Kerim B. Kaylan

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# Kerim B. Kaylan

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# Education

2017-2021 University of Illinois College of Medicine, Chicago, IL

**Doctor of Medicine**,

Medical Scholars (M.D./Ph.D.) Program

2012-2017 University of Illinois College of Medicine, Urbana, IL.

**Doctor of Philosophy,** Department of Bioengineering

Medical Scholars (M.D./Ph.D.) Program

*Dissertation:* [*Dissecting combinatorial micro environmental regulation of*](http://hdl.handle.net/2142/98244)[*cell fate and function using a multi-modal arraying platform*](http://hdl.handle.net/2142/98244)*.*

**Master of Science,** *Department of Bioengineering*

Thesis: Engineered microenvironments for studying liver progenitor differentiation.

2008–2012 University of Michigan, Ann Arbors, MI

**Bachelor of Science in Engineering,** Department of Biomedical Engineering

*Graduated magna cum laude.*

# Grants, Honors, and Awards

2017 **Teacher Ranked as Excellent**, *Cell and Tissue Biology*, College of Medicine, University of Illinois College of Medicine.

Top 25% of teaching assistants ranked by students.

2016 **Teacher Ranked as Excellent**, *Cell and Tissue Biology*, College of Medicine, University of Illinois College of Medicine.

Outstanding; top 10% of teaching assistants ranked by students.

### 2016 Medical Student Interest Group Matching Grant Program,

#### *$500*, Intersociety Council for Pathology Information.

Awarded to the Pathology Interest Group at the University of Illinois Col- lege of Medicine to continue supporting programs facilitating interactions between faculty and students in addition to providing education on pathol- ogy as a career choice.

#### 2016 **I-Corps**, *$2,000*, National Science Foundation, University of Illinois at Urbana–Champaign Site Cohort 11.

Awarded with Dr. Andreas P. Kourouklis for the use of lean methodologies to develop new, clinically-relevant technologies in liver tissue engineering.

### 2015 Medical Student Interest Group Matching Grant Program,

#### *$750*, Intersociety Council for Pathology Information.

Awarded to the Pathology Interest Group at the University of Illinois College of Medicine to support interactions between faculty and students and provide education on pathology as a career choice.

2014 **O’Morchoe Leadership Fellowship for Out in Medicine**, *$1,500*, University of Illinois College of Medicine.

Awarded to support the activities of Out in Medicine, chiefly education relating to the care of intersex patients.

2010 **Summer Biomedical and Life Science Fellowship**, *$4,000*, Uni- versity of Michigan Undergraduate Research Opportunity Program. Supported research with Prof. Shuichi Takayama to develop a novel cell migration assay using ATPS.

2008 **Michigan Promise Scholarship**, *$1,000*, State of Michigan. 2008 **Michigan Competitive Scholarship**, *$1,300*, State of Michigan.

# Research Experience

2018 **Microfabricated Tissue Models Laboratory**, *Visiting Scholar*, Department of Bioengineering, University of Illinois at Chicago. Advisor: Prof. Salman R. Khetani.

* Developed and documented a generalized pipeline to analyze data for cell microarrays.
* Investigated the regulation of primary human and iPSC-derived hepatocytes by matrix proteins and substrate stiffness.

2012–2017 **Tissue Development and Engineering Laboratory**, *Research Assistant*, Department of Bioengineering, University of Illinois at Urbana–Champaign.

Advisor: Prof. Gregory H. Underhill.

* Designed a cell-based microarray platform with multiple readouts to deconstruct combined biochemical and biomechanical regulation of cell fate and function.
* Characterized the regulation of liver progenitor differentiation by bio- chemical factors (namely TGF*β*, Notch, and MAPK signaling) and biomechanical cues (namely substrate stiffness and interfacial effects).
* Mapped the response of lung tumor cells to chemotherapeutic drugs as a function of both support by matrix protein combinations expression of the oncogene *ASCL1*.

2011 **Genentech, Inc.**, *Cooperative*, Biological Technologies, South San Francisco, CA.

Manager: Dr. Guoying Jiang.

* Designed a functional cell-based assay for a therapeutic monoclonal antibody (MAb1).
* Investigated alternative assay formats reflective of the MOA of MAb1.
* Screened alternative cell lines for response and efficacy in the assay.

2010–2011 **NeuroNexus, Inc.**, *Student Engineer*, Ann Arbor, MI.

Manager: Dr. John Seymour.

* Catalogued design requirements of novel optical neural stimulation systems for use in optogenetics research.
* Prototyped a portable optical neural stimulation system for mice.
* Optimized diode coupling efficiency using simulations and experiments.

2009–2011 **Micro/Nano/Molecular Biotechnology Laboratory**, *Undergrad- uate Research Assistant*, Department of Biomedical Engineering, University of Michigan.

Principal Investigator: Prof. Shuichi Takayama. Advisor: Dr. Hossein Tavana.

* Adapted polymeric aqueous two-phase systems (ATPS) for patterning of biomolecules and cells.
* Designed and validated a high-throughput ATPS migration assay for studying changes in cancer cell migration with drug treatment.
* Formulated and implemented SOPs for automated lab equipment.

# Publications

[1] M. J. Biehl, K. B. Kaylan, R. J. Thompson, R. V. Gonzalez, K. E. Weis, G. H. Underhill, and L. T. Raetzman, “Cellular fate decisions in the developing female anteroventral periventricular nucleus are regulated by canonical Notch signaling,” *Developmental Biology*, vol. 442, no. 1, pp. 87–100, 2018. doi: [10.1016/j.ydbio.2018.06.005.](https://doi.org/10.1016/j.ydbio.2018.06.005)

[2] R. C. A. Eguiluz, K. B. Kaylan, G. H. Underhill, and D. E. Leckband, “Substrate stiffness and VE-cadherin mechano-transduction coordinate to regulate endothelial monolayer integrity,” *Biomaterials*, vol. 140, pp. 45–57, 2017. doi: [10.1016/j.biomaterials.2017.06.](https://doi.org/10.1016/j.biomaterials.2017.06.010)

[010.](https://doi.org/10.1016/j.biomaterials.2017.06.010)

[3] K. B. Kaylan, A. P. Kourouklis, and G. H. Underhill, “A high-throughput cell microarray platform for correlative analysis of cell differentiation and traction forces,” *Journal of Visualized Experiments: JoVE*, no. 121, 2017. doi: [10.3791/55362.](https://doi.org/10.3791/55362)

[4] E. Atefi, D. Fyffe, K. B. Kaylan, and H. Tavana, “Characterization of aqueous two-phase systems from volume and density measurements,” *Journal of Chemical & Engineering Data*, vol. 61, no. 4, pp. 1531–1539, 2016. doi: [10.1021/acs.jced.5b00901.](https://doi.org/10.1021/acs.jced.5b00901)

[5] K. B. Kaylan, S. D. Gentile, L. E. Milling, K. N. Bhinge, F. Kosari, and G. H. Underhill, “Mapping lung tumor cell drug responses as a function of matrix context and genotype using cell microarrays,” *Integrative Biology*, vol. 8, no. 12, pp. 1221–1231, 2016. doi: [10.1039/c6ib00179c.](https://doi.org/10.1039/c6ib00179c)

[6] K. B. Kaylan and G. H. Underhill, “Hydrogels for hepatic tissue engineering,” in *Gels Handbook: Fundamentals, Properties and Applications Volume 2: Applications of Hydro- gels in Regenerative Medicine*, 2016, pp. 427–462. doi: [10.1142/9789813140394\_0015.](https://doi.org/10.1142/9789813140394_0015)

#### [7] K. B. Kaylan\*, V. Ermilova\*, R. C. Yada, and G. H. Underhill, “Combinatorial microen- vironmental regulation of liver progenitor differentiation by Notch ligands, TGF*β*, and extracellular matrix,” *Scientific Reports*, vol. 6, no. 23490, 2016. doi: [10.1038/srep23490.](https://doi.org/10.1038/srep23490)

[8] A. P. Kourouklis\*, K. B. Kaylan\*, and G. H. Underhill, “Substrate stiffness and matrix composition coordinately control the differentiation of liver progenitor cells,” *Biomaterials*, vol. 99, pp. 82–94, 2016. doi: [10.1016/j.biomaterials.2016.05.016.](https://doi.org/10.1016/j.biomaterials.2016.05.016)

[9] H. Tavana, K. Kaylan, T. Bersano-Begey, K. E. Luker, G. D. Luker, and S. Takayama, “Rehydration of polymeric, aqueous, biphasic system facilitates high throughput cell exclusion patterning for cell migration studies,” *Advanced Functional Materials*, vol. 21, no. 15, pp. 2920–2926, 2011. doi: [10.1002/adfm.201002559.](https://doi.org/10.1002/adfm.201002559)

# *\*Indicates equal authorship.*

Peer Reviewed Presentations

[1] K. B. Kaylan, V. Ermilova, R. C. Yada, and G. H. Underhill, “Cellular microarrays reveal combinatorial effects of Notch ligands, TGF*β*, and extracellular matrix on liver progenitor differentiation,” oral presentation at the American Society of Mechanical Engineers NanoEngineering for Medicine and Biology Conference in Houston, TX, Feb. 2016.

[2] K. B. Kaylan, S. D. Gentile, L. E. Milling, K. N. Bhinge, F. Kosari, and G. H. Underhill, “Mapping tumor cell drug response as a function of matrix context using combinatorial cell microarrays,” oral presentation at the Biomedical Engineering Society Annual Meeting in Minneapolis, MN, Oct. 2016.

[3] ——, “Combinatorial cell microarrays for analyzing ECM regulation of tumor cell drug response,” poster presentation at the American Physician Scientists Association Annual Meeting in Chicago, IL, Apr. 2015.

[4] K. Kaylan, V. Ermilova, and G. Underhill, “Arrayed microenvironments for probing liver progenitor cell fate decisions,” poster presentation at the Biomedical Engineering Society Meeting in San Antonio, TX, Oct. 2014.

Local/Regional

[1] K. B. Kaylan, “Engineering microenvironments for studying liver development,” poster presentation at the Ideas on Tap Research Mixer in Chicago, IL, Jul. 2018.

[2] ——, “Dissecting mechanisms of liver progenitor fate specification using cellular mi- croarrays,” oral presentation at the Medical Scholars Program Retreat in Monticello, IL, Aug. 2017.

[3] ——, “Engineering microenvironments for studying liver development,” poster presenta- tion at the College of Medicine Research Day in Chicago, IL, Dec. 2017.

[4] ——, “Combinatorial microenvironmental regulation of liver progenitor differentiation by Notch ligands, TGF*β*, and extracellular matrix,” oral presentation at oSTEM Minority Research Symposium in Urbana, IL, Apr. 2016.

[5] ——, “Combinatorial microenvironmental regulation of liver progenitor differentiation by Notch ligands, TGF*β*, and extracellular matrix,” oral presentation at Bioengineering Graduate Student Seminar Series in Urbana, IL, Sep. 2015.

[6] K. B. Kaylan, S. D. Gentile, L. E. Milling, K. N. Bhinge, F. Kosari, and G. H. Underhill, “Combinatorial cell microarrays for analyzing ECM regulation of tumor cell drug response,” poster presentation at the College of Medicine Research Day in Urbana, IL, Apr. 2015.

[7] ——, “Combinatorial cell microarrays for analyzing ECM regulation of tumor cell drug response,” poster presentation at the Medical Scholars Program Retreat in Monticello, IL, Aug. 2015.

[8] K. Kaylan, V. Ermilova, and G. Underhill, “Deconstructing combinatorial microenvi- ronmental regulation in hepatoblastoma using cell microarrays,” poster presentation at Bioengineering Days in Urbana, IL, Feb. 2014.

[9] ——, “Deconstructing combinatorial microenvironmental regulation in hepatoblastoma using cell microarrays,” poster presentation at the Medical Scholars Program Retreat in Monticello, IL, Aug. 2014.

[10] ——, “Deconstructing combinatorial microenvironmental regulation in hepatoblastoma using cell microarrays,” poster presentation at the Graduate Cancer Community Fall Symposium in Urbana, IL, Sep. 2014.

[11] ——, “Deconstructing combinatorial microenvironmental regulation in hepatoblastoma using cell microarrays.” poster presentation at the College of Medicine Research Day in Urbana, IL, Feb. 2014.

[12] K. Kaylan, I. Lesaca, G. Jiang, and H. Gazzano-Santoro, “Development of a functional assay for MAb1,” poster presentation at Genetech Intern Poster Day in South San Francisco, CA, Aug. 2011.

[13] ——, “Development of a functional assay for MAb1 utilizing peptide uptake,” poster presentation at the Genentech Analytical Development and Quality Control Poster Mixer in South San Francisco, CA, Oct. 2011.

[14] K. Kaylan, H. Tavana, and S. Takayama, “A novel cell migration assay utilizing polymeric aqueous two-phase systems.” poster presentation at the Student Biomedical Research Forum in Ann Arbor, MI, Nov. 2010.

# Teaching Experience

2016–2017 **Cell and Tissue Biology**, *Teaching Assistant*, University of Illinois College of Medicine.

* Supervised weekly lab sessions providing active review of histology and identification of structures.
* Held discussions sections on disease pathophysiology, provided written feedback on student case presentations.

2016 **Worldwide Youth in Science and Engineering Camp**, *Facilitator*, College of Engineering, University of Illinois at Urbana–Champaign.

* Redesigned module on PCR in response to previously identified issues.
* Taught PCR module to high school students.

2015–2016 **Discover Bioengineering Camp**, *Facilitator*, College of Engineer- ing, University of Illinois at Urbana–Champaign.

* Designed, revised, and taught module on PCR to high school students.

2015 **Introduction to Bioengineering**, *Mentor*, Department of Bioengi- neering, University of Illinois at Urbana–Champaign.

* Introduced 3 mentees to bioengineering research.

2014 **Quantitative Biotechnology**, *Guest Lecturer*, Department of Bio- engineering, University of Illinois at Urbana–Champaign.

* TBD

2014 **Stem Cell Bioengineering**, *Grader*, Department of Bioengineering, University of Illinois at Urbana–Champaign.

* Graded problem sets and provided written feedback to students.

2013 **Bioengineering the Future**, *Organizer*, University Lab High School, Urbana, IL.

* Organized and taught a week-long bioengineering course targeted at high school students.
* Engaged and coordinated multiple graduate and faculty speakers.

2012–2017 **Tissue Development and Engineering Laboratory**, *Undergraduate Mentor*, University of Illinois at Urbana–Champaign.

* Trained new lab members in lab-specific safety guidelines, experimental protocols, analysis of data, and interpretation of results.
* Established goals and specific projects for each mentee in addition to assuring development of specific technical skills.
* Held weekly subgroup and 1:1 meetings with undergraduates to design independent experiments and discuss project progress.

2012 **Quantitative Cell Biology**, *Instructional Aid*, Department of Biomedical Engineering, University of Michigan.

* Graded problem sets and administered exams.
* Held weekly office hours, organized review sessions for exams.

2011 **Engineering Advising Center**, *Peer Mentor*, College of Engineering, University of Michigan.

* Advised freshman mentee on gaining research and industry experience.
* Provided information regarding academics and course scheduling specific to the Department of Biomedical Engineering.

Leadership Experience

2017- Current **Student Curricular Board,** University of Illinois College of Medicine.

*Special Projects Chair,* 2018-19AY

* Designed a lean startup-based approach to student-driven curricular change focused on the build-measure-learn process, actionable metrics, minimum viable solutions, and pivoting.
* Collected qualitative and quantitative feedback on availability of study resources and preparedness for USMLE exams.
* Generated solutions to previously-unidentified curricular issues.

*Special Projects Team Member,* 2017-18AY

* Developed and carried out a tutorial series on Osmosis, a spaced- repetition tool integrated with the college’s curriculum.

2016–2017 **Medical Scholars Program Advisory Committee**, *Co-Chair*, University of Illinois College of Medicine.

* Maintained communication between students and faculty as the regional campus implemented plans to sunset the college.
* Initiated changes to the structure of the committee to adapt to changes in the demographics of the student body.

2015–2017 **Pathology Interest Group**, *Organizer*, University of Illinois College of Medicine.

* Planned and carried out activities to promote interactions between pathology faculty and students, including panels of recently-matched students and lunch talks with practicing pathologists.
* Held informational meetings regarding career options in pathology, sub-specialization options, and the outlook of the field.

2014–2017 **Out in Medicine at Illinois**, *Co-President*, University of Illinois College of Medicine.

* Held mixers in the homes of faculty to build community for students, staff, and faculty who identify as sexual or gender minorities.
* Organized seminars on the health of sexual or gender minorities, specifically the care of transgender and intersex patients.

2013–2016 **Graduate Cancer Community Illinois**, Organizer, University of Illinois at Urbana–Champaign.

* Planned and hosted 6 seminars on cancer biology from local faculty.
* Assisted in organizing the Graduate Cancer Community Fall Symposium, which brought students and regional faculty together to present posters and talks on their cancer research.
* Helped carry out the Pioneers in Cancer seminar series, which brought 3 highly-respected faculty members in the cancer field from across the country to speak to and interact with graduate students.

2013–2014 **Medical Scholars Program Retreat Committee**, Co*-Chair*, University of Illinois College of Medicine.

* Oversaw preparations for the Medical Scholars Program Retreat, including securing a venue, contracting with caterers, selecting and scheduling activities, and inviting students and alumni to speak.
* Served as master of ceremonies on the day of the retreat.

2010–2011 **Biomedical Engineering Society**, Executive *Board Member*, University of Michigan.

Kept chapter website updated, improved and upgraded backend code.

Extracurricular Experience

2017–2018 **USMLE Preparedness Committee**, *Member*, University of Illinois College of Medicine.

2017 **Medical Scholars Program Steering Committee**, *Member*, Uni- versity of Illinois College of Medicine.

2017 **Teaching Excellence and Innovation in Education Award Se- lection Committee**, *Member*, University of Illinois College of Medicine.

2012–2017 **Medical Scholars Program Advisory Committee**, *Member*, Uni- versity of Illinois College of Medicine.

2012–2014 **Medical Scholars Program Retreat Committee**, *Member*, Uni- versity of Illinois College of Medicine.

2012–2013 **Engineering Graduate Student Advisory Committee**, *Mem- ber and Secretary*, College of Engineering, University of Illinois at Urbana–Champaign.

2012 **Climate Survey Steering Committee**, *Member*, University of Illi- nois at Urbana–Champaign.

# Professional Affiliations

#### American College of Physicians.

* Tau Beta Pi—The Engineering Honor Society.
* Biomedical Engineering Society.
* American Physician Scientists Association.

Skills

Intersts & Hobbies