Stanford

Peter B. Catrysse

Sr Research Engineer

Academic Units

Bio

BIO

My interests are in the fields of nanophotonics and solid-state image sensing. My research in nanophotonics focuses on the theoretical and experimental exploration of metamaterials and 3D metaphotonic devices that enable efficient transport of light at the nano-scale with applications in energy, information technology, optical sensing, and even textiles. My research in solid-state image sensing stems from my doctoral work on the optics of image sensors. Here, I am particularly interested in light-matter interaction inside sub-micron-size image sensor pixels and the consequences of fundamental light properties on performance as solid state image sensor technology scales.

ACADEMIC APPOINTMENTS

- Sr Research Engineer, Academic Units

HONORS AND AWARDS

- Fellow, Optical Society (OSA) (2020)
- Fellow, International Society for Optics and Photonics (SPIE) (2018)
- Senior Member, Institute of Electrical and Electronics Engineers, Inc. (IEEE) (2008)
- Alumni Member, Engineering Honor Society (Tau Beta Pi) (2007)

BOARDS, ADVISORY COMMITTEES, PROFESSIONAL ORGANIZATIONS

- Program Committee - IS&T Electronic Imaging: Imaging Sensors and Systems, Society for Imaging Science and Technology (IS&T) (2022 - present)
- Chair - OSA Nanophotonics (ON) Technical Group (TG), Optical Society (OSA) (2016 - 2018)
- Program Chair - OSA Optics & Photonics Congress on Imaging Systems (IS), Optical Society (OSA) (2016 - 2016)
- Topical Editor - Applied Optics, Optical Society (OSA) (2016 - 2016)
- Topical Editor - Applied Optics, Optical Society (OSA) (2012 - 2013)
- General Chair - OSA Optics & Photonics Congress on Imaging Systems (IS), Optical Society (OSA) (2012 - 2012)
- Program Chair - OSA Optics & Photonics Congress on Imaging Systems (IS), Optical Society (OSA) (2011 - 2011)
- Program Committee - OSA Optics & Photonics Congress on Imaging Systems (IS), Optical Society (OSA) (2010 - present)
- Program Committee - IS&T Electronic Imaging: Digital Photography, Society for Imaging Science and Technology (IS&T) (2008 - 2021)

PROFESSIONAL EDUCATION

- Ph.D., Stanford University , Electrical Engineering (2003)

Research & Scholarship

CURRENT RESEARCH AND SCHOLARLY INTERESTS

Nanophotonics, 3D Metaphotonic devices, Metamaterials, Optical Imaging

Publications

PUBLICATIONS

- **A single-layer color router for solid-state image sensors** *APPLIED PHYSICS LETTERS*
  Catrysse, P. B., Fan, S.
  2026; 128 (9)
- **Scalable Carbon Dioxide Capture Using Clay-Derived Zeolites via Atomic Rearrangement.** *Journal of the American Chemical Society*
  Li, J., Li, J., Fang, S., Lyu, H., Yuan, L., Guan, X., Feng, G., Chi, X., Mao, H., Wu, Y., Li, Y., Liu, Z., Zhang, et al
  2026
- **Ideal optical antimatter using passive lossy materials under complex frequency excitation.** *Light, science & applications*
  Long, O. Y., Catrysse, P. B., Han, S., Fan, S.
  2026; 15 (1): 48
- **Shaping space-time wave packets beyond the paraxial limit using a dispersion magnifier** *PHYSICAL REVIEW A*
  Kim, D., Guo, C., Catrysse, P. B., Fan, S.
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- **Weyl points in a twisted multilayer photonic system** *APPLIED PHYSICS LETTERS*
  Abrashuly, A., Guo, C., Papadakis, G. T., Catrysse, P. B., Fan, S.
  2024; 125 (17)
- **Radiative cooling textiles using industry-standard particle-free nonporous micro-structured fibers.** *Nanophotonics (Berlin, Germany)*
  Catrysse, P. B., Fan, S.
  2024; 13 (5): 649-657
- **Multifunctional intelligent surfaces based on volumetric inverse topology design**
  Asgari, M., Catrysse, P. B., Wang, H., Fan, S., Asadchy, V., IEEE
  IEEE.2024
- **Spectral routers for snapshot multispectral imaging** *APPLIED PHYSICS LETTERS*
  Catrysse, P. B., Fan, S.
  2023; 123 (26)
- **Subwavelength Bayer RGB color routers with perfect optical efficiency** *NANOPHOTONICS*
  Catrysse, P. B., Zhao, N., Jin, W., Fan, S.
  2022
- **Subambient daytime radiative cooling textile based on nanoprocessed silk** *NATURE NANOTECHNOLOGY*
  Zhu, B., Li, W., Zhang, Q., Li, D., Liu, X., Wang, Y., Xu, N., Wu, Z., Li, J., Li, X., Catrysse, P. B., Xu, W., Fan, et al
  2021
- **Scattering of electromagnetic waves by cylinder inside uniaxial hyperbolic medium** *OPTICS EXPRESS*
  Rituraj, Catrysse, P. B., Fan, S.
  2019; 27 (4): 3991–4003
- **Scattering of electromagnetic waves by cylinder inside uniaxial hyperbolic medium**
  Rituraj, Catrysse, P. B., Fan, S.
  edited by Engheta, N., Noginov, M. A., Zheludev, N. I.
  SPIE-INT SOC OPTICAL ENGINEERING.2019

- **Spectrally Selective Nanocomposite Textile for Outdoor Personal Cooling** *ADVANCED MATERIALS*
  Cai, L., Song, A. Y., Li, W., Hsu, P., Lin, D., Catrysse, P. B., Liu, Y., Peng, Y., Chen, J., Wang, H., Xu, J., Yang, A., Fan, et al
  2018; 30 (35)
- **Spectrally Selective Nanocomposite Textile for Outdoor Personal Cooling.** *Advanced materials (Deerfield Beach, Fla.)*
  Cai, L., Song, A. Y., Li, W., Hsu, P., Lin, D., Catrysse, P. B., Liu, Y., Peng, Y., Chen, J., Wang, H., Xu, J., Yang, A., Fan, et al
  2018: e1802152
- **Broadband Control of Topological Nodes in Electromagnetic Fields** *PHYSICAL REVIEW LETTERS*
  Song, A. Y., Catrysse, P. B., Fan, S.
  2018; 120 (19): 193903
- **Nanoporous polyethylene microfibres for large-scale radiative cooling fabric** *NATURE SUSTAINABILITY*
  Peng, Y., Chen, J., Song, A. Y., Catrysse, P. B., Hsu, P., Cai, L., Liu, B., Zhu, Y., Zhou, G., Wu, D. S., Lee, H., Fan, S., Cui, et al
  2018; 1 (2): 105–12
- **Broadband Control of Topological Nodes in Electromagnetic Fields**
  Song, A. Y., Catrysse, P. B., Fan, S., IEEE
  IEEE.2018
- **A dual-mode textile for human body radiative heating and cooling** *SCIENCE ADVANCES*
  Hsu, P., Liu, C., Song, A. Y., Zhang, Z., Peng, Y., Xie, J., Liu, K., Wu, C., Catrysse, P. B., Cai, L., Zhai, S., Majumdar, A., Fan, et al
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- **Warming up human body by nanoporous metallized polyethylene textile** *NATURE COMMUNICATIONS*
  Cai, L., Song, A. Y., Wu, P., Hsu, P., Peng, Y., Chen, J., Liu, C., Catrysse, P. B., Liu, Y., Yang, A., Zhou, C., Zhou, C., Fan, et al
  2017; 8: 496
- **Modern imaging: introduction to the feature issue** *APPLIED OPTICS*
  Catrysse, P. B., Irsch, K., Javidi, B., Preza, C., Testorf, M., Zalevsky, Z.
  2017; 56 (9): MI1–MI2
- **Planar, Ultrathin, Subwavelength Spectral Light Separator for Efficient, Wide-Angle Spectral Imaging** *ACS PHOTONICS*
  Buyukalp, Y., Catrysse, P. B., Shin, W., Fan, S.
  2017; 4 (3): 525-535
- **Photonic Structure Textile Design for Localized Thermal Cooling Based on a Fiber Blending Scheme** *ACS PHOTONICS*
  Catrysse, P. B., Song, A. Y., Fan, S.
  2016; 3 (12): 2420-2426
- **Radiative human body cooling by nanoporous polyethylene textile** *SCIENCE*
  Hsu, P., Song, A. Y., Catrysse, P. B., Liu, C., Peng, Y., Xie, J., Fan, S., Cui, Y.
  2016; 353 (6303): 1019-1023
- **Photonic Structure Textile Design for Localized Thermal Management via Radiative Cooling**
  Catrysse, P. B., Song, A. Y., Fan, S., IEEE
  IEEE.2016
- **Integration of optical functionality for image sensing through sub-wavelength geometry design**
  Catrysse, P. B.
  edited by Dhar, N. K., Dutta, A. K.
  SPIE-INT SOC OPTICAL ENGINEERING.2015
- **Routing of deep-subwavelength optical beams without reflection and diffraction using infinitely anisotropic metamaterials**
  Catrysse, P. B., Fan, S.
  edited by Betz, M., Elezzabi, A. Y., Tsen, K. T.
  SPIE-INT SOC OPTICAL ENGINEERING.2015
- **Complete power concentration into a single waveguide in large-scale waveguide array lenses** *SCIENTIFIC REPORTS*
  Catrysse, P. B., Liu, V., Fan, S.

2014; 4

- **Directional perfect absorption using deep subwavelength low-permittivity films** *PHYSICAL REVIEW B*
  Luk, T. S., Campione, S., Kim, I., Feng, S., Jun, Y. C., Liu, S., Wright, J. B., Brener, I., Catrysse, P. B., Fan, S., Sinclair, M. B.
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- **Spectral light separator based on deep-subwavelength resonant apertures in a metallic film** *APPLIED PHYSICS LETTERS*
  Bueyuekalp, Y., Catrysse, P. B., Shin, W., Fan, S.
  2014; 105 (1)
- **Large-scale ideal waveguide lenses with complete power concentration in a single waveguide**
  Catrysse, P. B., Liu, V., Fan, S., IEEE
  IEEE.2014
- **Broadband Sharp 90-degree Bends and T-Splitters in Plasmonic Coaxial Waveguides.** *Nano letters*
  Shin, W., Cai, W., Catrysse, P. B., Veronis, G., Brongersma, M. L., Fan, S.
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- **Wireless power transfer in the presence of metallic plates: Experimental results** *AIP ADVANCES*
  Yu, X., Skauli, T., Skauli, B., Sandhu, S., Catrysse, P. B., Fan, S.
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- **Pixel scaling in infrared focal plane arrays** *APPLIED OPTICS*
  Catrysse, P. B., Skauli, T.
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- **Imaging systems and applications** *APPLIED OPTICS*
  Catrysse, P. B., Imai, F. H., von Berg, D., Sheridan, J. T.
  2013; 52 (7): ISA1–ISA3
- **Routing of Deep-Subwavelength Optical Beams and Images without Reflection and Diffraction Using Infinitely Anisotropic Metamaterials** *ADVANCED MATERIALS*
  Catrysse, P. B., Fan, S.
  2013; 25 (2): 194-198
- **Plasmonic nano-coaxial waveguides for 90-degree bends and T-splitters**
  Shin, W., Cai, W., Catrysse, P. B., Veronis, G., Brongersma, M. L., Fan, S., IEEE
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- **Broadband Sharp 90-degree Bends and T-Splitters in Plasmonic Coaxial Waveguides** *Nano Letters*
  Fan, S., H., Shin, W., Cai, W., S., Catrysse et al., P., B.
  2013; 13 (10): 4753-4758
- **From Electromagnetically Induced Transparency to Superscattering with a Single Structure: A Coupled-Mode Theory for Doubly Resonant Structures** *PHYSICAL REVIEW LETTERS*
  Verslegers, L., Yu, Z., Ruan, Z., Catrysse, P. B., Fan, S.
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- **Digital camera simulation** *APPLIED OPTICS*
  Farrell, J. E., Catrysse, P. B., Wandell, B. A.
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- **Imaging systems and applications** *APPLIED OPTICS*
  Bennett, G., Catrysse, P. B., Farrell, J. E., Fowler, B., Mait, J. N.
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- **Deep sub-wavelength beam propagation, beam manipulation and imaging with extreme anisotropic meta-materials** *Conference on Lasers and Electro-Optics (CLEO)*
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- **From electromagnetically induced transparency to superscattering with a single structure: A coupled-mode theory for doubly resonant structures**
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- **Transverse Electromagnetic Modes in Aperture Waveguides Containing a Metamaterial with Extreme Anisotropy** *PHYSICAL REVIEW LETTERS*
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- **Temporal Coupled-Mode Theory for Resonant Apertures** *Conference on Lasers and Electro-Optics (CLEO)*
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- **Transverse electro-magnetic modes in apertures filled with an extreme anisotropic meta-material** *Conference on Lasers and Electro-Optics (CLEO)*
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- **Temporal coupled-mode theory for resonant apertures** *JOURNAL OF THE OPTICAL SOCIETY OF AMERICA B-OPTICAL PHYSICS*
  Verslegers, L., Yu, Z., Catrysse, P. B., Fan, S.
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- **Nanopatterned Metallic Films for Use As Transparent Conductive Electrodes in Optoelectronic Devices** *NANO LETTERS*
  Catrysse, P. B., Fan, S.
  2010; 10 (8): 2944-2949
- **Digital Photography** *JOURNAL OF ELECTRONIC IMAGING*
  Catrysse, P. B., Suesstrunk, S.
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- **Phase front design with metallic pillar arrays** *OPTICS LETTERS*
  Verslegers, L., Catrysse, P. B., Yu, Z., Shin, W., Ruan, Z., Fan, S.
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- **Microlens performance limits in sub-2 mu m pixel CMOS image sensors** *OPTICS EXPRESS*
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  Verslegers, L., Catrysse, P. B., Yu, Z., Fan, S.
  SPIE-INT SOC OPTICAL ENGINEERING.2010
- **High-speed Document Sensing and Misprint Detection in Digital Presses** *Conference on Sensors, Cameras, and Systems for Industrial/ Scientific Applications XI*
  Leseur, G., Meunier, N., Georgiadis, G., Huang, L., DiCarlo, J., Wandell, B. A., Catrysse, P. B.
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- **Optimizing Nano-patterned Metal Films for Use as Transparent Electrodes in Optoelectronic Devices** *Conference on Lasers and Electro-Optics (CLEO)/Quantum Electronics and Laser Science Conference (QELS)*
  Catrysse, P. B., Fan, S.
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- **Phase Front Design with Metallic Pillar Arrays** *Conference on Lasers and Electro-Optics (CLEO)/Quantum Electronics and Laser Science Conference (QELS)*
  Verslegers, L., Catrysse, P. B., Yu, Z., Shin, W., Ruan, Z., Fan, S.
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- **Transparent electrode designs based on optimal nano-patterning of metallic films** *Conference on Plasmonics: Metallic Nanostructures and Their Optical Properties VIII*
  Catrysse, P. B., Fan, S.
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- **Planar metallic nanoscale slit lenses for angle compensation** *APPLIED PHYSICS LETTERS*
  Verslegers, L., Catrysse, P. B., Yu, Z., Fan, S.
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- **Deep-Subwavelength Focusing and Steering of Light in an Aperiodic Metallic Waveguide Array** *PHYSICAL REVIEW LETTERS*
  Verslegers, L., Catrysse, P. B., Yu, Z., Fan, S.
  2009; 103 (3)
- **Understanding the dispersion of coaxial plasmonic structures through a connection with the planar metal-insulator-metal geometry** *APPLIED PHYSICS LETTERS*
  Catrysse, P. B., Fan, S.
  2009; 94 (23)
- **Planar Lenses Based on Nanoscale Slit Arrays in a Metallic Film** *NANO LETTERS*
  Verslegers, L., Catrysse, P. B., Yu, Z., White, J. S., Barnard, E. S., Brongersma, M. L., Fan, S.
  2009; 9 (1): 235-238
- **Simple Analytical Expression for the Dispersion of Plasmonic Structures with Coaxial Geometry** *Conference on Lasers and Electro-Optics/ Quantum Electronics and Laser Science Conference (CLEO/QELS 2009)*
  Catrysse, P. B., Fan, S.
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- **Integrated nanophotonics: dynamic optical isolation, and nanoscale far-field focusing in aperiodic plasmonic waveguide array** *22nd Annual Meeting of the IEEE-Photonics-Society*
  Fan, S., Yu, Z., Verslegers, L., Catrysse, P.
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- **Optical confinement methods for continued scaling of CMOS image sensor pixels** *OPTICS EXPRESS*
  Fesenmaier, C. C., Huo, Y., Catrysse, P. B.
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- **Curving monolithic silicon for nonplanar focal plane array applications (vol 92, art no 091114, 2008)** *APPLIED PHYSICS LETTERS*
  Dinyari, R., Rim, S., Huang, K., Catrysse, P. B., Peumans, P.
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- **The optical advantages of curved focal plane arrays** *OPTICS EXPRESS*
  Rim, S., Catrysse, P. B., Dinyari, R., Huang, K., Peumans, P.
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- **Curving monolithic silicon for nonplanar focal plane array applications** *APPLIED PHYSICS LETTERS*
  Dinyari, R., Rim, S., Huang, K., Catrysse, P. B., Peumans, P.
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- **Propagating plasmonic mode in nanoscale apertures and its implications for extraordinary transmission** *JOURNAL OF NANOPHOTONICS*
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- **Deep-Subwavelength Coaxial Waveguides with a Hollow Core** *Conference on Lasers and Electro-Optics/Quantum Electronics and Laser Science Conference (CLEO/QELS 2008)*
  Catrysse, P. B., Fan, S.
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- **Mitigation of pixel soling effects in CMOS image sensors** *Conference on Digital Photography IV*
  Fesenmaier, C. C., Catrysse, P. B.
  SPIE-INT SOC OPTICAL ENGINEERING.2008

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  Catrysse, P. B.
  2007; 3 (12): 839–40
- **Enlarging the bandwidth of nanoscale propagating plasmonic modes in deep-subwavelength cylindrical holes** *APPLIED PHYSICS LETTERS*
  Catrysse, P. B., Fan, S.
  2007; 91 (18)
- **Near-complete transmission through subwavelength hole arrays in phonon-polaritonic thin films** *PHYSICAL REVIEW B*
  Catrysse, P. B., Fan, S.
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- **Phonon polariton reflectance spectra in a silicon carbide membrane hole array** *20th Annual Meeting of the IEEE-Lasers-and-Electro-Optics-Society*
  Provine, J., Catrysse, P. B., Roper, C. S., Maboudian, R., Fan, S., Howe, R. T.
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- **Extraordinary transmission through a poly-SiC membrane with subwavelength hole arrays** *IEEE/LEOS International Conference on Optical MEMS and Nanophotonics*
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- **Transmission enhancement and suppression by subwavelength hole arrays in polaritonic films** *Conference on Photonic Crystal Materials and Devices VI*
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  SPIE-INT SOC OPTICAL ENGINEERING.2007
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- **Optical interaction of space and wavelength in high-resolution digital imagers** *Conference on Digital Photography II*
  Rodricks, B., Venkataraman, K., Catrysse, P., Wandell, B.
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- **Propagating modes in subwavelength cylindrical holes** *49th International Conference on Electron, Ion, and Photon Beam Technology and Nanofabrication*
  Catrysse, P. B., Shin, H., Fan, S. H.
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  Shin, H., Catrysse, P. B., Fan, S.
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- **Mechanism for designing metallic metamaterials with a high index of refraction** *PHYSICAL REVIEW LETTERS*
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- **Nanophotonics: Stopping light, nonreciprocity, and metamaterials** *2005 PACIFIC RIM CONFERENCE ON LASERS AND ELECTRO-OPTICS*
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  SPIE-INT SOC OPTICAL ENGINEERING.2000: 420–430
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