



Ben Cipollini

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Research Projects (Advisor: Garrison Cottrell)

Using open data and open-source packages to investigate left-right asymmetries, using multivariate analyses to discover relationships amongst functional and anatomical asymmetries. Some datasets (e.g. PING) allow looking for genetic variants associated with these asymmetries; others (Human Connectome Project) allow relating interhemispheric interactions with functional and anatomical asymmetries.

<http://github.com/guruucsd/PING>

Developing biologically-informed models of spatial integration in sparse long-range lateral connectivity, using rate-coded models, focused on the relationship between the sparseness and spread of connections and the system's spatial frequency processing properties.

<http://github.com/guruucsd/DifferentialEncoding>

Applying models of long-range lateral connections to lateralization in visual processing, using rate-coded models. Focused on explaining data in local/global processing (Sergent, 1982), spatial frequency grating classification (Christman et al., 1991; Kitterle et al., 1992), and face processing (Young and Bion, 1981) from asymmetries in the average distance of connections.

<http://github.com/guruucsd/PING>

Developing biologically-informed models of interhemispheric transfer, focusing on the corpus callosum. This includes rate-coded models with temporal delays (e.g. Ringo et al., 1994) as well as polychronous spiking neural networks (Izhikevich, 2005).

<http://github.com/guruucsd/NoisyCC>

Using allometric analyses to examine interhemispheric connectivity across species, using data (electron and light microscopy, MRI) parsed from figures in the literature.

<http://github.com/guruucsd/CallosalScaling>

Education

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| 2007–2014 | Ph.D, specialization in human origins , <i>UC San Diego</i> , La Jolla, CA.
Cognitive Science Department |
| 2007–2010 | Masters of Science in Cognitive Science , <i>UC San Diego</i> , La Jolla, CA.
Cognition Science Department |
| 2004–2005 | Non-degree study , <i>Yoshida Nihongo Gakuin</i> , Tokyo, Japan.
Japanese language study; achieved JLPT level 3 |
| 2003–2004 | Non-degree study , <i>University of Washington</i> , Seattle, WA.
Focus in cognitive psychology |
| 1994–1998 | Bachelor of Science, Computer Science , <i>Lehigh University</i> , Bethlehem, PA.
Minors in philosophy, astronomy, physics |

Research Work Experience

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| July 2014–present | Post-doctoral Researcher , <i>UC San Diego</i> , La Jolla, CA, PI: Dr. Garrison Cottrell.
Continued Ph.D work on lateralization in visual processing. Implemented model to examine interactions between lateralization and interhemispheric communication. Applied multivariate analyses (PCA, partial correlation) for inter-relating anatomical asymmetries. Developed 3D browser-based visualizations for cortex surface data, contributed to Python packages for neuroimaging. |
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- Dec. 2009–June 2014 **Graduate Student**, *UC San Diego*, La Jolla, CA, PI: Dr. Garrison Cottrell.
Developed a biologically-informed, rate-coded neural network model of sparse, long-range lateral (“patchy”) connectivity. Used the model to explain asymmetry in visual processing and showed that the model may appear during typical development. Developed neural network and cross-species regression (“allometric”) models of interhemispheric connectivity and its relationship to functional lateralization.
- Feb. 2007–Sept. 2007 **Research Assistant**, *UC San Diego*, La Jolla, CA, PI: Dr. Eric Halgren.
Assisted in MATLAB programming to compute surface-based statistics of magnetoencephalography (MEG), developed face stimuli, and created movies of activity.
- Nov. 2005–Feb. 2007 **Research Assistant**, *UC San Diego*, La Jolla, CA, PI: Dr. Lourdes Anllo-Vento.
Used MATLAB to create processing stream of 2D joystick data in sync with electroencephalography (EEG) processing. Developed suite of analyses to visualize the processed data and EEG correlates. Used NBS Presentation software to develop a visual working memory task, and helped cap and run subjects.
- Sept. 2003–Feb. 2004 **Volunteer**, *University of Washington*, Seattle, WA, PI: Dr. David Corina.
Used SPM2 to process function magnetic resonance imaging (fMRI) results of comparisons between perception of American Sign Language (ASL), gesture, and motor movement.
- June 2003–Sept. 2003 **Volunteer**, *University of Washington*, Seattle, WA, PI: Dr. Jaime Olavarria.
Performed animal care, tracer injections, and post-mortem processing and mounting of rodent brains in experiments analyzing the development of rodent V1 and V2.

Non-Research Work Experience

- Mar. 2013–Apr. 2014 **Software Developer, Software Development Lead & Implementations Liaison**, *Foundation for Learning Equality*, La Jolla, CA.
Helped develop an efficient local web server for local access to Khan Academy videos, exercises, and learning paradigm. Led effort to deliver the system to the Idaho Department of Correction as part of the “Khan in Idaho” program. Organized software team, led prioritization, scheduling, development and quality control for team.
- June 2012–Sept. 2012 **Summer Internship**, *Brain Corporation*, San Diego, CA, CEO: Dr. Eugene Izhikevich.
Obtained patent for work on spiking neural network of optic flow. Worked collaboratively to use Webots framework and Python to implement and test PI² algorithm (Theodorou et al., 2010).
- Oct. 2006–Mar. 2010 **Owner/Operator**, *DODTracker.com*, La Jolla, CA.
Created an aggregator website for “tracking” daily deals. As of March 2010, was the top “deal of the day” aggregator site on the web. Sold site to Internet Brands, effective March 31, 2010.
- Jan. 2004 - Jun. 2005 **English Language Tutor**, *GlobalChat Corp.*, Tokyo, Japan.
Provided private English lessons and conversation to native Japanese speakers. Developed a website containing customized curriculum. Also used an existing book-based curriculum.
- Oct. 2001–Feb. 2003 **Software Developer in Test**, *Microsoft Corp.*, Redmond, WA, SQL Server.
Guided protocol test team of 6 direct reports. Responsible for setting and achieving team goals, for guiding career development of direct reports, and of providing technical leadership to team.
- June 1999–Sept. 2001 **Software Developer in Test**, *Microsoft Corp.*, Redmond, WA, Exchange Server.
Developed test automation and applications for the HTTP/DAV web protocol and document storage engine. Projects included web crawling engine and server event log aggregator.

Publications & Patents

Journal Publications

Wang, P., Malave, V., Cipollini, BN. (accepted) Encoding Voxels with Deep Learning. *Journal of Neuroscience* .

Shen, K., Misic, B., Cipollini, BN., Bezgin, G., Buschkuehl, M., Hutchison, RM., ... & Berman, M. G. (2015) Stable long-range interhemispheric coordination is supported by direct anatomical projections. *Proceedings of the National Academy of Sciences of the United States of America* 112(20), 6473.

Hsiao, JH, Cipollini, BN, Cottrell, GW. (2013) Hemispheric asymmetry in Perception: A Differential Encoding Account. *Journal of Cognitive Neuroscience* 25(7):998-1007.

Conference Publications

Cipollini, BN, Cottrell, GW. (2014) A Developmental Model of Hemispheric Asymmetries of Spatial Frequencies. In *Proceedings of the 36th Cognitive Science Society*. Austin, TX: Cognitive Science Society.

Cipollini, BN, Cottrell, GW. (2014) Patchy Connectivity and Visual Processing Asymmetries: A Neuro-developmental Hypothesis. In *Proceedings of the Neural Computation in Psychology Workshop 2014*. Lancaster, UK.

Cipollini, BN, Cottrell, GW. (2013) Uniquely human developmental timing may drive cerebral lateralization and interhemispheric coupling. In *Proceedings of the 35th Cognitive Science Society 2013*. Austin, TX: Cognitive Science Society.

Cipollini, BN, Hsiao, JH, Cottrell, GW. (2012) Connectivity Asymmetry Can Explain Visual Hemispheric Asymmetries in Local/Global, Face, and Spatial Frequency Processing. In *Proceedings of the 34th Cognitive Science Society*. Austin, TX: Cognitive Science Society.

Patents

Cipollini, BN, Ibarex, B, Izhhikevich, E. (2012) Apparatus and Methods for Object Detection via Optical Flow Cancellation *Patent #13/689,717* Submitted Nov. 29, 2012.

Open-source Software Contributions

- 2014–2015 **nilearn (Python)**, a library for machine learning in neuroimaging., I made nilearn Python 2/3 compatible, wrote the neurovault downloader, and contributed to examples and documentation., <http://github.com/nipy/nilearn>.
- 2015 **nibabel (Python)**, a library for reading and writing neuroimaging formats., I contributed refactoring the codebase to work for surface-based information (GIFTI), and am helping implement GIFTI format reading (from the Human Connectome Project). Also contributed a number of bugfixes., <http://github.com/nipy/nibabel>.
- 2015 **nipype (Python)**, a library for executing numerous neuroimaging tools from a common Python script interface., I led the effort to implement Python 3 support., <http://github.com/nipy/nipype>.
- 2015 **nidata (Python)**, a library for curating publicly available neuroimaging data with documentation, methods for downloads, and examples., I founded the project, created the object model, migrated existing work from nilearn to the project, discovered, documented and added new data sources., <http://github.com/nidata/nidata>.
- 2013–2014 **ka-lite (Python)**, an open-source, offline-capable web server that shows and tracks progress on Khan Academy educational materials., I contributed to the server UI, user tracking software, remote data sharing and reporting, and data mining. I also re-architected the interaction between the data collection server and remote syncing server, <http://github.com/learningequality/ka-lite>.

Presentations, Posters, & Workshops

Presentations

- June 2, 2015 **Exploring Anatomy and Genetics of Cortical Asymmetry**, *iSLC 2015*, Lancaster, UK, <http://www.psych.lancs.ac.uk/ncpw14/>.
- May 14, 2015 **Exploring Anatomy and Genetics of Cortical Asymmetry**, *PEN XXX*, St. Petersburg, FL.
- August 22, 2014 **A developmental approach to long-distance connectivity**, *NCPW14*, Lancaster, UK, <http://www.psych.lancs.ac.uk/ncpw14/>.

- July 29, 2014 **A Developmental Model of Hemispheric Asymmetry of Spatial Frequencies.**, *Cognitive Science Society Annual Meeting*, Quebec City, Canada, <https://mindmodeling.org/cogsci2014/>.
- November 7, 2013 **Rethinking callosal connectivity in humans: review and exploration of the existing data and theories**, *PEN Meeting XXVII*, Nashville, TN.
- August 3, 2013 **Uniquely human developmental timing may drive cerebral lateralization and interhemispheric coupling**, *Cognitive Science Society Annual Meeting*, Berlin, Germany.
- April. 14, 2013 **Uniquely human developmental timing may drive cerebral lateralization and interhemispheric coupling**, *PEN Meeting XXVI*, Pittsburgh, PA.
- Feb. 6, 2013 **“Patchy” Connectivity and Lateralized Visual Processing: A Neurodevelopmental Hypothesis**, *CMU Cognitive Neuroscience Lab*, Carnegie Mellon University; Pittsburgh, PA.
- July 13, 2012 **Sparse connectivity asymmetry in an autoencoder can explain visual hemispheric asymmetries in local/global, face, and spatial frequency processing**, *NCPW13*, San Sebastian, Spain, <http://www.bcbl.eu/events/ncpw13/en/conference/>.
- April 27, 2012 **“Patchy” Connectivity in Visual Processing Asymmetry: A Neurodevelopmental Hypothesis**, *PEN Meeting XXIV*, Chicago, IL.
- April 20, 2012 **Visual Processing Asymmetry**, *CARTA Student Symposium*, La Jolla, CA.
- April 5, 2012 **What is Human?**, *TDLC Trainee Dinner*, La Jolla, CA.
- April 27, 2011 **Cross-Callosum Coincidence: Bridging the Hemispheric Gap**, *PEN Meeting XXII*, Nashville, TN.
- May 01, 2010 **An Explanation of Lateralized Local/Global Processing via Differential Columnar Connectivity**, *2010 Cognitive Neuroscience Annual Spring Retreat*, La Jolla, CA, <http://inc2.ucsd.edu/2010retreat/index.html>.
- Mar. 02, 2010 **The Physiology of Lateralization: Reviewing Why Brain Size REALLY Matters**, *Center for Research in Language*, La Jolla, CA, <http://crl.ucsd.edu/talks/abstract/20100302.html>.
- Oct. 17, 2009 **Hemispheric Model of Visual Processing**, *PEN Meeting XIX*, Pittsburgh, PA.

Posters

- Oct. 25, 2015 **[interactive] Exploring the anatomy and genetics of cortical asymmetries in surface area and thickness**, *Society for Neuroscience*, Chicago, IL, <http://cseweb.ucsd.edu/~bcipolli/docs/posters/SfN2015/>.
- Jan. 25, 2015 **Implementing RSA Spotlight in Python to understand asymmetry in visual processing**, La Jolla, CA, <http://tdlc.ucsd.edu/events/all-hands-meeting-2015-overview.html>.
- Nov. 18, 2014 **[interactive] A developmental approach to long-distance connectivity and interhemispheric collaboration**, *Annual Meeting of the Society for Neuroscience 2014*, Washington, DC, <http://cseweb.ucsd.edu/~bcipolli/docs/SfN2014/>.
- Nov. 17, 2014 **Interhemispheric functional connectivity is not selectively reduced in larger-brained species**, *Annual Meeting of the Society for Neuroscience 2014*, Washington, DC.
- May 18, 2014 **Further evidence that connectivity differences may drive lateralization of visual processing**, *Vision Science Society Annual Meeting*, St. Petersburg, FL, http://visionsciences.org/abstract_detail.php?id=1132.
- Sept. 26, 2013 **Interhemispheric connectivity endures across species, as exposed by allometric regression.**, *Bernstein Conference 2013*, Tübingen, Germany, <https://portal.g-node.org/abstracts/bc13/#/doi/nmcn.bc2013.0047>.
- May 20, 2013 **A role for differences in long-range lateral connections in visual processing asymmetries**, *Vision Science Society Annual Meeting*, Naples, FL.

- Jan. 27, 2013 **Uniquely human developmental timing may drive cerebral lateralization and interhemispheric coupling**, *TDLC All-Hands Meeting*, La Jolla, CA, <http://tdlc.ucsd.edu/events/all-hands-meeting-2013-location-etc.html>.
- Oct. 13, 2012 **A role for differences in long-range lateral connections in the development and dynamic engagement of visual processing asymmetries**, *Annual Meeting of the Society for Neuroscience 2012*, New Orleans, Louisiana, USA, <http://www.abstractsonline.com/Plan/ViewAbstract.aspx?sKey=6b94ccf6-1e35-49a3-9806-4bd0f61f3bc6&cKey=c07b8b39-8f78-4c41-af11-34daf291d26d&mKey=%7b70007181-01C9-4DE9-A0A2-EEBFA14CD9F1%7d>.
- Aug. 3, 2012 **Connectivity Asymmetry Can Explain Visual Hemispheric Asymmetries in Local/Global, Face, and Spatial Frequency Processing**, *Annual Meeting of the Cognitive Science Society 2012*, Sapporo, Hokkaido, Japan, <http://cognitivesciencesociety.org/conference2012/submissions.html>.
- June. 2, 2012 **Receptive fields, sparsity, and frequency filtering**, *Joint Symposium on Neural Computation 2012*, UC Riverside.
- Jan. 27, 2012 **A Computational Exploration of Interhemispheric Integration**, *TDLC All-Hands Meeting*, La Jolla, CA, <http://tdlc.ucsd.edu/events/all-hands-meeting-2012-location-etc.html>.
- May 22, 2010 **Lateralized Local/Global Processing via Differential Columnar Connectivity**, *17th Joint Symposium on Neural Computation*, Los Angeles, CA, <http://www.jsnc.caltech.edu/program.html>.
- Jan. 22, 2010 **Hemispheric Model of Visual Processing Asymmetry**, *TDLC All-Hands Meeting*, La Jolla, CA, <http://tdlc.ucsd.edu/events/all-hands-meeting-2010-location-etc.html>.

Workshops

- August 15, 2015 **Neuroimaging analysis using open data in Python**, *TDLC Boot Camp 2015*, La Jolla, CA, <http://tdlc.ucsd.edu/events/boot-camp-2015-schedule.html>.
- August 10, 2015 **Introduction to Open Scientific Programming in Python**, *TDLC Boot Camp 2015*, La Jolla, CA, <http://tdlc.ucsd.edu/events/boot-camp-2015-schedule.html>.
- April. 23, 2012 **Morality in Science**, *iSLC Workshop*, La Jolla, CA, <http://2012.nsf-islc.org/schedule>.

Science Outreach

Public Lectures

- November 19, 2015 **I've Got Big Data on my Half-Mind**, *San Diego Wet Lab*, San Diego, CA, <https://thewetlablog.wordpress.com/2015/11/13/ive-got-big-data-on-my-half-mind-with-dr-ben-cipollini-ucsd/>.
- November 2, 2015 **A Mostly True History of the Human Half-Brain**, *San Diego Wet Lab*, La Jolla, CA, <https://thewetlablog.wordpress.com/2015/10/27/a-mostly-true-history-of-the-human-half-brain-with-dr-ben-cipollini-ucsd/>.

Contributed Blog Posts

- November 12, 2015 **I built an interactive, dynamic poster for SfN2015; here's why and how.**, *NeuWriteSD*, <http://neuwritesd.org/2015/11/12/i-built-an-interactive-dynamic-poster-for-sfn-2015-heres-why-and-how/>.
- October 22, 2015 **Deep neural networks help us read your mind.**, *NeuWriteSD*, <http://neuwritesd.org/2015/10/22/deep-neural-networks-help-us-read-your-mind/>.
- July 10, 2015 **Got a computer? We have data. Let's do neuroscience!**, *NeuWriteSD*, <http://neuwritesd.org/2015/07/10/got-a-computer-we-have-data-lets-do-neuroscience/>.

Awards & Funding

2015	Temporal Dynamics of Learning Young Investigator Award.
2014	Rumelhart Travel Award (for the NCPW 2014 Conference)
2014	Best Perception and Action Modeling Paper. See http://cognitivesciencesociety.org/conference2014/prizes.html
2014	Cognitive Science Society Glushko Travel Award. See http://cognitivesciencesociety.org/conference2014/prizes.html
2013	Cognitive Science Society Glushko Travel Award. See http://cognitivesciencesociety.org/conference2013/prizes.html
2010-2013	CARTA Fellow: For tuition, fees, and stipend. See http://carta.anthropogeny.org/training/specialization-track/carta-fellowship
1998	Lehigh University Dean's Scholarship: For tuition to continue education 1 year beyond undergraduate graduation date.

Teaching Experience & Advising

Teaching Assistant

Spring 2010	TA , <i>COGS 17: Neurobiology of Cognition</i> , UCSD, with Dr. Christine Johnson.
Fall 2009	TA , <i>COGS 17: Neurobiology of Cognition</i> , UCSD, with Dr. Mary Boyle.
Summer 2009	TA , <i>COGS 11: Minds and Brains</i> , UCSD, with Dr. Mary Boyle.
Summer 2009	TA , <i>COGS 3: Introduction to Computing</i> , UCSD, with Dr. Mary Boyle.
Winter 2009	TA , <i>COGS 107B: Systems Neuroscience</i> , UCSD, with Dr. Douglas Nitz.
Fall 2008	TA , <i>COGS 143: Animal Cognition</i> , UCSD, with Dr. Christine Johnson.
Summer 2008	TA , <i>COGS 17: Neurobiology of Cognition</i> , UCSD, with Dr. Christine Johnson.
Spring 2008	TA , <i>COGS 101C: Language and Memory</i> , UCSD, with Dr. Seana Coulson.
Winter 2008	TA , <i>COGS 1: Introduction to Cognitive Science</i> , UCSD, with Dr. Silvia Paparello.

Guest Lectures

April. 16, 2013	Origins of Asymmetry: Comparative and evolutionary perspectives , <i>Hemispheric Lateralization</i> (instructor: Dr. Marlene Behrmann), Carnegie Mellon University, Pittsburgh, PA.
Feb. 6, 2013	The Corpus Callosum may drive cerebral lateralization in humans , <i>Hemispheric Lateralization</i> (instructor: Dr. Marlene Behrmann), Carnegie Mellon University, Pittsburgh, PA.
Winter 2010	Mind Reading , <i>Introduction to Neuroscience</i> (instructor: Dr. Christine Johnson), UC San Diego, La Jolla, CA.

Undergraduate Student Advising

2014-present	Mentor , <i>Undergraduate Research Project</i> , of Vishaal Prasad.
2009-2010	Graduate Student Advisor , <i>Undergraduate Honors Project</i> , of Edmond Yee.

High School Mentoring

2015-present	Mentor , <i>Mentor Assist Program</i> , I am mentoring 13 high students—4 working with me on open-source, open-data research projects; 9 working on their own coding projects..
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Professional and Department Service

2009-2013	Founded and organized department peer mentorship program
2009-2010	Department student representative to the faculty

2008-2009

Department student representative for the Graduate Student Association