

Niall J. Lennon, Ph.D.

Current Areas of Focus

Chief Scientific Officer and Chairman of the Board

Present

Broad Clinical Labs LLC, Broad Institute of MIT & Harvard

- The Broad Clinical Labs (BCL) is a wholly owned subsidiary of the Broad Institute. BCL is the entity through which all clinical (CLIA or FDA authorized) testing, and external fee-for-service genomics services flow.
- During the COVID-19 pandemic, BCL (then named CRSP) became one of the largest single site SARS-CoV2 diagnostic testing laboratories in the United States, ultimately running >37M diagnostic tests in that period.

Senior Director, Genomics Platform at the Broad Institute

Present

Broad Institute of MIT & Harvard

- Lead a team of >230 scientists, computational biologists, software engineers, project managers, process development associates, quality and compliance specialists, and clinical geneticists.
- Responsible for leadership of Broad's largest technology platform (~\$200M annual revenue) for genomics.

Associate Director, Gerstner Center for Cancer Diagnostics

March 2019- Present

Broad Institute of MIT & Harvard

- Evaluate cutting edge molecular diagnostic techniques for cancer detection and characterization with a particular focus on liquid biopsy.
- Where appropriate, clinically validate assays for use in clinical research, clinical trials, and therapeutic decision making. As an example, currently Principal Investigator on a NCI UH2/UH3 award to validate low coverage genome sequencing as a biomarker of tumor fraction.

Institute Scientist

June 2017 - Present

Broad Institute of MIT & Harvard

- One of a group of 24 Institute Scientists who play a key role by catalyzing scientific connections across the Broad community and beyond; engaging in key institutional issues, developments and decisions, including shaping scientific priorities; fostering the continual renewal of the Broad community by recruiting, mentoring and supporting a new generation of young scientists; and fulfill key citizenship and service roles that strengthen the Broad community.

Assistant Professor (Adjunct)

January 2012 - Present

Biomedical Engineering Department, Tufts University

- Have taught >500 graduate and undergraduate students about genomics and Molecular Biotechnology
- Teach BME162 – Molecular Biotechnology every Spring semester. This popular class covers a wide range of topics from genome engineering, genome sequencing technology and applications, gene cloning, CRISPR, recombinant DNA technology, and the business of biotechnology.

Past Roles

Senior Director, Translational Genomics

Genomics Platform, Broad Institute of MIT & Harvard

2015 – 2023

- Responsible for several business units including Translational Analysis, Computational R&D, Regulatory Affairs, Informatics and Clinical Development.
- Oversee portfolio strategy and planning for products spanning Cancer, Inherited Disease, Microbial, and Software-as-a-Service.

Director, Technology Development and Clinical Development

Genomics Platform, Broad Institute of MIT & Harvard

2012 – 2015

- Directed the technology development efforts of the Genomics Platform through leadership of over 30 Platform projects involving 40+ Broad staff members.
- Led the activities around the creation of a CLIA-certified, clinical sequencing operation at the Broad Institute.
- Served as scientific, operational, and regulatory lead in our relationships with internal and external users of the clinical laboratory including academic groups, pathology groups, and pharmaceutical companies.
- Evaluated new technologies and reagents for sample preparation and sequencing across a range of application areas including inherited diseases, common diseases, cancer and microbial genomics.

Assistant Director, Process Development

Genome Sequencing Platform, Broad Institute of MIT & Harvard

2009 – 2012

- Developed novel assays, applications, processes, and protocols, to facilitate viral genomics, HLA typing, microbial sequencing and assembly, fungal sequencing, cancer genomics, and metagenomics.
- Collaborated with early stage companies (e.g. Ion Torrent) to explore and advance new approaches to DNA sequencing.
- Provided oversight for a program of continuous process improvement, innovation, and cost reduction using industry best practices (e.g. Six Sigma, 5S).

Manager, Sequencing Operations: 454 and Viral

Genome Sequencing Platform, Broad Institute of MIT & Harvard

2009 – 2009

- Managed a multi-disciplinary team (from lab assistant to PhD level) within the Genome Sequencing Platform, reporting to the Director of Sequencing Operations.
- Directed the R&D efforts for novel sequencing applications such as sample preparation of RNA viral genomes for sequencing on both 454 and Illumina platforms.

Research Scientist and Manager, Special Projects Group

Genome Sequencing Platform, Broad Institute of MIT & Harvard

2005 - 2009

- Led the effort to design a high-throughput viral genome sequencing process using both capillary-based and next generation technologies.
- Provided scientific and technical expertise to collaborators in five countries as part of the Genome Resources in Dengue and HIV Elite Controllers projects.

Postdoctoral Research Fellow

Cecil B. Day Laboratory for Neuromuscular Research, Massachusetts General Hospital & Harvard Medical School

PI: Dr. Robert H. Brown Jr. D.Phil., M.D.

2001-2005

- Used microarray technology and functional genomics to examine gene expression and interacting gene networks in models of muscular dystrophy.
- Developed a cell-based high-throughput screening assay to identify small molecules that modulate the membrane repair response in normal and dystrophic muscle.

Additional Professional Activities

- Scientific Advisory Board member (FYR Diagnostics)
- Advisor (2022-2023), SalioGen Therapeutics
- Key Opinion Leader panel member (2015-2021), New England Biolabs.
- Guest Lecturer (2017-present), Advanced Integrative Science Course, Harvard Medical School.
- Technical Advisory Board member (2016-2020), Genturi Inc.
- External Advisory Board member (2010-2021), Tufts University Dept of Biomedical Engineering.
- Scientific Advisory Board member (2013-2015), Swift Biosciences.
- Director (2005-2006) of the Boston chapter of BioLink USA-Ireland, a non-profit networking association.

Education & Training

Executive Certificate, Technology, Operations, and Value Chain, MIT Sloan School of Management	2016
Executive Certificate, Management and Leadership, MIT Sloan School of Management	2013
Six Sigma Black Belt Certification	2007
Ph.D. in Pharmacology	1997-2001
Conway Institute of Biomolecular and Biomedical Research, University College Dublin, Ireland	
<i>PI: Dr. Kay Ohlendieck, Ph.D.</i>	

Honors & Awards

Immigrant Hero Award

Immigrant Learning Center	2021
Recognized for my role in making SARS-CoV2 diagnostic testing available to communities, nursing homes, and educational institutions in the Commonwealth of Massachusetts and the New England Region.	

Broad Institute Award

Broad Institute of MIT & Harvard	2014
The Broad Institute Award honors outstanding individuals who have excelled in multiple areas that reflect the core principles of the Broad Institute, both in achievement and in citizenship. A maximum of two individuals per year are selected for this high honor.	

Selected Publications

Complete list of published work: <https://www.ncbi.nlm.nih.gov/myncbi/1TMcnVmn19Qm/bibliography/public/>

Cancer Genomics

1. Rickles-Young M, et al. (2024) Assay Validation of Cell-Free DNA Shallow Whole-Genome Sequencing to Determine Tumor Fraction in Advanced Cancers. **J Mol Diagn**. PMID: 38490303
2. Tsuji J, et al. (2022) Clinical Efficacy and Whole-Exome Sequencing of Liquid Biopsies in a Phase IB/II Study of Bazedoxifene and Palbociclib in Advanced Hormone Receptor-Positive Breast Cancer. **Clin Cancer Res**. PMID: 36215125
3. Church AJ, et al. (2022) Molecular profiling identifies targeted therapy opportunities in pediatric solid cancer. **Nature Medicine**. PMID: 35739269
4. Zeng C, et al. (2022) Association of pathogenic variants in hereditary cancer genes with multiple diseases. **JAMA Oncol**. PMID: 35446370
5. Schoenfeld JD, et al. (2022) Durvalumab plus tremelimumab alone or in combination with low-dose or hypofractionated radiotherapy in metastatic non-small-cell lung cancer refractory to previous PD(L)-1 therapy: an open-label, multicentre, randomised, phase 2 trial. **Lancet Oncol** PMID: 35033226
6. Gibson, et al. (2022) Donor Clonal Hematopoiesis and Recipient Outcomes After Transplantation. **J Clin Oncol**. PMID: 34793200
7. Weber ZT, et al. (2021) Modeling clonal structure over narrow time frames via circulating tumor DNA in metastatic breast cancer. **Genome Med**. PMID: 34016182
8. Parsons HA, et al. (2020) Sensitive Detection of Minimal Residual Disease in Patients Treated for Early-Stage Breast Cancer. **Clinical Cancer Res**. PMID: PMC7654718
9. Taylor-Weiner A, et al. (2018) DeTiN: overcoming tumor-in-normal contamination. **Nature Methods** PMID: PMC6528031
10. Keskin DB, et al. (2018) Neoantigen vaccine generates intratumoral T cell responses in phase Ib glioblastoma trial. **Nature** PMID: PMC6546179
11. Ott PA, et al. (2017) An immunogenic personal neoantigen vaccine for patients with melanoma. **Nature** PMID: PMC5577644

12. Lennon NJ, *et al.* (2016) Technological considerations for genome-guided diagnosis and management of cancer. **Genome Medicine** PMID: PMC5080740
13. Ahronian LG, *et al.* (2015) Clinical Acquired Resistance to RAF Inhibitor Combinations in BRAF-Mutant Colorectal Cancer through MAPK Pathway Alterations. **Cancer Discovery**. PMID: 25673644
14. Francis JM, *et al.* (2013) Somatic mutation of CDKN1B in small intestine neuroendocrine tumors. **Nat. Genet.** PMID: PMC4239432

Medical and Population Genomics

1. Lennon NJ, *et al.* (2024) Selection, optimization, and validation of ten chronic disease polygenic risk scores for clinical implementation in diverse US populations. **Nature Medicine** PMID: 38374346
2. The All of Us Research Program Genomics Investigators (2024) Genomic data in the All of Us Research Program. **Nature** PMID: 38374255
3. Linder JE, *et al.* (2023) Returning integrated genomic risk and clinical recommendations: The eMERGE study. **Genome Med.** PMID: 36621880
4. Venner E, *et al.* (2022) Whole-genome sequencing as an investigational device for return of hereditary disease risk and pharmacogenomic results as part of the All of Us Research Program. **Genome Med.** PMID: 35346344
5. Glazer AM, *et al.* (2022) Arrhythmia Variant Associations and Reclassifications in the eMERGE-III Sequencing Study. **Circulation** PMID: 34930020
6. Reis ALM, *et al.* (2022) Using synthetic chromosome controls to evaluate the sequencing of difficult regions within the human genome. **Genome Biol.** PMID: 35022065
7. Brockman DG, *et al.* (2021) Design and user experience testing of a polygenic score report: a qualitative study of prospective users. **BMC Med Genomics** PMID: 34598685
8. Vylet'al P, *et al.* (2021) Plasma Mucin-1 (CA15-3) Levels in Autosomal Dominant Tubulointerstitial Kidney Disease due to MUC1 Mutations. **Am J Nephrol.** PMID: 34098564
9. Marshall CR, *et al.* (2020) Best practices for the analytical validation of clinical whole-genome sequencing intended for the diagnosis of germline disease. **NPJ Genom Med.** PMID: 33110627
10. eMERGE Consortium (2020) Frequency of genomic secondary findings among 21,915 eMERGE network participants. **Genet. Med.** PMID: 32546831

Microbial and Viral Genomics

1. Earnest R *et al.* (2022) Comparative transmissibility of SARS-CoV-2 variants Delta and Alpha in New England, USA. **Cell Rep Med.** PMID: 35480627
2. Siddle KJ, *et al.* (2021) Transmission from vaccinated individuals in a large SARS-CoV-2 Delta variant outbreak. **Cell** PMID: 35051367
3. Pollock NR, *et al.* (2021) Implementation of SARS-CoV2 Screening in K-12 Schools Using In-School Pooled Molecular Testing and Deconvolution by Rapid Antigen Test. **J Clin Microbiol** PMID: 34191585
4. Lennon NJ *et al.* (2021) Cross-sectional assessment of SARS-CoV-2 viral load by symptom status in Massachusetts congregate living facilities. **J Infect Dis.** PMID: 3425584
5. Hay JA *et al.* (2021) Estimating epidemiologic dynamics from cross-sectional viral load distributions. **Science** PMID: 34083451
6. Pollock NR, *et al.* (2021) Performance and Implementation Evaluation of the Abbott BinaxNOW Rapid Antigen Test in a High-Throughput Drive-Through Community Testing Site in Massachusetts. **J Clin Microbiol.** PMID: 33622768
7. Neafsy DE, *et al.* (2015) Genetic Diversity and Protective Efficacy of the RTS,S/AS01 Malaria Vaccine. **N Engl J Med.** PMID: PMC4762279
8. Andersen KG, *et al.* (2015) Clinical Sequencing Uncovers Origins and Evolution of Lassa Virus. **Cell** PMID: 26276630
9. Thai KT, *et al.* (2012) High-resolution analysis of intrahost genetic diversity in dengue virus serotype 1 infection identifies mixed infections. **J Virol.** PMID: PMC3255838
10. OhAinle M, *et al.* (2011) Dynamics of dengue disease severity determined by the interplay between viral genetics and serotype-specific immunity. **Science Translational Medicine** PMID: PMC4517192

Genomic Technologies and Methods Development

1. Costello M *et al.* (2018) Characterization and remediation of sample index swaps by non-redundant dual indexing on massively parallel sequencing platforms. **BMC Genomics** PMCID: PMC5941783
2. Blumenstiel B, *et al.* (2016) Development and Validation of a Mass Spectrometry-Based Assay for the Molecular Diagnosis of Mucin-1 Kidney Disease. **J Mol Diag** PMID: 27157321
3. Trapnell C, *et al.* (2014) The dynamics and regulators of cell fate decisions are revealed by pseudotemporal ordering of single cells. **Nat Biotechnology** PMCID: PMC4122333
4. Yu Q, *et al.* (2011) *PriSM*: A Primer Selection and Matching tool for amplification and sequencing of viral genomes. **Bioinformatics** PMCID: PMC3018813
5. Lennon NJ, *et al.* (2010) A scalable, fully automated process for construction of sequence-ready barcoded libraries for 454. **Genome Biology** PMCID: PMC2872875