G. William Chapman IV

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Summary

R&D Scientist |Neuromorphic Computing & AI Hardware Co-Design PhD-level researcher with 6+ years of experience designing hardware-constrained AI algorithms. Proven track record of leading cross-functional teams (up to 9 members) and securing $4M in funding to drive innovation in edge computing. Expert in bridging theoretical neuroscience and energy-efficient microelectronics, achieving 95% energy reduction in remote sensing applications through analog computation. Pioneered methods for Physics-Informed Neural Networks (PINNs) to solve petascale spatiotemporal challenges.

Research Experience

- **Sandia National Laboratories** — Albuquerque, NM
  Postdoctoral Fellow, Neuromorphic Computing — *2023 – Present*
  - Developed hardware-constrained algorithms for object tracking for remote sensing applications. Achieved beyond state-of-the-art streaming algorithm performance, while also reducing energy consumption by over 95% through the design of analog computational elements.
  - Implemented hardware-aware methods for highly quantized activations and weights in transformer models. Utilized these methods to enable on-device inference of xLM networks with minimal loss in performance.
  - Designed hybrid local-distributed algorithms enabling GPS-free localization and mapping on heterogeneous architectures. Incorporating local learning rules and reinforcement learning for real-time edge-deployment and pursuit tasks.
  - Created methods for combining recurrent, graph, and physics informed neural networks to increase scalability of spatiotemporal data prediction. Applied to petascale datasets.
  - Funding: As principal investigator, secured four intramural and extramural grants totaling approximately $4M of funding for research on neuromorphic computing, microelectronics, and artificial intelligence.
  - Leadership: Lead multiple teams ranging from four to nine members of varying seniority. Provided technical and professional mentorship to junior researchers. Several projects involved coordinating multi-institutional research and deliverables.
- **Boston University** — Boston, MA
  Graduate Researcher — *2018 – 2023*
  - Biological Predictive Coding: I created a novel, biologically inspired, machine learning architecture and learning rule for temporal prediction. This network performs above state-of-the-art for both short-term and long-term time series prediction, with applications for lifelong learning, and on-device learning.
  - Egocentric-Allocentric Transformations: I designed an explainable ML model which receives self-centered sensor and motor information, fusing sensor information through recurrent hidden layers. Hidden layers create explicit reference-frame transformations, in addition to low-dimensional latent representations.
- **eCortex** — Boulder, CO
  Neural Modeler — *2016 – 2018*
  - Extended academic research efforts in biologically-inspired algorithms for commercial and government clients.
  - I created computational models of hyperdimensional-computing-based working memory for symbolic processing and composable AI, utilizing attentional mechanisms.
  - Designed and ran corresponding EEG experiments to test model predictions. Created novel causal frequency-time analyses to determine time-course causal interactions.
- **Conte Center for Systems Neuroscience** — Boston, MA
  Research Software Engineer — *2012 – 2016*
  - Built cross-lab software platforms for standardized neural and behavioral data analysis, now adopted by 6+ independent research groups.
  - Implemented data pipelines and SQL databases integrating multimodal neural data, automated via cloud frameworks.
  - Served as primary statistical analyst on advanced methods (time-series modeling, generalized linear models, dynamical systems modeling), supporting multiple high-impact publications.

Education

- **Boston University** — Boston, MA
  Doctor of Philosophy - Computational Neuroscience — *2023*
- **University of Colorado** — Boulder, CO
  Master of Arts - Cognitive Neuroscience — *2018*
- **Boston University** — Boston, MA
  Bachelor of Science - Biomedical Engineering & Electrical Engineering — *2012*

Skills

- Research Expertise: Machine Learning, Deep Learning, AI & xLM, Physics Informed Neural Networks, Reinforcment Learning, Spatiotemporal Data, Dynamical Systems, Circuit Design
- Languages: Python, MATLAB, Bash, C++, SQL, LaTeX, SPICE
- Frameworks: PyTorch, TensorFlow, Scikit Learn, Pandas, Numpy, Slurm, Dask, SGE, Git, AWS

Research Projects Lead

- **Physical Hardware Yielding Smart Integrated Computing Systems** — $2,400,000
  LDRD Computing Systems — *2025-2028*
- **Systems-Technology Co-Optimization of Ferroelectric Devices** — $270,000
  LDRD Computing Systems — *2025-2028*
- **Harnessing Temporal Elements for Enhanced Physical Neural Networks** — $270,000
  LDRD Computing Systems — *2025-2028*
- **Relative Encodings for Robust Allocentric Mapping and Estimation** — $1,050,000
  Department of Energy, Advanced Scientific Computing and Research — *2024-2027*

Research Proposals Contributed To

- **Individualized Scientific Targets to Inspire Neuromorphic Computing (Role: S&K)** — $6,000,000
  LDRD: Advanced Science and Technology; PI: Frances Chance — *2025-2028*
- **Magneto-Electric Dendrites Using Shape Anisotropy (Role: S&K)** — $1,120,000
  LDRD: Nanodevices and Microsystems; PI: Chris Bennett — *2025-2027*

Mentorship

- Distinguished Mentorship Award, for outstanding mentorship of graduate students, July 2025.
- All trainees listed below were graduate students under my supervision at the time of mentorship; current positions are provided.

Name	Current Position	Dates
Amanda Merkley	Computer Engineering, Carnegie Melon (PhD)	2025 - Present
James Boyle	Computer Architecture, UT Austin (PhD)	2024 - Present
Sarah Luca	Applied Math, University of Arizona (PhD)	2024 - Present
Martha T. Gahl, PhD	General Atomics	2024 - 2025
Trung Le	Computer Science, University of Washington (PhD)	2023 - 2024

Professional Service & Outreach

- **East Mountain Robotics Club**: Founded a middle-school based after school robotics club to teach the fundamentals of programming and internet-of-things (2024 - Present)
- **STEAM Summer Camp**: Led middle school students in a summer-long program to introduce the fundamentals of engineering, through robotic construction and entry-level programming.
- **Program Committee**: Neuro-Inspired Computational Elements (NICE) (2024-Present); International Conference on Neuromorphic Computing Systems (ICONS) (2024-Present); Research Software Engineering (RSE) (2024-Present);
- **Invited Reviewer**: Neural Networks (2018 - Present); Neural Information Processing Systems (NeurIPS) (2019 - Present); International Conference on Learning Representations (ICLR) (2020 - Present); Journal of Computational Neuroscience (2025 - Present); Journal of Neural Engineering (2025 - Present);
- **Academic Planning Committee**: Representative on a small panel of faculty responsible for overseeing and approving changes in undergraduate and graduate degree program requirements (2018 - 2020)

Teaching Experience

- **Boston University** — Boston, MA
  Teaching Fellow: Cognitive Neuroscience, Learning and Memory, Psychopharmacology — *2018 – 2020*
- **University of Colorado** — Boulder, CO
  Teaching Fellow: Advanced Cognitive Neuroscience & Research Methods — *2016 – 2018*
- **Boston University** — Boston, MA
  Teaching Assistant: Biomedical Instrumentation I & II — *2011 – 2012*

Patents

PT1 ‡ S. Luca, F. S. Chance, C. Teeter, and G. W. Chapman, "Mitigating Weight Decay In Neural Networks Using Context Modulation".

PT2 F. S. Chance, S. Agarwal, T. P. Xiao, N. Gilbert, J. A. Boyle, and G. W. Chapman, "Dynamic Gain Control in Image Sensor Pixel Arrays". Patent Application 19/404,517, November 2025.

‡: Mentee first or co-first author

Submissions in Review & Preprints

1 ‡ S. Luca, T. P. Xiao, F. Chance, S. Agarwal, C. Teeter, and G. W. Chapman, "Learned adaptive properties for weight noise mitigation in embedded spiking networks," 2025 (In Review)

2 G. W. Chapman, J. D. Smith, C. Teeter, and N. D. Jackson, "Graph Reservoir Networks for Prediction of Spatiotemporal Systems," 2025 (In Review)

3 F. S. Chance and G. W. Chapman, "Insect Neuroscience for Artificial Intelligence," 2025 (In Review)

4 P. Megginson, M. Vadlamani, J. Jia, G. W. Chapman, S. Cardwell, and S. Yu, "Charge-Domain Leaky-Integrate-and-Fire Neuron with Tunable Parameters Using Ferroelectric Non-Volatile Capacitors." (In Review)

5 G. W. Chapman, T. P. Xiao, C. Teeter, S. Agarwal, and F. S. Chance, "Stateful Dynamics for Edge-Efficient Binary Activation Recurrent Neural Networks," 2025 (In Revision)

6 ‡ A. Merkley, F. S. Chance, and G. W. Chapman, "Redundant and Synergistic Information flow in Neural Populations During Navigation," Sept. 2025 (In Preparation)

Peer Reviewed Publications

7 ‡ G. W. Chapman, M. T. Gahl, W. S. Wahby, C. Teeter, F. S. Chance, S. Agarwal, and T. P. Xiao, "Spiking Neural Networks for Efficient Streaming Event Detection," 2025 (Accepted; Government Microcircuit Applications & Critical Technology, March 2026)

8 ‡ G. W. Chapman, J. A. Boyle, N. Gilbert, T. P. Xiao, S. Agarwal, and F. S. Chance, "Lateral Divisive Inhibition for Dynamic Gain Control," in *International Conference on Neuromorphic Systems*, (Bellevue, WA), Aug. 2025

9 G. W. Chapman and F. S. Chance, "Embedded Neurally Inspired Visual Processing," in *Proceedings of the Great Lakes Symposium on VLSI 2025*, (New Orleans LA USA), pp. 893–897, ACM, June 2025

10 G. W. Chapman, A. S. Alexander, F. S. Chance, and M. E. Hasselmo, "Self-Supervised Mapping and Localization by Predictive Learning," in *International Conference on Neuromorphic Systems*, Aug. 2024

11 G. W. Chapman, C. Teeter, S. Agarwal, T. P. Xiao, P. Hays, and S. S. Musuvathy, "Biological Dynamics Enabling Training of Binary Recurrent Networks," in *2024 Neuro Inspired Computational Elements Conference (NICE)*, pp. 1–7, Apr. 2024

12 G. W. Chapman and M. E. Hasselmo, "Predictive Learning by a Burst-Dependent Learning Rule," *Neurobiology of Learning and Memory*, p. 107826, 2023

13 A. S. Alexander, J. C. Tung, G. W. Chapman, A. M. Conner, L. E. Shelley, M. E. Hasselmo, and D. A. Nitz, "Adaptive Integration of Self-Motion and Goals in Posterior Parietal Cortex," *Cell reports*, vol. 38, no. 10, p. 110504, 2022

14 L. C. Carstensen, A. S. Alexander, G. W. Chapman, A. J. Lee, and M. E. Hasselmo, "Neural Responses in Retrosplenial Cortex Associated with Environmental Alterations," *iScience*, vol. 24, p. 103377, Nov. 2021

15 M. E. Hasselmo, A. S. Alexander, A. Hoyland, J. C. Robinson, M. J. Bezaire, G. W. Chapman, A. Saudargiene, L. C. Carstensen, and H. Dannenberg, "The Unexplored Territory of Neural Models: Potential Guides for Exploring the Function of Metabotropic Neuromodulation," *Neuroscience*, p. S0306452220302141, Apr. 2020

16 A. S. Alexander, J. C. Robinson, H. Dannenberg, N. R. Kinsky, S. J. Levy, W. Mau, G. W. Chapman, D. W. Sullivan, and M. E. Hasselmo, "Neurophysiological Coding of Space and Time in the Hippocampus, Entorhinal Cortex, and Retrosplenial Cortex," *Brain and Neuroscience Advances*, vol. 4, p. 239821282097287, Jan. 2020

17 J. R. Hinman, G. W. Chapman, and M. E. Hasselmo, "Neuronal Representation of Environmental Boundaries in Egocentric Coordinates," *Nature Communications*, vol. 10, p. 2772, Dec. 2019

18 A. S. Alexander, L. C. Carstensen, J. R. Hinman, F. Raudies, G. W. Chapman, and M. E. Hasselmo, "Egocentric Boundary Vector Tuning of the Retrosplenial Cortex," *Science Advances*, July 2019

19 C. K. Monaghan, G. W. Chapman, and M. E. Hasselmo, "Systemic Administration of Two Different Anxiolytic Drugs Decreases Local Field Potential Theta Frequency in the Medial Entorhinal Cortex without Affecting Grid Cell Firing Fields," *Neuroscience*, vol. 364, pp. 60–70, 2017

20 J. R. Hinman, M. P. Brandon, J. R. Climer, G. W. Chapman, and M. E. Hasselmo, "Multiple Running Speed Signals in Medial Entorhinal Cortex," *Neuron*, vol. 91, no. 3, pp. 666–679, 2016

21 M. Ferrante, C. F. Shay, Y. Tsuno, G. W. Chapman, and M. E. Hasselmo, "Post-Inhibitory Rebound Spikes in Rat Medial Entorhinal Layer II/III Principal Cells: In-Vivo, In-Vitro, and Computational Modeling Characterization," *Cerebral Cortex*, vol. 27, no. March, 2016

22 F. Raudies, M. P. Brandon, G. W. Chapman, and M. E. Hasselmo, "Head Direction Is Coded More Strongly than Movement Direction in a Population of Entorhinal Neurons," *Brain Research*, vol. 1621, pp. 355–367, Sept. 2015

23 A. L. Jefferson, K. A. Gifford, S. Damon, G. W. Chapman, D. Liu, J. Sparling, V. Dobromyslin, and D. Salat, "Gray & White Matter Tissue Contrast Differentiates Mild Cognitive Impairment Converters from Non-Converters," *Brain Imaging and Behavior*, vol. 9, pp. 141–148, June 2015

24 Y. Tsuno, G. W. Chapman, and M. E. Hasselmo, "Rebound Spiking Properties of Mouse Medial Entorhinal Cortex Neurons in Vivo.," *The European journal of neuroscience*, vol. 42, pp. 2974–2984, Jan. 2015

25 K. Gifford, D. Liu, S. M. Damon, G. W. Chapman, R. R. Romano, L. R. Samuels, Z. Lu, and A. L. Jefferson, "Subjective Memory Complaint Only Relates to Verbal Episodic Memory Performance in Mild Cognitive Impairment," *Journal of Alzheimer's Disease*, vol. 44, pp. 309–318, Jan. 2015

26 C. F. Shay, M. Ferrante, G. W. Chapman, and M. E. Hasselmo, "Rebound Spiking in Layer II Medial Entorhinal Cortex Stellate Cells: Possible Mechanism of Grid Cell Function," *Neurobiology of Learning and Memory*, 2015

Book Chapters

BK1 M. E. Hasselmo, J. C. Robinson, P. A. LaChance, L. K. Wilmerding, and G. W. Chapman, "Coding of Space and Time for Memory Function," in *Time, Space and Memory*, Oxford University Press, 2024

Invited Talks

IT1 G. W. Chapman, "Intracellular dynamics for mixed signal neuromorphic computation," Georgia Institute of Technology, Atlanta, GA, Feb. 2026.

IT2 G. W. Chapman, "Automated Optimization for Analog AI Accelerator Design,", Georgia Institute of Technology Research Forum, Atlanta GA, November 2025.

IT3 G. W. Chapman, "How AI is Changing Circuit Design," , HBCU CHIPS Network Conference, Washington D.C. DC USA, Apr. 2025

IT4 G. W. Chapman and F. S. Chance, "Embedded neurally inspired visual processing," invited Talk, Great Lakes VLSI Conference, June 2025

IT5 G. W. Chapman, "Beyond Spikes: Dendritic Dynamics for Intracellular Processing," , International Conference on Neuromorphic Systems, July 2024

Other Conference Talks

CT1 G. W. Chapman, J. D. Smith, J. Mott, C. Teeter, and N. D. Jackson, "Graph Reservoir Networks for Prediction of Spatiotemporal Systems," , SIAM Conference on Dynamical Systems, May 2025

CT2 N. D. Jackson, G. W. Chapman, J. D. Smith, C. Teeter, J. Mott, L. Scuderi, and Z. Strasberg, "Chaotic Dynamics and Machine Learning for Medium-term Drought Prediction," , AGU Annual Meeting, Dec. 2025

CT3 J. D. Smith, G. W. Chapman, and N. D. Jackson, "Predictor Sensitivity and Variable Importance in Drought Forecasting," , SIAM Conference on Dynamical Systems, May 2025

CT4 N. D. Jackson, G. W. Chapman, J. D. Smith, C. Teeter, J. Mott, L. Scuderi, and Z. Strasberg, "Machine Learning and Reservoir Computing for Watershed-Scale Drought Prediction," , AGU Annual Meeting, Dec. 2024

CT5 G. W. Chapman, W. Wahby, T. P. Xiao, B. Feinberg, C. H. Bennett, S. Musuvathy, M. J. Marinella, and S. Agarwal, "CrossSim: A Hardware/Software Co-Design Tool for Analog In-Memory Computing (Tutorial)," , Neurally Inspired Computing Systems, San Diego, CA, Apr. 2024

CT6 G. W. Chapman and M. E. Hasselmo, "Trajectory Prediction in a Biologically Inspired Network," , From Neuroscience to Artificially Intelligent Systems, Cold Spring Harbor, Nov. 2020

CT7 G. W. Chapman, "A Model of Relational Reasoning through Selective Attention and Working Memory," , Memory Messabout, Boston, MA, Mar. 2019

CT8 G. W. Chapman, A. Gentile, N. Cantwell, V. Williams, D. Salat, and A. L. Jefferson, "White Matter Integrity in Entorhinal Cortex & Parahippocampal Region Is Associated with Memory Performances in Individuals with Mild Cognitive Impairment," , Annual Meeting of the International Neuropsychological Society, Boston, MA, Feb. 2010

Conference Abstracts & Posters

PO1 ‡ S. Luca, G. W. Chapman, T. P. Xiao, S. Agarwal, F. S. Chance, and C. Teeter, "Context modulation enables model robustness to weight noise in recurrent spiking neural networks," , International Conference on Neuromorphic Systems, Bellevue, WA, July 2025

PO2 G. W. Chapman, J. D. Smith, J. Mott, C. Teeter, and N. D. Jackson, "Graph Reservoir Networks for Prediction of Spatiotemporal Systems," poster, Conference on Data Analysis, Santa Fe NM USA, Mar. 2025

PO3 E. D. Cimino, X. Lin, G. W. Chapman, and A. S. Alexander, "Spatial Context Invariant Representations in the Retrosplenial Cortex," , Society for Neuroscience, Oct. 2024

PO4 G. W. Chapman, A. S. Alexander, F. S. Chance, and M. E. Hasselmo, "Self-Supervised Mapping and Localization by Predictive Learning," , Computational Cognitive Neuroscience, Aug. 2024

PO5 G. W. Chapman, S. Agarwal, T. P. Xiao, P. Hays, and S. Musuvathy, "Neurally-Inspired Spatiotemporal Processing with Analog In-Memory Compute," , Winter Workshop on Physical Computing, Jan. 2024

PO6 Z. Strasberg, L. Scuderi, N. D. Jackson, G. W. Chapman, J. D. Smith, C. Teeter, and J. Mott, "Developing Machine-Learning and Statistical Models for Western US Seasonal Precipitation Anomalies," , AGU Annual Meeting, Dec. 2024

PO7 E. D. Cimino, X. Lin X., G. W. Chapman, and A. S. Alexander, "Systematic Comparison of Receptive Field Properties Across a Distributed Egocentric Vector Cell Circuit," , Society for Neuroscience, Oct. 2024

PO8 A. S. Alexander, D. Sheehan, G. W. Chapman, and M. E. Hasselmo, "Spatial Memory Related Interactions between Rat Retrosplenial and Medial Entorhinal Cortices," , Society for Neuroscience, San Diego, California, Oct. 2022

PO9 L. C. Carstensen, A. Alexander, G. W. Chapman, and M. E. Hasselmo, "Representations of Landmarks in the Retrosplenial Cortex," , Society for Neuroscience, Chicago, Illinois, Oct. 2019

PO10 J. R. Hinman, G. W. Chapman, and M. E. Hasselmo, "Neuronal Representation of Egocentric Boundaries in Egocentric Coordinates," , Society for Neuroscience, San Diego, California, Oct. 2018

PO11 L. C. Carstensen, A. Alexander, J. R. Hinman, G. W. Chapman, and M. E. Hasselmo, "Spatial Correlates of the Retrosplenial Cortex during Free Exploration," , Society for Neuroscience, San Diego, California, Oct. 2018

PO12 A. Alexander, L. C. Carstensen, F. Raudies, G. W. Chapman, J. R. Hinman, and M. E. Hasselmo, "Retrosplenial and Entorhinal Cortical Representations during Visually-Based Triangulation," , Society for Neuroscience, San Diego, California, Oct. 2018

PO13 J. R. Hinman, G. W. Chapman, and M. E. Hasselmo, "Egocentric Representation of Environmental Boundaries in the Striatum," , Society for Neuroscience, Washington, DC, Oct. 2017

PO14 J. R. Hinman, G. W. Chapman, and M. E. Hasselmo, "Representation of Environmental Boundaries within an Egocentric Reference Frame," , Society for Neuroscience, San Diego, California, Oct. 2016

PO15 Y. Tsuno, G. W. Chapman, and M. E. Hasselmo, "In Vivo Rebound Spike Characteristics of Medial Entorhinal Cortex Cells," , Society for Neuroscience, Chicago, Illinois, Oct. 2015

PO16 C. K. Monaghan, G. W. Chapman, and M. E. Hasselmo, "Medial Septal Infusion of a Serotonin 1A Agonist Anxiolytic Reduces Theta Frequency in the Medial Entorhinal Cortex," , Society for Neuroscience, Chicago, Illinois, Oct. 2015

PO17 J. R. Hinman, J. R. Climer, G. W. Chapman, and M. E. Hasselmo, "A Novel Slow Oscillatory Neuron in the Lateral Septum," , Society for Neuroscience, Chicago, Illinois, Oct. 2015

PO18 C. F. Shay, M. Ferrante, G. W. Chapman, and M. E. Hasselmo, "Layer II Medial Entorhinal Cortex Stellate Cells in Rat Display Phase Specific Post Inhibitory Rebound Spiking," , Society for Neuroscience, Washington, DC, Nov. 2014

PO19 M. Ferrante, C. F. Shay, Y. Tsuno, G. W. Chapman, and M. E. Hasselmo, "Modeling Intrinsic and Extrinsic Mechanisms in Rat Entorhinal Cortex and Hippocampus That May Influence Grid and Place Cells," , Society for Neuroscience, Washington, DC, Nov. 2014

PO20 J. R. Climer, R. DiTullio, J. R. Hinman, G. W. Chapman, M. P. Brandon, M. E. Hasselmo, and U. T. Eden, "Addressing Theta Rhythmicity in Extracellularly Recorded Neurons in Rat and Bat," , Society for Neuroscience, Washington, DC, Oct. 2014

PO21 F. Raudies, M. P. Brandon, G. W. Chapman, and M. E. Hasselmo, "Movement Direction Is Not Coded by the Firing of Most Entorhinal Cells, but Required by Grid Cell Models," , Society for Neuroscience, San Diego, California, Oct. 2013

PO22 J. R. Hinman, M. P. Brandon, G. W. Chapman, and M. E. Hasselmo, "Speed Modulation of Medial Entorhinal Cortical Neurons During Medial Septal Inactivation," , Society for Neuroscience, San Diego, California, Oct. 2013

PO23 M. Ferrante, C. F. Shay, G. W. Chapman, M. Migliore, N. J. Kopell, H. Eichenbaum, and M. E. Hasselmo, "Modeling Intrinsic and Extrinsic Mechanisms in Rat Entorhinal Cortex and Hippocampus That May Influence Firing of Grid and Place Cells," , Society for Neuroscience, San Diego, California, Oct. 2013

PO24 G. W. Chapman, N. W. Schultheiss, M. P. Brandon, and M. E. Hasselmo, "Theta Cycle Skipping Relationships in the Medial Entorhinal Cortex Are Robust," , Society for Neuroscience, San Diego, California, Oct. 2013

PO25 K. A. Gifford, S. Damon, R. R. Romano, G. W. Chapman, and A. L. Jefferson, "Cognitive Complaints Are Related to Memory Performance in Older Adults with Mild Cognitive Impairment," Feb. 2013

PO26 G. W. Chapman, A. L. Jefferson, K. A. Gifford, J. Sparling, N. Cantwell, R. R. Romano, V. Dobromyslin, and D. Salat, "Grey-White Matter Contrast Ratio Relates to Progression in Mild Cognitive Impairment.," , Vancouver, British Columbia, July 2012

PO27 A. L. Jefferson, G. W. Chapman, J. Sparling, K. A. Gifford, B. Martin, V. Dobromyslin, and D. Salat, "Semi-Automated Method for Quantifying Infarcts in Older Adults with and without Dementia," Feb. 2012

PO28 M. Badaracco, K. A. Gifford, A. Gentile, G. W. Chapman, Y. Tripodis, and A. L. Jefferson, "The Relation of Hypertension to Cognition in Observational Studies: A Meta-Analysis," Feb. 2010