AMY RAE FOX

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As an **applied cognitive scientist**, I aim to cultivate virtuous cycles between applied and use-inspired basic research at the **intersection of cognition and computing.** Through my instructional, design and research practice, **I explore how, why, and to what effect humans use external representations as tools for thinking.**

EDUCATION

2022 **PhD in Cognitive Science**
University of California San Diego
Committee: James D. Hollan (Chair), David Kirsh, Philip Guo,
Caren Walker, William Bechtel, Mary Hegarty (UCSB), Arvind Satyanarayan (MIT)

2015 **MA in Interdisciplinary Studies — International Cognitive Visualization**
California State University, Chico (with distinction)
Committee: Martin Van Den Berg (Chair), Neil Schwartz, Erica de Vries, Wolfgang Schnotz

2015 **MSEd in Instructional Design**
(Master Sciences de L'Education Ingénierie de la Formation)
Université Pierre Mendès-France — Université Grenoble
Committee: Erica de Vries (Chair), Lucille Vacard, Laurent Lima

2009 **post-baccalaureate coursework**
Durham Technical Community College, Fayetteville State University
(undergraduate courses in: general, abnormal, cognitive psychology, sociology of disaster)

2004 **BSc Computer Science**
University of North Carolina at Chapel Hill
Morehead Scholar, Honors Program, Dean's List

RESEARCH EXPERIENCE

2022–2024 **Distinguished Postdoctoral Fellow, MIT**
Computer Science & Artificial Intelligence Laboratory (CSAIL), Visualization Group
graphical pragmatics, interactive visualization for exploratory data analysis
PI: Arvind Satyanarayan

2015-2022 **PhD Student Researcher, UC San Diego**
The Design Lab, Early Learning & Cognition Lab
graph comprehension, graphical discovery, scholarly information workflows
PI: Jim Hollan, PI: Caren Walker

2020 **Director of Research and User Experience, SpoonRead, Inc.**
Educational technology startup
evidence-driven design of mobile application for K-6 reading practice
Supervisor: Bob Glushko

summer 2016 **Cybersecurity Research Intern, US DoE Oak Ridge National Laboratory**
US Department of Homeland Security STEM Summer Internship
UX and visualization design for cybersecurity situational awareness application
PI: John Goodall

2013-2015 **Graduate Student Researcher, CSU Chico, Université Grenoble**
Cognitive Visualization Laboratory
diagrammatic reasoning, spatial construals of time, multimedia learning, forensic visualization
PI: Neil Schwartz, Erica de Vries

PROFESSIONAL EXPERIENCE

Through nearly ten years of post-graduate experience across industry and higher education, I developed expertise in in **management, design** and **computing**. It was during this period that I developed a deep curiosity about **boundary artifacts**: the external (often graphic) representations affording communication and collaborative problem solving in distributed project teams. This curiosity (and observation that I was far more interested in the humans interacting with the technologies I built) that catalyzed my decision to apply to graduate school and pursue a career in research at the intersection of cognition and computing.

2012 –2013 **UX Designer / Project Manager** MANAGEMENT COMPUTING DESIGN
SciMed Solutions | Durham, NC
project management, business process analysis, information design, UX for scientific computing software

2011–2012 **Technologist, Designer, Developer** HIGHER-ED COMPUTING DESIGN
DUKE Talent Identification Program (TIP) | Durham, NC
business process analysis, UX design, full stack web development

2009–2011 **Technologist, Program Coordinator** HIGHER-ED COMPUTING DESIGN
Robertson Scholars Leadership Program (Duke-UNC) | Durham, NC
scholar advising, program development, technology consulting, recruiting & admissions

2004–2009 **Management & Technology Consultant** MANAGEMENT COMPUTING DESIGN
International Business Machines (IBM) | worldwide
enterprise integration consulting, business process design, project management

summer 2002 **Information Architect (Intern)** COMPUTING DESIGN
GlaxoSmithKline Biologicals | Brussels, Belgium
information architecture, business process analysis

2002 – 2004 **Residential Computing Consultant** INSTRUCTION COMPUTING DESIGN
University of North Carolina at Chapel Hill | Chapel Hill, NC
design & facilitation of (residential) personal computing workshops

summer 2001 **Summer School Instructor (Gr. 6-9 Math, CS) (Intern)** INSTRUCTION DESIGN COMPUTING
LearningBridge Norfolk | Norfolk, VA
course design & facilitation for 8-week summer session serving underprivileged youth

summer 2002, 2004 **Stage Manager / Lighting Designer (Intern)** DESIGN
American Dance Festival (ADF) | Durham, NC
lighting design, audio engineering and stage management for 15+ touring dance companies

2001–2004 **Production Supervisor (technical theatre)** MANAGEMENT DESIGN
Carolina Union Production Services, UNC-CH | Chapel Hill, NC
supervision & facilitation of lighting, audio engineering, stage management for touring productions

TEACHING EXPERIENCE

The UCSD calendar includes 3 10-week academic quarters (FA, WI, SP) and two 5-week summer sessions (S1, S2).

Instructor of Record (UCSD)

FA 2021	COGS 126 — Thinking With Computers
S1 2021	COGS 14B — Introduction to Statistical Analysis

Teaching Assistant (UCSD, CSU-CHICO)

Human-Computer Interaction & Design

SP 2016	COGS 121 — Human-Computer Interaction Programming	*Dr. Nadir Weibel*
FA 2019	COGS 126 — Thinking With Computers	*Dr. Jim Hollan*
SP 2020	COGS 128 — Information Visualization	*Dr. Taylor Jackson Scott*
S2 2019	COGS 187A — Information Architecture	*Dr. Mary Boyle*
WI 2017	COGS 187B — Practicum in Professional Web Design	*Dr. David Kirsh*

Research Methods and Data Analysis

SP 2019	COGS 13 — Field Methods: Studying Cognition in the Wild	*Dr. Federico Rossano*
SP 2021 S1 2022	COGS 14B — Introduction to Statistical Analysis	*Drs. Drew Hoffman, Zoe Cheng*
WI 2020 SP 2022	PSYC 60 — Statistics for Psychology	*Dr. Judith Fan*
WI 2022	COGS 8 — Hands on Computing	*Dr. Eric Leonardis*

Cognitive Theories and Applications

SP 2018	COGS 10 — Cognitive Consequences of Technology	*Dr. Jim Hollan*
FA 2020	COGS 100 — Cyborgs, Now and in the Future	*Dr. David Kirsh*
WI 2021	COGS 102A — Cognitive Perspectives	*Dr. Christine Johnson*
FA 2019	COGS 160 — Sensemaking & Organizing	*Dr. Bob Glushko*
SP 2015 (CSU-C)	BADM 495 — Applied Strategic Decision Making	*Dr. Rick Hubbard*

ADVISING & MENTORING

Undergraduate Honors Theses Supervised (UCSD)

2018	COGS	Isaac Fehr	AR/VR Design Technologist @ Google
2018	CSE	Xiangyu (Steve) Zhao	Software Engineer @ Google

Undergraduate Research Assistants (UCSD)

2020	COGS	Emilia Pokta	Product Designer @ VISA
2020	COGS	Gabriel Bentancourt	Senior Product Designer @ PenChecks
2020	COGS	Erich McMillan	Media Technician
2018	COGS	Alexis Flores	
2018	COGS	Mei (Helen) Cheng	UX Designer @ Blind Squirrel Games
2018	COGS	Mejan Rostamian	Sr. Product Designer @ Amazon
2018	MS CSE	Bhargav Sridharan	
2018	MATH	Shangqing Gu	Senior Engineer @ Qualcomm
2017-18	CSE	Xinwei Wang	Software Engineer III @ Google
2017-18	CSE	Michael Tolentino	Software Engineer @ c2fo
2017-18	CSE	Gaurav Parmar	PhD student (CS-robotics) @ Carnegie Mellon University
2017-18	COGS	Raquel Dawis	MS student (Data Science) @ DePaul University
2017-18	COGS	Joshua Tjong	Senior UX Researcher @ Vanta
2016-18	PSYCH	Howyan (Hazel) Leung	Senior Product Designer @ NPR
2016-18	COGS	Evan Barosay	Lead UX Researcher @ Google
2016-17	COGS	Kai-yu Chang	
2015-16	COGS	Rachel Chen	Senior UX Researcher @ SAP

Graduate Student Mentoring (MIT)

2022-24	MIT EECS	Dylan Wooten	PhD Student in EECS (HCI / VIS) @ MIT

MAJOR FELLOWSHIPS & SCHOLARSHIPS

2022 **PFFEE** Postdoctoral Fellowship for Engineering Excellence, MIT School of Engineering ($90,000)
2022 **METEOR** Postdoctoral Fellowship, MIT CSAIL ($85,000)
2016 **NDSEG** National Defense Science and Engineering Doctoral Fellowship ($156,000)
2016 **DHS-STEM** Department of Homeland Security STEM Fellowship ($7000)
2013/4 **ATLANTIS-ERASMUS** (US Department of Education) Scholar Grant ($12,000)
2013/5 **CSU-CHICO** Out-of-State Tuition Remission Award ($20,000)
2000 **Morehead** John Motley Morehead Scholarship, University of North Carolina at Chapel Hill ($200,000)

GRANTS & AWARDS

Extramural Grants

2020 **Microsoft** Research: Future of Work Research Grant (co-authored w/ PI Hollan) ($250,000)
2017 **NASA Visionary Grant** — GRC Visualization in Science and Education (PI) ($4000)

Conference Travel Awards

2019 IEEE Information Visualization Doctoral Colloquium Grant ($2500)
2019 GRC Broadening Participation in Visualization Workshop Grant ($1500)
2017, 2019 GRC Visualization in Science and Education (Registration Award) ($1000)
2017, 2019 UCSD Graduate Student Association Travel Grant ($1500)
2016, 2018 Int'l Conference on the Theory & Application of Diagrams Doctoral Colloquium Award ($1000)
2016-2020 UCSD Cognitive Science Travel Grant ($850)
2016 Young Scientist Travel Award (UIUC) ($1000)

Honors

2014 HASTAC Interdisciplinary Scholar
2007 IBM Service Excellence Award
2000 David Lawrence Yakimovich Personal Achievement Award
2000 Governor General's Medal for Academic Excellence

PROFESSIONAL DEVELOPMENT

As a lifelong learner, I prioritize time for continued professional development, especially regarding innovations in teaching, research methods, and approaches for supporting diversity, equity and inclusion in research and education.

Learning & Instruction

2023 MIT Kaufman Teaching Certificate Program
2021 UCSD Introduction to College Teaching Program

Diversity, Equity & Inclusion

2023 MIT Inclusive Rigor: Motivating Students with Challenge + Support (Workshop)
2023 MIT Mental Health First Aid (Certification)
2022 UCSD Culturally Relevant Pedagogy in the College Classroom (Workshop)
2021 UCSD Creating a Culture of Care — Supporting Students in Distress (Workshop)
2019 GRC Broadening Participation in Visualization Research (Workshop)

Research Methods & Analysis

2023 SICSS Summer Institutes in Computational Social Science — (virtual) Bootcamp
2020 UofM EDMS (Measurement, Statistics and Evaluation) — Bayesian Modelling (w/ Dr. Roy Levy) (Workshop)

SERVICE ACTIVITIES

Outreach for Diversity, Equity & Inclusion

2021	UCSD SPACES (Student Access, Retention, Community) (Panelist)
2020	California Forum for Diversity in Graduate Education (Panelist)
2019-2020	UCSD Undergraduate Summer Research Conference (Mentor, Moderator)
2017-2018	UCSD McNair Scholars — Graduate School Panel
2016	EYH (Expanding Your Horizons) Conference Program Mentor

International Research Community

2020-present	DIAGRAMS Conference, Program Committee — Psychology & Education Track
2022	DIAGRAMS Conference, Organizing Committee — Publicity Chair
2020	ACM CHI, Associate Chair — Late Breaking Work
2019	ACM DIS (Designing Interactive Systems), Organizing Committee — Local Co-Chair
2019	ACM C&C (Creativity and Cognition), Organizing Committee — Local Co-Chair
2019	ACM C&C (Creativity and Cognition), Organizing Committee — Art Event Coordinator

Reviewing

(VIS/ TVCG) IEEE VIS, IEEE Transactions on Visualization and Computer Graphics
(CHI/NORDICHI) ACM Conference on Human Factors in Computing Systems, NordiCHI
(CSCW) ACM Conference on Computer-Supported Cooperative Work
(UIST) ACM Symposium on User Interface Software and Technology
(COGS) Annual Meeting of the Cognitive Science Society
(DIAGRAMS) International Conference on the Theory and Application of Diagrams
(ICLS) International Society of Learning Science — Conference of the Learning Sciences

Institutional Service

UCSD Rady Business School Dean Selection Advisory Committee
UCSD Student Information Services Transformation Advisory Committee

Departmental Service

UCSD Cognitive Science Head TA
UCSD Cognitive Science Research Methods Training Assistant
UCSD Cognitive Science Graduate Representative (to faculty, to Grad Student Association)
UCSD Cognitive Science Department Webmaster

PROFESSIONAL AFFILIATIONS

As an interdisciplinary scholar working to bridge multiple research communities, I maintain memberships in the cognitive, learning, computing, and information sciences, and participate in industrial communities of practice.

Computing Research	**(VIS)** IEEE Visualization and Graphics Technical Community **(CHI)** ACM SIG Human-Computer Interaction **(ASIS&T)** Association for Information Science & Technology
Cognitive Research	**(CSS)** Cognitive Science Society **(PS)** Psychonomics Society **(APS)** Association for Psychological Science
Education Research	**(ISLS)** International Society of the Learning Sciences **(EARLI-SIG2)** Euro. Assoc. of Research on Learning & Instruction (Comp. Text.+ Graphics) **(APA Div 2)** Society for the Teaching of Psychology **(CSE)** ACM SIG Computer Science Education
Communities of Practice	**(DVS)** Data Visualization Society **(IAS)** Information Architecture Institute

PUBLICATIONS

(in preparation)

Fox, A.R., Hollan, J.D., Walker, C.M. (in prep) **Graphical Discovery: When Graph Comprehension Meets Problem Solving.**
Fox. A.R., Hollan, J.D., (in prep). **Scaffolding Graphical Discovery: Implicit (vs) Explicit Strategies.**
Fox, A.R. (in prep) **Piercing the Illusion of Causality: Are Diamond Plots an Answer?**
Fox, A.R. (in prep) **Graph Comprehension is but one component of Visualization Literacy.**

(under review)

Wooten, D., **Fox A.R.,** Peck, E., Satyanarayan, A. (under review) **Charting EDA: Characterizing How Visualizations and Interaction Shape Insights in Computational Notebooks**

(preprints)

Fox, A.R., Kaufman, R., Hollan, J.D. **Falling Down the Rabbit Hole: Exploratory Search and the Case for Personal Information Spaces.**

Articles (Journals & Archival Conferences)

Fox, A. R., Hollan, J. (2018). **Read It This Way: Scaffolding Comprehension for Unconventional Statistical Graphs.** In International Conference on Theory and Application of Diagrams. Lecture Notes in Computer Science: Springer International Publishing.

Fox, A. R., de Vries, E., Lima, L., & Loker, S. (2016). **Exploring Representations of Student Time-Use.** In International Conference on Theory and Application of Diagrams (pp. 40-47). Lecture Notes in Computer Science: Springer International Publishing.

Book Chapters

Fox, A. R. (2023) **Models and Theories in Graph Comprehension.** *In* Visualization Psychology, Albers Szafir, D., Borgo, R., Chen, M., Edwards, D.J., Fisher, B., Padilla, L. (eds). Springer, Cham.

Fox, A.R., Hollan, J.D. (2023). **Visualization Psychology: Foundations for an Interdisciplinary Research Program.** *In* Visualization Psychology, Albers Szafir, D., Borgo, R., Chen, M., Edwards, D.J., Fisher, B., Padilla, L. (eds). Springer, Cham.

Proceedings (Short Papers, Workshops & Non-Archival Proceedings)

Fox, A. R., Guo, P., Klokmose, CN., Dalsgaard, P., Satyanarayan, A., Xia, H., Hollan, J. (2020). **Towards a Dynamic, Multiscale Personalized Information Space: Beyond Application and Document Centered Views of Information.** In Conference Companion of the 4th International Conference on the Art, Science and Engineering of Programming (PROGRAMMING '20). Porto, Portugal.

Fox, A. R. (2020) **A Psychology of Visualization, or (external) Representation?** 1st Workshop on Visualization Psychology, at IEEE Vis, Salt Lake City, UT.

Fox, A. R., Scott, JT. (2020) **Surfacing Misconceptions Through Visualization Critique.** The VisActivities Workshop, at IEEE Vis, Salt Lake City, UT. PEDAGOGICAL FOCUS

Fox, A. R., Byrd, S., Ciston, S., Navarro, F., Kayser, H. (2019) **The Burden of Selfhood.** In Proceedings of the 2019 ACM Conference on Creativity and Cognition. San Diego, CA.

Fox, A. R., Hollan, J., Walker, CM. (2019). **When Graph Comprehension is an Insight Problem.** Proceedings of the Annual Meeting of The Cognitive Science Society 2019. Montreal, QC.

Fox, A. R., van den Berg, M., & de Vries, E. (2016). **Representing Sequence: The Influence of Timeline Axis and Direction on Causal Reasoning in Litigation Law.** Proceedings of the Annual Meeting of The Cognitive Science Society 2016. Philadelphia, PA.

Extended Abstracts — Poster Presentations

Fox, A. R. (2023) **Empirical Construct Diagrams: Diagramming the Structure of Variables in Empirical Research Studies.** Annual PsychTERMS Conference. PEDAGOGICAL FOCUS

Fox, A. R. (2023) **Can Diamond Plots Mitigate Causal Inferences from Correlational Data?** Annual Meeting of the Psychonomics Society, San Francisco, CA.

Fox, A. R. (2023) **Diamond Plots: An Evaluation.** Gordon Research Conference on Visualization in Science and Education. Lewiston, Maine.

Fox, A. R., Hollan, J.D., Walker C.M. (2022) **Graphical Discovery: Transitions in Understanding a Novel Coordinate System.** Annual Meeting of the Psychomomics Society, Boston, MA.

Fox, A. R., Hollan, J.D. (2017) **How Can we Scaffold Comprehension for Unconventional Graphs?** Gordon Research Conference on Visualization in Science and Education. Lewiston, Maine.

Loker, S., de Vries, E., Fox, A.R. (2015). **Dynamic vs. Static Visualizations for Learning Procedural and Declarative Information.** Annual Conference of the American Educational Research Association. PEDAGOGICAL FOCUS

Ludewig, U., Fox, A.R., Schwartz, N.H., Preuss, S. (2015). **Constructing knowledge from interactive visualizations: How data viewing strategies influence comprehension of complex relations.** Conference of the European Association for Research on Learning and Instruction (EARLI).

Preuss, S., Nurra, C., de Vries, E., Fox, A.R., Schwartz, N. H. (2015). **Impact of need for cognition and design of infographics on attitude change: a study on homophobia.** Conference of the European Association for Research on Learning and Instruction (EARLI).

Extended Abstracts — Oral Presentations

Fox, A. R., Walker, CM, Hollan, J. (2018). **Graphical Insight: How To Read an Unconventional Graph.** 2018 Meeting of the European Association of Learning & Instruction — SIG 2 Text and Graphics Comprehension. Freiburg, Germany. **Best JURE Paper & Presentation Award**

Doctoral Colloquia

Fox, A. R. (2019). **Stepping Closer to a Science of Interaction in Information Visualization.** IEEE VIS, Doc- toral Colloquium, Berlin, Germany.

Fox, A. R. (2019). **Discovering Primitives in Graph Comprehension.** 10th International Conference on the Theory and Application of Diagrams, Edinburgh, Scotland.

Fox, A. R. (2016). **Digital Pens in Diagrams Research.** 9th International Conference on the Theory and Application of Diagrams, Philadelphia, PA.

Theses & Dissertations

Fox, A. R. (2022). **Tales of Graphical Discovery: A Case Study at the Intersection of Graph Comprehension and Visualization Design.** University of California San Diego, La Jolla, CA. Supervised by Dr. James D. Hollan

Fox, A. R. (2015). **Visualizing time: the influence of timeline axis and direction on causal reasoning in litigation law.** California State University - Chico. Chico, CA. Supervised by Dr. Erica de Vries and Dr. Martin van den Berg.

Art & Media Installations

2019 The Burden of Selfhood | large format viz live performance | ACM Creativity & Cognition — Art Track
2017 The Burden of Selfhood | large format viz live performance | Cal IT2 IDEAS Performance Series
2017 Design Lab MicroVideo | video installation | UCSD Qualcomm Institute

INVITED TALKS

Managing Unstructured Time — Undergraduate Success in the Age of Covid
2020 First Year Seminar, University of Alberta—Augustana Campus, Camrose, Alberta, Canada
2020 Triton Tools & Tidbits Podcast, UC San Diego, La Jolla, CA

Distributed Cognition in Computing Research
2021 Guest Lecture for UCSD COGS 102A (Cognitive Perspectives), UC San Diego

Mixed Methods Research in Cognitive Science: Choose Your Own Adventure
2020 Guest Lecture for COGS 13 (Field Methods), UC San Diego
2021 Guest Lecture for COGS 13 (Field Methods), UC San Diego

Visualization as an Organizing System
2019 Guest Lecture for COGS 160 (Sensemaking & Organizing), UC San Diego
2020 Guest Lecture for INFO 202 (Information Organization & Retrieval), UC Berkeley
2021 Guest Lecture for INFO 202 (Information Organization & Retrieval), UC Berkeley

Project Management for Effective Group Work
2016 Guest Lecture for COGS 121 (HCI Programming Studio), UC San Diego

Cognition in Information Visualization
2016 Health Care Data Dive, Qualcomm Institute, La Jolla, CA

Tales of Graphical Deception — Displaying Data Badly
2015 Information Design Studio, California State University, Chico, CA

Visualizing Time
2015 Graduate Research Symposium, California State University, Chico, CA

Time-Use Research in Sociology
2014 Masters Education Seminar, Université Grenoble, France

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