# Chrysafis Andreou

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## Profile

Experimental researcher developing, modeling, and employing nano- and micro- systems, coupled with machine-learning methods, for rapid screening, biological and chemical analysis, medical imaging, diagnosis, and therapy.

## Current Projects

Highly multiplexed biomarker detection with SERRS nanoparticles; Machine learning techniques for classification of Raman spectral images; Nanoparticles as contrast agents for optoacoustic biomedical imaging.

## Employment

**Lecturer** (tenure track), University of Cyprus, Electrical and Computer Engineering 2018–present

- Taught general and specialized electrical engineering classes.
- Advised 2 undergraduate students on their senior thesis projects.

## Education

**Ph.D. in Biochemistry and Molecular Biology**, emphasis in Biomolecular Science and Engineering 2008–2013
University of California, Santa Barbara
"Interfacial transport processes in microfluidic systems for precision surface enhanced Raman spectroscopy".

**M.Sc. in Electrical Engineering**, University of Cyprus 2006–2008
"Design and fabrication of dielectrophoresis-based devices for cell manipulation and separation".

**B.Sc. in Mathematics**, Pennsylvania State University 2002–2006
**B.Sc. in Physics** (with Honors), emphasis in Electronics
Honors Thesis: "Tunnelling and phase-sensitive studies of odd-parity superconductor $Sr_2RuO_4$".

## Research experience

**Research Scholar,** Memorial Sloan Kettering Cancer Center, Radiology 2014–2018

- Synthesized nanoparticle probes for Raman and optoacoustic *in vivo* molecular imaging.
- Imaged microscopic tumors in animal models of cancer.
- Developed machine learning algorithms for optical spectroscopic medical imaging.
- Designed and implemented graphical user interfaces for medical spectral data analysis.

**Postdoctoral Researcher,** UCSB, Institute for Collaborative Biotechnologies 2013–2014

- Designed and fabricated microfluidic systems for health monitoring applications.
- Engineered multiphase microfluidic systems for precise nanoparticle control.
- Mentored and trained undergraduate and graduate students.
- Organized academic outreach programs for undergraduates.

**Graduate Student Researcher,** UCSB, Biomolecular Science and Engineering 2008–2013

- Designed and fabricated microfluidic devices for biofluid analysis and drug detection.
- Employed machine learning techniques to analyze complex sprectroscopic data.
- Developed hardware and software for microfluidic flow control.

**Graduate Student Researcher,** University of Cyprus, Electrical and Computer Engineering 2006–2008

- Helped configure and setup a new experimental lab.
- Designed and used electrokinetic microfluidic devices for microparticle manipulation.
- Captured and enriched specific cell populations using the electrokinetic microdevices.

**Undergraduate Researcher,** Pennsylvania State University, Low Temperature Physics 2003–2006

- Fabricated and characterized superconducting devices (SQUIDs and Josephson junctions).
- Investigated super-lattice structure geometries of odd-parity superconducting crystals.

## Publications

### Original Research

[13] S. Roberts*, **C. Andreou***, C. Choi, P. Donabedian, M. Jayaraman, E. C. Pratt, J. Tang, C. Prez-Medina, M. J. de la Cruz, W. J. M. Mulder, J. Grimm, M. F. Kircher, T. Reiner, Sonophore-enhanced nanoemulsions for optoacoustic imaging of cancer, **Chemical Science**, 2018. ***equal first co-author** Get article

[12] C. Kaittanis, **C. Andreou**, H. Hieronymus, N. Mao, C. A. Foss, M. Eiber, G. Weirich, P. Panchal, A. Gopalan, J. Zurita, S. Achilefu, G. Chiosis, V. Ponomarev, M. Schwaiger, B. S. Carver, M. G. Pomper, and J. Grimm: Prostate-specific membrane antigen cleavage of vitamin B9 stimulates oncogenic signaling through metabotropic glutamate receptors, **Journal of Experimental Medicine**, 2017. Get article

[11] S. Banala, S. Fokong, C. Brand, **C. Andreou**, B. Krautler, M. Rueping, and F. Kiessling: Quinone-Fused Porphyrins as Contrast Agents for Photoacoustic Imaging, **Chemical Science**, 2017. Get article

[10] T. R. Nayak*, **C. Andreou***, A. Oseledchyk, W. D. Marcus, H. C. Wong, J. Massagué, and M. F. Kircher: Tissue Factor-Specific Ultra-bright SERRS Nanostars for Raman Detection of Pulmonary Micrometastases, **Nanoscale**, 2017. ***equal first co-author** Get article

[9] A. Oseledchyk, **C. Andreou**, M. A. Wall, and M. F. Kircher: Folate-targeted SERRS Nanoprobe Ratiometry for Detection of Microscopic Ovarian Cancer, **ACS Nano**, 2016. Get article

[8] M. Spaliviero, S. Harmsen, R. Huang, M. A. Wall, **C. Andreou**, J. A. Eastham, K. A. Touijer, P. T. Scardino, and M. F. Kircher: Detection of Lymph Node Metastases with SERRS Nanoparticles, **Molecular Imaging and Biology**, 2016. Get article

[7] **C. Andreou**, V. Neuschmelting, D.-F. Tschaharganeh, C.-H. Huang, A. Oseledchyk, P. Iacono, H. Karabeber, R. R. Colen, L. Mannelli, S. W. Lowe, and M. F. Kircher: Imaging of Liver Tumors Using Surface-Enhanced Raman Scattering Nanoparticles, **ACS Nano**, 2016. Get article

[6] **C. Andreou**, R. Mirsafavi, M. Moskovits, and C. D. Meinhart: Detection of Low Concentrations of Ampicillin in Milk, **Analyst**, 2015. Get article

[5] B. Piorek, **C. Andreou**, M. Moskovits, and C. D. Meinhart: Discrete Free- Surface Millifluidics for Rapid Capture and Analysis of Airborne Molecules Using Surface Enhanced Raman Spectroscopy, **Analytical Chemistry**, 2014. Get article

[4] M. R. Barmi, **C. Andreou**, M. R. Hoonejani, M. Moskovits, and C. D. Meinhart: Aggregation Kinetics of SERS-Active Nanoparticles in Thermally Stirred Sessile Droplets, **Langmuir**, 2013. Get article

[3] **C. Andreou**, M. R. Hoonejani, M. R. Barmi, M. Moskovits, and C. D. Meinhart, Rapid Detection of Drugs of Abuse in Saliva Using Surface Enhanced Raman Spectroscopy and Microfluidics, **ACS Nano**, 2013. Get article

### Review Articles

[2] **C. Andreou**, S. Pal, L. Rotter, J. Yang, and M. F. Kircher: Molecular Imaging in Nanotechnology and Theranostics, **Molecular Imaging and Biology**, 2017. Get article

[1] **C. Andreou**, S. A. Kishore, and M. F. Kircher: Surface-Enhanced Raman Spectroscopy: A New Modality for Cancer Imaging, **Journal of Nuclear Medicine**, 2015. Get article

## Presentations

### Invited Talks

University of Cyprus, Electrical Engineering seminar series, Surface Enhanced Raman Spectroscopy for Chemical Sensing and Biomedical Imaging: Microsystems and Microtumors, 29-Jun-2017.

University of Cyprus, Electrical Engineering seminar series, Multiphase Microfluidics and Surface Enhanced Raman Spectroscopy for Chemical Detection, 19-Jun-2013.

UCSB, Systems Biology seminar series, Multiphase Microfluidics and Surface Enhanced Raman Spectroscopy for Chemical Detection, 07-Jun-2013.

### Selected Conference Presentations

S. Roberts, A. Strome, C. Choi, **C. Andreou**, S. Kossatz, C. Brand, T. Williams, M. Bradbury, M.F. Kircher, Y.K. Reshetnyak, J. Grimm, J.S. Lewis, and T. Reiner: Acid specific dark quencher QC1 pHLIP for multi-spectral optoacoustic diagnoses of breast cancer, European Molecular Imaging Meeting, Glasgow, United Kingdom, Mar. 19-22, 2019.

S. Roberts, **C. Andreou**, C. Choi, P. Donabedian, E.C. Pratt, M. Jayaraman, C.P. Medina, W.J.M. Mulder, J. Grimm, M.F. Kircher, and T. Reiner: Optoacoustic diagnoses of cancer using sonophore-enhanced nanoemulsions, European Molecular Imaging Meeting, Glasgow, United Kingdom, Mar. 19-22, 2019.

S. Roberts, A. Strome, C. Choi, **C. Andreou**, S. Kossatz, M.F. Kircher, J.S. Lewis, and t. Reiner: pH specific quencher enables multi-spectral optoacoustic imaging of breast cancer, World Molecular Imaging Congress, Seattle, Washington, United States, Sept. 12-15, 2018.

S. Roberts, **C. Andreou**, C. Choi, P. Donabedian, M. Jayaraman, E.C. Pratt, J. Tang, C.P. Medina, W.J.M. Mulder, J. Grimm, M.F. Kircher, and T. Reiner: Dark yet bright: Non radiative and high performance optoacoustic nanoemulsions, World Molecular Imaging Congress, Philadelphia, Pennsylvania, United States, Sept. 13-16, 2017.

T.R. Nayak, **C. Andreou**, A. Oseledchyk, W.D. Marcus, H.C. Wong, M.F. Kircher: Imaging Tissue Factor Expression in a Breast Cancer Lung Metastasis Model Using SERRS Nanoparticles, World Molecular Imaging Congress, New York, New York, USA, Sep. 07-10, 2016.

A. Oseledchyk, **C. Andreou**, M. Wall, and M. F. Kircher: Ovarian Cancer Imaging using Folate-targeted SERRS nanoprobes Ratiometry, World Molecular Imaging Congress, New York, New York, USA, Sep. 07-10, 2016.

**C. Andreou**, V. Neuschmelting, D.-F. Tschaharganeh, C.-H. Huang, A. Oseledchyk, P. Iacono, H. Karabeber, S. W. Lowe, and M. F. Kircher: Imaging of Liver Tumors with Surface-Enhanced Raman Scattering Nanoparticles, World Molecular Imaging Congress, New York, New York, USA, Sep. 07-10, 2016.

**C. Andreou**, M. Moskovits, C. Meinhart, Picoliter Droplets of Controlled Composition for SERS Studies, 67th Annual Meeting of the APS Division of Fluid Dynamics, San Francisco, California, USA, Nov. 23-25, 2014.

**C. Andreou**, M. Moskovits, C. Meinhart, Assembly of Ag-Nanoparticle Clusters for Surface Enhanced Raman Spectroscopy in Droplets, The 18th International Conference on Miniaturized Systems for Chemistry and Life Sciences (MicroTAS 2014), San Antonio, Texas, USA, October 26-30, 2014.

**C. Andreou**, M.R. Hoonejani, M.R. Barmi, B. Piorek, M. Moskovits, and C. D. Meinhart, Microfluidic Device for Detection of Chemicals in Aqueous Mixtures using Surface Enhanced Raman Spectroscopy, The 15th International Conference on Miniaturized Systems for Chemistry and Life Sciences (MicroTAS 2011), Seattle, Washington, USA, October 2-6, 2011.

**C. Andreou**, SJ. Lee, B. Piorek, M. Moskovits, C. D. Meinhart, Multiphase microfluidics and Surface Enhanced Raman Spectroscopy, 63rd Annual Meeting of the APS Division of Fluid Dynamics, Long Beach, California, USA, Nov. 21-23, 2010.

**C. Andreou**, SJ. Lee, B. Piorek, M. Moskovits, C. Meinhart, Mapping concentration dependencies of SERS in a microfluidic device, Gordon Research Conference, Microfluidics (Physics and Chemistry of), Lucca, Italy, June 28- July 3, 2009.

**C. Andreou**, E. Demosthenous, C. Odiatis, N. Loucaides, P. Georgiades, A. Ramos, G. Georghiou, Dielectrophoretic capture and separation of Trophoblast Stem Cells and their differentiated progeny, 34th Micro- and Nano-Engineering Conference, Athens, Greece, 15-19 September 2008.

## Honors and Awards

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| Best fifth-year graduate student seminar in Biological Sciences, UCSB | 2013 |
| Best third-year graduate student seminar in Biological Sciences, UCSB | 2011 |
| Dean's Fellowship, UC Santa Barbara Graduate Division | 2008-2009 |
| 'Standard Bearer' of Penn State Physics graduating class | 2006 |
| Penn State Schreyer Honors College Scholar | 2004-2006 |
| Penn State Eberly College of Science Dean's list for 8/8 semesters | 2002-2006 |
| Full scholarship from the AMIDEAST Cyprus-America ScholarshipmProgram (CASP) | 2002-2006 |
| National Scholarship from Cyprus to attend the United World College of the Adriatic | 1998-2000 |

## Teaching and Mentoring

### Teaching

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| **Primary instructor:** University of Cyprus, "Digital Image Processing" (8 students) | Spring 2019 |
| **Primary instructor:** University of Cyprus, "Electric Fields, Theory and Applications" (60 students) | Fall 2018 |
| **Primary instructor:** UCSB, "Blender 3D: rendering graphics for scientific illustrations" (6 students) | Winter 2014 |
| **Substitute lecturer:** UCSB, "Physical Chemistry" (30 students, 4 lectures) | Spring 2014 |
| **Substitute lecturer:** UCSB, "Thermodynamics for engineers" (100+ students, 6 lectures) | Fall 2013 |
| **Teaching assistant:** UCSB, "Thermodynamics for engineers" (100+ students) | Fall 2012 |

### Mentoring and Outreach

**Supermentor/program coordinator:**

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| Jack Kent Cooke Bridges for Engineering and Science Transfers, UCSB | Summer 2014 |
| Condor Techs program, UCSB | Summer 2014 |

**Research mentor:**

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| Independent studies of two high-school students, MSKCC | Summer 2016 |
| Independent studies of a high-school student and a medical student, MSKCC | Summer 2015 |
| Independent studies of two postgraduate researchers, UCSB | Summer 2014 |
| Jack Kent Cooke Bridges for Engineering and Science Transfers, UCSB | Summer 2013 |
| Condor Techs program, UCSB | Summer 2013 |
| SABRE program, UCSB | Summer 2012 |