Charlotte Garcia

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Citizenship: British | American

Education

2022 **PhD in Cognitive Neuroscience**
MRC Cognition & Brain Sciences Unit, University of Cambridge
Thesis: The Panoramic ECAP Method: estimating patient-specific patterns of current spread and neural health in cochlear-implant users
Supervisors: Robert P Carlyon, Manohar Bance, Richard Turner

2015 **Bachelor of Science in Biomedical Engineering**
McCormick School of Engineering, Northwestern University

2015 **Bachelor of Arts in Music Theory and Cognition**
Bienen School of Music, Northwestern University

Positions

Sep 2022 – *present* **Research Associate**, supervised by Bob Carlyon | Cambridge, UK
MRC Cognition & Brain Sciences Unit, University of Cambridge

May 2024 – *present* **College Research Associate** | Cambridge, UK
Wolfson College, University of Cambridge

Oct 2023 – Dec 2023 **Visiting Research Fellow**, supervised by Julie Arenberg | Boston, USA
Massachusetts Eye & Ear, Harvard University

Oct 2015 – Aug 2018 **Senior Engineer / Engineer II** | Round Lake, IL, USA
Containers Manufacturing Engineering | Baxter Healthcare International

Mar 2015 – Oct 2015 **Auditory Cognition Engineer** | Chicago, IL, USA
Resonance Medical LLC

Grants / Awards

Jul 2025 – Jun 2026 £10,000 **Royal National Institute for Deaf People (RNID) Innovation Seed Fund**
Co-Lead: Dorothée Arzounian | Toward Accelerated and More Accurate Objective Fitting: Integrating Multi-Latency Measures of Auditory Processing in Cochlear Implant Patients

Jan 2024 – Jun 2025 £49,909 **Medical Research Council (MRC) Impact Acceleration Award**
Precision Medicine for Cochlear Implant Healthcare: Translating the Panoramic ECAP Method from Laboratory to Clinic

Jun 2024 €200 **Virtual Conference on Computational Audiology Video Pitch Award**
Translating the Panoramic ECAP Method to Clinic (YouTube Link)

Oct 2023 – Aug 2024 £24,095 **Centre for Neuroscience Discovery (CIND) Early Career Award**
Personalizing Cochlear Implant Healthcare: translating the Panoramic ECAP Method from laboratory to clinic

2023 £1,000 **Graham Fraser Travel Grant (British Cochlear Implant Group)**
Supported visiting fellowship to Mass Eye & Ear, Boston, USA

2018 – 2022 £42,650 **WD Armstrong Fund** | PhD Studentship, engineering applied to medicine

2018 – 2021 £70,000 **The Cambridge Trust** | part-cost PhD Studentship

2019 £5,000 **AIM-Day Hearing & Acoustics Grant**
Alan Archer-Boyd, Matt Davis, **Charlotte Garcia**, Bradford Backus
The Silent Stream: Using Internet of Things technology to reduce background music levels in public spaces for hearing device users

Teaching

2024 **Basic Mechanisms of Auditory Perception, Acoustically and with Cochlear Implants**
Lecture, *Cognition and the Brain* | MPhil in Cognitive Neuroscience
MRC Cognition & Brain Sciences Unit, University of Cambridge

2024 **Objective Measures in Cochlear Implants**
Lecture, *Advances in Auditory Implants Masterclass* | MPhil in Audiology
The Ear Institute, University College London

Jul – Sep 2023 **Undergraduate Internship, Extended Analysis for the Panoramic ECAP Method**
Supervision, *Cambridge Math Placements Programme* | University of Cambridge

2017 – 2018 **Multivariate Data Analysis for Real-Time Manufacturing Process Control**
Developed and Delivered four-day training course for Quality Engineers
Cuernavaca Mexico, Guangzhou China, Sabiñánigo Spain, Grosotto Italy, Round Lake IL USA, Mountain Home AR USA, North Cove NC USA | Baxter Healthcare

2017 – 2018 **Multivariate Data Analysis for Real-Time Manufacturing Process Control**
Developed two online training courses for Quality Engineers & Machine Operators
Virtual | Baxter Healthcare

Journal Publications

2025 **Garcia, C.,** Sismono, F., Goehring, T., Guérit, F., Arzounian, D., & Carlyon, R. P. (2025). A comparison of electrophysiological measures for characterizing the cochlear-implant electrode-neuron interface. *JASA Express Letters.* **5**, 082001. doi: 10.1121/10.0038746

Arzounian, D., Guérit, F., Deeks, J.M., **Garcia, C.**, de Groote, E., Bance, M. and Carlyon, R.P. (2025). Measurement of phase-locked neural responses to cochlear-implant stimulation from multiple stages of the auditory system. *Hearing Research.* **464**, 109338. doi: 10.1016/j.heares.2025.109338

Garcia, C. and Carlyon, R.P. (2025). Assessing Array-Type Differences in Cochlear Implant Users Using the Panoramic ECAP Method. *Ear and Hearing*, **46**(5), 1355-1368. doi: 10.1097/AUD.0000000000001673

Peng, T., **Garcia, C.**, Haneman, M., Shader, M., Carlyon, R.P. and McKay, C. (2025). Comparing patient-specific variations in intra-cochlea neural health estimated using psychophysical thresholds and panoramic electrically evoked compound action potentials (PECAPs). *Journal of the Association for Research in Otolaryngology*, **26,** 77-91. doi: 10.1007/s10162-024-00972-z

2024 **Garcia, C.**, Morse-Fortier, C., Guérit, F., Hislop, S., Goehring, T., Carlyon, R.P. and Arenberg, J.G. (2024). Investigating the effect of blurring and focusing current in cochlear implant users with the Panoramic ECAP Method. *Journal of the Association for Research in Otolaryngology,* **25**, 591–609. doi: 10.1007/s10162-024-00966-x

2023 de Rijk, S.R., Boys, A.J, Roberts, I.V., Jiang, C., **Garcia, C.**, Owens, R.M. and Bance, M. (2023). Tissue-Engineered Cochlear Fibrosis Model Links Complex Impedance to Fibrosis Formation for Cochlear Implant Patients. *Advanced Healthcare Materials*, **12**, 2300732. doi: 10.1002/adhm.202300732

Garcia, C., Deeks, J.M., Goehring, T., Borsetto, D., Bance, M. and Carlyon, R.P. (2023). SpeedCAP: An Efficient Method for Estimating Neural Activation Patterns Using Electrically-Evoked Compound Action-Potentials in Cochlear Implant Users. *Ear and Hearing*, **44**(3), 627-640. doi: 10.1097/AUD.0000000000001305

2022 **Garcia, C.** (2022). The Panoramic ECAP Method: estimating patient-specific patterns of current spread and neural health in cochlear implant users. *Dissertation*. University of Cambridge. doi: 10.17863/CAM.89113

de Rijk, S.R., Hammond-Kenny, A., Tam, Y.C., Eitutis, S.T., **Garcia, C.**, Carlyon, R.P. and Bance, M. (2022). Detection of Extracochlear Electrodes Using Stimulation-Current-Induced Non-Stimulating Electrode Voltage Recordings with Different Electrode Designs. *Otology & Neurotology*, **43**(5), 548-557. doi: 10.1097/MAO.0000000000003512

2021 **Garcia, C.**, Goehring, T., Cosentino, S., Turner, R.E., Deeks, J.M., Brochier, T., Rughooputh, T., Bance, M. and Carlyon, R.P. (2021). The Panoramic ECAP Method: estimating patient-specific patterns of current spread and neural health in cochlear implant users. *Journal of the Association for Research in Otolaryngology*, **22**(5), 567-589. doi: 10.1007/s10162-021-00795-2

Brochier, T., Guerit, F., Deeks, J.M., **Garcia, C.**, Bance, M. and Carlyon, R.P. (2021). Evaluating and Comparing Behavioural and Electrophysiological Estimates of Neural Health in Cochlear Implant Users. *Journal of the Association for Research in Otolaryngology*, **22**(1), 67-80. doi: 10.1007/s10162-020-00773-0

Book Chapters

2025 **Garcia, C.** (in press). Electrically Evoked Compound Action Potentials (ECAPs). In B. Molaee-Ardekani and M. Segovia-Martinez (Eds.), *Performant Cochlear Implants: The role of objective measures, imaging, and modelling.* Springer Nature.

Manuscripts in preparation

Garcia, C., Guérit, F., Arzounian, D. and Carlyon, R.P. (in prep). Optimising ALFIES: the contribution of multiple distortion products, effect of starting phase and of alternating polarity on cortical responses to sustained high-rate stimulation in cochlear implants with EEG and reverse telemetry.

*Borsetto, D., ***Garcia, C.**, …, and Bance, M. *(under review, Ear and Hearing)*. Intraoperative Application of Stimulation Current Induced Non-Stimulating Electrode Voltages for Identifying Extra-cochlear Electrodes in Cochlear implants.

Clinical Research Translation

Oct 2024 **Panoramic ECAP Website |** Developed with CIND Award
Allows users (e.g. clinicians) to analyse PECAP data from cochlear implant patients
https://panoramic-ecap.mrc-cbu.cam.ac.uk

2021 – 2025 **Medical Research Scientist, HIDO Clinic**
Emmeline Centre | Addenbrookes Hospital | Cambridge

International PECAP Collaborators

Massachusetts Eye & Ear (Julie Arenberg) | Rinri Therapeutics / Nottingham University (Doug Hartley) | Cochlear Australia (Pam Dawson) | Bionics Institute (Colette McKay) | Zurich University Hospital (Flurin Pfiffner) | BoysTown National Research Hospital (Adam Bosen) | Ear Science Institute Australia (Christo Bester)

Invited Talks

July 2025 Conference on Implantable Auditory Prostheses | Lake Tahoe CA USA
Characterising the Electrode-Neuron Interface using the Panoramic ECAP Method

Feb 2025 Young Investigator Symposium: Cochlear Health after Cochlear Implants: Biomarkers , Therapeutics, and Outcomes | MidWinter Meeting, Association for Research of Otolaryngology | Orlando FL USA
Using the Panoramic ECAP Method to characterize current spread and neural responsiveness in cochlear implant users

Oct 2024 Seminars in Hearing Research, Purdue University | West Lafayette Indiana USA
Electrophysiological measures of auditory perception in cochlear implant users from the electrode-neuron interface to the cortex

Jul 2024 Ear Science Institute Australia | Perth Australia
The Panoramic ECAP Method: Characterizing patient-specific patterns of current spread and neural responsiveness in cochlear implants

Dec 2023 Arenberg Lab, Eaton Peabody Laboratories, Massachusetts Eye & Ear | Boston USA
The Panoramic ECAP Method: Characterizing patient-specific patterns of current spread and neural responsiveness in cochlear implants

Conference Podium Presentations

Nov 2024 *You're a Cubic one, Mr Alfie (Cubic and Quadratic Neural Distortion Responses with the ALFIES method with both EEG and reverse telemetry in cochlear implant users)*
Cambridge Hearing Group Christmas Symposium | Cambridge UK

Jun 2024 *Translating the Panoramic ECAP Method to Clinic* | Won 'Best Video Pitch' Award
Virtual Conference on Computational Audiology (VCCA) | Virtual | **YouTube Link**

Sep 2022 *Investigating Changes in Current Spread with Focused and Blurred Stimulation in Cochlear Implant Users using the Panoramic ECAP Method*
Ear and Hear (UK Acoustics Network) Meeting | Southampton UK

Feb 2022 *BlurCAP: Investigating Changes in Current Spread with Focused and Blurred Stimulation in Cochlear Implant Users using the Panoramic ECAP Method*
MidWinter Meeting, Association for Research of Otolaryngology | Virtual

Dec 2022 *How to identify some ingredients for a good Christmas: Hugging, good elf, and lots of currants (Estimating Current Spread using the Panoramic ECAP Method)*
Cambridge Hearing Group Christmas Symposium | Cambridge UK

Dec 2021 *SpeedCAP: like PECAP but much faster, and sometimes in the operating theatre*
Cambridge Hearing Group Christmas Symposium | Cambridge UK

Jun 2020 *The PECAP Method: electrode-neuron interface modelling in cochlear implant users*
Virtual Conference on Computational Audiology (VCCA) | Virtual | **Online Abstract**

Dec 2019 *Estimating Neural Survival Using a New Version of the Panoramic ECAP Method*
Cambridge Hearing Group Christmas Symposium | Cambridge UK

Conference Posters

Feb 2025 *ALFIES unwrapped: recording cortical responses to sustained high-rate stimulation in cochlear implant users*
MidWinter Meeting, Association for Research of Otolaryngology | Orlando FL USA

Sep 2024 *Probing discrepancies between perceived loudness and ECAPs along the electrode array in Cochlear Implant users*

Auditory Science Meeting (ASM) | Cambridge UK

Jun 2024 *Assessing Array-Type differences in current spread in Cochlear Implant users using the Panoramic ECAP Method*
Hearing Across the Lifespan (HEAL) | Cernobbio Lago di Como Italy

Apr 2024 *The Panoramic ECAP Method: from Lab to Clinic*
British Cochlear Implant Group (BCIG) Meeting | Gateshead / Newcastle UK

Sep 2023 *Assessing Array-Type differences in current spread in Cochlear Implant users using the Panoramic ECAP Method*
Basic Auditory Science (UK Acoustics Network) Meeting | London UK

Jul 2023 *Investigating current spread in cochlear implant users with the Panoramic ECAP Method | Assessing Array-Type differences in current spread in Cochlear Implant users using the Panoramic ECAP Method |Towards using cochlear implant electrodes to record cortical responses to sustained high-rate stimulation*
Conference for Implantable Auditory Prostheses (CIAP) | Lake Tahoe California USA

Apr 2023 *Assessing Array-Type differences in current spread in Cochlear Implant users using the Panoramic ECAP Method* | **Won 'Best Poster Presentation' Award**
British Cochlear Implant Group (BCIG) Meeting | Cambridge UK

Feb 2023 *Investigating current spread in cochlear implants with the Panoramic ECAP Method*
MidWinter Meeting, Association for Research of Otolaryngology | Orlando FL USA

Jun 2022 *BlurCAP: Investigating Changes in Current Spread with Focused and Blurred Stimulation in Cochlear Implant Users using the Panoramic ECAP Method*
Royal Society Meeting Realising the potential of cochlear implants | Nottingham UK

Jul 2021 *SpeedCAP: A Method for Efficiently Measuring Multiple Electrically Evoked Compound Action Potentials for Clinical Applications | The Silent Stream: Removal of Background Music in Communication Settings Using Audio Streaming and an Adaptive Filter*
Conference for Implantable Auditory Prostheses (CIAP) | Virtual

Jan 2020 *Estimating Neural Survival using a New Version of the Panoramic ECAP Method*
MidWinter Meeting, Association for Research of Otolaryngology | San Jose CA USA

Sep 2019 *Estimating Neural Survival using a New Version of the Panoramic ECAP Method*
Basic Auditory Science (UK Acoustics Network) Meeting | London UK

Jun 2019 *Estimating Neural Survival using a New Version of the Panoramic ECAP Method*
Improving Cochlear Implant Performance | Cambridge UK

Peer-Reviewing

The International Journal of Audiology (IJA), Ear and Hearing (Ear Hear), Hearing Research (Hear Res), Journal of the Acoustical Society of America (JASA), Nature Scientific Reports (Sci Rep), Institute for Electrical and Electronics Engineers (IEEE), Journal of Neuroscience (JNeurosci), Trends in Hearing (Trends)

Service

Jan 2024 – present **Chair, Equality & Diversity Committee**
MRC Cognition & Brain Sciences Unit | University of Cambridge
Organised yearly Equality & Diversity events | Installed Automatic Captioning in the Lecture Theatre | Hosted seminar on 'Colonised Minds: Narratives that Shape Psychology,' Akira O'Connor, Book Author/ Senior Lecturer, University of St Andrews

2019 – present **Member, Equality & Diversity Committee**
MRC Cognition & Brain Sciences Unit | University of Cambridge

2019 - 2025 **Member, Equality Diversity and Inclusion Governance Group**
Clinical School | University of Cambridge

2024 – present **Equality Champion, Equality Champions' Network**
Clinical School | University of Cambridge

2023 – 2024 **Admissions Support – Application Ranking | MPhil Cognitive Neuroscience**
MRC Cognition & Brain Sciences Unit | University of Cambridge

Sep 2024 **Co-organised Auditory Science (ASM, UK Acoustics Network) Meeting**
St Catharine's College | University of Cambridge

Public Engagement

Mar 2024 **Presenter, 'Bionic Ears'| Science Night, MRC Cognition & Brain Sciences Unit**
Cambridge Science Festival | University of Cambridge

Dec 2023 **Presenter, 'How Cochlear Implants Work'**
Cochlear Implant Volunteer Appreciation Day
MRC Cognition & Brain Sciences Unit | University of Cambridge

2019 – 2025 **Facilitator, Cochlear Implant User Socials**
MRC Cognition & Brain Sciences Unit | University of Cambridge

2019 – 2020 **BrainBus** | Neuroscience Engagement Programme with local schools
MRC Cognition & Brain Sciences Unit | University of Cambridge

Technical Expertise

Programming
MATLAB, Python, elementary C++, LaTeX, git

General Software
Office Suite, Adobe, Minitab, ProTools, SPSS, SIMCA, Docker, Logic, GPower

Cochlear-Implant Software
Cochlear: Custom Sound Pro, Custom Sound EP, NIC2, NIC4.1 NIC4.3
Advanced Bionics: Soundwave, BEDCS, Volta
MEDEL: Maestro, RIB2
EEG: Biosemi ActiView, specifically with custom hyper-rate (262kHz) system
General: specific expertise with reverse telemetry, clinical and research systems

Analysis (highlights)
nonlinear optimisation models (i.e. sequential quadratic programming), ANOVA, ANCOVA, linear mixed effects models, basic machine learning algorithms (python), Fourier analysis, group delay, extracting neural signals from electrical artefacts in electrophysiological data, principal components analysis, projection to latent structures of partial least squares, factorial designed experiments, gage R&R

General Research Skills
research with human research participants, programming cochlear implant direct stimulation experiments, reverse telemetry, electroencephalography, oscilloscopes, programming graphical user interfaces (GUIs) in MATLAB and python, auditory psychophysics

Languages
English (native), Spanish (intermediate), Italian (elementary), French (elementary)