

**BIOGRAPHICAL SKETCH****NAME:** Franz Edward Boas, MD, PhD**eRA COMMONS USER NAME:** boasfe**POSITION TITLE:** Associate professor**EDUCATION/TRAINING**

INSTITUTION AND LOCATION	DEGREE	COMPLETION DATE	FIELD OF STUDY
Harvard University, Cambridge, MA	AB	06/1999	Biochemistry
Stanford University, Stanford CA	MD	06/2008	Medicine
Stanford University, Stanford CA	PhD	06/2008	Biochemistry / Protein engineering
Stanford Hospital, Stanford CA		06/2009	Internship, General surgery
Stanford Hospital, Stanford CA		06/2013	Residency, Radiology
University of Pennsylvania, Philadelphia, PA		06/2014	Fellowship, Interventional radiology

**A. Personal Statement**

I am an interventional radiologist at City of Hope, with a clinical focus on tumor embolization, radioembolization, and ablation. My research focuses on developing the next generation of minimally invasive cancer therapies, including new devices and materials for local drug delivery into tumors.

We developed a transgenic pig model of liver and pancreatic cancer, in collaboration with the University of Illinois, funded by a multi-institutional DOD grant. We are using the Oncopig to test new embolization and ablation techniques, prior to translation into human clinical trials. These new therapies include: embolization of liver metastases using vaccine adjuvants, pancreatic chemoembolization, and new drug-eluting tumor-targeting embolics. (Collaborators: Hooman Yarmohammadi, Stephen Solomon, Larry Schook, Ron Gaba, and others)

We recently completed the first clinical trial of bronchial or pulmonary artery chemoembolization in the United States. This phase I trial showed that the intratumoral drug concentration was 380 times the plasma concentration, which enabled treatment of chemorefractory lung and mediastinal lymph node metastases. Metabolic response rate was 40%, in a group of patients with no other good treatment options. Planning for a multicenter phase II/III trial is underway. (Co-PIs: Stephen Solomon and Nancy Kemeny)

I have a track record for developing new tools for diagnostic and interventional radiology, and bringing them into routine clinical use. For example, I 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 in 160 hospitals, including MGH, MD Anderson, and Stanford.

**B. Positions, Scientific Appointments, and Honors****Positions and Scientific Appointments**

2021–present	Associate professor, Interventional radiology, City of Hope National Medical Center
2021	Associate clinical professor, Interventional radiology, City of Hope National Medical Center
2014–2021	Assistant Attending, Interventional Radiology Service, Department of Radiology, Memorial Sloan Kettering Cancer Center, New York, NY
2014–2021	Assistant professor of radiology, Weill Cornell Medical College, Cornell University, New York, NY

## Selected honors

2022	JVIR Editor's Award for Outstanding Laboratory Investigation
2020	The Academy Imaging Shark Tank, best pitch
2019, '16, '15	Certificate of Recognition for Excellence in Teaching, Department of Radiology, MSKCC
2013	RSNA Roentgen Resident/Fellow Research Award
2013	ARRS Residents in Radiology Executive Council Award
1998	Barry M. Goldwater Scholar
1996, 1997	John Harvard Scholar

## C. Contributions to Science

**1. New minimally invasive therapies for liver, pancreatic, and lung cancer.** My current research focuses on developing the next generation of minimally invasive cancer therapies, including new devices and materials for local drug delivery into tumors. Projects include: bronchial artery chemoembolization, pancreatic chemoembolization, and local immunotherapy / in situ cancer vaccination.

- a. **Boas FE**, Kemeny NE, Sofocleous CT, Yeh R, Thompson VR, Hsu M, Moskowitz CS, Ziv E, Yarmohammadi H, Bendet A, Solomon SB. (2021) "Bronchial or Pulmonary Artery Chemoembolization for Unresectable and Unablatable Lung Metastases: A Phase I Clinical Trial." *Radiology*. 301(2): 474-84.
- b. **Boas FE**, Nurili F, Bendet A, Cheleuitte-Nieves C, Basturk O, Askan G, Michel AO, Monette S, Ziv E, Sofocleous CT, Maxwell AWP, Schook LB, Solomon SB, Kelsen DP, Scherz A, Yarmohammadi H. (2020) "Induction and characterization of pancreatic cancer in a transgenic pig model." *PLOS ONE*. 15(9): e0239391.
- c. Nurili F, Monette S, Michel AO, Bendet A, Basturk O, Askan G, Cheleuitte-Nieves C, Yarmohammadi H, Maxwell AWP, Ziv E, Schachtschneider KM, Gaba RC, Schook LB, Solomon SB, **Boas FE**. (2021) "Transarterial embolization of liver cancer in a transgenic pig model." *Journal of Vascular and Interventional Radiology*. 32(4): 510-7.
- d. Yarmohammadi H, Elsakka AS, Nurili F, Maxwell AWP, Ridouani F, Ziv E, O'Reilly EM, Cheleuitte-Nieves C, Schook LB, Solomon SB, **Boas FE**. (2021) "Treatment of pancreatic cancer by intra-arterial injection of an emulsion of Lipiodol and bumetanide (an anti-glycolytic drug) in a transgenic mutated pig model (Oncopig)." Oral presentation at SIR, 2021-03-26. *J Vasc Interv Radiol* 32(5): S38.
- e. **Boas F**, Nurili F, Erinjeri J, Schook L, Solomon S, Yarmohammadi H. (2019) "Local immunotherapy: Intra-arterial liver tumor vaccination in a pig model of metastatic pancreatic cancer." *J Vasc Interv Radiol*. 30(3S): S98-9.
- f. Nurili F, Yarmohammadi H, Bendet A, Schook L, Srimathveeravalli G, Solomon S, **Boas F**. (2019) "Improved intra-arterial tumor targeting using an omniphobic oil in a pig model." *J Vasc Interv Radiol*. 30(3S): S204.

**2. Locoregional therapy of liver tumors.** Developed several new tools and techniques for improving embolization and ablation of liver tumors in humans.

- a. Maxwell AWP, Mendoza HG, Sellitti MJ, Camacho JC, Deipolyi AR, Ziv E, Sofocleous CT, Yarmohammadi H, Maybody M, Humm JL, Schwartz J, Juluru K, Dunphy MP, **Boas FE**. (2022) "Optimizing <sup>90</sup>Y particle density improves outcomes after radioembolization." *Cardiovascular and Interventional Radiology*. 45: 958-69.
- b. **Boas FE**, Brown KT, Ziv E, Yarmohammadi H, Sofocleous CT, Erinjeri JP, Harding JJ, Solomon SB. (2019) "Aspirin is associated with improved liver function after embolization of hepatocellular carcinoma." *Am J Roentgenol*. 213: 689-95.
- c. **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." *J Vasc Interv Radiol*. 26(1): 69-73.
- d. **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." *J Vasc Interv Radiol*. 28: 971-7.

- e. **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." *Cardiovasc Intervent Radiol.* 40(5): 761-8.

**3. 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 (including cases of cancer and stroke that were missed without MDT). This method has been successfully used on thousands of patients in 160 hospitals, including MGH, MD Anderson, and Stanford. This project involved development of a scalable cloud application, integration with PACS, and technology licensing.

- a. <http://www.revisionrads.com>
- b. **Boas FE** and Fleischmann D. (2011) "Evaluation of two iterative techniques for reducing metal artifacts in computed tomography." *Radiology.* 259(3): 894-902.
- c. **Boas FE.** (2012) "Iterative reduction of artifacts in computed tomography images using forward projection and an edge-preserving blur filter." U.S. Patent 8233586.

**4. Research web PACS.** Co-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.

- a. <http://www.claripacs.com>

**5. Engineering custom binding proteins.** Developed and validated a technique for predicting binding constants, predicting structures of protein binding sites, and designing binding proteins. This was the first successful design of a binding protein using a standard physical model, which could pave the way for the rational design of new biotech drugs.

- a. **Boas FE**, Harbury PB. (2008) "Design of protein-ligand binding based on the molecular-mechanics energy model." *J Mol Biol.* 380(2):415-24.

## D. Research Support

### Current support:

Guerbet 2023 – 2025  
*Phase II trial of lung chemoembolization*  
 Role: Principal Investigator

City of Hope 2021 – 2025  
*Interventional Oncology Bioengineering Lab*  
 Role: Principal Investigator

### Completed support:

Department of Defense 2016 – 2020  
 Congressionally Directed Medical Research Program  
*Genetically Inducible Porcine Model of Primary and Metastatic HCC in Comorbidity Host Environments for Interventional Radiology Guided Detection and Treatment*  
 Role: Principal Investigator

Thompson family foundation 2017 – 2022  
*Targeting pancreatic cancer*  
 Role: Aim co-leader

Society of Interventional Oncology (funded by Guerbet) 2019 – 2020  
Transarterial lipiodol chemoembolization research grant.  
*Phase I study of transarterial chemoembolization of lung metastases*  
Role: Principal Investigator

Brockman Medical Research Foundation 2019 – 2021  
*Phase I study of transarterial chemoembolization of lung metastases*  
Role: Principal Investigator

Other support:

Dr Boas received research supplies (investigator-initiated) from Boston Scientific, and research support (investigator-initiated) from GE Healthcare.