

F. Edward Boas, MD PhD

Assistant attending, Interventional radiology, Memorial Sloan Kettering Cancer Center

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Medical training

Board certified in Diagnostic Radiology (2013). AU eligible. Medical licensure: New York.
Fellow, Interventional radiology, Hospital of the University of Pennsylvania, July 2013 – July 2014.
Resident, Radiology, Stanford Hospital, July 2009 – June 2013.
Intern, General surgery, Stanford Hospital, June 2008 – June 2009.

Education

MD / PhD, Biochemistry, Stanford University, June 2008.
AB, Biochemistry, magna cum laude with highest honors, Harvard University, June 1999.

Research and product development

My research focuses on developing new methods for improving tumor embolization and ablation, testing them in animals, and then translating the most promising methods into human clinical trials. The basic strategy is to make tumor embolization safer and more effective by using new intra-arterial agents and devices, and to develop methods for safely embolizing tumors outside the liver. (1323 citations, 25 papers, 36 abstracts, and 2 patent applications.)

Research web PACS. Developed a multi-institutional research web PACS with image analysis and image processing plug-ins, interactive multimedia radiology reports, and screen share. This PACS currently contains more than 120,000 anonymized and annotated images that are available for research use, thus enabling multi-site research collaboration. (collaboration with Bao Do and Michael Muelly). <http://www.claripacs.com>.

CT metal artifact reduction. Developed a patented method (MDT) for reducing metal artifacts in CT scans, which improves image quality in 86% of scans, and improves diagnosis in 14% of scans. This method has been successfully used on hundreds of patients in 140 hospitals, including MGH, MD Anderson, and Stanford. This project involved development of a scalable cloud application, integration with PACS, and technology licensing. <http://www.revisionrads.com>.

Leadership and professional activities

Reviewer for *JVIR* (2014-16), *CVIR* (2015), *Academic radiology* (2015), *WCIO* (2015), *Medical Physics* (2013), *Neuroradiology* (2013), and *AJNR* (2013).
President, Harvard Science Review (1998 – 1999)
President, Harvard Hippocratic Society (1998 – 1999)

Selected awards

RSNA Roentgen Resident/Fellow Research Award (2013)
ARRS Residents in Radiology Executive Council Award (2013)
SIR Annual Scientific Meeting Resident-in-Training Scholarship (2010)
Barry M. Goldwater Scholar (1998)
John Harvard Scholar (1996, 1997)
United States Presidential Scholar (named by Bill Clinton, 1995)
Top ten finalist, Westinghouse (now Intel) Science Talent Search (1995)

25 papers and 36 abstracts, cited 1323 times.

★ indicates key publications.

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Papers

★ 25. Boas FE, Ziv E, Yarmohammadi H, Brown KT, Erinjeri JP, Sofocleous CT, Harding JJ, Solomon SB. (2017) “Adjuvant medications that improve survival after locoregional therapy.” *Journal of Vascular and Interventional Radiology*. In press.

★ 24. **Boas FE**, Srimathveeravalli G, Kaye EA, Durack JC, Erinjeri JP, Ziv E, Maybody M, Yarmohammadi H, Solomon SB. (2017) “Development of a searchable database of cryoablation simulations for use in treatment planning.” *Cardiovascular and Interventional Radiology*. 40(5): 761-8.

23. Ziv E, Erinjeri JP, Yarmohammadi H, **Boas FE**, Petre EB, Gao S, Shady W, Sofocleous CT, Jones DR, Rudin CM, Solomon SB. (2016) “Lung adenocarcinoma: Predictive value of KRAS mutation status in assessing local recurrence in patients undergoing image-guided ablation.” *Radiology*. In press.

22. Maybody M, Tang PQ, Moskowitz CS, Hsu M, Yarmohammadi H, **Boas FE**. (2016) “Pneumodissection for skin protection in image-guided cryoablation of superficial musculoskeletal tumors.” *European Radiology*. In press.

★ 21. **Boas FE**, Brody LA, Erinjeri JP, Yarmohammadi H, Shady W, Kishore S, Sofocleous CT. (2016) “Quantitative enhancement measurements on preprocedure triphasic CT can predict response to radioembolization of colorectal liver metastases.” *AJR*. 207: 671-5.

20. Rotman JA, Getrajdman GI, Maybody M, Erinjeri JP, Yarmohammadi H, Sofocleous CT, Solomon SB, **Boas FE**. (2016) “Effect of abdominopelvic abscess drain size on drainage time and probability of occlusion.” *The American Journal of Surgery*. In press.

19. Yarmohammadi H, Brody LA, Erinjeri JP, Covey AM, **Boas FE**, Ziv E, Maybody M, Gonzalez-Aguirre AJ, Brown KT, Sheinfeld J, Getrajdman GI. (2016) "Therapeutic application of percutaneous peritoneovenous (Denver) shunt in treating chylous ascites in cancer patients." *Journal of Vascular and Interventional Radiology*. 27(5): 665-73.
18. Shady W, Kishore S, Gavane S, Do RK, Osborne JR, Ulaner GA, Gonen M, Ziv E, **Boas FE**, Sofocleous CT. (2016) "Metabolic tumor volume and total lesion glycolysis on FDG-PET/CT can predict overall survival after ⁹⁰Y radioembolization of colorectal liver metastases: A comparison with SUVmax, SUVpeak, and RECIST 1.0." *European Journal of Radiology*. 85(6): 1224-31.
17. Yarmohammadi H, Wilkins LR, Erinjeri JP, Novak RD, Exner AA, Wu H, Petre EN, **Boas FE**, Ziv E, Haaga JR. (2016) "Efficiency of combined blocking of aerobic and glycolytic metabolism pathways in treatment of N1-S1 hepatocellular carcinoma in a rat model." *Journal of Cancer Research and Therapeutics*. In press.
16. **Boas FE**, Kadivar F, Kelly PD, Drebin JA, Vollmer CM, Shlansky-Goldberg RD. (2015) "Targeted transgastric drainage of isolated pancreatic duct segments to cure persistent pancreaticocutaneous fistulas from pancreatitis." *Journal of Vascular and Interventional Radiology*. 26(2): 247-51.
- ★ 15. **Boas FE**, Do B, Louie JD, Kothary N, Hwang GL, Kuo WT, Hovsepian DM, Kantrowitz M, Sze DY. (2015) "Optimal imaging surveillance schedules after liver-directed therapy for hepatocellular carcinoma." *Journal of Vascular and Interventional Radiology*. 26(1): 69-73.
- ★ 14. **Boas FE**, Kamaya A, Do B, Dessler TS, Beaulieu CF, Vasanaawala SS, Hwang GL, Sze DY. (2015) "Classification of hypervascular liver lesions based on hepatic artery and portal vein blood supply coefficients calculated from triphasic CT scans." *Journal of Digital Imaging*. 28: 213-23.
13. Olcott EW, Shin LK, Sommer G, Chan I, Rosenberg J, Molvin FL, **Boas FE**, Fleischmann D. (2014) "Model-based Iterative Reconstruction Compared to Adaptive Statistical Iterative Reconstruction and Filtered Back-projection in CT of the Kidneys and the Adjacent Retroperitoneum." *Academic radiology*. 21(6): 774-84.
- ★ 12. **Boas FE** and Fleischmann D (2012). "CT artifacts: Causes and reduction techniques." *Imaging in Medicine*. 4(2): 229-40.
11. Abelson JA, Murphy JD, Wiegner EA, Abelson D, Sandman DN, **Boas FE**, Hristov D, Fleischmann D, Daly ME, Chang DT, Loo BW, Hara W, Le QT. (2012) "Evaluation of a metal artifact reduction technique in tonsillar cancer delineation." *Practical Radiation Oncology*. 2(1): 27-34.
- ★ 10. **Boas FE** and Fleischmann D. (2011) "Evaluation of two iterative techniques for reducing metal artifacts in computed tomography." *Radiology*. 259(3): 894-902.
9. Fleischmann D and **Boas FE**. (2011) "Computed tomography: Old ideas and new technology." *European Radiology*. 21(3): 510-17.

- ★ 8. **Boas FE**, Harbury PB. (2008) "Design of protein-ligand binding based on the molecular-mechanics energy model." *Journal of Molecular Biology*. 380(2): 415-24.
7. **Boas FE** and Harbury PB. (2007) "Potential energy functions for protein design." *Current Opinion in Structural Biology*. 17(2): 199-204.
6. Bass JL, Bhatia A, **Boas FE**, Sansary J, Rauch D. (2006) "Validation of a body mass index nomogram for children as an obesity screening tool in young children." *Clinical Pediatrics*. 45(8): 718-24.
5. Arava Y, **Boas FE**, Brown PO, Herschlag D. (2005) "Dissecting eukaryotic translation and its control by ribosome density mapping." *Nucleic Acids Research*. 33(8):2421-32.
4. **Boas FE**. (2000) "Linkage to Gaucher mutations in the Ashkenazi population: Effect of drift on decay of linkage disequilibrium and evidence for heterozygote selection." *Blood Cells, Molecules, and Diseases*. 26(4): 348-59.
3. Demina A, **Boas E**, and Beutler E. (1998) "Structure and linkage relationships of the region containing the human L-type pyruvate kinase (*PKLR*) and glucocerebrosidase (*GBA*) genes." *Hematopathol Mol Hematol*. 11(2): 63-71.
- ★ 2. **Boas FE**, Forman L, Beutler E. (1998) "Phosphatidylserine exposure and red cell viability in red cell aging and in hemolytic anemia." *Proc Natl Acad Sci USA*. 95(6): 3077-3081.
1. Ahn CS, **Boas E**, and Rahn B. (1997) "The geometry and the game theory of chases." *The UMAP Journal*. 18(3): 225-242.

Abstracts (presenter in italics)

36. **Boas F**, Ziv E, Yarmohammadi H, Brown K, Erinjeri J, Sofocleous C, Harding J, Solomon S. "Adjuvant medications that improve survival after locoregional therapy." Oral presentation at WCIO, Boston, MA, 2017-06-10.
35. **Boas F**, Ziv E, Yarmohammadi H, Brown K, Erinjeri J, Sofocleous C, Harding J, Solomon S. "Home medications that improve survival after locoregional therapy." Poster presentation at SIR, Washington, DC, 2017-03-07.
34. **Boas F**, Gonzalez Aguirre A, Srimathveeravalli G, Rund L, Schwind R, Schook L, Erinjeri J, Solomon S, Yarmohammadi H. "Induction of pancreatic cancer in a porcine model: Initial results." Poster presentation at SIR, Washington, DC, 2017-03-07.
33. *Borgheresi A*, **Boas FE**, Brown KT, Covey AM, Erinjeri JP, Getrajdman GI, Gonen M, Solomon SB, Yarmohammadi H, Ziv E. "Outcome Following Hepatic Artery Embolization for HCC in Presence of Portal Vein Tumor." Oral presentation at SIR, Washington, DC, 2017-03-07.

32. *Perez-Johnston R, Boas FE, Durack JC, Muallem N, Siegelbaum RH.* “Endovascular stenting for symptomatic pelvic venous thrombosis or occlusion in cancer patients.” Oral presentation at SIR, Washington, DC, 2017-03-07.
31. *Bergen MA, Boas FE, Brown KT, Covey AM, Erinjeri JP, Getrajdman GI, Kim TH, Petre E, Sofocleous CT, Solomon SB, Yarmohammadi H, Ziv E.* “Mutations in NFE2L2 complex predict progression of disease in patients with hepatocellular carcinoma treated with hepatic artery embolization.” Oral presentation at SIR, Washington, DC, 2017-03-06.
30. *Gonzalez Aguirre AJ, Boas FE, Erinjeri JP, Petre E, Sofocleous CT, Solomon SB.* “Comparison of microwave and radiofrequency ablation of colon cancer pulmonary metastases.” Oral presentation at SIR, Washington, DC, 2017-03-06.
29. *Borgheresi A, Gonzalez-Aguirre A, Brown KT, Getrajdman GI, Erinjeri JP, Covey A, Yarmohammadi H, Ziv E, Sofocleous C, Boas FE.* “Does enhancement or perfusion predict outcomes after embolization of hepatocellular carcinoma.” Oral presentation at SIR, Washington, DC, 2017-03-05.
28. *Yarmohammadi H, Gonzalez-Aguirre AJ, Schook L, Ziv E, Erinjeri JP, Brown KT, Srimathveeravalli G, O’Reilly EM, Allen PJ, Solomon SB, Boas FE.* “Treatment of pancreatic cancer by intra-arterial injection of an emulsion of Lipiodol and Bumetanide (an anti-glycolytic drug) in a porcine model: Initial results.” Oral presentation at SIR, Washington, DC, 2017-03-05.
27. *Filtes J, Boas FE, Brody L, Covey AM, Erinjeri JP, Getrajdman GI, Kim TH, Petre E, Sofocleous CT, Solomon SB, Yarmohammadi H, Ziv E.* “DAXX mutation is associated with poor response and shorter hepatic progression after hepatic artery embolization of neuroendocrine liver metastases.” Oral presentation at SIR, Washington, DC, 2017-03-05.
26. *Muallem N, Boas FE, Erinjeri JP, Sofocleous CT, Solomon SB, Yarmohammadi H.* “Protective techniques to provide a safe margin in difficult ablations.” Poster presentation at SIR, Washington, DC, 2017.
25. *Gonzalez AJ, Yarmohammadi H, Boas FE, Getrajdman GI, Ziv E, Erinjeri JP, Solomon SB, Maybody M.* “Impact of Experience on Oncologic and Quality Outcomes of Hepatic Artery Embolization for Metastatic Neuroendocrine Tumors.” Oral presentation at RSNA, Chicago, 2016-12-01.
24. *Currie BM, Getrajdman GI, Covey AM, Alago W, Erinjeri JP, Maybody M, Boas FE.* “Push versus Pull Gastrostomy: A Single Center Retrospective Analysis of Complications and Technical Success Rates.” Oral presentation at RSNA, Chicago, 2016-11-30.
23. *Fine GC, Boas FE, Durack JC, Covey A, Getrajdman GI, Erinjeri JP, Brody LA, Maybody M, Muallem N, Brown KT.* “Outcomes after portal vein stenting in cancer patients.” Poster presentation at WCIO, Boston, 2016-06-10.

22. *Yarmohammadi H, Boas FE, Brody L, Durack JC, Erinjeri JP, Flood L, Getrajdman GI, Gonzalez-Aguirre A, Maybody M, Mohabir HR, Solomon SB, Thornton RH, Ziv E.* "Comparison of Radiation dose, Procedure Time and Diagnostic Yield of Conventional CT-guided lung biopsy with CT fluoroscopy-guided lung biopsy." Oral presentation at SIR, Vancouver, 2016-04-06.
21. *Bergen MA, Boas FE, Do KG, Erinjeri JP, Petre E, Sofocleous CT, Solomon SB, Yarmohammadi H, Ziv E.* "PIK3CA mutation status associated with improved tumor response to Yttrium-90 radioembolization (Y90) of chemorefractory liver-dominant colorectal cancer (CRC) metastases." Oral presentation at SIR, Vancouver, 2016-04-06.
20. *Temiyakarn L, Boas FE, Durack JC, Erinjeri JP, Maybody M, Temiyakarn L, Yarmohammadi H, Ziv E.* "The time cost of graduate medical education: Do fellows actually increase procedure time?" Oral presentation at SIR, Vancouver, 2016-04-04.
19. *Boas FE, Srimathveeravalli G, Kaye E, Durack JC, Erinjeri JP, Ziv E, Maybody M, Yarmohammadi H, Solomon SB.* "Development of a searchable database of cryoablation simulations, for use in treatment planning." *JVIR* 27(3): S31. Oral presentation at SIR, Vancouver, 2016-04-03.
18. *Morel-Ovalle LM, Boas FE, Durack JC, Erinjeri JP, Kotarska MA, Mohabir HR, Yarmohammadi H, Ziv E.* "Predicting optimal outpatient IR procedure locations using a Google Maps application." Oral presentation at SIR, Vancouver, 2016-04-03.
17. *Boas FE, Brody LA, Erinjeri JP, Yarmohammadi H, Shady W, Kishore S, Sofocleous CT.* (2015). "Quantitative Enhancement Measurements on Pre-procedure Triphasic CT Can Predict Response to Radioembolization of Colorectal Liver Metastases." Oral presentation at RSNA, Chicago, 2015-12-01.
16. *Shady W, Kishore S, Pandit-Taskar N, Carrasquillo JA, Osborne JR, Gonen M, Brody L, Alago W, Siegelbaum RH, Yarmohammadi H, Boas FE, Do RK, Segal NH, Kemeny NE, Sofocleous C.* (2015). "A Comparison of Response by 4 FDG-PET Metrics of Metabolic Activity and RECIST 1.1 as Predictors of Overall Survival after Selective Internal Radiation Therapy (SIRT) of Colorectal Liver Metastases." *JVIR* 26(5):e37. Oral presentation at WCIO, New York.
15. *Sotirchos VS, Shady W, Violari EG, Pietanza MC, Pandit-Taskar N, Do RK, Gonen M, Carrasquillo JA, Brody L, Alago W, Siegelbaum RH, Yarmohammadi H, Boas FE, Sofocleous C.* (2015). "Single-Center Experience of Selective Internal Radiation Therapy as a Salvage Treatment for Small Cell Lung Cancer Hepatic Metastases." *JVIR* 26(5):e77. Poster presentation at WCIO, New York.
14. *Goel A, Yarmohammadi H, Boas FE, Erinjeri JP.* (2015). "Modeling hematologic effects of chemotherapy commonly used in patients undergoing interventional radiology procedures: what is the safe window?" *JVIR* 26(2): S187. Poster presentation at SIR, Atlanta.
13. *Shady W, Sotirchos VS, Pandit-Taskar N, Carrasquillo JA, Do K, Brody LA, Alago W, Siegelbaum RH, Yarmohammadi H, Boas FE, Kishore S, Gonen M, Kemeny NE, Sofocleous CT.* (2015)

- “Enhancement patterns of colorectal liver metastases on pre-SIRT mapping CT arteriography correlates with FDG-PET SUVmax metabolic response.” *JVIR* 26(2): S189-S190. Poster presentation at SIR, Atlanta.
12. **Boas FE**, Kelly P, and Shlansky-Goldberg R. (2014) “Targeted transgastric drainage of persistent pancreaticocutaneous fistulas.” *JVIR* 25(3): S41. Oral presentation at SIR, San Diego, 2014-03-23.
 11. *Do BH*, **Boas FE**, Muelly M, Massaband PM, Biswal S. (2013) “Simplifying the understanding of shoulder labral tears using a multimedia reporting enabled PACS.” Presented at RSNA, Chicago, 2013.
 10. **Boas F**, Kamaya A, Do B, Beaulieu C, Desser T, Vasanawala S, Hwang G, Sze D. (2013) “Hepatic artery and portal vein blood volumes in hypervascular liver lesions: Estimation from triphasic CT scans.” Oral presentation at ARRS, Washington, DC, 2013-04-15.
 9. *Blake T*, *Dao C*, **Boas FE**, Fearon W, Miller D, Fleischmann D. (2012) “CT-based instantaneous calculation of viewing angles for device deployment in patients undergoing transcatheter aortic valve replacement (TAVR).” Presented at RSNA, Chicago, 2012-11-27.
 8. **Boas FE**, Bammer R, Fleischmann D. (2012) “Optimized CT metal artifact reduction using the Metal Deletion Technique (MDT).” Oral presentation at RSNA, Chicago, 2012-11-26.
 7. *Fleischmann D*, *Dao C*, *Blake T*, **Boas FE**, *Liang D*, *Yeung, A*, *Fearon W*, *Fischbein M*, *Miller DC*. (2012) “Computed tomography based prediction of angiographic deployment angles may reduce procedure time and contrast medium volume for transcatheter aortic valve replacement.” *J Am Coll Cardiol*. 59(13s1):E1199-E1199. Poster presentation at ACC, Chicago, 2012-03-24.
 6. *Fleischmann D*, **Boas FE**, *Tye GA*, *Sheahan D*, *Molvin LZ*. (2011) “Effect of low radiation dose on image noise and subjective image quality for analytic vs iterative image reconstruction in abdominal CT.” Oral presentation at RSNA, Chicago, 2011-12-01.
 - ★ 5. **Boas FE**, *Desser TS*, and *Kamaya A*. (2011) “Does separating the resistive index into pre- and postglomerular resistance and vascular compliance improve upon the diagnostic accuracy of renal transplant doppler sonography?” *AJR* 196(5): A31-35. Oral presentation at ARRS, Chicago, 2011-05-03.
 4. *Golden C*, *Mazin SR*, **Boas FE**, *Tye G*, *Ghanouni P*, *Gold G*, *Sofilos M*, *Pelc NJ*. (2011) “A comparison of four algorithms for metal artifact reduction in CT imaging.” *Proc. SPIE*. 7961: 79612Y. Poster presentation at SPIE.
 3. **Boas FE** and *Fleischmann D*. (2010) “Evaluation of the metal deletion technique (MDT): A new method for reducing metal streak artifacts in computed tomography scans.” Oral presentation at RSNA, Chicago, 2010-11-29.

2. **Boas FE**, Forman L, and Beutler E. (1997) "Phosphatidylserine exposure and red cell viability in red cell ageing, storage, and in hemolytic anemia." *Blood*. 90(10) (Supplement 1, Part 1): 272a.
1. **Boas FE**, Forman L, and Beutler E. (1997) "Phosphatidylserine exposure in red cell aging." *The Scripps Research Institute Scientific Report 1996-97*. pp. 258-60.

Talks without abstracts

4. Boas FE. "Precision medicine and image guided interventions" in "Oncologic imaging in the age of precision medicine." Speaker and moderator at European Congress of Radiology, Vienna, 2017-03-01.
3. Soulen MC, Rilling WS, Shamimi-Noori S, **Boas FE**. "Basic embolization I (patient selection and triage)." Case-based workshop speaker at SIR, Vancouver, 2016-04-04.
2. **Boas FE**. (2012) "CT metal artifact reduction and other image post-processing applications." Stanford Radiology grand rounds, Stanford, CA, 2012-04-03.
1. **Boas FE**. (2011) "Iterative techniques for metal artifact reduction." Oral presentation at the International Society for Computed Tomography meeting, San Francisco, 2011-06-13.

Book chapters and other publications

5. Soulen MC, Rilling WS, Shamimi-Noori S, **Boas FE**. (2016). "Basic embolization I (patient selection and triage)." In *FAQs in Interventional Radiology, Volume 3*. Fairfax, VA: Society of Interventional Radiology.
4. Solomon SB, Griffin JF, Weiss MJ, **Boas FE**. (2016). "Postoperative complications requiring intervention: Diagnosis and management" In WR Jarnagin (Ed.), *Blumgart's Surgery of the Liver, Biliary Tract, and Pancreas, 6th ed.* New York, NY: Elsevier.
3. **Boas FE**, Shlansky-Goldberg RD. (2015). "Role of interventional radiology in managing bile duct injuries." In Dixon E, Vollmer CM, May GR (Eds.), *Management of Benign Biliary Stenosis and Injury: A Comprehensive Guide*. New York, NY: Springer.
- ★ 2. **Boas FE**. (2008) *Physics-Based Design of Protein-Ligand Binding*. PhD dissertation, Department of Biochemistry, Stanford University.
- ★ 1. **Boas FE**. (1999) "Polyvalent inhibitors of *Pseudomonas aeruginosa* adhesion." Senior honors thesis, Harvard University.

Patent applications

2. **Boas FE.** (2012) "Iterative reduction of artifacts in computed tomography images using forward projection and an edge-preserving blur filter." U.S. Patent 8233586.
1. **Boas FE.** (2008) "Methods and apparatus for reducing artifacts in computed tomography images." U.S. Patent Application 2008/0273651 (abandoned).

Software

2. ClariPACS (2012-2014). Modern web-based PACS, including interactive multimedia radiology reports, screen share, and image post-processing. Co-written with Bao Do and Michael Muelly. <http://www.claripacs.com>.
1. Metal deletion technique (2010-2013). Patented CT metal artifact reduction software, used in more than 140 hospitals, including MGH, MD Anderson, and Stanford. <http://www.revisionrads.com>

Selected awards

Certificate of Recognition for Excellence in Teaching, Department of Radiology, MSKCC (2015, 2016)
RSNA Roentgen Resident/Fellow Research Award (2013)
ARRS Residents in Radiology Executive Council Award (2013)
SIR Annual Scientific Meeting Resident-in-Training Scholarship (2010)
Medical Scientist Training Program (1999 – 2008)
Barry M. Goldwater Scholar (1998)
John Harvard Scholar (1996, 1997)
United States Presidential Scholar (named by Bill Clinton, 1995)
Top ten finalist, Westinghouse (now Intel) Science Talent Search (1995)
USA Today All-USA Academic First Team (1995)