Ana Murillo, David Kriegman, Serge Belongie, and Peter Belhumeur, submitted to the *British Machine Vision Conference*, April 2012.
55. "Tom vs. Pete Classifiers and Identity Preserving Alignment for Face Verification and Identification," Thomas Berg, Peter N. Belhumeur, **Everingham Prize** at *British Machine Vision Conference*, September 2012.
56. "POOF: Part-based One vs. One Features for Fine-grained Classification, Face Verification, and Attribute Estimation," Thomas Berg and Peter N. Belhumeur, to appear in Proceedings of the *26th IEEE Conference on Computer Vision and Pattern Recognition (CVPR)*, Portland, OR, June 2013.
57. "Dog Breed Classification Using Part Localization," Jiongxin Liu, David W. Jacobs, Peter N. Belhumeur, *European Conference on Computer Vision*, October 2012.
58. "Multi-Attribute Spaces: Calibration for Attribute Fusion and Similarity Search," Walter Scheirer, Neeraj Kumar, Peter N. Belhumeur, Terrance E. Boult, Proceedings of the *25th IEEE Conference on Computer Vision and Pattern Recognition (CVPR)*, June 2012.
59. "Fusing with Context: a Bayesian Approach to Combining Descriptive Attributes," Walter Scheirer, Neeraj Kumar, Karl Ricanek, Terrance E. Boult, Peter N. Belhumeur, Proceedings of the *IEEE International Joint Conference on Biometrics (IJCB)*, October 2011.
60. "Two faces are better than one: Face recognition in group photographs," Ohil K. Manyam, Neeraj Kumar, Peter N. Belhumeur, David J. Kriegman, Proceedings of the *IEEE International Joint Conference on Biometrics (IJCB)*, October 2011.
61. "Localizing Parts of Faces Using a Consensus of Exemplars," Peter N. Belhumeur, David W. Jacobs, David J. Kriegman, Neeraj Kumar, Proceedings of the *24th IEEE Conference on Computer Vision and Pattern Recognition (CVPR)*, June 2011.
62. "Towards Full 3D Helmholtz Stereovision Algorithms," Asian Conference on Computer Vision, 2010. (A. Delaunoy, Emmanuel Prados, P. Belhumeur)
63. "Attribute and Simile Classifiers for Face Verification," *International Conference on Computer Vision*, 2009. (N. Kumar, P. Belhumeur, S. K. Nayar)
64. "Face Tracer: A Search Engine for Large Collections of Images with Faces," *Proc. European Conference on Computer Vision*, 2008. (N. Kumar, P. Belhumeur, S. K. Nayar)
65. "Searching the World's Herbaria: A System for the Visual Identification of Plant Species," *Proc. European Conference on Computer Vision*, 2008. (S. Shirdhonkar, S. White, S. Feiner, D. Jacobs, J. Kress, P. N. Belhumeur)
66. "Compressive Structured Light for Recovering Inhomogeneous Participating Media," *European Conference on Computer Vision*, October 2008. (J. Gu, S. K. Nayar, E. Grinspun, P. Belhumeur, R. Ramamoorthi)
67. "Dirty Glass: Modeling and Rendering Contamination on Transparent Surfaces," *Proc. EuroGraphics Symposium on Rendering*, 2007. (J. Gu, P. N. Belhumeur, R. Ramamoorthi, and Shree Nayar)
68. "Directed Rigid Formations of Autonomous Agents," the *45th IEEE Conference on Decision and Control*, San Diego, California, 2006. (T. Eren, W. Whiteley, P. N. Belhumeur)

69. "Specularity Removal in Images and Videos: A PDE Approach," *Proc. European Conference on Computer Vision*, 2006. (S. P. Mallick, T. E. Zickler, P. N. Belhumeur, and D. J. Kriegman)
70. "Color Spaces as Photometric Invariants," *Proc. IEEE Conf. Computer Vision and Pattern Recognition*, 2006. (T. Zickler, S. P. Mallick, D. J. Kriegman, and P. N. Belhumeur)
71. "Beyond Lambert: Reconstructing Specular Surfaces Using Color," *Proc. IEEE Conf. Computer Vision and Pattern Recognition*, 2005. (S. P. Mallick, T. E. Zickler, D. J. Kriegman, P. N. Belhumeur)
72. "Reflectance Sharing: Image-based Rendering from a Sparse Set of Images," *Proc. Eurographics Symposium on Rendering*, pp. 253–265, 2005. (T. E. Zickler, S. Enrique, R. Ramamoorthi, P. N. Belhumeur)
73. "Reflectance Sharing: Image-based Rendering from a Sparse Set of Images," *ACM SIGGRAPH Technical Sketch*, 2005. (T. E. Zickler, S. Enrique, R. Ramamoorthi, P. N. Belhumeur)
74. "Using Eye Reflections for Face Recognition Under Varying Illumination," *IEEE Int'l Conf. on Computer Vision ICCV*, 2005. (K. Nishino, P. N. Belhumeur, and S. K. Nayar)
75. "Further Results on Sensor Network Localization Using Rigidity," *Proceedings of the Second European Workshop on Sensor Networks (EWSN)*, January 2005, pp. 405-409. (T. Eren, W. Whiteley, and P. N. Belhumeur)
76. "A Fourier Theory for Cast Shadows," *European Conference on Computer Vision*, May 2004. (R. Ramamoorthi, M. Koudelka, P. Belhumeur)
77. "Making One Object Look Like Another: Controlling Appearance Using a Projector-Camera System," *Proc. IEEE Computer Vision and Pattern Recognition (CVPR)*, Vol. 1, p. 452-459, 2004. (M. D. Grossberg, H. P., S. K. Nayar, and P. N. Belhumeur)
78. "Rigidity, Computation, and Randomization in Network Localization," *Proceedings of the International Annual Joint Conference of the IEEE Computer and Communications Societies (INFOCOM)*, Hong Kong, March 2004, pp. 2673-2684. T. Eren, D. Goldenberg, W. Whiteley, Y. R. Yang, A. S. Morse, B. D. O. Anderson, and P. N. Belhumeur)
79. "Information Structures to Secure Control of Globally Rigid Formations," *Proceedings of the American Control Conference*, Boston, July 2004, pp. 4945-4950. (T. Eren, W. Whiteley, A. S. Morse, P. N. Belhumeur, and B. D. O. Anderson)
80. "Information Structures to Control Formation Splitting and Merging," *Proceedings of the American Control Conference*, Boston, July 2004, pp. 4951-4956. (T. Eren, B. D. O. Anderson, W. Whiteley, A. S. Morse, and P. N. Belhumeur)
81. "Merging Globally Rigid Formations," *Proceedings of AAMAS (the Third International Joint Conference on Autonomous Agents & Multi Agent Systems)*, New York, July 2004, pp. 1258-1259. (T. Eren, W. Whiteley, A. S. Morse, P. N. Belhumeur, and B. D. O. Anderson)
82. "Binocular Helmholtz Stereopsis," *Proc. IEEE International Conference on Computer Vision*, October 2003. pp. 1411-1417. (T. Zickler, J. Ho, D. Kriegman, J. Ponce, and P. Belhumeur)
83. "Toward a Stratification of Helmholtz Stereopsis," *Proc. IEEE Conference on Computer Vision and Pattern Recognition*, June 2003. Vol. I, pp. 548-555. (T. Zickler, P. Belhumeur, and D. Kriegman)
84. "A Projection System with Radiometric Compensation for Screen Imperfections," *Proc. of the IEEE Inter. Workshop on Projector Camera Systems*, Nice, October 2003. (S. Nayar, H. Peri, M. Grossberg, and P. Belhumeur)
85. "Acquiring, Compressing, and Synthesizing Bidirectional Texture Functions," *Texture 2003: Third International Workshop on Texture Analysis and Synthesis*, Nice, France, October 2003. (M. Koudelka, S. Magda, P. Belhumeur, D. Kriegman)

86. "Sensor and Network Topologies of Formations with Distance-Direction-Angle Constraints," 2003 IEEE Conference on Decision and Control, submitted. (T. Eren, W. Whiteley, A. S. Morse, and P. Belhumeur)
87. "Helmholtz Stereopsis: Exploiting Reciprocity for Surface Reconstruction," Proc. 7th European Conference on Computer Vision, May 2002. Vol. III, pp. 869-884. (T. Zickler, P. Belhumeur, and D. Kriegman)
88. "A Framework for Maintaining Formations Based on Rigidity," Proceedings of the 2002 IFAC World Congress, July, 2002, Barcelona, Spain. (T. Eren, P. Belhumeur, B. D. O. Anderson, and A. S. Morse)
89. "Closing Ranks in Vehicle Formations Based on Rigidity," Proceedings of the 2002 IEEE Conference on Decision and Control, December 2002, Las Vegas, NV, USA. (T. Eren, P. Belhumeur, and A. S. Morse)
90. "Image-based Modeling and Rendering of Surfaces with Arbitrary BRDFs," *Proc. IEEE Conf. CVPR*, submitted, 2001. (M. Koudelka, P. Belhumeur, S. Magda and D. Kriegman) [\[PDF\]](#)
91. "Finding Folds: On the Appearance and Identification of Occlusion," *Proc. IEEE Conf. CVPR*, submitted, 2001. (P. Huggins, H. Chen, P. Belhumeur, and S. Zucker)
92. "Beyond Lambert: Reconstructing Surfaces with Arbitrary BRDFs," *Proc. Int. Conf. of Computer Vision*, to appear, 2001. (S. Magda, T. Zickler, D. Kriegman and P. Belhumeur) [\[PS\]](#) [\[PDF\]](#)
93. "Lighting-Sensitive Displays," *SIGGRAPH Technical Sketch*, p. 218, 2001. (S. Nayar, P. Belhumeur, and T. Boult)
94. "Judging Whether Multiple Silhouettes Can Come From the Same Object," *Proc. Fourth Int. Workshop on Visual Form*, pp. 533—41, 2001. (D. Jacobs, P. Belhumeur, and I. Jermyn)
95. "Shedding Light on Image-Based Rendering," *SIGGRAPH Technical Sketch*, p. 255, 2000. (S. Magda, J. Lu, D. Kriegman and P. Belhumeur)
96. "In Search of Illumination Invariants," **Best Paper Honorable Mention** at *Proc. IEEE Conf. CVPR*, vol. 2, pp. 254—61, 2000.¹ (H. Chen, P. Belhumeur and D. Jacobs) [\[PS\]](#) [\[PDF\]](#)
97. "From Few to Many: Generative Models of Recognizing Faces under Variable Pose and Illumination," *Proc. Fourth IEEE Int. Conf. on Automatic Face and Gesture Recognition*, pp. 277—84, 2000. (A. Georghiades and P. Belhumeur) [\[PS\]](#) [\[PDF\]](#)
98. "Illumination-Based Image Synthesis: Creating Novel Images of Human Faces Under Differing Pose and Lighting," *Proc. IEEE Workshop on Multi-View Modeling and Analysis of Visual Scenes*, pp. 47—54, 1999. (A. Georghiades and P. Belhumeur)
99. "Tracking in 3D: Image Variability Decomposition for Recovering Object Pose and Illumination," *Proc. Int. Conf. on Pattern Analysis and Applications*, 1998. (P. Belhumeur and G. Hager)
100. "Illumination Cones for Recognition Under Variable Lighting: Faces," *Proc. IEEE Conf. CVPR*, pp. 52—58, 1998. (A. Georghiades, D. Kriegman and P. Belhumeur) [\[PS\]](#) [\[PDF\]](#)
101. "Comparing Images Under Variable Illumination," *Proc. IEEE Conf. CVPR*, pp. 610—17, 1998. (D. Jacobs, P. Belhumeur and R. Basri) [\[PS\]](#) [\[PDF\]](#)
102. "What Do Shadows Reveal About Object Structure?" **Olympus Prize** at *Proc. Fifth European Conf. on Computer Vision*, vol. 2, pp. 399—414, 1998.² (D. Kriegman and P. Belhumeur) [\[PS\]](#) [\[PDF\]](#)
103. "The Bas-Relief Ambiguity," *Proc. IEEE Conf. CVPR*, pp. 1060—66, 1997. (P. Belhumeur, D. Kriegman and A. Yuille) [\[PS\]](#) [\[PDF\]](#)

¹ Best Paper Honorable Mention Award.

² Best Paper Award.

104. "What Is the Set of Images of an Object Under All Possible Illumination Conditions?" **Best Paper** at *Proc. IEEE Conf. CVPR*, pp. 270—277, 1996.³ (P. Belhumeur and D. Kriegman) [\[PS\]](#) [\[PDF\]](#)
105. "Real-Time Tracking of Image Regions with Changes in Geometry and Illumination," *Proc. IEEE Conf. CVPR*, pp. 403—10, 1996.⁴ (G. Hager and P. Belhumeur) [\[PS\]](#) [\[PDF\]](#)
106. "Eigenfaces vs. Fisherfaces: Recognition Using Class Specific Linear Projection," *Proc. Fourth European Conf. on Computer Vision*, vol. 1, pp. 45—58, 1996. (P. Belhumeur., J. Hespanha and D. Kriegman) [\[PS\]](#) [\[PDF\]](#)
107. "Learning Object Representations from Lighting Variations," *Proc. Int. Workshop on Object Representation in Computer Vision II*, pp. 179—99, 1996. (R. Epstein, A. Yuille and P. Belhumeur) [\[PS\]](#) [\[PDF\]](#)
108. "Estimation of Motion Boundary Location and Optical Flow Using Dynamic Programming," *Proc. IEEE Int. Conf. on Image Processing*, vol. 3, pp. 509—12, 1996. (X. Papademetris and P. Belhumeur) [\[PS\]](#) [\[PDF\]](#)
109. "Recovering Object Surfaces from Viewed Changes in Surface Texture Patterns," *Proc. IEEE Fifth Int. Conf. on Computer Vision*, pp. 876—81, 1995. (P. Belhumeur and A. Yuille) [\[PS\]](#)
110. "Global Priors for Binocular Stereopsis," *Proc. IEEE Int. Conf. on Image Processing*, vol. 2, pp. 730—4, 1994. (P. Belhumeur) [\[PS\]](#) [\[PDF\]](#)
111. "A Binocular Stereo Algorithm for Reconstructing Sloping, Creased, and Broken Surfaces in the Presence of Half-occlusion," *Proc. IEEE Fourth Int. Conf. on Computer Vision*, pp. 431—8, 1993. (P. Belhumeur) [\[PS\]](#) [\[PDF\]](#)
112. "A Bayesian Treatment of the Stereo Correspondence Problem Using Half-occluded Regions," *Proc. IEEE Conf. CVPR*, pp. 506—12, 1992. (P. Belhumeur and D. Mumford) [\[PS\]](#) [\[PDF\]](#)
113. "3-D Object Position Estimation and Recognition Based on Parameterized Surfaces and Multiple Views," *Proc. IEEE Conf. Robotics and Automation*, vol. 1, pp. 639—44, 1986. (B. Cernuschi-Frias, D. B. Cooper and P. Belhumeur)
114. "Estimating and Recognizing Parameterized 3-D Objects Using a Moving Camera," *Proc. IEEE Conf. CVPR*, pp. 167—71, 1985. (B. Cernuschi-Frias, P. Belhumeur and D. B. Cooper)

Selected Invited Lectures

1. "Intermediate Feature Spaces: Attributes, Tom vs. Pete, and POOFs for Face Verification," University of Maryland, January 2014.
2. "Face Recognition in the Wild," Amazon, Seattle, WA, January 2014.
3. "Parts and Attributes for Fine-grained Visual Categorization," ECCV 2014.
4. "Describable Visual Attributes for Computer Vision," Plenary Lecture, ICVGIP, December 2012.
5. "Lessons Learned from Photographing the World's Plant Species," keynote talk at International Conference on Computational Photography, April 2011.
6. "Lessons Learned from Photographing the World's Plant Species," Workshop on Fine-Grained Visual Categorization, *IEEE Conference on Computer Vision*, June 2011.
7. "Leafsnap: An Electronic Field Guide," E. O. Wilson Award Ceremonies, October 2011.
8. National Academy of Engineering, GAFOE OC Meeting, 2008.

³ Best Paper Award.

⁴ Nominated for Best Paper Award, same award as in Footnote 3.

9. "An Electronic Field Guide: Plant Exploration in the 21st Century," NYU Computer Science Colloquium, November 2007.
10. Invited Speaker, Symposium to Honor David Mumford, 2007.
11. National Academy of Engineering's U.S. Frontiers of Engineering Symposium, September 2005.
12. INRIA Lectures in Computer Science and Information Systems, June 2005.
13. "Lighting Sensitive Displays," New York Academy of Sciences, New York, April 2003.
14. "The Reflectance of Human Skin," *Visionquest*, Tenants Harbor, Maine, June 2001.
15. "Photometric Statistics of Occluding Edges," *Snowbird Learning Workshop*, Snowbird, Utah, April 2001.
16. "Reflections on Illumination," *IBM T. J. Watson Mathematical Research Symposium*, IBM T. J. Watson Research Labs, March 2001.
17. "Shedding Light on Illumination," *Columbia University Computer Science Colloquium*, Columbia University, February 2001.
18. "Yale Projects on Visual Appearance," *NSF ITR Meeting*, U. C. Berkeley, January 2001.
19. "Shedding Light on Illumination," *IMA Symposium on Vision*, University of Minnesota, November 2000.
20. "Shedding Light on Illumination," University of Pennsylvania, November 2000.
21. "Yale Projects on Visual Appearance," *NSF ITR Meeting*, Stanford University, September 2000.
22. "In Search of Illumination Invariants," *Int. Meeting of the Canadian Mathematical Society*, McMaster University, June 2000.
23. "Learning the Reflectance of Human Faces," *Snowbird Learning Workshop*, Snowbird, Utah, April 2000.
24. "Recognizing Objects in the Absence of Illumination Invariants," Princeton University, April 1999.
25. "Recognizing Objects in the Absence of Illumination Invariants," *The United States Army Research Office: Center for Imaging Science Review*, the Johns Hopkins University, March 1999.
26. "Shape, Contour, and Projective Ambiguity," Royal Academy of Technology, Stockholm, Sweden, January 1999.
27. "Shadows, Shading, and Projective Ambiguity," Institut National de Recherche en Informatique et en Automatique (INRIA) , Sophia Antipolis, France, September 1998.
28. *National Academy of Sciences First Annual Japanese-American Frontiers of Science Symposium*, Arnold and Mabel Beckman Center of the National Academy of Sciences, Irvine, CA, August 1998.
29. "Shape, Contour, and Projective Ambiguity," *Int. Workshop on Shape, Contour, and Grouping*, Palermo, Italy, May 1998.
30. "The Bas-Relief Ambiguity," University of Oxford, February 1998.
31. "Illumination Cones and the Bas-Relief Ambiguity," Columbia University, November 1997.
32. "Recognizing Objects Under Variable Illumination," *Applied Math Seminar Series*, Brown University, March 1997.
33. "Image Understanding Under Variable Illumination," *United States Army Research Office: First Annual Center for Imaging Science Review*, St. Louis, January 1997.
34. "The Illumination Cone Representation for Object Recognition," *NECI Vision Workshop*, NEC Research Institute, June 1996.
35. "What is the Set of Images of an Object under All Possible Illumination Conditions?" *Cognitive Science Seminar Series*, Brown University, November 1995.

36. "Object Recognition Under Varying Illumination Conditions," *Army Research Office Workshop*, Washington University, October 1995.
37. "Stochastic Models for Binocular Stereopsis," *Seminar on Visual Information Processing*, Artificial Intelligence Lab, Massachusetts Institute of Technology, February 1995.
38. "A Bayesian Approach to the Stereo Correspondence Problem," Institut National de Recherche en Informatique et en Automatique (INRIA), Sophia Antipolis, France, November 1993.
39. "A Bayesian Approach to the Stereo Correspondence Problem," *LEMS and Electrical Sciences Seminar*, Division of Engineering, Brown University, April 1993.
40. "Global Optimization and Bayesian Estimation," *Workshop on Geometry Driven Diffusions*, Berlin, Germany, May 1993. (with D. Mumford)
41. "Bayesian Models for Reconstructing the Scene Geometry in a Pair of Stereo Images," *IEEE Conf. Info. Sciences and Systems*, the Johns Hopkins University, March 1993.