Stanford

Charles Roques-Carmes

Postdoctoral Scholar, Electrical Engineering

Curriculum Vitae available Online

Bio

BIO

Charles Roques-Carmes is a Science Fellow at Stanford and an incoming Assistant Professor at the Institute of Science and Technology Austria (ISTA). His lab studies and engineers subwavelength light–matter interactions to unlock quantum technologies, advanced microscopes, and next-generation communications and computing platforms—combining rigorous theory with ultrafast electron microscopy, X-ray imaging, and quantum sensing to turn insights into devices. Before joining ISTA, Charles was a Stanford Science Fellow at Stanford University and a Visiting Scientist at MIT, where he earned his PhD in Electrical Engineering and Computer Science in 2022. Charles has delivered 40+ invited talks at major venues including APS, CLEO, and SPIE.

In 2025, he received the inaugural Photonics Innovation Award in honor of Federico Capasso for pioneering achievements that broaden photonics' frontiers and connect fundamentals to real-world impact; Charles is widely regarded as one of the founders of the emerging field of nanophotonic scintillation. His honors include numerous distinctions such as Forbes 30 Under 30 (Science, 2023), the Stanford Science Fellowship, the MathWorks Engineering Fellowship, the Robert B. Guenassia Award, and a Carnot Foundation Fellowship. He holds M.S. degrees from MIT (2018) and École Polytechnique (2016), and a B.S. from École Polytechnique (2015).

HONORS AND AWARDS

- Rising Stars Committee member, Newton Cell Press (2026)
- Photonics Innovation Award in honor of Federico Capasso (inaugural awardee), Nanophotonics De Gruyter Journal (2025)
- Best Paper award, OPTO Symposium, SPIE Photonics West (2025)
- US NAS Young Researcher Nominee, Lindau Nobel Laureate Meetings (2024)
- Forbes 30 under 30, Science, North America, Forbes (2023)
- Stanford Science Fellow, Stanford Humanities and Sciences (2023)
- MathWorks Engineering Fellowship, MathWorks (2020)
- Robert B. Guenassia Award, MIT (2019)
- Carnot Foundation Fellow, Fondation Carnot (France) (2016)

PROFESSIONAL EDUCATION

- Master of Science, Ecole Polytechnique (2016)
- Bachelor of Science, Ecole Polytechnique (2015)

- Doctor of Philosophy, Massachusetts Institute of Technology (2022)
- Master of Science, Massachusetts Institute of Technology (2018)
- BSc, École polytechnique (France) , Engineering (2015)
- MSc, École polytechnique (France) , Physics (2016)
- MSc, MIT , Electrical Engineering and Computer Science (2018)
- PhD, MIT , Electrical Engineering and Computer Science (2022)

STANFORD ADVISORS

- Shanhui Fan, Postdoctoral Faculty Sponsor

LINKS

- Group website: https://roques-carmes.com

Research & Scholarship

LAB AFFILIATIONS

- Shanhui Fan, Ginzton Laboratories (7/1/2023)

Publications

PUBLICATIONS

- **Transcending shift-invariance in the paraxial regime via end-to-end inverse design of freeform nanophotonics** *OPTICS EXPRESS*
  Li, W. F., Arya, G., Roques-Carmes, C., Lin, Z., Johnson, S. G., Soljacic, M.
  2023; 31 (15): 24260-24272
- **Biasing the quantum vacuum to control macroscopic probability distributions.** *Science (New York, N.Y.)*
  Roques-Carmes, C., Salamin, Y., Sloan, J., Choi, S., Velez, G., Koskas, E., Rivera, N., Kooi, S. E., Joannopoulos, J. D., Soljačić, M.
  2023; 381 (6654): 205-209
- **Learning photons go backward** *SCIENCE*
  Roques-Carmes, C.
  2023; 380 (6643): 341-342
- **Free-electron-light interactions in nanophotonics** *APPLIED PHYSICS REVIEWS*
  Roques-Carmes, C., Kooi, S. E., Yang, Y., Rivera, N., Keathley, P. D., Joannopoulos, J. D., Johnson, S. G., Kaminer, I., Berggren, K. K., Soljacic, M.
  2023; 10 (1)
- **Enhanced Imaging Using Inverse Design of Nanophotonic Scintillators** *ADVANCED OPTICAL MATERIALS*
  Shultzman, A., Segal, O., Kurman, Y., Roques-Carmes, C., Kaminer, I.
  2023
- **Photonic flatband resonances for free-electron radiation** *NATURE*
  Yang, Y., Roques-Carmes, C., Kooi, S. E., Tang, H., Beroz, J., Mazur, E., Kaminer, I., Joannopoulos, J. D., Soljacic, M.
  2023; 613 (7942): 42-+
- **End-to-end metasurface inverse design for single-shot multi-channel imaging** *OPTICS EXPRESS*
  Lin, Z., Pestourie, R., Roques-Carmes, C., Li, Z., Capasso, F., Soljacic, M., Johnson, S. G.
  2022; 30 (16): 28358-28370
- **A framework for scintillation in nanophotonics** *SCIENCE*
  Roques-Carmes, C., Rivera, N., Ghorashi, A., Kooi, S. E., Yang, Y., Lin, Z., Beroz, J., Massuda, A., Sloan, J., Romeo, N., Yu, Y., Joannopoulos, J. D., Kaminer, et al
  2022; 375 (6583): 837-+

- **Toward 3D-Printed Inverse-Designed Metaoptics** *ACS PHOTONICS*
  Roques-Carmes, C., Lin, Z., Christiansen, R. E., Salamin, Y., Kooi, S. E., Joannopoulos, J. D., Johnson, S. G., Soljacic, M.
  2022; 9 (1): 43-51
- **Observation of an Accidental Bound State in the Continuum in a Chain of Dielectric Disks** *PHYSICAL REVIEW APPLIED*
  Sidorenko, M. S., Sergaeva, O. N., Sadrieva, Z. F., Roques-Carmes, C., Muraev, P. S., Maksimov, D. N., Bogdanov, A. A.
  2021; 15 (3)
- **End-to-end nanophotonic inverse design for imaging and polarimetry** *NANOPHOTONICS*
  Lin, Z., Roques-Carmes, C., Pestourie, R., Soljacic, M., Majumdar, A., Johnson, S. G.
  2021; 10 (3): 1177-1187
- **Computational inverse design for ultra-compact single-piece metalenses free of chromatic and angular aberration** *APPLIED PHYSICS LETTERS*
  Lin, Z., Roques-Carmes, C., Christiansen, R. E., Soljacic, M., Johnson, S. G.
  2021; 118 (4)
- **A general framework for shaping luminescence in materials**
  Roques-Carmes, C., Rivera, N., Ghorashi, A., Kooi, S. E., Yang, Y., Lin, Z., Beroz, J., Joannopoulos, J. D., Kaminer, I., Johnson, S., Soljacic, M., IEEE
  IEEE.2021
- **Overcoming the Manley-Rowe Limit for CW Terahertz Generation in Q-Engineered Multimodal Cavity**
  Salamin, Y., Roques-Carmes, C., Lin, Z., Johnson, S. G., Soljacic, M., IEEE
  IEEE.2021
- **Fullwave Maxwell inverse design of axisymmetric, tunable, and multi-scale multi-wavelength metalenses** *OPTICS EXPRESS*
  Christiansen, R. E., Lin, Z., Roques-Carmes, C., Salamin, Y., Kooi, S. E., Joannopoulos, J. D., Soljacic, M., Johnson, S. G.
  2020; 28 (23): 33854-33868
- **Roadmap on emerging hardware and technology for machine learning.** *Nanotechnology*
  Xia, Q., Berggren, K. K., Likharev, K., Strukov, D. B., Jiang, H., Mikolajick, T., Querlioz, D., Salinga, M., Erickson, J., Pi, S., Xiong, F., Lin, P., Li, et al
  2020
- **Monochromatic X-ray Source Based on Scattering from a Magnetic Nanoundulator** *ACS PHOTONICS*
  Fisher, S., Roques-Carmes, C., Rivera, N., Wong, L., Kaminer, I., Soljacic, M.
  2020; 7 (5): 1096-1103
- **Accelerating recurrent sing machines in photonic integrated circuits** *OPTICA*
  Prabhu, M., Roques-Carmes, C., Shen, Y., Harris, N., Jing, L., Carolan, J., Hamerly, R., Baehr-Jones, T., Hochberg, M., Ceperic, V., Joannopoulos, J. D., Englund, D. R., Soljacic, et al
  2020; 7 (5): 551-558
- **Heuristic recurrent algorithms for photonic Ising machines** *NATURE COMMUNICATIONS*
  Roques-Carmes, C., Shen, Y., Zanoci, C., Prabhu, M., Atieh, F., Jing, L., Dubcek, T., Mao, C., Johnson, M. R., Ceperic, V., Joannopoulos, J. D., Englund, D., Soljacic, et al
  2020; 11 (1): 249
- **Toward Nanophotonic Free-Electron Lasers**
  Rivera, N., Roques-Carmes, C., Kaminer, I., Soljacic, M., IEEE
  IEEE.2020
- **Towards integrated tunable all-silicon free-electron light sources** *NATURE COMMUNICATIONS*
  Roques-Carmes, C., Kooi, S. E., Yang, Y., Massuda, A., Keathley, P. D., Zaidi, A., Yang, Y., Joannopoulos, J. D., Berggren, K. K., Kaminer, I., Soljacic, M.
  2019; 10: 3176
- **Integrated Nanophotonic Ising Sampler**
  Roques-Carmes, C., Prabhu, M., Shen, Y., Harris, N., Jing, L., Carolan, J., Hamerly, R., Baehr-Jones, T., Hochberg, M., Ceperic, V., Joannopoulos, J. D., Englund, D., Soljacic, et al

IEEE.2019

- **Photonic Recurrent Ising Sampler**
  Roques-Carmes, C., Shen, Y., Zanoci, C., Prabhu, M., Atieh, F., Jing, L., Dubcek, T., Ceperic, V., Joannopoulos, J. D., Englund, D., Soljacic, M., IEEE
  IEEE.2019

- **Nonperturbative Quantum Electrodynamics in the Cherenkov Effect** *PHYSICAL REVIEW X*
  Roques-Carmes, C., Rivera, N., Joannopoulos, J. D., Soljacic, M., Kaminer, I.
  2018; 8 (4)

- **Smith-Purcell Radiation from Low-Energy Electrons** *ACS PHOTONICS*
  Massuda, A., Roques-Carmes, C., Yang, Y., Kooi, S. E., Yang, Y., Murdia, C., Berggren, K. K., Kaminer, I., Soljacic, M.
  2018; 5 (9): 3513-3518

- **Maximal spontaneous photon emission and energy loss from free electrons (vol 14, pg 894, 2018)** *NATURE PHYSICS*
  Yang, Y., Massuda, A., Roques-Carmes, C., Kooi, S. E., Christensen, T., Johnson, S. G., Joannopoulos, J. D., Miller, O. D., Kaminer, I., Soljacic, M.
  2018; 14 (9): 967

- **Maximal spontaneous photon emission and energy loss from free electrons** *NATURE PHYSICS*
  Yang, Y., Massuda, A., Roques-Carmes, C., Kooi, S. E., Christensen, T., Johnson, S. G., Joannopoulos, J. D., Miller, O. D., Kaminer, I., Soljacic, M.
  2018; 14 (9): 894-+

- **Substrate aberration and correction for meta-lens imaging: an analytical approach** *APPLIED OPTICS*
  Groever, B., Roques-Carmes, C., Byrnes, S. J., Capasso, F.
  2018; 57 (12): 2973-2980

- **Single-Layer Metasurface with Controllable Multiwavelength Functions** *NANO LETTERS*
  Shi, Z., Khorasaninejad, M., Huang, Y., Roques-Carmes, C., Zhu, A. Y., Chen, W., Sanjeev, V., Ding, Z., Tamagnone, M., Chaudhary, K., Devlin, R. C., Qiu, C., Capasso, et al
  2018; 18 (4): 2420-2427

- **Fundamental limits on spontaneous emission and energy loss of free electrons**
  Yang, Y., Massuda, A., Roques-Carmes, C., Kooi, S. E., Christensen, T., Johnson, S. G., Joannopoulos, J. D., Miller, O. D., Kaminer, I., Soljacic, M., IEEE
  IEEE.2018

- **Metasurfaces with wavelength-controlled functions**
  Shi, Z., Khorasaninejad, M., Huang, Y. W., Roques-Carmes, C., Zhu, A. Y., Chen, W. T., Sanjeev, V., Ding, Z. W., Tamagnone, M., Chaudhary, K., Devlin, R. C., Qiu, C. W., Capasso, et al
  IEEE.2018

- **Quantum Cerenkov radiation in weakly and strongly-coupled regimes**
  Roques-Carmes, C., Rivera, N., Joannopoulos, J. D., Soljacic, M., Kaminer, I., IEEE
  IEEE.2018

- **Electron beam-induced tunable radiation from silicon-only structures in the near-infrared**
  Roques-Carmes, C., Kooi, S. E., Massuda, A., Zaidi, A., Yang, Y., Yang, Y., Berggren, K. K., Kaminer, I., Soljacic, M., IEEE
  IEEE.2018

- **Manipulating Smith-Purcell radiation polarization with metasurfaces**
  Yang, Y., Roques-Carmes, C., Kaminer, I., Zaidi, A., Massuda, A., Yang, Y., Kooi, S. E., Berggren, K. K., Soljacic, M., IEEE
  IEEE.2018

- **Spectral and spatial shaping of Smith-Purcell radiation**
  Remez, R., Shapira, N., Roques-Carmes, C., Tirole, R., Yang, Y., Lereah, Y., Soljacic, M., Kaminer, I., Arie, A., IEEE
  IEEE.2018

- **Spectral and spatial shaping of Smith-Purcell radiation** *PHYSICAL REVIEW A*
  Remez, R., Shapira, N., Roques-Carmes, C., Tirole, R., Yang, Y., Lereah, Y., Soljacic, M., Kaminer, I., Arie, A.
  2017; 96 (6)

- **Visible Wavelength Planar Metalenses Based on Titanium Dioxide** *IEEE JOURNAL OF SELECTED TOPICS IN QUANTUM ELECTRONICS*
  Khorasaninejad, M., Chen, W., Zhu, A. Y., Oh, J., Devlin, R. C., Roques-Carmes, C., Mishra, I., Capasso, F.
  2017; 23 (3)
- **High-order Smith-Purcell radiation in Silicon Nanowires**
  Massuda, A., Roques-Carmes, C., Solanki, A., Yang, Y., Kooi, S. E., Habbal, F., Kaminer, I., Soljacic, M., IEEE
  IEEE.2017
- **Smith-Purcell radiation from low-energy electrons**
  Massuda, A., Roques-Carmes, C., Yang, Y., Kooi, S. E., Yang, Y., Murdia, C., Berggren, K. K., Kaminer, I., Soljacic, M., IEEE
  IEEE.2017
- **Polarization-Insensitive Metalenses at Visible Wavelengths** *NANO LETTERS*
  Khorasaninejad, M., Zhuit, A. Y., Roques-Carmes, C., Chen, W. T., Oh, J., Mishra, I., Devlin, R. C., Capasso, F.
  2016; 16 (11): 7229-7234