<html> <html xmlns="http://www.w3.org/1999/xhtml"><head><meta http-equiv="Content-Type" content="text/html; charset=UTF-8"><title>Zotero Report</title><link rel="stylesheet" type="text/css" href="Zotero%20Report_retinotopy_ni_methods_files/detail.css"><link rel="stylesheet" type="text/css" media="screen,projection" href="Zotero%20Report_retinotopy_ni_methods_files/detail_screen.css"><link rel="stylesheet" type="text/css" media="print" href="Zotero%20Report_retinotopy_ni_methods_files/detail_print.css"></head><body><ul class="report combineChildItems"><li id="item-15483" class="item journalArticle"><h2>*Mapping Human Cortical Areas In Vivo Based on Myelin Content as Revealed by T1- and T2-Weighted MRI*</h2><table><tbody><tr class="creator author"><th class="author">Author</th><td>Matthew F. Glasser</td></tr><tr class="creator author"><th class="author">Author</th><td>David C. Van Essen</td></tr><tr class="url"><th class="url">URL</th><td>*http://www.jneurosci.org/content/31/32/11597*</td></tr><tr class="volume"><th class="volume">Volume</th><td>31</td></tr><tr class="issue"><th class="issue">Issue</th><td>32</td></tr><tr class="pages"><th class="pages">Pages</th><td>11597-11616</td></tr><tr class="publicationTitle"><th class="publicationTitle">Publication</th><td>The Journal of Neuroscience</td></tr><tr class="date"><th class="date">Date</th><td>08/10/2011</td></tr><tr class="DOI"><th class="DOI">DOI</th><td>*10.1523/JNEUROSCI.2180-11.2011*</td></tr><tr class="abstractNote"><th class="abstractNote">Abstract</th><td>*Noninvasively mapping the layout of cortical areas in humans is a continuing challenge for neuroscience. We present a new method of mapping cortical areas based on myelin content as revealed by T1-weighted (T1w) and T2-weighted (T2w) MRI. The method is generalizable across different 3T scanners and pulse sequences. We use the ratio of T1w/T2w image intensities to eliminate the MR-related image intensity bias and enhance the contrast to noise ratio for myelin. Data from each subject were mapped to the cortical surface and aligned across individuals using surface-based registration. The spatial gradient of the group average myelin map provides an observer-independent measure of sharp transitions in myelin content across the surface—i.e., putative cortical areal borders. We found excellent agreement between the gradients of the myelin maps and the gradients of published probabilistic cytoarchitectonically defined cortical areas that were registered to the same surface-based atlas. For other cortical regions, we used published anatomical and functional information to make putative identifications of dozens of cortical areas or candidate areas. In general, primary and early unimodal association cortices are heavily myelinated and higher, multimodal, association cortices are more lightly myelinated, but there are notable exceptions in the literature that are confirmed by our results. The overall pattern in the myelin maps also has important correlations with the developmental onset of subcortical white matter myelination, evolutionary cortical areal expansion in humans compared with macaques, postnatal cortical expansion in humans, and maps of neuronal density in non-human primates.*</td></tr></tbody></table>
<li *id="item-15487" class="item journalArticle"><h2>Diffusion properties of cortical and pericortical tissue: regional variations, reliability and methodological issues</h2><table><tbody><tr class="creator author"><th class="author">Author</th><td>Xiaojian Kang</td></tr><tr class="creator author"><th class="author">Author</th><td>Timothy J Herron</td></tr><tr class="creator author"><th class="author">Author</th><td>And U Turken</td></tr><tr class="creator author"><th class="author">Author</th><td>David L Woods</td></tr><tr class="volume"><th class="volume">Volume</th><td>30</td></tr><tr class="issue"><th class="issue">Issue</th><td>8</td></tr><tr class="pages"><th

class="pages">Pages</th><td>1111-1122</td></tr><tr class="publicationTitle"><th class="publicationTitle">Publication</th><td>Magnetic resonance imaging</td></tr><tr class="date"><th class="date">Date</th><td>Oct 2012</td></tr><tr class="DOI"><th class="DOI">DOI</th><td>10.1016/j.mri.2012.04.004</td></tr><tr class="abstractNote"><th class="abstractNote">Abstract</th><td>Characterizing the diffusion properties of cortical tissue is complicated by intersubject variability in the relative locations of gyri and sulci. Here we extend methods of measuring the average diffusion properties of gyral and sulcal structures after they have been aligned to a common template of cortical surface anatomy. Diffusion tensor image (DTI) data were gathered from 82 young subjects and co-registered with high-resolution T1 images that had been inflated and co-registered to a hemispherically unified spherical coordinate system based on FreeSurfer. We analyzed fractional anisotropy (FA), mean diffusivity (MD) and the novel quantity of cortical primary diffusion direction (cPDD) at five surfaces parallel to the white/gray junction, spanning approximately 5 mm from the pial surface into white matter. FA increased with increasing depth, whereas MD and cPDD were reduced. There were highly significant and reliable regional differences in FA, MD and cPDD as well as systematic differences between cortical lobes and between the two hemispheres. The influence of nearby cortical spinal fluid (CSF), local cortical curvature and thickness, and sulcal depth was also investigated. We found that FA correlated significantly with cortical curvature and sulcal depth, while MD was strongly influenced by nearby CSF. The measurement of FA, MD and cPDD near the cortical surface clarifies the organization of fiber projections to and from the cortex.</td></tr></tbody></table>
<li id="item-16773" class="item journalArticle"><h2>*A Two-Stage Cascade Model of BOLD Responses in Human Visual Cortex*</h2><table><tbody><tr class="creator author"><th class="author">Author</th><td>Kendrick N. Kay</td></tr><tr class="creator author"><th class="author">Author</th><td>Jonathan Winawer</td></tr><tr class="creator author"><th class="author">Author</th><td>Ariel Rokem</td></tr><tr class="creator author"><th class="author">Author</th><td>Aviv Mezer</td></tr><tr class="creator author"><th class="author">Author</th><td>Brian A. Wandell</td></tr><tr class="url"><th class="url">URL</th><td>http://dx.doi.org/10.1371/journal.pcbi.1003079</td></tr><tr class="volume"><th class="volume">Volume</th><td>9</td></tr><tr class="issue"><th class="issue">Issue</th><td>5</td></tr><tr class="pages"><th class="pages">Pages</th><td>e1003079</td></tr><tr class="publicationTitle"><th class="publicationTitle">Publication</th><td>PLoS Comput Biol</td></tr><tr class="date"><th class="date">Date</th><td>May 30, 2013</td></tr><tr class="DOI"><th class="DOI">DOI</th><td>10.1371/journal.pcbi.1003079</td></tr><tr class="abstractNote"><th class="abstractNote">Abstract</th><td>Author SummaryMuch has been learned about how stimuli are represented in the visual system from measuring responses to carefully designed stimuli. Typically, different studies focus on different types of stimuli. Making sense of the large array of findings requires integrated models that explain responses to a wide range of stimuli. In this study, we measure functional magnetic resonance imaging (fMRI) responses in early visual cortex to a wide range of band-pass filtered images, and construct a computational model that takes the stimuli as input and predicts the fMRI responses as output. The model has a cascade architecture, consisting of two stages of linear and nonlinear operations. A novel component of the model is a nonlinear operation that generates selectivity for second-order contrast, that is, variations in contrast-energy across the visual field. We find that this nonlinearity is stronger in extrastriate areas V2 and V3 than in primary visual

*cortex V1. Our results provide insight into how stimuli are encoded and transformed in the visual system.</td></tr></tbody></table>
<li id="item-5668" class="item journalArticle"><h2>How much luxury is there in 'luxury perfusion'? An analysis of the BOLD response in the visual areas V1 and V2</h2><table><tbody><tr class="creator author"><th class="author">Author</th><td>Valentine L Marcar</td></tr><tr class="creator author"><th class="author">Author</th><td>Thomas Loenneker</td></tr><tr class="creator author"><th class="author">Author</th><td>Andrea Straessle</td></tr><tr class="creator author"><th class="author">Author</th><td>Franck Girard</td></tr><tr class="creator author"><th class="author">Author</th><td>Ernst Martin</td></tr><tr class="url"><th class="url">URL</th><td>http://www.ncbi.nlm.nih.gov/pubmed/15288132</td></tr><tr class="volume"><th class="volume">Volume</th><td>22</td></tr><tr class="issue"><th class="issue">Issue</th><td>7</td></tr><tr class="pages"><th class="pages">Pages</th><td>921-928</td></tr><tr class="publicationTitle"><th class="publicationTitle">Publication</th><td>Magnetic Resonance Imaging</td></tr><tr class="date"><th class="date">Date</th><td>Sep 2004</td></tr><tr class="DOI"><th class="DOI">DOI</th><td>10.1016/j.mri.2004.02.013</td></tr><tr class="abstractNote"><th class="abstractNote">Abstract</th><td>We re-analyzed the functional magnetic resonance imaging data from a study involving awake, adult, human volunteers in order to examine the influence of vascular density on the blood oxygenation level-dependent (BOLD) response. We employed a flashed and reversing stimulus paradigm where the latter stimulated twice the number of receptive fields and with it doubled the neuronal metabolic load (CMRO2) compared to the former stimulus. The blood flow increase to these stimuli was identical, so that differences in the BOLD response are due to differences in the oxygen extraction fraction. By comparing the BOLD response in human striate cortex (V1) and its neighbor, extra-striate area V2 to the two stimuli, we were able to determine the influence of the higher vascular density of striate cortex on the BOLD response. In striate cortex, the extent of activation, as measured by the number of activated voxels, was larger for the flashed than for the reversing stimulus. In extra-striate area V2, no such difference in the extent of activation was noted. Gauging the local concentration of HbR using deltaR2*, we found it to be significantly lower for the flashed than for the reversing checkerboard. We estimated the HbR concentration in extra-striate area V2 to be double that of striate cortex independent of the stimulus presented. A frequency distribution of the deltaR2* values for the flashed and reversing checkerboard revealed a shift consistent with an increase in the HbR concentration between areas V1 and V2. The metabolically most demanding stimulus, the reversing checkerboard was associated with the highest HbR concentration and with the largest number of voxels with a negative BOLD response.</td></tr></tbody></table>
<li id="item-15397" class="item journalArticle"><h2>Retinotopic mapping with spin echo BOLD at 7T</h2><table><tbody><tr class="creator author"><th class="author">Author</th><td>Cheryl A Olman</td></tr><tr class="creator author"><th class="author">Author</th><td>Pierre-Francois Van de Moortele</td></tr><tr class="creator author"><th class="author">Author</th><td>Jennifer F Schumacher</td></tr><tr class="creator author"><th class="author">Author</th><td>Joseph R Guy</td></tr><tr class="creator author"><th class="author">Author</th><td>Kâmil Uğurbil</td></tr><tr class="creator author"><th class="author">Author</th><td>Essa Yacoub</td></tr><tr class="volume"><th class="volume">Volume</th><td>28</td></tr><tr class="issue"><th class="issue">Issue</th><td>9</td></tr><tr class="pages"><th class="pages">Pages</th><td>1258-1269</td></tr><tr class="publicationTitle"><th*

*class="publicationTitle">Publication</th><td>Magnetic resonance imaging</td></tr><tr class="date"><th class="date">Date</th><td>Nov 2010</td></tr><tr class="DOI"><th class="DOI">DOI</th><td>10.1016/j.mri.2010.06.001</td></tr><tr class="abstractNote"><th class="abstractNote">Abstract</th><td>For blood oxygenation level-dependent (BOLD) functional MRI experiments, contrast-to-noise ratio (CNR) increases with increasing field strength for both gradient echo (GE) and spin echo (SE) BOLD techniques. However, susceptibility artifacts and nonuniform coil sensitivity profiles complicate large field-of-view fMRI experiments (e.g., experiments covering multiple visual areas instead of focusing on a single cortical region). Here, we use SE BOLD to acquire retinotopic mapping data in early visual areas, testing the feasibility of SE BOLD experiments spanning multiple cortical areas at 7T. We also use a recently developed method for normalizing signal intensity in T(1)-weighted anatomical images to enable automated segmentation of the cortical gray matter for scans acquired at 7T with either surface or volume coils. We find that the CNR of the 7T GE data (average single-voxel, single-scan stimulus coherence: 0.41) is almost twice that of the 3T GE BOLD data (average coherence: 0.25), with the CNR of the SE BOLD data (average coherence: 0.23) comparable to that of the 3T GE data. Repeated measurements in individual subjects find that maps acquired with 1.8-mm resolution at 3T and 7T with GE BOLD and at 7T with SE BOLD show no systematic differences in either the area or the boundary locations for V1, V2 and V3, demonstrating the feasibility of high-resolution SE BOLD experiments with good sensitivity throughout multiple visual areas.</td></tr></tbody></table>
<li id="item-15417" class="item journalArticle"><h2>Mapping the human cortical surface by combining quantitative t1 with retinotopy</h2><table><tbody><tr class="creator author"><th class="author">Author</th><td>Martin I Sereno</td></tr><tr class="creator author"><th class="author">Author</th><td>Antoine Lutti</td></tr><tr class="creator author"><th class="author">Author</th><td>Nikolaus Weiskopf</td></tr><tr class="creator author"><th class="author">Author</th><td>Frederic Dick</td></tr><tr class="volume"><th class="volume">Volume</th><td>23</td></tr><tr class="issue"><th class="issue">Issue</th><td>9</td></tr><tr class="pages"><th class="pages">Pages</th><td>2261-2268</td></tr><tr class="publicationTitle"><th class="publicationTitle">Publication</th><td>Cerebral cortex (New York, N.Y.: 1991)</td></tr><tr class="date"><th class="date">Date</th><td>Sep 2013</td></tr><tr class="DOI"><th class="DOI">DOI</th><td>10.1093/cercor/bhs213</td></tr><tr class="abstractNote"><th class="abstractNote">Abstract</th><td>We combined quantitative relaxation rate (R1= 1/T1) mapping-to measure local myelination-with fMRI-based retinotopy. Gray-white and pial surfaces were reconstructed and used to sample R1 at different cortical depths. Like myelination, R1 decreased from deeper to superficial layers. R1 decreased passing from V1 and MT, to immediately surrounding areas, then to the angular gyrus. High R1 was correlated across the cortex with convex local curvature so the data was first "de-curved". By overlaying R1 and retinotopic maps, we found that many visual area borders were associated with significant R1 increases including V1, V3A, MT, V6, V6A, V8/VO1, FST, and VIP. Surprisingly, retinotopic MT occupied only the posterior portion of an oval-shaped lateral occipital R1 maximum. R1 maps were reproducible within individuals and comparable between subjects without intensity normalization, enabling multi-center studies of development, aging, and disease progression, and structure/function mapping in other modalities.</td></tr></tbody></table>
<li id="item-4197" class="item journalArticle"><h2>Mechanisms underlying decoding at 7 T: Ocular dominance columns, broad structures, and macroscopic blood vessels in V1 convey information on the stimulated*

*eye</h2><table><tbody><tr class="creator author"><th class="author">Author</th><td>Amir Shmuel</td></tr><tr class="creator author"><th class="author">Author</th><td>Denis Chaimow</td></tr><tr class="creator author"><th class="author">Author</th><td>Guenter Raddatz</td></tr><tr class="creator author"><th class="author">Author</th><td>Kamil Ugurbil</td></tr><tr class="creator author"><th class="author">Author</th><td>Essa Yacoub</td></tr><tr class="url"><th class="url">URL</th><td>http://www.ncbi.nlm.nih.gov/pubmed/19715765</td></tr><tr class="publicationTitle"><th class="publicationTitle">Publication</th><td>NeuroImage</td></tr><tr class="date"><th class="date">Date</th><td>Aug 26, 2009</td></tr><tr class="DOI"><th class="DOI">DOI</th><td>10.1016/j.neuroimage.2009.08.040</td></tr><tr class="abstractNote"><th class="abstractNote">Abstract</th><td>Recent studies have demonstrated that multivariate machine learning algorithms applied to human functional MRI data can decode information segregated in cortical columns, despite the voxel size being large relative to the width of columns. The mechanism by which low spatial resolution imaging decodes information represented in a fine-scale organization is not clear. To investigate mechanisms underlying decoding signals we employed high-resolution gradient-echo BOLD functional MRI of visual area V1. We show that in addition to the fine-scale ocular dominance columns, coarse-scale structures extending over several millimeters also convey discriminative power for decoding the stimulated eye. Discriminative power is conveyed by both macroscopic blood vessels and gray matter regions. We hypothesize that gray-matter regions which drain into specific vessels may preferentially contain ocular-dominance columns biased towards one eye; the bias of a specific region thereby causing a functionally selective ocular-dominance response in the associated vessel. Our findings indicate that coarse-scale structures and macroscopic blood vessels contribute to decoding of the stimulated eye based on low-resolution multivariate data.</td></tr></tbody></table>
<li id="item-9242" class="item journalArticle"><h2>fMRI retinotopic mapping at 3 T: Benefits gained from correcting the spatial distortions due to static field inhomogeneity</h2><table><tbody><tr class="creator author"><th class="author">Author</th><td>Flor Vasseur</td></tr><tr class="creator author"><th class="author">Author</th><td>Chantal Delon-Martin</td></tr><tr class="creator author"><th class="author">Author</th><td>Cécile Bordier</td></tr><tr class="creator author"><th class="author">Author</th><td>Jan Warnking</td></tr><tr class="creator author"><th class="author">Author</th><td>Laurent Lamalle</td></tr><tr class="creator author"><th class="author">Author</th><td>Christoph Segebarth</td></tr><tr class="creator author"><th class="author">Author</th><td>Michel Dojat</td></tr><tr class="url"><th class="url">URL</th><td>http://www.journalofvision.org/content/10/12/30.abstract</td></tr><tr class="volume"><th class="volume">Volume</th><td>10</td></tr><tr class="issue"><th class="issue">Issue</th><td>12</td></tr><tr class="publicationTitle"><th class="publicationTitle">Publication</th><td>Journal of Vision</td></tr><tr class="date"><th class="date">Date</th><td>October 25 , 2010</td></tr><tr class="DOI"><th class="DOI">DOI</th><td>10.1167/10.12.30</td></tr><tr class="abstractNote"><th class="abstractNote">Abstract</th><td>fMRI retinotopic mapping usually relies upon Fourier analysis of functional responses to periodic visual stimuli that encode eccentricity or polar angle in the visual field. Generally, phase estimations are assigned to a surface model of the cerebral cortex and borders between retinotopic areas are eventually determined following ad hoc phase

analysis on the surface model. Assigning functional responses to a surface model of the cortex is particularly sensitive to geometric distortions of the 3D functional data due to static field inhomogeneity. Here, we assess and document the benefits gained from correcting the fMRI data for these effects, under standard experimental conditions (echo-planar imaging, 3.0-T field strength) and with well-chosen acquisition parameters (regarding slice orientation and phase-encoding direction). While it appears that, in the absence of correction, errors in the estimates of the borders between low-order visual areas do not then significantly exceed the variance of statistical origin, about half of the functional responses in a retinotopic experiment are misassigned to neighboring functional areas. Therefore, correction of the effects due to geometric distortions is important in any retinotopic mapping experiment and by extension in any fMRI experiment on the visual system.</td></tr></tbody></table>
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