

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

- **Metacrystals: inversely-designed 3D-printed intelligent panels for 6G communications.** *Nature communications*
Asgari, M. M., Catrysse, P. B., Yuan, S. S., Wang, H., Fan, S., Asadchy, V.
2026; 17 (1)
- **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.
2025; 111 (1)
- **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 microfibrils 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
2017; 3 (11): e1700895
- **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.
2014; 90 (8)
- **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.
2013; 13 (10): 4753-4758
- **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.
2013; 3 (6)
- **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
IEEE.2013
- **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.
2012; 108 (8)
- **Digital camera simulation** *APPLIED OPTICS*
Farrell, J. E., Catrysse, P. B., Wandell, B. A.
2012; 51 (4): A80-A90
- **Imaging systems and applications** *APPLIED OPTICS*
Bennett, G., Catrysse, P. B., Farrell, J. E., Fowler, B., Mait, J. N.
2012; 51 (4): ISA1
- **Deep sub-wavelength beam propagation, beam manipulation and imaging with extreme anisotropic meta-materials** *Conference on Lasers and Electro-Optics (CLEO)*

Catrysse, P. B., Fan, S.
IEEE.2012

- **From electromagnetically induced transparency to superscattering with a single structure: A coupled-mode theory for doubly resonant structures**
Verslegers, L., Yu, Z., Ruan, Z., Catrysse, P. B., Fan, S.
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SPIE-INT SOC OPTICAL ENGINEERING.2012
- **Transverse Electromagnetic Modes in Aperture Waveguides Containing a Metamaterial with Extreme Anisotropy** *PHYSICAL REVIEW LETTERS*
Catrysse, P. B., Fan, S.
2011; 106 (22)
- **Temporal Coupled-Mode Theory for Resonant Apertures** *Conference on Lasers and Electro-Optics (CLEO)*
Verslegers, L., Yu, Z., Catrysse, P. B., Ruan, Z., Fan, S.
IEEE.2011
- **Transverse electro-magnetic modes in apertures filled with an extreme anisotropic meta-material** *Conference on Lasers and Electro-Optics (CLEO)*
Catrysse, P. B., Fan, S.
IEEE.2011
- **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.
2010; 27 (10): 1947-1956
- **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.
2010; 19 (2)
- **Phase front design with metallic pillar arrays** *OPTICS LETTERS*
Verslegers, L., Catrysse, P. B., Yu, Z., Shin, W., Ruan, Z., Fan, S.
2010; 35 (6): 844-846
- **Microlens performance limits in sub-2 μ m pixel CMOS image sensors** *OPTICS EXPRESS*
Huo, Y., Fesenmaier, C. C., Catrysse, P. B.
2010; 18 (6): 5861-5872
- **Deep-subwavelength focusing and steering of light in an aperiodic metallic waveguide array** *Conference on Integrated Optics - Devices, Materials, and Technologies XIV*
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.
SPIE-INT SOC OPTICAL ENGINEERING.2010
- **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.
IEEE.2010
- **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.

IEEE.2010

- **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.
SPIE-INT SOC OPTICAL ENGINEERING.2010
- **Planar metallic nanoscale slit lenses for angle compensation** *APPLIED PHYSICS LETTERS*
Verslegers, L., Catrysse, P. B., Yu, Z., Fan, S.
2009; 95 (7)
- **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.
IEEE.2009: 1838–1839
- **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.
IEEE.2009: 646–647
- **Optical confinement methods for continued scaling of CMOS image sensor pixels** *OPTICS EXPRESS*
Fesenmaier, C. C., Huo, Y., Catrysse, P. B.
2008; 16 (25): 20457-20470
- **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.
2008; 92 (16)
- **The optical advantages of curved focal plane arrays** *OPTICS EXPRESS*
Rim, S., Catrysse, P. B., Dinyari, R., Huang, K., Peumans, P.
2008; 16 (7): 4965-4971
- **Curving monolithic silicon for nonplanar focal plane array applications** *APPLIED PHYSICS LETTERS*
Dinyari, R., Rim, S., Huang, K., Catrysse, P. B., Peumans, P.
2008; 92 (9)
- **Propagating plasmonic mode in nanoscale apertures and its implications for extraordinary transmission** *JOURNAL OF NANOPHOTONICS*
Catrysse, P. B., Fan, S.
2008; 2
- **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.
IEEE.2008: 3567–3568
- **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

- **Plasmonics - Beaming light into the nanoworld** *NATURE PHYSICS*
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.
2007; 75 (7)
- **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*
Provine, J., Catrysse, P. B., Roper, C., Maboudian, R., Fan, S., Howe, R. T.
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- **Transmission enhancement and suppression by subwavelength hole arrays in polaritonic films** *Conference on Photonic Crystal Materials and Devices VI*
Catrysse, P. B., Fan, S.
SPIE-INT SOC OPTICAL ENGINEERING.2007
- **Cut-through metal slit array as an anisotropic metamaterial film** *IEEE JOURNAL OF SELECTED TOPICS IN QUANTUM ELECTRONICS*
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2006; 12 (6): 1116–1122
- **Guided modes supported by plasmonic films with a periodic arrangement of subwavelength slits** *APPLIED PHYSICS LETTERS*
Catrysse, P. B., Veronis, G., Shin, H., Shen, J. T., Fan, S.
2006; 88 (3)
- **Plasmonic films with a periodic arrangement of sub-wavelength slits** *Conference on Photonic Crystal Materials and Devices IV*
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SPIE-INT SOC OPTICAL ENGINEERING.2006
- **Optical interaction of space and wavelength in high-resolution digital imagers** *Conference on Digital Photography II*
Rodricks, B., Venkataraman, K., Catrysse, P., Wandell, B.
SPIE-INT SOC OPTICAL ENGINEERING.2006
- **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.
A V S AMER INST PHYSICS.2005: 2675–78
- **Effect of the plasmonic dispersion relation on the transmission properties of subwavelength cylindrical holes** *PHYSICAL REVIEW B*
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2005; 72 (8)
- **Mechanism for designing metallic metamaterials with a high index of refraction** *PHYSICAL REVIEW LETTERS*
Shen, J. T., Catrysse, P. B., Fan, S. H.
2005; 94 (19)
- **Nanophotonics: Stopping light, nonreciprocity, and metamaterials** *2005 PACIFIC RIM CONFERENCE ON LASERS AND ELECTRO-OPTICS*
Fan, S., Yanik, M. F., Wang, Z., Suh, W. J., Shen, J. T., Catrysse, P. C.

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- **Monolithic integration of electronics and sub-wavelength metal optics in deep submicron CMOS technology** *Symposium on Materials, Integration and Technology for Monolithic Instruments held at the 2005 MRS Spring Meeting*
Catrysse, P. B.
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- **Sub-wavelength resonances in metal-dielectric-metal plasmonic structures** *18th Annual Meeting of the IEEE-Lasers-and-Electro-Optical-Society*
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- **Geometries and materials for subwavelength surface plasmon modes** *JOURNAL OF THE OPTICAL SOCIETY OF AMERICA A-OPTICS IMAGE SCIENCE AND VISION*
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- **One-mode model for patterned metal layers inside integrated color pixels** *OPTICS LETTERS*
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- **Optical efficiency of image sensor pixels** *JOURNAL OF THE OPTICAL SOCIETY OF AMERICA A-OPTICS IMAGE SCIENCE AND VISION*
Catrysse, P. B., Wandell, B. A.
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Xiao, F., DiCarlo, J. M., Catrysse, P. B., Wandell, B. A.
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- **How small should pixel size be?** *Conference on Sensors and Camera Systems for Scientific, Industrial, and Digital Photography Applications*
Chen, T., Catrysse, P., El Gamal, A., Wandell, B.
SPIE-INT SOC OPTICAL ENGINEERING.2000: 451–459
- **QE reduction due to pixel vignetting in CMOS image sensors** *Conference on Sensors and Camera Systems for Scientific, Industrial, and Digital Photography Applications*
Catrysse, P. B., Liu, X. Q., El Gamal, A.
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- **Silicon deformable mirrors and CMOS-based wavefront sensors** *Conference on High-Resolution Wavefront Control: Methods, Devices, and Applications II*
Mansell, J. D., Catrysse, P. B., Gustafson, E. K., Byer, R. L.
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