



## Jennifer A McNab

Assistant Professor (Research) of Radiology (Radiological Sciences Laboratory)

### CONTACT INFORMATION

- **Alternate Contact**

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### Bio

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#### BIO

Dr. McNab is an MRI Physicist focused on the development of magnetic resonance imaging (MRI) contrast mechanisms and acquisition strategies that yield new and/or improved images of the in vivo human brain. Over the past decade, she has developed numerous MRI acquisition methods, with her primary contributions being in the field of diffusion MRI. Dr. McNab has extensive experience with the most cutting-edge MRI technology, including the world's strongest human-MRI gradients (300 mT/m), highly-parallelized phased-array RF coils (64-channels) and ultra-high magnetic field (7T).

#### ACADEMIC APPOINTMENTS

- Assistant Professor (Research), Radiology
- Member, Bio-X
- Member, Maternal & Child Health Research Institute (MCHRI)
- Member, Wu Tsai Neurosciences Institute

#### BOARDS, ADVISORY COMMITTEES, PROFESSIONAL ORGANIZATIONS

- Annual Meeting Program Committee Member, International Society for Magnetic Resonance in Medicine (2015 - 2017)
- Chair of the Diffusion Study Group, International Society for Magnetic Resonance in Medicine (2018 - present)

#### PROFESSIONAL EDUCATION

- Post-doc, Harvard Medical School, Massachusetts General Hospital , Radiology (2012)
- PhD, University of Oxford , MRI Physics (2009)
- MSc, University of Western Ontario , Medical Biophysics (2005)
- BSc, University of British Columbia , Physics (2003)

#### LINKS

- Group Website: <http://med.stanford.edu/mcnablab/>

## Research & Scholarship

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### CURRENT RESEARCH AND SCHOLARLY INTERESTS

My research is focused on developing magnetic resonance imaging (MRI) methods that probe brain tissue microstructure. This requires new MRI contrast mechanisms, strategic encoding and reconstruction schemes, physiological monitoring, brain tissue modeling and validation. Applications of these methods include neuronavigation, neurosurgical planning and the development of improved biomarkers for brain development, degeneration, disease and injury.

Active projects include:

- development of q-space trajectory imaging methods for probing tissue microstructure
- development of diffusion MRI methods for mapping cortical fiber patterns
- comparisons of MRI with CLARITY 3D histology
- development of a mixed-reality neuronavigation system for TMS
- leveraging 7T MRI for predicting healthy versus pathological aging
- developing diffusion tractography-based neurosurgical targeting methods

## Teaching

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### STANFORD ADVISEES

#### Postdoctoral Faculty Sponsor

Erpeng Dai, Supriya Sathyanarayana, Emmanuelle Weber

#### Doctoral Dissertation Advisor (AC)

Gustavo Chau Loo Kung, Grant Yang

### GRADUATE AND FELLOWSHIP PROGRAM AFFILIATIONS

- Bioengineering (Phd Program)
- Neuropathology (Fellowship Program)
- Neuroradiology (Fellowship Program)
- Neurosciences (Phd Program)

## Publications

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### PUBLICATIONS

- **Double diffusion encoding MRI for the clinic** *MAGNETIC RESONANCE IN MEDICINE*  
Yang, G., Tian, Q., Leuze, C., Wintermark, M., McNab, J. A.  
2018; 80 (2): 507–20
- **Eddy current nulled constrained optimization of isotropic diffusion encoding gradient waveforms.** *Magnetic resonance in medicine*  
Yang, G., McNab, J. A.  
2018
- **The separate effects of lipids and proteins on brain MRI contrast revealed through tissue clearing.** *NeuroImage*  
Leuze, C., Aswendt, M., Ferenczi, E., Liu, C. W., Hsueh, B., Goubran, M., Tian, Q., Steinberg, G., Zeineh, M. M., Deisseroth, K., McNab, J. A.  
2017
- **Wiring and Molecular Features of Prefrontal Ensembles Representing Distinct Experiences** *CELL*  
Ye, L., Allen, W. E., Thompson, K. R., Tian, Q., Hsueh, B., Ramakrishnan, C., Wang, A., Jennings, J. H., Adhikari, A., Halpern, C. H., Witten, I. B., Barth, A. L., Luo, et al

2016; 165 (7): 1776-1788

- **Q-space truncation and sampling in diffusion spectrum imaging.** *Magnetic resonance in medicine*  
Tian, Q., Rokem, A., Folkerth, R. D., Nummenmaa, A., Fan, Q., Edlow, B. L., McNab, J. A.  
2016
- **The impact of gradient strength on in vivo diffusion MRI estimates of axon diameter.** *NeuroImage*  
Huang, S. Y., Nummenmaa, A., Witzel, T., Duval, T., Cohen-Adad, J., Wald, L. L., McNab, J. A.  
2015; 106: 464-472
- **The Human Connectome Project and beyond: Initial applications of 300 mT/m gradients** *NEUROIMAGE*  
McNab, J. A., Edlow, B. L., Witzel, T., Huang, S. Y., Bhat, H., Heberlein, K., Feiweier, T., Liu, K., Keil, B., Cohen-Adad, J., Tisdall, M. D., Folkerth, R. D., Kinney, et al  
2013; 80: 234-245
- **Surface based analysis of diffusion orientation for identifying architectonic domains in the in vivo human cortex** *NEUROIMAGE*  
McNab, J. A., Polimeni, J. R., Wang, R., Augustinack, J. C., Fujimoto, K., Stevens, A., Janssens, T., Farivar, R., Folkerth, R. D., Vanduffel, W., Wald, L. L.  
2013; 69: 87-100
- **Generalized diffusion spectrum magnetic resonance imaging (GDSI) for model-free reconstruction of the ensemble average propagator.** *NeuroImage*  
Tian, Q., Yang, G., Leuze, C. W., Rokem, A., Edlow, B. L., McNab, J. A.  
2019
- **Motion-robust reconstruction of multishot diffusion-weighted images without phase estimation through locally low-rank regularization.** *Magnetic resonance in medicine*  
Hu, Y., Levine, E. G., Tian, Q., Moran, C. J., Wang, X., Taviani, V., Vasanaawala, S. S., McNab, J. A., Daniel, B. A., Hargreaves, B. L.  
2018
- **Increased white matter connectivity seen in young judo athletes with MRI** *CLINICAL RADIOLOGY*  
Toh, Z. H., Gu, Q. L., Seah, T. C., Wong, W. H., McNab, J. A., Chuang, K., Hong, X., Tang, P. H.  
2018; 73 (10)
- **RNA-Sequencing Analysis Revealed a Distinct Motor Cortex Transcriptome in Spontaneously Recovered Mice After Stroke** *STROKE*  
Ito, M., Aswendt, M., Lee, A. G., Ishizaka, S., Cao, Z., Wang, E. H., Levy, S. L., Smerin, D. L., McNab, J. A., Zeineh, M., Leuze, C., Goubran, M., Cheng, et al  
2018; 49 (9): 2191-99
- **Multimodal Characterization of the Late Effects of Traumatic Brain Injury: A Methodological Overview of the Late Effects of Traumatic Brain Injury Project** *JOURNAL OF NEUROTRAUMA*  
Edlow, B. L., Keene, C., Perl, D. P., Iacono, D., Folkerth, R. D., Stewart, W., Mac Donald, C. L., Augustinack, J., Diaz-Arrastia, R., Estrada, C., Flannery, E., Gordon, W. A., Grabowski, et al  
2018
- **Characterizing Signals within Lesions and Mapping Brain Network Connectivity After Traumatic Axonal Injury: A 7 Tesla Resting-State FMRI Study.** *Brain connectivity*  
Lee, S., Polimeni, J. R., Price, C. M., Edlow, B. L., McNab, J. A.  
2018
- **Dementia After Moderate-Severe Traumatic Brain Injury: Coexistence of Multiple Proteinopathies** *JOURNAL OF NEUROPATHOLOGY AND EXPERIMENTAL NEUROLOGY*  
Kenney, K., Iacono, D., Edlow, B. L., Katz, D. I., Diaz-Arrastia, R., Dams-O'Connor, K., Daneshvar, D. H., Stevens, A., Moreau, A. L., Tirrell, L. S., Varjabedian, A., Yendiki, A., van der Kouwe, et al  
2018; 77 (1): 50-63
- **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
- **Accelerating Functional MRI Using Fixed-Rank Approximations and Radial-Cartesian Sampling** *MAGNETIC RESONANCE IN MEDICINE*  
Chiew, M., Graedel, N. N., McNab, J. A., Smith, S. M., Miller, K. L.  
2016; 76 (6): 1825-1836

- **Motion correction for functional MRI with three-dimensional hybrid radial-Cartesian EPI.** *Magnetic resonance in medicine*  
Graedel, N. N., McNab, J. A., Chiew, M., Miller, K. L.  
2016
- **Characterization of Axonal Disease in Patients with Multiple Sclerosis Using High-Gradient Diffusion MR Imaging** *RADIOLOGY*  
Huang, S. Y., Togyne, S. M., Nummenmaa, A., Witzel, T., Wald, L. L., McNab, J. A., Klawiter, E. C.  
2016; 280 (1): 244-251
- **The Structural Connectome of the Human Central Homeostatic Network.** *Brain connectivity*  
Edlow, B. L., McNab, J. A., Witzel, T., Kinney, H. C.  
2016; 6 (3): 187-200
- **In vivo mapping of human spinal cord microstructure at 300 mT/m** *NEUROIMAGE*  
Duval, T., McNab, J. A., Setsompop, K., Witzel, T., Schneider, T., Huang, S. Y., Keil, B., Klawiter, E. C., Wald, L. L., Cohen-Adad, J.  
2015; 118: 494-507
- **Targeting of White Matter Tracts with Transcranial Magnetic Stimulation** *BRAIN STIMULATION*  
Nummenmaa, A., McNab, J. A., Savadjiev, P., Okada, Y., Haemaelaenen, M. S., Wang, R., Wald, L. L., Pascual-Leone, A., Wedeen, V. J., Raij, T.  
2014; 7 (1): 80-84
- **A 22-channel receive array with Helmholtz transmit coil for anesthetized macaque MRI at 3 T** *NMR IN BIOMEDICINE*  
Janssens, T., Keil, B., Serano, P., Mareyam, A., McNab, J. A., Wald, L. L., Vanduffel, W.  
2013; 26 (11): 1431-1440
- **Pushing the limits of in vivo diffusion MRI for the Human Connectome Project.** *NeuroImage*  
Setsompop, K., Kimmlingen, R., Eberlein, E., Witzel, T., Cohen-Adad, J., McNab, J. A., Keil, B., Tisdall, M. D., Hoecht, P., Dietz, P., Cauley, S. F., Tountcheva, V., Matschl, et al  
2013
- **A combined post-mortem magnetic resonance imaging and quantitative histological study of multiple sclerosis pathology** *BRAIN*  
Kolasinski, J., Stagg, C. J., Chance, S. A., DeLuca, G. C., Esiri, M. M., Chang, E., Palace, J. A., McNab, J. A., Jenkinson, M., Miller, K. L., Johansen-Berg, H.  
2012; 135: 2938-2951
- **An implanted 8-channel array coil for high-resolution macaque MRI at 3 T** *NEUROIMAGE*  
Janssens, T., Keil, B., Farivar, R., McNab, J. A., Polimeni, J. R., Gerits, A., Arsenault, J. T., Wald, L. L., Vanduffel, W.  
2012; 62 (3): 1529-1536
- **T-2\* mapping and B-0 orientation-dependence at 7 T reveal cyto- and myeloarchitecture organization of the human cortex** *NEUROIMAGE*  
Cohen-Adad, J., Polimeni, J. R., Helmer, K. G., Benner, T., McNab, J. A., Wald, L. L., Rosen, B. R., Mainero, C.  
2012; 60 (2): 1006-1014
- **Diffusion tractography of post-mortem human brains: Optimization and comparison of spin echo and steady-state free precession techniques** *NEUROIMAGE*  
Miller, K. L., McNab, J. A., Jbabdi, S., Douaud, G.  
2012; 59 (3): 2284-2297
- **Size-optimized 32-Channel Brain Arrays for 3 T Pediatric Imaging** *MAGNETIC RESONANCE IN MEDICINE*  
Keil, B., Alagappan, V., Mareyam, A., McNab, J. A., Fujimoto, K., Tountcheva, V., Triantafyllou, C., Dilks, D. D., Kanwisher, N., Lin, W., Grant, P. E., Wald, L. L.  
2011; 66 (6): 1777-1787
- **Diffusion imaging of whole, post-mortem human brains on a clinical MRI scanner** *NEUROIMAGE*  
Miller, K. L., Stagg, C. J., Douaud, G., Jbabdi, S., Smith, S. M., Behrens, T. E., Jenkinson, M., Chance, S. A., Esiri, M. M., Voets, N. L., Jenkinson, N., Aziz, T. Z., Turner, et al  
2011; 57 (1): 167-181
- **Steady-state diffusion-weighted imaging: theory, acquisition and analysis** *NMR IN BIOMEDICINE*  
McNab, J. A., Miller, K. L.  
2010; 23 (7): 781-793

- **3D Steady-State Diffusion-Weighted Imaging With Trajectory Using Radially Batched Internal Navigator Echoes (TURBINE)** *MAGNETIC RESONANCE IN MEDICINE*  
McNab, J. A., Gallichan, D., Miller, K. L.  
2010; 63 (1): 235-242
- **Reduced limbic connections may contraindicate subgenual cingulate deep brain stimulation for intractable depression Case report** *JOURNAL OF NEUROSURGERY*  
McNab, J. A., Voets, N. L., Jenkinson, N., Squier, W., Miller, K. L., Goodwin, G. M., Aziz, T. Z.  
2009; 111 (4): 780-784
- **High resolution diffusion-weighted imaging in fixed human brain using diffusion-weighted steady state free precession** *NEUROIMAGE*  
McNab, J. A., Jbabdi, S., Deoni, S. C., Douaud, G., Behrens, T. E., Miller, K. L.  
2009; 46 (3): 775-785
- **Cortical and subcortical connections within the pedunculo-pontine nucleus of the primate Macaca mulatta determined using probabilistic diffusion tractography** *JOURNAL OF CLINICAL NEUROSCIENCE*  
Aravamuthan, B. R., McNab, J. A., Miller, K. L., Rushworth, M., Jenkinson, N., Stein, J. F., Aziz, T. Z.  
2009; 16 (3): 413-420
- **Sensitivity of diffusion weighted steady state free precession to anisotropic diffusion** *MAGNETIC RESONANCE IN MEDICINE*  
McNab, J. A., Miller, K. L.  
2008; 60 (2): 405-413
- **Quantitative short echo-time H-1 LASER-CSI in human brain at 4T** *NMR IN BIOMEDICINE*  
McNab, J. A., Bartha, R.  
2006; 19 (8): 999-1009
- **Tissue oxygen tension measurements in the Shionogi model of prostate cancer using F-19 MRS and MRI** *12th Annual Meeting of the ISMRM*  
McNab, J. A., Yung, A. C., Kozlowski, P.  
SPRINGER.2004: 288-95