

Stanford



Raag Airan

Assistant Professor of Radiology (Neuroradiology) at the Stanford University Medical Center and, by courtesy, of Materials Science and Engineering and of Psychiatry and Behavioral Sciences

CLINICAL OFFICES

- **Radiology Department**

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Bio

CLINICAL FOCUS

- Radiology
- Neuroradiology

ACADEMIC APPOINTMENTS

- Assistant Professor - Med Center Line, Radiology
- Assistant Professor - Med Center Line (By courtesy), Materials Science and Engineering
- Assistant Professor - Med Center Line (By courtesy), Psychiatry and Behavioral Sciences
- Member, Bio-X
- Member, Maternal & Child Health Research Institute (MCHRI)
- Faculty Fellow, Stanford ChEM-H
- Member, Wu Tsai Neurosciences Institute

PROFESSIONAL EDUCATION

- Board Certification: Neuroradiology, American Board of Radiology (2018)
- Residency: Johns Hopkins University Radiology Residency (2015) MD
- Internship: Medstar Washington Hospital Center Internal Medicine Residency (2011) DC
- Fellowship: Johns Hopkins University Neuroradiology Fellowship MD
- Board Certification: Radiology, American Board of Radiology (2016)
- Medical Education: Stanford University School of Medicine Registrar (2010) CA
- PhD, Stanford University , Bioengineering (2010)

LINKS

- Airan Lab: <http://airan-lab.stanford.edu>

Research & Scholarship

CURRENT RESEARCH AND SCHOLARLY INTERESTS

Our goal is to develop and clinically implement new technologies for high-precision and noninvasive intervention upon the nervous system. Every few millimeters of the brain is functionally distinct, and different parts of the brain may have counteracting responses to therapy. To better match our therapies to neuroscience, we develop techniques that allow intervention upon only the right part of the nervous system at the right time, using technologies like focused ultrasound and nanotechnology.

Teaching

COURSES

2019-20

- Introduction to Imaging and Image-based Human Anatomy: BIOE 220, RAD 220 (Win)

STANFORD ADVISEES

Postdoctoral Faculty Sponsor

Muna Aryal Rizal, Tommaso Di Ianni, Niloufar Hosseini Nassab, Zhenbo Huang, Sanaz Mohajeri, Sunmee Park, Mahaveer Purohit

Doctoral Dissertation Reader (NonAC)

Francis Masuda

Postdoctoral Research Mentor

James Bishop

GRADUATE AND FELLOWSHIP PROGRAM AFFILIATIONS

- Biophysics (Phd Program)
- Medicine (Masters Program)
- Neuroradiology (Fellowship Program)
- Neurosciences (Phd Program)

Publications

PUBLICATIONS

- **CT and CEST MRI bimodal imaging of the intratumoral distribution of iodinated liposomes** *QUANTITATIVE IMAGING IN MEDICINE AND SURGERY*
Chen, Z., Li, Y., Airan, R., Han, Z., Xu, J., Chan, K. Y., Xu, Y., Bulte, J. M., van Zijl, P. M., McMahon, M. T., Zhou, S., Liu, G.
2019; 9 (9): 1579-+
- **Polymeric perfluorocarbon nanoemulsions are ultrasound-activated wireless drug infusion catheters.** *Biomaterials*
Zhong, Q., Yoon, B. C., Aryal, M., Wang, J. B., Ilovitsh, T., Baikoghli, M. A., Hosseini-Nassab, N., Karthik, A., Cheng, R. H., Ferrara, K. W., Airan, R. D.
2019; 206: 73–86
- **CT and CEST MRI bimodal imaging of the intratumoral distribution of iodinated liposomes.** *Quantitative imaging in medicine and surgery*
Chen, Z., Li, Y., Airan, R., Han, Z., Xu, J., Chan, K. W., Xu, Y., Bulte, J. W., van Zijl, P. C., McMahon, M. T., Zhou, S., Liu, G.
2019; 9 (9): 1579–91
- **Noninvasive Ultrasonic Drug Uncaging Maps Whole-Brain Functional Networks.** *Neuron*
Wang, J. B., Aryal, M., Zhong, Q., Vyas, D. B., Airan, R. D.
2018; 100 (3): 728
- **Hearing out Ultrasound Neuromodulation.** *Neuron*
Airan, R. D., Butts Pauly, K.

2018; 98 (5): 875–77

- **Optogenetic Control of Intracellular Signaling: Class II Opsins** *OPTOGENETICS: A ROADMAP*
Ellwardt, E., Airan, R. D., Stroh, A.
2018; 133: 63–73
- **Diffusion MRI tractography for improved transcranial MRI-guided focused ultrasound thalamotomy targeting for essential tremor.** *NeuroImage. Clinical*
Tian, Q., Wintermark, M., Jeffrey Elias, W., Ghanouni, P., Halpern, C. H., Henderson, J. M., Huss, D. S., Goubran, M., Thaler, C., Airan, R., Zeineh, M., Pauly, K. B., McNab, et al
2018; 19: 572–80
- **Neuromodulation with nanoparticles** *SCIENCE*
Airan, R.
2017; 357 (6350): 465
- **Noninvasive Targeted Transcranial Neuromodulation via Focused Ultrasound Gated Drug Release from Nanoemulsions.** *Nano letters*
Airan, R. D., Meyer, R. A., Ellens, N. P., Rhodes, K. R., Farahani, K., Pomper, M. G., Kadam, S. D., Green, J. J.
2017; 17 (2): 652-659
- **MR-Guided Delivery of Hydrophilic Molecular Imaging Agents Across the Blood-Brain Barrier Through Focused Ultrasound.** *Molecular imaging and biology : MIB : the official publication of the Academy of Molecular Imaging*
Airan, R. D., Foss, C. A., Ellens, N. P., Wang, Y., Mease, R. C., Farahani, K., Pomper, M. G.
2017; 19 (1): 24–30
- **Factors affecting characterization and localization of interindividual differences in functional connectivity using MRI** *HUMAN BRAIN MAPPING*
Airan, R. D., Vogelstein, J. T., Pillai, J. J., Caffo, B., Pekar, J. J., Sair, H. I.
2016; 37 (5): 1986-1997
- **Presurgical brain mapping of the language network in patients with brain tumors using resting-state fMRI: Comparison with task fMRI** *HUMAN BRAIN MAPPING*
Sair, H. I., Yahyavi-Firouz-Abadi, N., Calhoun, V. D., Airan, R. D., Agarwal, S., Intrapromkul, J., Choe, A. S., Gujar, S. K., Caffo, B., Lindquist, M. A., Pillai, J. J.
2016; 37 (3): 913-923
- **Neurovascular Uncoupling in Resting State fMRI Demonstrated in Patients With Primary Brain Gliomas** *JOURNAL OF MAGNETIC RESONANCE IMAGING*
Agarwal, S., Sair, H. I., Yahyavi-Firouz-Abadi, N., Airan, R., Pillai, J. J.
2016; 43 (3): 620-626
- **Estimating a graphical intra-class correlation coefficient (GICC) using multivariate probit-linear mixed models** *COMPUTATIONAL STATISTICS & DATA ANALYSIS*
Yue, C., Chen, S., Sair, H. I., Airan, R., Caffo, B. S.
2015; 89: 126-133
- **Label-free in vivo molecular imaging of underglycosylated mucin-1 expression in tumour cells** *NATURE COMMUNICATIONS*
Song, X., Airan, R. D., Arifin, D. R., Bar-Shir, A., Kadayakkara, D. K., Liu, G., Gilad, A. A., van Zijl, P. C., McMahon, M. T., Bulte, J. W.
2015; 6
- **Neuroinflammation and brain atrophy in former NFL players: An in vivo multimodal imaging pilot study** *NEUROBIOLOGY OF DISEASE*
Coughlin, J. M., Wang, Y., Munro, C. A., Ma, S., Yue, C., Chen, S., Airan, R., Kim, P. K., Adams, A. V., Garcia, C., Higgs, C., Sair, H. I., Sawa, et al
2015; 74: 58-65
- **Optogenetics in Freely Moving Mammals: Dopamine and Reward.** *Cold Spring Harbor protocols*
Zhang, F., Tsai, H., Airan, R. D., Stuber, G. D., Adamantidis, A. R., de Lecea, L., Bonci, A., Deisseroth, K.
2015; 2015 (8): pdb top086330-?
- **Natural neural projection dynamics underlying social behavior.** *Cell*
Gunaydin, L. A., Grosenick, L., Finkelstein, J. C., Kauvar, I. V., Fenno, L. E., Adhikari, A., Lammel, S., Mirzabekov, J. J., Airan, R. D., Zalocusky, K. A., Tye, K. M., Anikeeva, P., Malenka, et al
2014; 157 (7): 1535-1551
- **Human brain atlas for automated region of interest selection in quantitative susceptibility mapping: application to determine iron content in deep gray matter structures.** *NeuroImage*

Lim, I. A., Faria, A. V., Li, X., Hsu, J. T., Airan, R. D., Mori, S., van Zijl, P. C.
2013; 82: 449-469

● **Genetic tools to manipulate MRI contrast** *NMR IN BIOMEDICINE*

Airan, R. D., Li, N., Gilad, A. A., Pelled, G.
2013; 26 (7): 803-809

● **MRI biosensor for protein kinase A encoded by a single synthetic gene** *MAGNETIC RESONANCE IN MEDICINE*

Airan, R. D., Bar-Shir, A., Liu, G., Pelled, G., McMahon, M. T., van Zijl, P. C., Bulte, J. W., Gilad, A. A.
2012; 68 (6): 1919-1923

● **Optogenetic interrogation of neural circuits: technology for probing mammalian brain structures** *NATURE PROTOCOLS*

Zhang, F., Gradinaru, V., Adamantidis, A. R., Durand, R., Airan, R. D., de Lecea, L., Deisseroth, K.
2010; 5 (3): 439-456

● **Temporally precise in vivo control of intracellular signalling** *NATURE*

Airan, R. D., Thompson, K. R., Fenno, L. E., Bernstein, H., Deisseroth, K.
2009; 458 (7241): 1025-1029

● **Brain circuit dynamics** *AMERICAN JOURNAL OF PSYCHIATRY*

Hu, E. S., Airan, R. D., Vijaykumar, R., Deisseroth, K.
2008; 165 (7): 800-800

● **Integration of light-controlled neuronal firing and fast circuit imaging** *CURRENT OPINION IN NEUROBIOLOGY*

Airan, R. D., Hu, E. S., Vijaykumar, R., Roy, M., Meltzer, L. A., Deisseroth, K.
2007; 17 (5): 587-592

● **High-speed Imaging reveals neurophysiological links to behavior in an animal model of depression** *SCIENCE*

Airan, R. D., Meltzer, L. A., Roy, M., Gong, Y., Chen, H., Deisseroth, K.
2007; 317 (5839): 819-823