

Andreas P. Kourouklis, PhD

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SUMMARY

Intrigued by the material properties of biological systems, I enjoy exploring the mechanisms of multicellular organization and differentiation in response to their physical interactions. Using biomaterials to engineer tissue microenvironment, my objective is to reveal critical mechanisms in tissue development and disease, and deliver technological solutions with broader societal impact.

EDUCATION AND APPOINTMENTS

10/2017 – present

Postdoctoral Research Associate

Princeton University – Department of Chemical and Biological Engineering
Lab of Tissue Morphodynamics. Prof. Celeste M. Nelson, Advisor.

2014 – 09/2017

Postdoctoral Research Associate

University of Illinois Urbana - Champaign - Department of Bioengineering
Lab of Tissue Development and Engineering. Prof. Gregory H. Underhill, Advisor.

2009 – 2014

Ph.D. - Chemical Engineering

University of Massachusetts at Amherst
Lab of synthetic and natural biomimetic materials. Prof. Harry Bermudez, Advisor.
Dissertation: Cell adhesion biophysics on dynamic polymer constructs

2002 – 2007

Diploma of Chemical Engineering

National Technical University of Athens, Greece
Prof. Doros N. Theodorou, Advisor.
Thesis: PEG-modified dendritic polymers for controlled drug delivery

RESEARCH EXPERIENCE

10/2017 – present

Princeton University – Department of Chemical and Biological Engineering

- Mechanical concepts of branching morphogenesis through soft materials principles.
- Integrated systems of cancer metastasis through engineered breast tumors.

2014 – present

University of Illinois at Urbana Champaign – Department of Bioengineering

- Designed cellular traction arrays to correlate traction force and differentiation.

- Designed hybrid organoids of 3-D liver progenitor cells and hydrogel particles to control cell differentiation.
- Designed alginate gels to control the mechanical responses of human stellate cells.

2009 – 2014

University of Massachusetts at Amherst – Department of Polymer Science and Engineering

- Engineered structured nano-thin polymer films with controlled viscosity.
- Developed biophysical assays to decouple the effects of force transduction and extracellular (ECM) remodeling in response to the mechanical properties of the ECM.
- Designed micro-patterned protein arrays on viscous substrates to engineer the presentation of complex mechanical signaling.

2004 – 2007

Institute of Physical Chemistry, National Centre for Scientific Research (Athens, Greece): (Undergraduate Research)

- Synthesized PEGylated hyper-branched polymers for pH-dependent drug release.
- Designed and performed in vitro studies for cellular uptake and biodegradability.

PUBLICATIONS

1. **Kourouklis, A.P.**, and Nelson, C.M., Modeling branching morphogenesis using materials with programmable mechanical instabilities. Current opinion in Biomedical Engineering, 2018. In press.
2. Kaylan, K. **Kourouklis, A.P.**, Underhill, G.H., High-throughput cell microarray platform for correlative analysis of cell differentiation and traction forces. Journal of Visualized Experiments, **2017**. DOI: 10.3791/55362
3. **Kourouklis, A.P.**, Kaylan, K., Underhill, G.H., Substrate stiffness and matrix composition coordinately control the differentiation of liver progenitor cells. Biomaterials. **2016**; DOI: 99: 82-94. DOI: 10.1016/j.biomaterials.2016.05.016.
4. **Kourouklis, A.P.**, Dawn, S., John, J., Carter, K., Bermudez, H., The interplay of substrate mobility and patterning in cell-fibronectin interactions., Matters, **2016**. DOI: 10.19185/matters.201601000016
5. **Kourouklis, A.P.**, Bermudez, H., Integrins Direct Cell Adhesion in a Substrate-Dependent Manner. Cellular and Molecular Bioengineering. **2015**; 8(3): 488-495. DOI: 10.1007/s12195-015-0394-7
6. **Kourouklis, A.P.**, Lerum, R.V, Bermudez, H., Cell adhesion mechanisms on laterally mobile polymer films., Biomaterials. **2014**; 35(17): 4827-34. DOI: 10.1016/j.biomaterials.2014.02.052.
In preparation:
7. **Kourouklis, A.P.**, Gentile, S.D., Underhill, G.H., Polymeric particles for instructive liver progenitor differentiation in 3-D spheroids. (attached abstract)
8. **Kourouklis, A.P.**, Brougham-Cook, A., Underhill, G.H., Activation of Hepatic Stellate cells within engineered alginate gels.

TECHNICAL SKILLS

Engineering: Design and characterization of polymer and biological materials, Self and directed assembly of materials, Composite gels, Controlled release systems, AFM, Dynamic contact angle, Ellipsometry, Dynamic experiments for mechanical characterization.

Biology: Cell (stem and immortal lines) and tissue culture, Immuno-staining, qPCR, Western blot, ELISA, Confocal microscopy, Fluorescence Recovery after photo-bleaching (FRAP), Fluorescence Resonance Energy Transfer (FRET), Traction Force Microscopy (TFM), High-throughput cellular and protein arrays.

Computer: ImageJ, MATLAB, Microsoft Office.

AWARDS AND HIGHLIGHTS

- 2018 **New Jersey Commission for Cancer Research (NJCCR)**, Post-doctoral Cancer Research Fellowship Award. Project title: YAP-regulated metastasis in engineered human breast tumors integrated with interstitial fluid pressure.
- 2013 **American Physical Society (APS)**, International Travel Award from the Division of Biological Physics.
- 2012 **University of Massachusetts at Amherst**, Selected from the Graduate School Committee for the 2012 student Travel Award.
- 2012 **Gordon Research Conference**, Selected for the International Travel Award at the Biointerface Science Meeting in Les Diablerets, Switzerland.
- 2010 **International Center for Materials Research, National Science Foundation** Travel Award for the International Summer School on Biological Interfaces

SELECTED PRESENTATIONS

1. **Kourouklis, A.P.**, Simi A.K., Piotrowski-Dasptit A.S., Joe Tien, Nelson C.M., The relationship between interstitial fluid pressure, collective invasion and YAP activation in engineered breast tumors. AACR 2018 Annual Meeting, Chicago, IL (poster presentation).
2. **Kourouklis, A.P.**, **Gentile, S.D.**, Underhill, G.H., Engineering the Microenvironment of Liver Progenitor Cell Spheroids with Hydrogel Microparticles. BMES 2017 Annual Meeting, Phoenix, Arizona (oral presentations).
3. **Kourouklis, A.P.**, Kaylan, K., Underhill, G.H., Combinatorial ECM Arrays Reveal the Role of Biomechanics in Liver Progenitor Differentiation. AICHE Annual Meeting and Exposition 2016, San Francisco, California (oral presentation).
4. **Kourouklis, A.P.**, Kaylan, K., Underhill, G.H., The Role of ECM Biomechanics in Liver Progenitor Differentiation. AICHE Annual Meeting and Exposition 2016, San Francisco, California (Session for Biomaterials Faculty Candidates, oral presentation).
5. **Kourouklis, A.P.**, Kerim Kaylan, Gregory Underhill. Combinatorial ECM Arrays Reveal the Effects of Biomechanics in Liver Progenitor Differentiation BMES 2016 Annual Meeting, Minneapolis, Minnesota (oral presentation).
6. **Kourouklis, A.P.**, Kerim Kaylan, Gregory Underhill. Matrix Composition and Biophysical Characteristics Coordinately Influence Liver Progenitor Differentiation, NanoEngineering for Medicine and Biology, 2016, Houston, Texas (oral presentation).

7. **Kourouklis, A.P.**, Harry Bermudez. Mechanosensing of laterally mobile viscoelastic films induced biphasic cell spreading response. Annual Meeting of the Society for Biomaterials 2014, Denver, Colorado, (oral presentation).
8. **Kourouklis, A.P.**, Lerum, R.V., Harry Bermudez. The dynamic interplay between cell and substrate mechanical properties, AIChE Annual Meeting 2013, San Francisco, California (oral presentation).
9. **Kourouklis, A.P.**, Lerum, R.V., Harry Bermudez. Biphasic Cell Responses on Laterally Mobile Films, Annual Meeting of the Society for Biomaterials 2013, Boston, Massachusetts (poster presentation).
10. **Kourouklis, A.P.**, Lerum, R.V., Harry Bermudez, Cells Sense and Respond to Substrate Viscoelasticity, BMES 2013 Annual Meeting (poster presentation).
11. **Kourouklis, A.P.**, Ronald V. Lerum, Harry Bermudez. Biphasic cell responses on laterally mobile film, APS March Meeting 2013, Baltimore, Maryland (oral presentation)
12. **Kourouklis, A.P.**, Ronald V. Lerum, Harry Bermudez. Gordon Research Conference, Biointerface Science, Les Diablerets, Switzerland (poster presentation).
13. **Kourouklis, A.P.**, Ronald V. Lerum, Harry Bermudez., Controlling cell adhesion with dynamic polymer films, 2012 MRS Spring Meeting (oral presentation).
14. **Kourouklis, A.P.**, Ronald V. Lerum, Harry Bermudez, Summer School for Biological Interfaces, ICMR, University of California Santa Barbara, 2010 (poster presentation).

MANAGEMENT, MENTORSHIP AND TEACHING

2015 – 2016 **Team Leader, National Science Foundation sponsored i-CORPS**

Technology Entrepreneur Center at the University of Illinois Urbana-Champaign

Project: Development of novel technology for liver regeneration.

Proposal writing. Project design and presentation. Customer and market validation.

2009 – 2016 **Research mentor**

- Katherine Kiang (UIUC undergraduate), Aug. 2016 - Oct. 2017
- Nick Pudik (UIUC undergraduate), Jun. 2016 - Oct. 2017
- Lily Bhargi (UIUC undergraduate), Sept. 2015 – Oct. 2017
- Francesca Gambacorta (UIUC undergraduate, currently: PhD student at the University of Wisconsin-Madison), April 2015 - June 2017
- Xiaomeng Wang (UIUC/SJTU summer program, currently: graduate student at ParisTech), July 2015 - August 2015
- Research Experience for Teachers (RET), Summer 2011
- Research experience for undergraduates (REU), 2009-2014

2009 - 2014 **Teaching Assistant**

Department of Chemical Engineering, University of Massachusetts at Amherst

- Chemical Engineering Lab I: ChE 401, Nano-structured Biomaterials: ChE 597D, Advanced Chemical Engineering Analysis III: ChE 663, Advanced Materials Engineering: ChE 579.

PREVIOUS AND CURRENT AFFILIATIONS

- American Association for Cancer Research (AACR)
- American Society for Cell Biology (ASCB)
- Biomedical Engineering Society (BMES)