

CURRICULUM VITAE

GARRY P. NOLAN, Ph.D.

EDUCATION

UNDERGRADUATE SCHOOL

1979-1983 **Cornell University**
B.S., Biology, specialization in Genetics
Research: Rhizobium/Legume Microbial Genetics,
Advisor: Professor Aladar Szalay

GRADUATE SCHOOL

1983-1989 **Scientific Advisor: Professor Leonard Herzenberg Ph.D.,**
Department of Genetics, Stanford University

- **Research: Immunogenetics, Individual Cell Gene Expression**
- **Thesis: *Individual cell gene regulation studies and in situ detection of transcriptionally active chromatin using fluorescence-activated cell sorting with a viable cell fluorogenic assay***

1989-1990 **Continuing Post-Graduate Research:**
Epigenetics of Mammalian Gene Expression; Whole Animal Cell Sorting.

POSTDOCTORAL WORK

1990-1993 **Scientific Advisor: Professor David Baltimore**
Postdoctoral Fellow

- **NIH Fellowship Program**
- **Leukemia Society Special Fellow**

Research conducted at:

- **Whitehead Institute for Biomedical Research (MIT)**
- **Rockefeller University**

Research:

- **The NF- κ B/I κ B proteins (cloning and characterization of p65/RelA).**
- **Development of 293T based retroviral packaging and delivery systems**

FACULTY POSITIONS

2011-present **Rachford and Carlota A. Harris Professor**
Department of Pathology, Stanford University School of Medicine

2009-present **Professor (Tenure)**
Department of Microbiology and Immunology, Stanford University School of Medicine

1999-2009 **Associate Professor (Tenure)**
Department of Molecular Pharmacology, Stanford University School of Medicine

1995- 1999 **Assistant Professor, Joint Appointment**
Department of Microbiology and Immunology, Stanford University School of Medicine

1993-1999 **Assistant Professor**
Department of Molecular Pharmacology, Stanford University School of Medicine

OVERVIEW:

Dr. Nolan is the Rachford and Carlota A. Harris Professor in the Department of Pathology at Stanford University School of Medicine. He trained with Leonard Herzenberg (for his Ph.D.) and Nobelist Dr. David Baltimore (for postdoctoral work for the first cloning/characterization of NF- κ B p65/RelA and the development of rapid retroviral production systems). He has published over 330 research papers, is the holder of 50 US patents, and has been honored as one of the top 25 inventors at Stanford University.

Dr. Nolan is the first recipient of the Teal Innovator Award (2012) from the Department of Defense (a \$3.3 million grant for advanced studies in ovarian cancer), the first recipient of an FDA BAAA to an academic institution (\$3 million for “Bio-agent protection” grant from the FDA for a “Cross-Species Immune System Reference”), received the award for “Outstanding Research Achievement in 2011” from the Nature Publishing Group for his development of CyTOF applications in the immune system, Elected as a Fellow of the American Institute for Medical and Biological Engineering, and is the recipient of the Ernest Cotlove Award from the Academy of Clinical Laboratory Physicians & Scientists.

Dr. Nolan is an outspoken proponent of translating public & private investment in basic research to serve the public welfare. Dr. Nolan was the founder of Rigel Inc. (NASDAQ: RIGL), and Nodality, Inc., a diagnostics development company and serves on the Boards of Directors of several companies, as well as consults for other biotechnology companies. DVS Sciences, on which he is Chair of the Scientific Advisory Board, was sold for \$207 million underscoring the considerable interest in the technology in academic and clinical venues. He was the co-Founder of BINA, a sequence analysis company sold to Roche for \$110 million, and is the co-Founder of Apprise, Akoya, Scale, Cellformatica, Health Universe, IonPath, and StarDustX—all companies in the single cell analysis, pathology imaging arena, atomic imaging, or artificial intelligence fields.

Dr. Nolan’s areas of research include hematopoiesis, cancer and leukemia, immuno-oncology, autoimmunity and inflammation, and computational approaches for network and systems immunology. He has focused on a single cell analysis advance using a mass spectrometry-flow cytometry hybrid device, the so-call “CyTOF”. The approach uses an advanced ion plasma source to determine the levels of tagged reagents bound to cells—enabling a vast increase in the number of parameters that can be measured per cell. Another innovation is termed molecular ion beam imaging (MIBI), a system that also uses mass tags that will enable sub-light imaging (50 nm resolution) of tissue sections as well as the CODEX system enabling 50 or more parameters per image. Further innovations include atomic imaging and split pool single cell labeling for proteomics and genomics. Dr. Nolan’s efforts are to enable a deeper understanding not only of normal immune function, trauma, and other inflammatory events but also detailed substructures of leukemias and solid cancers—which will enable wholly new understandings that will enable better management of disease and clinical outcomes. His laboratory lately mostly focuses on AI and Large Language Model human-level interpretation of complex datasets.

HONORS AND FELLOWSHIPS

- National Science Foundation Fellowship. Organization and Function of the Eukaryotic Genome. Spetsai, Greece. September 1988.
- Awarded American Cancer Society Fellowship (declined).
- National Institutes of Health Fellowship: June 1990-June 1992.
- Leukemia Society Special Fellow: July 1992-June 1995.
- Leukemia Society Scholar Award: July 1995-June 2000.
Hume Faculty Scholar: 1993-1998
- Board of Trustees, Leukemia Society of America, Northern California: 1995-1998.
- Burroughs Wellcome Fund New Investigator Award: July 1996 - June 2000.
- Stanford University: Howard Hughes Medical Institute Junior Faculty Scholar Award. May 1997 - April 1998.

- Leukemia and Lymphoma Society: Stohlman Scholar. January 2000 – December 2000.
- Nature Publishing Group “Outstanding Research Achievement for 2011” for Mass Cytometry and CyTOF.
- Department of Defense Teal Innovator Award, 2012.
- Elected as a Fellow of the American Institute for Medical and Biological Engineering, 2014 (induction in 2015).
- Cotlove Award, Academy of Clinical Laboratory Physicians & Scientists (2015).
- International Society for Laboratory Hematology Award (2021)
- University of Bern - Hans Sigrist Prize (2021)
- Keio University Medical Science Prize. (2022)
- M.D. Anderson Award (2022)
- The Arthur Kornberg and Paul Berg Lifetime Achievement Award in Biomedical Sciences (2024)

NIH BOARDS (prior and current)

Co-Chair, trans-NIH Roadmap Initiative on Cellular Signatures.
 National Heart, Lung, and Blood Institute Board of External Experts.
 NCI-Frederick Advisory Committee.

NATIONAL SOCIETIES (prior and current)

American Association for the Advancement of Science	Society of Developmental Biology
American Society for Microbiology	American Society for Gene Therapy
American Association of Immunologists	

EDITORIAL BOARDS (prior)

<i>Chemistry and Biology</i> (1997-1999)	<i>Gene Therapy & Molecular Biology</i>
<i>Genes to Cells</i>	<i>Molecular Therapy</i> (American Cancer Society)
<i>Molecular Systems Biology</i>	<i>Open Network Biology</i>

PUBLICATIONS

1. Zhu, B., Gao, S., Chen, S., Wang, Y., Yeung, J., Bai, Y., Huang, A.Y., Yeo, Y.Y., Liao, G., Mao, S., Jiang, Z.G., Rodig, S.J., Wong, K.C., Shalek, A.K., **Nolan, G.P.**, Jiang, S., and Ma, Z. (2025). CellLENS enables cross-domain information fusion for enhanced cell population delineation in single-cell spatial omics data. *Nat Immunol* 26, 963–974. 10.1038/s41590-025-02163-1.
2. Zhu, B., Bai, Y., Yeo, Y.Y., Lu, X., Rovira-Clave, X., Chen, H., Yeung, J., Nkosi, D., Glickman, J., Delgado-Gonzalez, A., Gerber, G.K., Angelo, M., Shalek, A.K., **Nolan, G.P.**, and Jiang, S. (2025). A multi-omics spatial framework for host-microbiome dissection within the intestinal tissue microenvironment. *Nat Commun* 16, 1230. 10.1038/s41467-025-56237-7.
3. Zhang, Z., Xu, A., Bai, Y., Chen, Y., Cates, K., Kerr, C., Bermudez, A., Susanto, T.T., Wysong, K., Garcia Marques, F.J., **Nolan, G.P.**, Pitteri, S., and Barna, M. (2025). A subcellular map of translational machinery composition and regulation at the single-molecule level. *Science* 387, eadn2623. 10.1126/science.adn2623.
4. Klughammer, J., Abravanel, D.L., Segerstolpe, A., Blosser, T.R., Goltsev, Y., Cui, Y., Goodwin, D.R., Sinha, A., Ashenberg, O., Slyper, M., Vigneau, S., Jane-Valbuena, J., Alon, S., Caraccio, C., Chen, J., Cohen, O., Cullen, N., DelloStritto, L.K., Dionne, D., Files, J., Frangieh, A., Helvie, K., Hughes, M.E., Inga, S., Kanodia, A., Lako, A.,

- MacKichan, C., Mages, S., Moriel, N., Murray, E., Napolitano, S., Nguyen, K., Nitzan, M., Ortiz, R., Patel, M., Pfaff, K.L., Porter, C.B.M., Rotem, A., Strauss, S., Strasser, R., Thorner, A.R., Turner, M., Wakiro, I., Waldman, J., Wu, J., Gomez Tejada Zanudo, J., Zhang, D., Lin, N.U., Tolaney, S.M., Winer, E.P., Boyden, E.S., Chen, F., **Nolan, G.P.**, Rodig, S.J., Zhuang, X., Rozenblatt-Rosen, O., Johnson, B.E., Regev, A., and Wagle, N. (2025). Author Correction: A multi-modal single-cell and spatial expression map of metastatic breast cancer biopsies across clinicopathological features. *Nat Med* 31, 1713. 10.1038/s41591-025-03665-z.
5. Haist, M., Matusiak, M., Tan, Y., Zimmer, S., Stege, H., Kempchen, T.N., Mitschke, S., Chu, P., Weidenthaler-Barth, B., Barlow, G.L., Rogall, F., Gonzalez, A.D., Baertsch, M.A., Albertini, S., Gariglio, M., Borgogna, C., Goltsev, Y., Grabbe, S., Hickey, J.W., and **Nolan, G.P.** (2025). Spatially organized inflammatory myeloid-CD8(+) T cell aggregates linked to Merkel-cell Polyomavirus driven Reorganization of the Tumor Microenvironment. *bioRxiv*. 10.1101/2025.06.06.657162.
 6. Drainas, A.P., McIlwain, D.R., Dallas, A., Chu, T., Delgado-Gonzalez, A., Baron, M., Angulo-Ibanez, M., Trejo, A., Bai, Y., Hickey, J.W., Lu, G., Lu, S., Pineda-Ramirez, J., Anglin, K., Richardson, E.T., Prostko, J.C., Frias, E., Servellita, V., Brazer, N., Chiu, C.Y., Peluso, M.J., Martin, J.N., Wirz, O.F., Pham, T.D., Boyd, S.D., Kelly, J.D., Sage, J., **Nolan, G.P.**, and Rovira-Clave, X. (2025). High-throughput multiplexed serology via the mass-spectrometric analysis of isotopically barcoded beads. *Nat Biomed Eng*. 10.1038/s41551-025-01349-0.
 7. Ding, D.Y., Tang, Z., Zhu, B., Ren, H., Shalek, A.K., Tibshirani, R., and **Nolan, G.P.** (2025). Quantitative characterization of tissue states using multiomics and ecological spatial analysis. *Nat Genet* 57, 910–921. 10.1038/s41588-025-02119-z.
 8. Barlow, G.L., Schurch, C.M., Bhate, S.S., Phillips, D.J., Young, A., Dong, S., Martinez, H.A., Kaber, G., Nagy, N., Ramachandran, S., Meng, J., Korpos, E., Bluestone, J.A., **Nolan, G.P.**, and Bollyky, P.L. (2025). The extra-islet pancreas supports autoimmunity in human type 1 diabetes. *Elife* 13. 10.7554/eLife.100535.
 9. Zhu, B., Gao, S., Chen, S., Yeung, J., Bai, Y., Huang, A.Y., Yeo, Y.Y., Liao, G., Mao, S., Jiang, Z.G., Rodig, S.J., Shalek, A.K., **Nolan, G.P.**, Jiang, S., and Ma, Z. (2024). Cross-domain information fusion for enhanced cell population delineation in single-cell spatial-omics data. *bioRxiv*. 10.1101/2024.05.12.593710.
 10. Zhu, B., Bai, Y., Yeo, Y.Y., Lu, X., Rovira-Clave, X., Chen, H., Yeung, J., Gerber, G.K., Angelo, M., Shalek, A.K., **Nolan, G.P.**, and Jiang, S. (2024). A Spatial Multi-Modal Dissection of Host-Microbiome Interactions within the Colitis Tissue Microenvironment. *bioRxiv*. 10.1101/2024.03.04.583400.
 11. Yeo, Y.Y., Qiu, H., Bai, Y., Zhu, B., Chang, Y., Yeung, J., Michel, H.A., Wright, K., Shaban, M., Sadigh, S., Nkosi, D., Shanmugam, V., Rock, P., Tung Yiu, S.P., Cramer, P., Paczkowska, J., Stephan, P., Liao, G., Huang, A.Y., Wang, H., Chen, H., Frauenfeld, L., Mitra, B., Gewurz, B.E., Schurch, C.M., Zhao, B., **Nolan, G.P.**, Zhang, B., Shalek, A.K., Angelo, M., Mahmood, F., Ma, Q., Burack, W.R., Shipp, M.A., Rodig, S.J., and Jiang, S. (2024). Epstein-Barr Virus Orchestrates Spatial Reorganization and Immunomodulation within the Classic Hodgkin Lymphoma Tumor Microenvironment. *bioRxiv*. 10.1101/2024.03.05.583586.
 12. Weerasekera, A., Ion-Margineanu, A., **Nolan, G.P.**, and Mody, M. (2024). Subcortical-cortical white matter connectivity in adults with autism spectrum disorder and schizophrenia patients. *Psychiatry Res Neuroimaging* 340, 111806. 10.1016/j.pscychresns.2024.111806.
 13. Shaban, M., Bai, Y., Qiu, H., Mao, S., Yeung, J., Yeo, Y.Y., Shanmugam, V., Chen, H., Zhu, B., Weirather, J.L., **Nolan, G.P.**, Shipp, M.A., Rodig, S.J., Jiang, S., and Mahmood, F. (2024). MAPS: pathologist-level cell type annotation from tissue images through machine learning. *Nat Commun* 15, 28. 10.1038/s41467-023-44188-w.
 14. Roeder, T., Baertsch, M.A., Fitzgerald, D., Vohringer, H., Brinkmann, B.J., Czernilofsky, F., Knoll, M., Llao-Cid, L., Mathioudaki, A., Fassbender, B., Herbon, M., Lautwein, T., Bruch, P.M., Liebers, N., Schurch, C.M., Passerini, V., Seifert, M., Brobeil, A., Mechtersheimer, G., Muller-Tidow, C., Weigert, O., Seiffert, M., **Nolan, G.P.**, Huber, W., and Dietrich, S. (2024). Multimodal and spatially resolved profiling identifies distinct patterns of T cell infiltration in nodal B cell lymphoma entities. *Nat Cell Biol* 26, 478–489. 10.1038/s41556-024-01358-2.
 15. Patel, A.G., Ashenberg, O., Collins, N.B., Segerstolpe, A., Jiang, S., Slyper, M., Huang, X., Caraccio, C., Jin, H., Sheppard, H., Xu, K., Chang, T.C., Orr, B.A., Shirinifard, A., Chapple, R.H., Shen, A., Clay, M.R., Tatevossian, R.G., Reilly, C., Patel, J., Lupo, M., Cline, C., Dionne, D., Porter, C.B.M., Waldman, J., Bai, Y., Zhu, B., Barrera, I., Murray,

- E., Vigneau, S., Napolitano, S., Wakiro, I., Wu, J., Grimaldi, G., Dellostritto, L., Helvie, K., Rotem, A., Lako, A., Cullen, N., Pfaff, K.L., Karlstrom, A., Jane-Valbuena, J., Todres, E., Thorner, A., Geeleher, P., Rodig, S.J., Zhou, X., Stewart, E., Johnson, B.E., Wu, G., Chen, F., Yu, J., Goltsev, Y., **Nolan, G.P.**, Rozenblatt-Rosen, O., Regev, A., and Dyer, M.A. (2024). A spatial cell atlas of neuroblastoma reveals developmental, epigenetic and spatial axis of tumor heterogeneity. *bioRxiv*. 10.1101/2024.01.07.574538.
16. Matusiak, M., Hickey, J.W., van, I.D.G.P., Lu, G., Kidzinski, L., Zhu, S., Colburg, D.R.C., Luca, B., Phillips, D.J., Brubaker, S.W., Charville, G.W., Shen, J., Loh, K.M., Okwan-Duodu, D.K., **Nolan, G.P.**, Newman, A.M., West, R.B., and van de Rijn, M. (2024). Spatially Segregated Macrophage Populations Predict Distinct Outcomes in Colon Cancer. *Cancer Discov* 14, 1418–1439. 10.1158/2159-8290.CD-23-1300.
 17. Lee, A., Floyd, K., Wu, S., Fang, Z., Tan, T.K., Froggatt, H.M., Powers, J.M., Leist, S.R., Gully, K.L., Hubbard, M.L., Li, C., Hui, H., Scoville, D., Ruggiero, A.D., Liang, Y., Pavenko, A., Lujan, V., Baric, R.S., **Nolan, G.P.**, Arunachalam, P.S., Suthar, M.S., and Pulendran, B. (2024). BCG vaccination stimulates integrated organ immunity by feedback of the adaptive immune response to imprint prolonged innate antiviral resistance. *Nat Immunol* 25, 41–53. 10.1038/s41590-023-01700-0.
 18. Klughammer, J., Abravanel, D.L., Segerstolpe, A., Blosser, T.R., Goltsev, Y., Cui, Y., Goodwin, D.R., Sinha, A., Ashenberg, O., Slyper, M., Vigneau, S., Jane-Valbuena, J., Alon, S., Caraccio, C., Chen, J., Cohen, O., Cullen, N., DelloStritto, L.K., Dionne, D., Files, J., Frangieh, A., Helvie, K., Hughes, M.E., Inga, S., Kanodia, A., Lako, A., MacKichan, C., Mages, S., Moriel, N., Murray, E., Napolitano, S., Nguyen, K., Nitzan, M., Ortiz, R., Patel, M., Pfaff, K.L., Porter, C.B.M., Rotem, A., Strauss, S., Strasser, R., Thorner, A.R., Turner, M., Wakiro, I., Waldman, J., Wu, J., Gomez Tejada Zanudo, J., Zhang, D., Lin, N.U., Tolaney, S.M., Winer, E.P., Boyden, E.S., Chen, F., **Nolan, G.P.**, Rodig, S.J., Zhuang, X., Rozenblatt-Rosen, O., Johnson, B.E., Regev, A., and Wagle, N. (2024). A multi-modal single-cell and spatial expression map of metastatic breast cancer biopsies across clinicopathological features. *Nat Med* 30, 3236–3249. 10.1038/s41591-024-03215-z.
 19. Hutchison, W.J., Keyes, T.J., tidyomics, C., Crowell, H.L., Serizay, J., Soneson, C., Davis, E.S., Sato, N., Moses, L., Tarlinton, B., Nahid, A.A., Kosmac, M., Clayssen, Q., Yuan, V., Mu, W., Park, J.E., Mamede, I., Ryu, M.H., Axisa, P.P., Paiz, P., Poon, C.L., Tang, M., Gottardo, R., Morgan, M., Lee, S., Lawrence, M., Hicks, S.C., **Nolan, G.P.**, Davis, K.L., Papenfuss, A.T., Love, M.I., and Mangiola, S. (2024). The tidyomics ecosystem: Enhancing omic data analyses. *bioRxiv*. 10.1101/2023.09.10.557072.
 20. Hutchison, W.J., Keyes, T.J., tidyomics, C., Crowell, H.L., Serizay, J., Soneson, C., Davis, E.S., Sato, N., Moses, L., Tarlinton, B., Nahid, A.A., Kosmac, M., Clayssen, Q., Yuan, V., Mu, W., Park, J.E., Mamede, I., Ryu, M.H., Axisa, P.P., Paiz, P., Poon, C.L., Tang, M., Gottardo, R., Morgan, M., Lee, S., Lawrence, M., Hicks, S.C., **Nolan, G.P.**, Davis, K.L., Papenfuss, A.T., Love, M.I., and Mangiola, S. (2024). The tidyomics ecosystem: enhancing omic data analyses. *Nat Methods* 21, 1166–1170. 10.1038/s41592-024-02299-2.
 21. Holman, D.R., Rubin, S.J.S., Ferenc, M., Holman, E.A., Koron, A.N., Daniel, R., Boland, B.S., **Nolan, G.P.**, Chang, J.T., and Rogalla, S. (2024). Automated spatial omics landscape analysis approach reveals novel tissue architectures in ulcerative colitis. *Sci Rep* 14, 18934. 10.1038/s41598-024-68397-5.
 22. Hickey, J.W., Agmon, E., Horowitz, N., Tan, T.K., Lamore, M., Sunwoo, J.B., Covert, M.W., and **Nolan, G.P.** (2024). Integrating multiplexed imaging and multiscale modeling identifies tumor phenotype conversion as a critical component of therapeutic T cell efficacy. *Cell Syst* 15, 322–338 e325. 10.1016/j.cels.2024.03.004.
 23. Germain, R.N., Van Allen, E.M., Trynka, G., Tsang, J.S., Grun, D., Kiemen, A.L., Shi, Y., Pugh Bernard, A., and **Nolan, G.P.** (2024). AI and immunology. *Immunity* 57, 1177–1181. 10.1016/j.immuni.2024.05.016.
 24. Chen, S., Zhu, B., Huang, S., Hickey, J.W., Lin, K.Z., Snyder, M., Greenleaf, W.J., **Nolan, G.P.**, Zhang, N.R., and Ma, Z. (2024). Integration of spatial and single-cell data across modalities with weakly linked features. *Nat Biotechnol* 42, 1096–1106. 10.1038/s41587-023-01935-0.
 25. Chang, Y., Liu, J., Jiang, Y., Ma, A., Yeo, Y.Y., Guo, Q., McNutt, M., Krull, J.E., Rodig, S.J., Barouch, D.H., **Nolan, G.P.**, Xu, D., Jiang, S., Li, Z., Liu, B., and Ma, Q. (2024). Graph Fourier transform for spatial omics representation and analyses of complex organs. *Nat Commun* 15, 7467. 10.1038/s41467-024-51590-5.

26. Barlow, G.L., Schurch, C.M., Bhate, S.S., Phillips, D., Young, A., Dong, S., Martinez, H.A., Kaber, G., Nagy, N., Ramachandran, S., Meng, J., Korpos, E., Bluestone, J.A., **Nolan, G.P.**, and Bollyky, P.L. (2024). The Extra-Islet Pancreas Supports Autoimmunity in Human Type 1 Diabetes. *medRxiv*. 10.1101/2023.03.15.23287145.
27. Zhu, B., Chen, S., Bai, Y., Chen, H., Liao, G., Mukherjee, N., Vazquez, G., McIlwain, D.R., Tzankov, A., Lee, I.T., Matter, M.S., Goltsev, Y., Ma, Z., **Nolan, G.P.**, and Jiang, S. (2023). Robust single-cell matching and multimodal analysis using shared and distinct features. *Nat Methods* 20, 304–315. 10.1038/s41592-022-01709-7.
28. Wu, C.T., Lidsky, P.V., Xiao, Y., Cheng, R., Lee, I.T., Nakayama, T., Jiang, S., He, W., Demeter, J., Knight, M.G., Turn, R.E., Rojas-Hernandez, L.S., Ye, C., Chiem, K., Shon, J., Martinez-Sobrido, L., Bertozzi, C.R., **Nolan, G.P.**, Nayak, J.V., Milla, C., Andino, R., and Jackson, P.K. (2023). SARS-CoV-2 replication in airway epithelia requires motile cilia and microvillar reprogramming. *Cell* 186, 112–130 e120. 10.1016/j.cell.2022.11.030.
29. Weerasekera, A., Ion-Margineanu, A., Green, C., Mody, M., and **Nolan, G.P.** (2023). Predictive models demonstrate age-dependent association of subcortical volumes and cognitive measures. *Hum Brain Mapp* 44, 801–812. 10.1002/hbm.26100.
30. Strasser, M.K., Gibbs, D.L., Gascard, P., Bons, J., Hickey, J.W., Schurch, C.M., Tan, Y., Black, S., Chu, P., Ozkan, A., Basisty, N., Sangwan, V., Rose, J., Shah, S., Camilleri-Broet, S., Fiset, P.O., Bertos, N., Berube, J., Djambazian, H., Li, R., Oikonomopoulos, S., Fels-Elliott, D.R., Vernovsky, S., Shimshoni, E., Collyar, D., Russell, A., Ragoussis, I., Stachler, M., Goldenring, J.R., McDonald, S., Ingber, D.E., Schilling, B., **Nolan, G.P.**, Tlsty, T.D., Huang, S., and Ferri, L.E. (2023). Concerted epithelial and stromal changes during progression of Barrett's Esophagus to invasive adenocarcinoma exposed by multi-scale, multi-omics analysis. *bioRxiv*. 10.1101/2023.06.08.544265.
31. Shaban, M., Bai, Y., Qiu, H., Mao, S., Yeung, J., Yeo, Y.Y., Shanmugam, V., Chen, H., Zhu, B., **Nolan, G.P.**, Shipp, M.A., Rodig, S.J., Jiang, S., and Mahmood, F. (2023). MAPS: Pathologist-level cell type annotation from tissue images through machine learning. *bioRxiv*. 10.1101/2023.06.25.546474.
32. Sarno, J., Domizi, P., Liu, Y., Merchant, M., Pedersen, C.B., Jedoui, D., Jager, A., **Nolan, G.P.**, Gaipa, G., Bendall, S.C., Bava, F.A., and Davis, K.L. (2023). Dasatinib overcomes glucocorticoid resistance in B-cell acute lymphoblastic leukemia. *Nat Commun* 14, 2935. 10.1038/s41467-023-38456-y.
33. Quardokus, E.M., Saunders, D.C., McDonough, E., Hickey, J.W., Werlein, C., Surette, C., Rajbhandari, P., Casals, A.M., Tian, H., Lowery, L., Neumann, E.K., Bjorklund, F., Neelakantan, T.V., Croteau, J., Wiblin, A.E., Fisher, J., Livengood, A.J., Dowell, K.G., Silverstein, J.C., Spraggins, J.M., Pryhuber, G.S., Deutsch, G., Ginty, F., **Nolan, G.P.**, Melov, S., Jonigk, D., Caldwell, M.A., Vlachos, I.S., Muller, W., Gehlenborg, N., Stockwell, B.R., Lundberg, E., Snyder, M.P., Germain, R.N., Camarillo, J.M., Kelleher, N.L., Borner, K., and Radtke, A.J. (2023). Organ Mapping Antibody Panels: a community resource for standardized multiplexed tissue imaging. *Nat Methods* 20, 1174–1178. 10.1038/s41592-023-01846-7.
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ISSUED PATENTS

1. Monitoring of cells and trans-activating transcription elements. **Garry P. Nolan**, Steven Fiering, and Leonard A. Herzenberg. US Patent number: 5070012. Dec. 3, 1991.
2. Rapid, stable high-titer production of recombinant retrovirus. Todd Kinsella and **Garry P. Nolan**. US patent number: 5830725. Nov. 3, 1998.
3. Methods for screening for transdominant intracellular effector peptides and RNA molecules **Garry P. Nolan** and Michael Rothenberg (this patent is co-owned with Rigel). US Patent number: 6153380. Nov. 28, 2000.
4. Methods for screening for transdominant effector peptides and RNA molecules. Inventors: **Garry P. Nolan** and Michael Rothenberg (this patent is co-owned with Rigel). US Patent number: 6365344. April 2, 2002.
5. Methods for screening for transdominant effector peptides and RNA molecules. Inventors: **Garry P. Nolan** and Michael Rothenberg (this patent is co-owned with Rigel). US Patent number: 6455247. Sept 24, 2002
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