Curriculum Vitae:

PERSONAL INFORMATION

Name: Ido Kaminer
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Date of birth: 29/12/1985, Haifa, Israel
Nationality: Israeli
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Research Interests: Ido is a physicist studying the frontiers of photonics, quantum optics, and laser-driven electron microscopy. He is head of the AdQuanta Lab at the Technion, doing both theory and experiments. Ido's work established the foundations of macroscopic quantum electrodynamics with photonic quasiparticles. His research predicts new phenomena that arise from engineering the wavefunctions of matter and of photons in specific ways that yield physical situations not encountered in natural settings.

Ido's lab employs femtosecond lasers in transmission electron microscopes for new kinds of experiments: they developed a unique microscope that combines record resolution in space & time. Their work on light-matter interactions in nanophotonics and 2D materials is leading to disruptive applications for novel light sources (e.g., X-ray sources for spectroscopy) and ultrafast detectors (e.g., scintillators for medical imaging).

Career: Ido is an Associate Professor at the Technion. In his PhD research, Ido discovered new classes of accelerating beams in nonlinear optics and electromagnetism, for which he received the 2014 American Physical Society (APS) Award for Outstanding Doctoral Dissertation in Laser Science. Ido was the first Israeli to win an APS award for his PhD thesis. As a postdoc at MIT, he established the foundations of macroscopic quantum electrodynamics (MQED) for photonic quasiparticles and used it to enable forbidden electronic transitions in atoms. As a faculty member, Ido created a paradigm shift in the understanding of free-electron radiation, connecting it to the field of quantum optics. He performed the first experiment on electron microscopy with quantum light, demonstrating that the quantum statistics of photons can be imprinted on the electron. For his achievements as a faculty member, Ido was recently **elected to the Israeli Young Academy**, which includes 32 young Israeli faculty members below the age of 45. He has won multiple awards and grants, including **two ERC Grants**, the Moore foundation grant, and the **2022 Schmidt Science Polymath Award**. Ido is the laureate of the 2021 Krill Prize, the **2021 Blavatnik Award** in Physical Sciences & Engineering in Israel, and the recipient of the **2022 Adolph Lomb Medal**, the top international award for a young scientist (age 35 or younger) in the field of optics. He was recently selected for the 2023 Lem European Research Prize and for the 2024 ACS Photonics Young Investigator Award.

CURRENT AND PREVIOUS POSITIONS

2021-current	Associate Professor, Electrical and Computer Engineering, Technion, Israel
2018-2021	Assistant Professor, Electrical and Computer Engineering, Technion, Israel
2017 (summer)	Visiting Scientist, EPFL, Switzerland, UTEM training while setting up the Technion lab
2014-2017	Postdoc Fellow, Research Laboratory of Electronics, MIT, United States

EDUCATION

2008-2014	Ph.D., Physics, Technion – Israel Institute of Technology, Israel Advisor: Distinguished Professor Mordechai Segev
2003-2007	B.Sc. Electrical Engineering and Physics, Technion – Israel Institute of Technology, Israel Advisor: Professor Levi Schächter Technion's Excellence Program (selecting 16 students from all fields each year) GPA: 98/100, President's list for academic achievement, every semester

PUBLIC PROFESSIONAL ACTIVITIES (selected)

2023-2025	Member of the Adolph Lomb Medal Selection Committee
2022-	Preparatory Committee of the Electrical and Computer Engineering Department, which votes on recruitment of new faculty members (special early nomination before full Prof.)
2021-	Steering Committee and Faculty Search Committee of the Technion Helen Diller Quantum Center
2019-	Member of *Mada Gadol Baktana*, the largest Israeli society for explaining science to the public, voluntary association advocating scientific accuracy and fighting fake news
2021-	Co-leader of the SMART-electron FET OPEN project
Supervision	4 postdocs currently in the group (first 3 postdocs to work with me are now assistant Profs.) 9 PhD and 5 MSc students currently working on their theses (9 alumni graduated so far)

I am proud of more than 20 undergrads that published 1st-author papers under my supervision

FELLOWSHIPS AND AWARDS (selected)

2024-2029	ERC Consolidator Grant
2024	The 2024 ACS Photonics Young Investigator Award
2023	Stanisław Lem European Research Prize
2022	Recipient of the **Schmidt Science Polymath Award**
2022	Recipient of the **Adolph Lomb Medal**, the top international award for a young scientist (age 35 or younger) in the field of optics
2021	Elected to the Israeli Young Academy, which includes 32 young Israeli faculty members below the age of 45, selected based on excellence in research and social involvement
2021	Krill Prize for Excellence in Scientific Research, by the Wolf Foundation
2021	**Blavatnik Award** for Young Scientists in Israel, Laureate in Physical Sciences & Engineering
2020-2025	ERC Starting Grant
2020-2021	GIF Young Investigator Grant
2017	Azrieli Faculty Fellow (most prestigious fellowship for a starting faculty member in Israel)
2015	Invited as Young Researcher at the 65th Lindau Nobel Laureate Meeting
2014	American Physical Society (APS) **Award for Outstanding Doctoral Dissertation** in Laser Science (first Israeli to win an APS thesis award)
2014-2017	**Marie Curie IOF Fellowship**
2014	Rothschild Fellowship (the most prestigious postdoc fellowship for Israelis going abroad)
2012	Israel Physical Society (IPS) **Prize for a Graduate Student in Theoretical Physics** (awarded to one Israeli student every year)
2007	The Knesset (Israeli Parliament) **Award for Outstanding Undergraduate Achievements**

TEACHING ACTIVITIES (selected)

2018-2022 Lecturer, Department of Electrical and Computer Engineering, Technion, Israel

Courses taught: Quantum Technologies, Macroscopic Quantum Electrodynamics, Advanced Topics in Photonics, Advanced Topics in Quantum Optics

Academic Excellence in Teaching (top 4% of Technion lecturers): Winter 2021-2022, Spring 2022

ORGANISATION OF SCIENTIFIC MEETINGS (selected)

- Member of the program committee and session co-organizer in FiO-LS (2015) and PIERS (2019)
- Member of the CLEO Nano-Optics and Plasmonics Subcommittee (2018)
- Scientific program committee member in ICOAM (2020), Q-Sort (2021), and ISM (2022)
- Co-organizer of a special symposium "Photonics meets free-electron science" **selected for CLEO2024**
- Head of the organizing & scientific committees of Novel Concepts in Photonics Research (2024)

REVIEWING ACTIVITIES (selected)

Intl. grants: ERC AdG, ERC CoG, ERC StG, DFG, FWF, DOE Natl. grants: ISF, MOST, IIA

Journals: *Nature, Science, Nature Photonics, Nature Physics, Nature Materials, Advanced Materials, Nature Communications, Science Advances, Chemical Society Reviews, Physical Review Letters, Nano Letters, Optica, Advanced Science, Light: Science & Applications, Nanophotonics, Optics Letters, Optics Express, Physical Review A, Physical Review E, 2D Materials, Physical Review Applied, Applied Physics Letters*.

2022,2023	Chairman of the Helen Diller students' excellence scholarships committee, Technion, Israel
2022-2024	Member of the selection committee for the Israeli Young Academy, Israel
2021,2022	Member of two ISF grant committees, Israel
2022	Member of the Israel Physics Society (IPS) awards committee, Israel

2018-2023 Interviewer for the Technion's Excellence Program, Israel

SELECTED TALKS: PLENARY, KEYNOTE, INVITED, COLLOQUIA

- Three keynote talks, e.g., *Quantum optics with free electrons*, International Quantum Cascade Lasers School and Workshop (IQCLSW), ETH Zürich and Monte Verità Ascona, Switzerland, August 2022
- Three **plenary talks**, at NANOMETA 2022, IVNC 2023, and NANOP 2023
  - *Quantum Optics with Free Electrons*, NANOMETA, Seefeld, Austria, April 2022; IVNC, MIT, Massachusetts, July 2023; and upcoming at NANOP, Barcelona, November 2023
- A contributed submission upgraded to a **breakthrough talk** in NANOMETA 2017
  - N. Rivera*, I. Kaminer*, and M. Soljacic, *Turning Forbidden Transitions into Dominant Transitions: Towards Efficient Sources of Entangled Light*, NANOMETA, Seefeld, Austria, January 2017
- Seven contributed submissions to CLEO ranked at the **top 1-2%** and upgraded to invited highlighted talks (once as a student, six times as a PI), among them:
  - A. Gorlach, et al., *High Harmonic Generation Driven by Quantum Light: General Formalism and Extended Cutoff*, CLEO FM3B.1 (2022)
  - R. Dahan, et al., *Observation of the Stimulated Quantum Cherenkov Effect*, CLEO FF1Q.1 (2020)
  - I. Kaminer, et al., *Self-Accelerating Beams in Photonic Crystal Slabs*, CLEO QM2E.1 (2013)
- Two more invited talks in CLEO as a PI and additional invited talks such as:
  - I. Kaminer, *Nanophotonic particle detectors: how quantum optics can contribute to scintillators and Cherenkov detectors*, MPGD22, Rehovot, Israel, December 2022
  - I. Kaminer, *Shaping Light in Complex Settings*, FiO, Tucson, Arizona, October 2014 (** invited talk in the APS-DLS Session for Outstanding Doctoral Dissertation in Laser Science)
  - I. Kaminer, *Nanophotonic Particle Detectors and Nanophotonic Light Sources*, NANOMETA, Seefeld, Austria, January 2019
  - I. Kaminer, *Photonic crystals, graphene, and new effects in Cherenkov radiation*, 9th International Workshop on Ring Imaging Cherenkov Detectors (RICH), Bled, Slovenia, September 2016
- Speaker at the University of Ottawa's Schawlow-Townes Symposium, October 2023
- **Colloquia** in University of Heidelberg, Kiel University, Argonne National Lab, Hebrew University, Stanford, Jülich (the PGI Colloquium), Vienna (the VCQ Colloquium), and several other universities

(Additional >50 seminars, >100 invited talks, and >200 contributed talks in refereed conferences)

MAJOR COLLABORATIONS (selected)

Marin Soljačić and John D. Joannopoulos, MIT, United States	(nanophotonics)
Peter Hommelhoff, University of Erlangen–Nuremberg, Germany	(dielectric laser accelerators)
Fabrizio Carbone, EPFL, Switzerland	(ultrafast electron microscopy)
Javier García de Abajo, ICFO, Spain	(theory of free electron interactions)
Hongsheng Chen, Zhejiang University, China	(free-electron radiation)
Liang Jie Wong, Nanyang Technological University, Singapore	(free-electron radiation)
Sajan Easo, CERN LHCb, Switzerland	(nanophotonic particle detectors)
Frank H. L. Koppens, ICFO, Spain	(polaritons in 2D materials)

SELECTED PUBLICATIONS HIGHLIGHTING MAIN ACHIEVEMENTS

156 publications in refereed journals (+22 under review); **14** patents; **7500** GS citations; h-index **47**

(●) X. Lin, … **I. Kaminer**, *Controlling Cherenkov angles with resonance transition radiation*, ***Nature Physics***, 14, 816–821 (2018); selected for Research Highlights in ***Nature Photonics***

· Seminal contribution to *nanophotonic particle detectors*, pursued in collaboration with colleagues at CERN.
· First proposal and design of nanophotonic metamaterial radiators for high energy particle identification.
· Immediate interest and follow up: my colleagues in CERN LHCb assembled an experiment to test the concept, showing preliminary results of a Cherenkov ring from a photonic crystal radiator designed by my group.
· Led to the emerging field of *nanophotonic scintillators*, based on my theory proposal [***PRL*** 125, 040801 (2020)] and first demonstration by my collaboration with MIT [***Science*** 375, eabm9293 (2022)].

(●) K. Wang, R. Dahan, M. Shentcis, Y. Kauffmann, A. Ben- Hayun, O. Reinhardt, S. Tsesses, **I. Kaminer**, *Coherent Interaction between Free Electrons and a Photonic Cavity*, ***Nature*** 582, 50, (2020)

· Until 2019, all work on interactions between cavity-confined light and quantum matter focused on *bound electron* systems. My group was the first to demonstrate coherent cavity interactions of *free electrons*.
· Selected for *Research Highlights* in ***Nature Reviews Physics*** and featured in various media outlets.

(●) N. Rivera and **I. Kaminer**, *Light–matter interactions with photonic quasiparticles*, ***Nature Reviews Physics*** 2, 538 (2020) (Review); based on the graduate class that I developed and taught at the Technion
· Emerged from my earlier discoveries in light-matter interactions enhanced by polaritons in 2D materials, such as enabling electrons to undergo forbidden optical transitions [***Science*** 353, 263 (2016)].
· Over the last few years, the formalism we developed led to a surge of fundamental discoveries by different groups and by us, e.g., [***PRL*** 122, 53901 (2019); ***Nature Phys.*** 15,1284 (2019); ***Nature Mat.*** 22, 345 (2023)].

(●) Y. Kurman, ... **I. Kaminer**, *Control of semiconductor emitter frequency by increasing polariton momenta*, ***Nature Photonics***, 12, 423–429 (2018)
· It is well-known that the optical environment of an emitter alters its transition rate (the Purcell effect); however, it was believed to leave the *transition frequency* mostly unchanged. We showed how polaritons enable substantial control of transition frequencies: a paradigm shift from viewing these frequencies as intrinsic.
· First prediction of *nonlocality* and non-vertical optical transitions in indirect-bandgap materials like silicon.
· Led to our discovery of ultra-strong coupling at optical frequencies [***Nature Physics*** 16, 868 (2020)].

(●) A. Pizzi, … **I. Kaminer**, *Light emission from strongly driven many-body systems*, ***Nature Physics*** 19, 551-561 (2023); Selected for News & Views, covered by ***Scientific American***
· A general concept: correlations between quantum emitters transfer onto nonclassical features in the emission.
· Suggesting high-harmonic generation as a tool for characterizing correlations in many-body systems with attosecond temporal resolution, marrying the fields of *attosecond* & *quantum information science*.
· Emerged from our quantum-optical theory of extreme nonlinear optics [***Nature Comm.*** 11, 4598 (2020)].
· Led to a novel concept: Compton scattering driven by quantum light [***Science Adv.*** 9, eade093 (2023)].
· Spawned a sequence of discoveries forming an emerging area in strong-field physics, with the two follow-up papers by our group selected for News & Views by the journals [***Nature Photonics*** 17, 501-509 (2023); ***arXiv***:2211.03188 accepted to ***Nature Physics*** (2023)].

(●) M. Shentcis, … **I. Kaminer**, *Tunable free-electron X-ray radiation from van der Waals materials*, ***Nature Photonics*** 14, 686–692 (2020); Selected for News & Views in ***Nature Photonics***
· The first compact source of tunable X-ray radiation. First observation of X-ray generation from vdW materials.
· Emerged from my earlier work posing the first prediction of X-ray emission from electron interactions with 2D materials [***Nature Photonics*** 10, 46 (2016)], which opened the area of nanophotonic X-ray sources.

(●) R. Dahan, … **I. Kaminer**, *Resonant phase-matching between a light wave and a free-electron wavefunction*, ***Nature Physics*** 16, 1123-1131, (2020); selected for Research Highlights
· The first experiment on the quantum nature of the Cherenkov effect, following my first prediction of such effects in [***Phys. Rev. X*** 6, 011006 (2016)], as part of a series of papers showing the quantum nature of electron interactions in places where they were modelled as classical point-particles for over a hundred years.
· Highlighted in ***OPN*****'s special issue "Optics in 2020"**, selecting the top contributions to the field of optics.

(●) Y. Kurman, … **I. Kaminer**, *Spatiotemporal imaging of 2D polariton wave packet dynamics using free electrons*, ***Science*** 372, 1181-1186, (2021)
· Constituted the first observation of coherent optical dynamics in any 2D material.

(●) R. Dahan, … **I. Kaminer**, *Imprinting the quantum statistics of photons on free electrons*, ***Science*** 6561, 1309-1310, (2021); selected for Perspective in ***Science***
· First experiment showing free-electron interaction with the quantum photon statistics of light.
· First experiment in an area receiving major theory interest, first by Kfir et al. and di Giulio et al., and also by my lab [***Nature Comm.*** 12, 1700, (2021); ***Science Adv.*** 7, eabe4270, (2021); ***Science Adv.*** 7, eabf8096, (2021)].

(●) G. Raayoni, … **I. Kaminer**, *The Ramanujan Machine: Automatically Generated Conjectures on Fundamental Constants*, ***Nature*** 590, 67–73, (2021); our follow-up work was recently accepted to ***ICML*** 202, 28809 (2023)
· The first algorithm to generate conjectures on fundamental mathematical constants such as π and e.
· In the past, new mathematical conjectures about fundamental constants were discovered sporadically by famous mathematicians such as Euler, Gauss, and Ramanujan. In this work, I proposed a systematic approach for deriving conjecture equations for fundamental constants by *using computer algorithms*.
· Discovered thousands of new formulas for π, e, Catalan's constant, and values of the Riemann zeta function.

- We launched a website with the goal of inspiring people to leverage algorithms to discover new conjectures and hopefully even prove them collaboratively. Hundreds of volunteers are running our algorithms daily.
- This first ***arXiv*** version of our work went viral in the social networks and many media outlets, reaching millions of people, becoming the #1 topic in artificial intelligence worldwide for about a week.