

# Mohamed ElKabbash

Photonics for Grand Challenges Lab  
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## Education

2013-2017	Ph.D. in Physics, Case Western Reserve University (CWRU). Area: Condensed Matter Physics and Optical Physics.
2010-2012	B.A. in Physics and Economics, Illinois Wesleyan University
2008-2009	Masters, Law and Political Economy. Alexandria University, Egypt.
2003-2007	LL.B., Alexandria University, Egypt.

## Positions

2023- Present	Assistant Professor, <b>University of Arizona</b> , The Wyant College of Optical Sciences.
2020- 2023	Postdoctoral researcher, <b>Massachusetts Institute of Technology</b> , RLE, Quantum Photonics Laboratory.
2018- 2020	Postdoctoral researcher, <b>University of Rochester</b> , The Institute of Optics, High Intensity Femtosecond Laser Lab.
2014- 2017	Research Assistant, <b>Case Western Reserve University</b> , Physics Department, The Nanoplasm Lab.
2013- 2014	Teaching Assistant, <b>Case Western Reserve University</b> , Physics Department,
2009- 2010	Assistant Faculty member, <b>Alexandria University</b> , Faculty of Law, Political economy, Fiscal and Tax laws.
2008- 2009	Junior Faculty member, <b>Alexandria University</b> , Faculty of Law, Political economy, Fiscal and Tax laws.
2007-2008	Part Time lecturer of Law, <b>Arab Academy for Science, Technology &amp; Maritime Transport</b> .

## Research Milestones:

1. Demonstration of the **first cooperative spontaneous emission process** in Plasmonics (**Physical Review Letters**, 122, 203901, 2019).

2. **Invention of a new class of optical coatings** with applications in solar energy and structural coloring (**Nature Nanotechnology**, 16, 440–446, 2021)- [in the news](#).
3. Demonstration of **record efficiency in plasmonic metasurfaces** (**Light: Science & Applications**, 8, 53, 2019)
4. Creating a **perfect solar absorber** based on femtosecond laser treated metals – (**Light: Science & Applications**, 9, 14, 2020)- [in the news](#).
5. **Invention of a solar-panel equivalent for water desalination** using superwicking-black metals (**Nature Sustainability**, 3, 938–946, 2020)- [in the news](#).
6. **First table-top ultrafast optical imaging of the femtosecond photoinduced phase transition** of nanostructures (**Cell Reports Physical Sciences**, 100651, 2, 12, 2021)
7. **Discovery of anisotropic excitons in Lead Halide Perovskites** nanostructures and exploiting this property to engineer their optical properties and increase the performance of LHP-based optoelectronic devices (**Nature Photonics**, 1-8, 2023).
8. Proposing an experiment to **measure gravitational force from nanoscale objects** (arXiv:2212.06970).

#### Patents:

1. Optical sensor platform employing hyperbolic metamaterials. US Patent number 10533941, Application number 15684071.
2. Fano resonant optical coating. U.S. Provisional Application No.: 63/165,881.

**Publications (1 book chapter, 1 book, 50 peer reviewed journal articles, 10 preprints):** [Google scholar](#)

#### Fellowships and Awards

2020	<b>Certificate of recognition</b> for “ <b>Top downloaded papers of Light: Science &amp; Applications in 2020.</b> ” from <b>Nature Springer</b> for our work “Spectral absorption control of femtosecond laser-treated metals and application in solar-thermal devices”.
2016-2017	<b>Fellowship</b> <ul style="list-style-type: none"> <li>• Case Comprehensive Cancer Center-GU Malignancies</li> </ul>
2017	<b>Best Oral Presentation</b> <ul style="list-style-type: none"> <li>• 2017 SAS/MSNO/ACS/AVS May Conference- MSNEO</li> </ul>
2016	<b>Graduate student Travel Award</b> <ul style="list-style-type: none"> <li>• Case Western Reserve University.</li> </ul>
2010-2012	<b>Dean’s List</b> <ul style="list-style-type: none"> <li>• Illinois Wesleyan University (Spring 2010, Fall 2011, Spring 2011, Fall 2012)</li> </ul>
2007	<b>Best Tutor</b> <ul style="list-style-type: none"> <li>• Alexandria International Model of United Nations.</li> </ul>
2004-2007	<b>Dean’s List</b> Alexandria University, Faculty of Law (Spring 2004, Fall 2004, Spring 2005, Fall 2005, Spring 2006, Fall 2006, Spring 2007, Fall 2007)

#### Teaching

Fall 2021	<b>Guest Lecturer:</b> Fundamental of Photonics- Massachusetts Institute of Technology
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Spring 2014- Summer 2014	<b>TA:</b> General Physics Lab (Electromagnetism)- Case Western Reserve University
Fall 2013	<b>TA:</b> General Physics Lab (Mechanics)- Case Western Reserve University
Spring 2008-Spring 2009	<b>Lecturer:</b> Legal Concepts in a Foreign Language (English)- Alexandria University, Faculty of Law
Fall 2009	<b>Lecturer:</b> Introduction to Political Economy- Alexandria University, Faculty of Law
Fall 2008	<b>Lecturer:</b> History of Political Economy - Alexandria University, Faculty of Law
Fall 2007- Spring 2008	<b>Lecturer:</b> Maritime Law- Arab Academy for Science, Technology & Maritime Transport
Fall 2007- Spring 2008	<b>Lecturer:</b> Commerce Law- Arab Academy for Science, Technology & Maritime Transport

**Grants:**

- Optical imaging of ultrafast photo-induced phase transitions of nanostructures using neural lenses. Grant #: 76872-MS-II.

**Peer Review Activities**

- Nature electronics, Optics express, Optical materials express, Scientific Reports, Applied Physics Express, JVST B, Micromachines, Proceedings of the Royal Society A, Applied Sciences.

**Seminars and Talks:**

Nov 2022	“Quantum Nanophotonics- how Nanophotonics can revolutionize quantum research” Harvard University, Applied Physics Department.
Aug 2022	“High-speed electro-optic guided resonance spatial light modulator” SPIE optics and photonics 2022.
Aug 2022	“Gigantic suppression of recombination rate in 3D Lead-Halide Perovskites for enhanced photodetector performance”  SPIE optics and photonics 2022.
Aug 2022	“Angularly Selective Thermal Emitters for Robust and Deep Subfreezing Daytime Radiative Cooling”  SPIE optics and photonics 2022.
Aug, 2019	“Designer thin-film based perfect light absorption and its applications in structural coloring, gas sensing, and solar-thermal conversion”  SPIE optics and photonics 2019.
Aug, 2019	“Femtosecond optical imaging of nanostructures using ultrafast ultramicroscopy”  SPIE optics and photonics 2019.
Aug, 2019	“Fano resonance in thin-film optical coatings”

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| Aug, 2019 | SPIE optics and photonics 2019.<br>"Hybrid thermal and electric solar energy generation based on thin-film optical coatings"                             |
| Aug, 2019 | SPIE optics and photonics 2019.<br>"Improving the transmission efficiency of plasmonic and dielectric metasurfaces"                                      |
| Aug, 2018 | SPIE optics and photonics 2019.<br>"Cooperative Spontaneous Emission from quantum emitters coupled to plasmonic nanocavities"                            |
| May 2017  | SPIE optics and photonics 2018.<br>"Tunable Black Gold: controlling plasmon hybridization in Au Nanoparticles immobilized in porous Silica Mesocapsules" |
| July 2016 | SAS/MSNO/ACS/AVS May Conference- MSNEO<br>"Directional radiation from out-of-plane plasmonic nanoantennas"<br>Nanoplasm, Italy, 2016.                    |