

Exponent®
Engineering & Scientific Consulting

Ben Wetherfield, Ph.D.

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Professional Profile

Dr. Wetherfield has experience across a range of engineering and computing disciplines, spanning free-space optics, integrated photonics, display technologies, software system design and implementation, high-performance computing architectures, electromagnetic simulation, and audio technology. His cross-disciplinary expertise allows him to tackle challenges across diverse technology stacks, often bridging software and hardware elements.

Prior to joining Exponent, Dr. Wetherfield served as Principal Research Scientist in an interim role at a deep technology startup in the computer vision and hyperspectral imaging space. There, he developed software and systems for large-scale material development and simulation, as well as algorithmic approaches for targeted computer vision tasks. In previous work at SpaceX, he made software contributions (C++, Python) to the Starlink network, introducing new telemetry pipelines and bolstering fleet simulation tools.

For his Ph.D. work, Dr. Wetherfield studied the fundamental performance limits of optical and photonic computing devices that harness diffraction. He used a broad range of computational, mathematical, and experimental methodologies to pursue his research agenda, developing mathematical frameworks for analyzing integrated photonic device performance, implementing large-scale simulated testing of optical computing architectures, and designing optical apparatuses from scratch to demonstrate optical computing principles. In further project work, he investigated holographic display technology based on liquid crystal devices, for virtual and augmented reality (VR/AR) applications. He received the honor of passing his viva (or Ph.D. defense process) without corrections, a rare distinction of which he was the first recipient among his supervisor's twenty years' worth of students.

Dr. Wetherfield has teaching and course-devising experience at the graduate and undergraduate level across technology areas in music, audio and acoustics, high-performance computing, theory of computation and engineering mathematics. He has further work experience in the education technology sector, and as a musician, with highlights including producing the theme music for a successful arts podcast, and touring Japan as a jazz pianist. Beyond work in optics and photonics, Dr. Wetherfield has presented original research applying network optimization methods to problems in music technology.

Academic Credentials & Professional Honors

Ph.D., Engineering, University of Cambridge, England, 2024

B.A., Applied Mathematics, Harvard University, 2017

Richard Norman Scholarship, Department of Engineering, University of Cambridge, 2020-2024

Phi Beta Kappa

Licenses and Certifications

IBM Data Science Professional Certificate

Prior Experience

Interim Principal Research Scientist, Prospectral, 2024

Supervisor (First Year Engineering Mathematics), Emmanuel College, University of Cambridge, 2023-2024

Software Engineer Intern, SpaceX, 2022

Strategy Consultant, Crimson Education, 2018-2020

Teaching Fellow and Course Developer, Harvard University, 2018

Professional Affiliations

SPIE (2022-2024) – student member

Publications

Sha, J., Wojcik, A., Wetherfield, B., Yu, J. & Wilkinson, T. D. Multi frame holograms batched optimization for binary phase spatial light modulators. Sci Rep 14, 19380 (2024).

Wetherfield, B. & Wilkinson, T. D. Planar Fourier optics for slab waveguides, surface plasmon polaritons, and 2D materials. Opt. Lett., OL 48, 2945–2948 (2023).

Yang, F. et al. Perceptually motivated loss functions for computer generated holographic displays. Sci Rep 12, 7709 (2022). Christopher, P. J., Mouthaan, R., Wetherfield, B., Medcalf, E. J. & Wilkinson, T. D. Computer-generated holography in the intermediate domain. J. Opt. Soc. Am. A, JOSAA 39, 392–400 (2022).

El Guendy, M. D. V. et al. Kaczmarz holography: holographic projection in the Fraunhofer region. OE 60, 103101 (2021).

Presentations

Wetherfield, B. & Wilkinson, T. D. Time-Aware Fourier Optics: Modeling Implications and Device Performance Predictions. in Optics + Photonics (SPIE, San Diego, 2023).

Wetherfield, B., Kadis, A. & Wilkinson, T. D. A Fast DST-Based Gerchberg-Saxton Algorithm for Binary-Phase Holography. in OSA Imaging and Applied Optics Congress 2021 (3D, COSI, DH, ISA, pcAOP) (2021), paper DW5E.6 DW5E.6 (Optical Society of America, 2021).

Wetherfield, B. The minimum cut pitch spelling algorithm. in Proceedings of the international conference on technologies for music notation and representation – TENOR'20/21 (eds. Gottfried, R., Hajdu, G., Sello, J., Anatrini, A. & MacCallum, J.) 149–157 (Hamburg University for Music and Theater, Hamburg, Germany, 2020).

Project Experience

Supported expert witness reports for patent litigation matters (on e.g. display technologies, IoT systems).
Performed reverse-engineering of optical and circuit systems from product teardowns.