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Associate Professor of Engineering,
Associate Professor of Physics

Overview

Domenico Pacifici is an Associate Professor of Engineering and Physics at Brown University and Director of the Nanofabrication Central Facility (former Microelectronics Core Research Facility). He is the recipient of a Richard B. Salomon Faculty Research Award, three Brown Research Seed Awards, a Dedicated Faculty Award from Brown's School of Engineering and Tau Beta Pi, and a Henry Merritt Wriston Fellowship "for his contributions to excellence in teaching and for the devotion to the intellectual development of both graduate and undergraduate students."

His research efforts have focused on the optoelectronic properties of erbium doped silicon quantum dots for silicon-based microphotonics and fundamental light-matter interactions at the nanometer-scale for biosensing and energy harvesting applications. He has pioneered the field of plasmonic interferometry and received grants from the National Science Foundation, from the Office of Naval Research, and from the Juvenile Diabetes Research Foundation.

He is currently a Visiting Associate Professor at the University of Maryland College Park, in the Institute for Research In Electronics & Applied Physics (IREAP), and a CNST Visiting Fellow in the Nanofabrication Research Group at the National Institute of Standards and Technology (NIST). As part of his sabbatical leave, he is working with Dr. Henri Lezec on photon drag detection, negative optical pressure, and the development of active materials for implementation of novel plasmonic lasers and electrically-pumped plasmon sources.

Selected Publications:

- Measuring subwavelength spatial coherence with plasmonic interferometry, D. Morrill, D. Li, and D. Pacifici, *Nature Photonics* **10**, 681–687 (2016).

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- Nanoscale optical interferometry with incoherent light, D. Li, J. Feng, D. Pacifici, *Scientific Reports* **6**, 20836 (2016).
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- Noise performance of high-efficiency germanium quantum dot photodetectors, S. Siontas, P. Liu, A. Zaslavsky, D. Pacifici, *Applied Physics Letters* **109** (5), 053508 (2016).
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- A spectroscopic refractometer based on plasmonic interferometry, J. Feng, D. Pacifici, *Journal of Applied Physics* **119** (8), 083104 (2016).
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- Nanoscale plasmonic interferometers for multispectral, high-throughput biochemical sensing, J. Feng, V. Siu, A. Roelke, V. Mehta, S. Rhieu, G.T.R. Palmore, and D. Pacifici, *Nano Letters* **12**, 602–609 (2012).
-
- All-optical modulation by plasmonic excitation of CdSe quantum dots, D. Pacifici, H. J. Lezec, H. A. Atwater, *Nature Photonics* **1**, 402–406 (2007).

Education:

Domenico Pacifici joined Brown University in 2009 as an assistant professor in the School of Engineering. Professor Pacifici received his M.Sc. (2000) and Ph.D. (2004) in Physics, both summa cum laude, from the University of Catania in Italy, where he studied the optical, structural and electrical properties of silicon quantum dots and their interaction with rare-earth ions for a silicon-based Microphotonics.

In 2004 he received an award from STMicroelectronics, a global leader in electronics and semiconductor manufacturing, for the best PhD thesis performed in collaboration with industry. Prior to joining Brown, he spent four years as a postdoctoral scholar in the Department of Applied Physics at the California Institute of Technology.

Research Activities:

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 nanostructured materials to manipulate light and surface plasmons for integrated optical communication, sensing and energy-harvesting applications.

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 Recently, the Pacifici Group has achieved the following results:

- (1) plasmonic concentrators for broad-band enhanced absorption in ultra-thin film solar cells;
- (2) germanium quantum dot photodetectors with responsivity and internal quantum efficiency rivaling conventional silicon-based technologies;
- (3) high-throughput biochemical sensors using plasmonic interferometers integrated on-chip for detection of extremely low glucose and insulin concentrations, typically found in saliva, for non-invasive glucose screening;
- (4) plasmonic interferometry to measure the refractive index dispersion of dielectric materials;
- (5) measurement of subwavelength coherence length of electromagnetic fields with plasmonic interferometers;
- (6) modulation of the fluorescence emission through nano-apertures with plasmonic interferometry for sensing;
- (7) nano-imprinted silicon nanowire solar cells with high internal quantum efficiency;
- (8) estimate of the optical bandgap in amorphous germanium quantum wells.

Brown Affiliations



Engineering

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Physics

(<https://vivo.brown.edu/display/org-brown-univ-dept45>)

Research Areas

nanophotonics (https://vivo.brown.edu/search?fq=research_areas|nanophotonics) |
optoelectronics (https://vivo.brown.edu/search?fq=research_areas|optoelectronics) | plasmonics
(https://vivo.brown.edu/search?fq=research_areas|plasmonics)

On the Web

 **Pacifici Research Group**

(<http://pacifici.engin.brown.edu>)

 **PhD Thesis**

(http://pacifici.engin.brown.edu/pdf/DomenicoPacifici_PhDThesis.pdf)