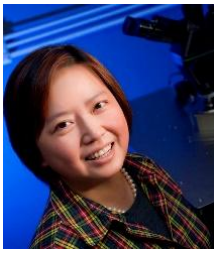
Xin Zhang, Ph.D.

Member of EASA; Fellow of ASME, IEEE, AIMBE, APS, Optica, AAAS, NAI, and Guggenheim



Distinguished Professor of Engineering
Professor, Mechanical Engineering
Professor, Electrical & Computer Engineering
Professor, Biomedical Engineering
Professor, Materials Science & Engineering

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Research Site: https://sites.bu.edu/xinzhang-lab/
Photonics Center, 8 St. Mary's Street
Boston University, Boston, MA
Citizenship: United States of America

Education and Training

Postdoc, Electrical Engineering and Computer Science, Massachusetts Institute of Technology (MIT)
Ph.D., Mechanical Engineering, Hong Kong University of Science and Technology (HKUST)

Positions and Employment

2011 – present	Professor, College of Engineering[1], Boston University
2006 – 2011	Associate Professor, College of Engineering, Boston University
2002 – 2006	Assistant Professor, College of Engineering, Boston University
2000 – 2001	Research Scientist, Department of Electrical Engineering and Computer Science, MIT

Other Positions

2020 – present	Co-Founder and Chief Technology Officer, Acoulent LLC
2018 – present	Co-Founder and Chief Technology Officer, Primetaz LLC
2016 – present	Associate Director, Nanotechnology Innovation Center (BUnano)
2015 – present	Director, NSF Research Experiences for Teachers (RET Site)
2015 – present	Director, NSF Research Experiences for Undergraduates (REU Site)
2008 – 2011	Associate Chair, Department of Mechanical Engineering, Boston University

Major Honors/Awards/Special Recognitions

2025: ASME Thomas A. Edison Patent Award
2024: ASME Robert Henry Thurston Lecture Award
2023: Sigma Xi Walston Chubb Award for Innovation
2023: ASME Per Bruel Gold Medal
2023: IEEE EMBS Technical Achievement Award
2022: Guggenheim Fellowship
2016: IEEE Sensors Council Technical Achievement Award (Advanced Career)

2025: TIME's Best Inventions Honoree
2025: Fast Company World Changing Ideas Awards Honoree
2025: Global Good Awards – *Game Changing Innovation of the Year* Award (Silver)
2024: Fast Company Innovation by Design Awards Honoree
2024: Falling Walls Science Breakthroughs of the Year Finalist
2023: STAT Madness All-Star Award
2023: Falling Walls Science Breakthroughs of the Year Finalist
2019: IET Innovation Awards – *Emerging Technology Design* Winner

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2023: Member, European Academy of Sciences and Arts
2019: Fellow, National Academy of Inventors
2019: Fellow, American Physical Society (APS)
2017: Fellow, Institute of Electrical and Electronics Engineers (IEEE)

[1] *Appointments in Mechanical Engineering (primary), with secondary appointments in Electrical & Computer Engineering, Biomedical Engineering, Materials Science & Engineering, and the Photonics Center at Boston University.*

2017: Associate Fellow, American Institute of Aeronautics and Astronautics (AIAA)
2016: Fellow, American Association for the Advancement of Science (AAAS)
2016: Fellow, American Institute for Medical and Biological Engineering (AIMBE)
2016: Fellow, Optica (formerly The Optical Society, OSA)
2015: Fellow, American Society of Mechanical Engineers (ASME)

2023: IET Excellence and Innovation Awards – *International Award* Finalist
2022: IET Innovation Awards – *Chief Engineer of the Year* Finalist
2021: *Invented Here!* Honoree, Boston Patent Law Association
2021: IET Innovation Awards – *Digital Health and Social Care* Finalist
2021: IET Innovation Awards – *Tech for Good* Finalist
2020: *Invented Here!* Honoree, Boston Patent Law Association
2020: IET Achievement Medal Finalist
2020: IET Innovation Awards – *Excellence in R&D* Finalist

2022: Distinguished Professor of Engineering, Boston University
2021: Rajen Kilachand Fund for Life Sciences and Engineering Award
2018: Boston University Innovator of the Year Award (First Woman Chosen)
2018: Charles DeLisi Award and Distinguished Lecture
2011: E.U.-U.S. National Academy of Engineering Invitee (ages 30—45)
2009: Inaugural Distinguished Faculty Fellow, College of Engineering, Boston University
2007: National Academy of Engineering Invitee (ages 30—45)

Honors/Awards/Special Recognitions with Startups

2025: Winner (DeepTech track), Massachusetts Innovation Network "Eddies" Award
2025: Global Prize Winner, Pitch2Tokyo Global Pitch Competition
2025: First Place, Yale Innovation Summit Poster Competition
2024: Winner, Pitch2Tokyo Regional Pitch Competition (Venture Café Cambridge)
2024: Top Innovator, New England Venture Summit
2024: Top 10 Finalist, MassChallenge U.S. Early-Stage Accelerator – Community Choice Award
2024: Fifth Place (Global), TiE University Global Competition
2024: First Place, UMass Lowell M2D2 IMPACT Accelerator Pitch-Off
2024: First Place, TiE University Boston Pitch Competition

Selected Recent Papers

*(# denotes supervised by X. Zhang; * denotes corresponding author: X. Zhang)*

I. Photonic and Terahertz Metamaterials & Microsystems

Reconfigurable quasi-BIC terahertz metasurfaces through MEMS-induced symmetry breaking
Z. Yang#, J. Zhang, S. Lee, X. Xie#, R.D. Averitt, and X. Zhang*
Advanced Optical Materials, 2026, **14**(9): e03164

Diatom Cribellum-inspired hierarchical metamaterials: Unifying perfect absorption towards subwavelength color printing
X. Xie#, Y. Huang#, Z. Yang#, A. Li#, and X. Zhang*
Advanced Materials, 2024, **36**(33): 2403304

All-silicon active bound states in the continuum terahertz metamaterials
Y. Huang#, K. Kaj, Z. Yang#, E. Alvarado, W. Man, Y. Zhang, V. Ramaprasad, R.D. Averitt, and X. Zhang*
Optics & Laser Technology, 2024, **179**: 111176

Tunable bound states in the continuum in a reconfigurable terahertz metamaterial
Y. Huang#, K. Kaj, C. Chen#, Z. Yang#, R.D. Averitt, and X. Zhang*
Advanced Optical Materials, 2023, **11**(4): 2300559

Broadband terahertz silicon membrane metasurface absorber
Y. Huang#, K. Kaj, C. Chen#, Z. Yang#, S.R. Haque, Y. Zhang, X. Zhao#, R.D. Averitt, and X. Zhang*
ACS Photonics, 2022, **9**(4): 1150–1156
On-demand terahertz surface wave generation with microelectromechanical-system-based metasurface
C. Chen#, K. Kaj, X. Zhao#, Y. Huang#, R.D. Averitt, and X. Zhang*
Optica, 2022, **9**(1): 17–25
Tunable toroidal response in a reconfigurable terahertz metamaterial
C. Chen#, K. Kaj, Y. Huang#, X. Zhao#, R.D. Averitt, and X. Zhang*
Advanced Optical Materials, 2021, **9**(22), 2101215
Terahertz investigation of bound states in the continuum of metallic metasurfaces
X. Zhao#, C. Chen#, K. Kaj, I. Hammock, Y. Huang#, R.D. Averitt, and X. Zhang*
Optica, 2020, **7**(11): 1548–1554
Diatom frustule-inspired metamaterial absorbers: the effect of hierarchical pattern arrays
A. Li#, X. Zhao#, G. Duan#, S.W. Anderson, and X. Zhang*
Advanced Functional Materials, 2019, **29**(22): 1809029
Optically modulated ultra-broadband all-silicon metamaterial terahertz absorbers
X. Zhao#, Y. Wang#, J. Schalch, G. Duan#, K. Cremin, J. Zhang, C. Chen#, R.D. Averitt, and X. Zhang*
ACS Photonics, 2019, **6**(4): 830–837
Electromechanically tunable metasurface transmission waveplate at terahertz frequencies
X. Zhao#, J. Schalch, J. Zhang, H.R. Seren#, G. Duan#, R.D. Averitt, and X. Zhang*
Optica, 2018, **5**(3): 303–310
Voltage-tunable dual-layer terahertz metamaterials
X. Zhao#, K. Fan#, J. Zhang, G.R. Keiser, G. Duan#, R.D. Averitt, and X. Zhang*
Microsystems & Nanoengineering – Nature, 2016, **2**: 16025

II. Metamaterials for Accessible and High-Performance MRI

A wireless reconfigurable metasurface for enhanced parallel magnetic resonance imaging
Y. Liu#, X. Zhu#, K. Wu#, A. Kaliaev, C.A. LeBedis, S.W. Anderson, and X. Zhang*
arXiv, 2026, preprint arXiv:2605.24791
Circularly polarized metamaterial cage for homogeneous signal-to-noise ratio enhancement in magnetic resonance imaging
Y. Liu#, X. Zhu#, K. Wu#, S.W. Anderson, and X. Zhang*
Advanced Materials, 2026, **38**: e16569
Metamaterial-enabled hybrid receive coil for enhanced magnetic resonance imaging capabilities
X. Zhu#, K. Wu#, S.W. Anderson, and X. Zhang*
Advanced Science, 2025, **12**(3): 2410907
Conformal metamaterials with active tunability and self-adaptivity for magnetic resonance imaging
K. Wu#, X. Zhu#, X. Zhao#, S.W. Anderson, and X. Zhang*
Research, 2024, **7**: 0560
Wireless, customizable coaxially shielded coils for magnetic resonance imaging
K. Wu#, X. Zhu#, S.W. Anderson, and X. Zhang*
Science Advances, 2024, **10**(24): eadn5195
Wearable coaxially-shielded metamaterial for magnetic resonance imaging
X. Zhu#, K. Wu#, S.W. Anderson, and X. Zhang*
Advanced Materials, 2024, **36**(31): 2313692
Computational-design enabled wearable and tunable metamaterials via freeform auxetics for magnetic resonance imaging
K. Wu#, X. Zhu#, T.G. Bifano, S.W. Anderson, and X. Zhang*
Advanced Science, 2024, **11**(26): 2400261

Helmholtz coil-inspired volumetric wireless resonator for magnetic resonance imaging
X. Zhu#, K. Wu#, S.W. Anderson, and X. Zhang*
Advanced Materials Technologies, 2023, **8**(22): 2301053
Auxetics-inspired tunable metamaterials for magnetic resonance imaging
K. Wu#, X. Zhao#, T.G. Bifano, S.W. Anderson, and X. Zhang*
Advanced Materials, 2022, **34**(6): 2109032
Nonreciprocal magnetic coupling using nonlinear meta-atoms
X. Zhao#, K. Wu#, C. Chen#, T.G. Bifano, S.W. Anderson, and X. Zhang*
Advanced Science, 2020, **7**(19): 2001443
Intelligent metamaterials based on nonlinearity for magnetic resonance imaging
X. Zhao#, G. Duan#, K. Wu#, S.W. Anderson, and X. Zhang*
Advanced Materials, 2019, **31**(49): 1905461
Boosting magnetic resonance imaging signal-to-noise ratio using magnetic metamaterials
G. Duan#, X. Zhao#, S.W. Anderson, and X. Zhang*
Communications Physics – Nature, 2019, **2**: 35

III. Metamaterials for Acoustics and Wireless Sensing

Physics-aware machine-learning-driven inverse design of broadband ultra-open acoustic metamaterial
Z. Yang#, M. Li#, X. Xie#, A. Chen#, T.G. Bifano, and X. Zhang*
arXiv, 2026, preprint arXiv:2605.16031
Phase gradient ultra open metamaterials for broadband acoustic silencing
Z. Yang#, A. Chen#, X. Xie#, S.W. Anderson, and X. Zhang*
Scientific Reports – Nature, 2025, **15**: 21434
Electrically-shielded coil-enabled battery-free wireless sensing for underwater environmental monitoring
K. Wu#, X. Zhu#, S.W. Anderson, and X. Zhang*
Advanced Science, 2025, **12**(14): 2414299
Two-sided acoustic modulator for broadband and individual control of reflected and transmitted sound waves
A. Chen# and X. Zhang*
Physical Review Applied, 2024, **22**(4): 044010
A robust near-field body area network based on coaxially-shielded textile metamaterial
X. Zhu#, K. Wu#, X. Xie#, S.W. Anderson, and X. Zhang*
Nature Communications, 2024, **15**: 6589
Angle-variant metamaterial with reconfigurable phase modulation
A. Chen#, Z. Yang#, S.W. Anderson, and X. Zhang*
Physical Review Applied, 2024, **21**(1): 014062
Composite acoustic metamaterial for broadband low-frequency acoustic attenuation
A. Chen#, Z. Yang#, X. Zhao#, S. Anderson, and X. Zhang*
Physical Review Applied, 2023, **20**(1): 014011
Broadband labyrinthine acoustic insulator
A. Chen#, X. Zhao#, Z. Yang#, S. Anderson, and X. Zhang*
Physical Review Applied, 2022, **18**(6): 064057
Metamaterial-enhanced near-field readout platform for passive microsensor tags
K. Wu#, G. Duan#, X. Zhao#, C. Chen#, S.W. Anderson, and X. Zhang*
Microsystems & Nanoengineering – Nature, 2022, **8**: 28
Ultra-open acoustic metamaterial silencer based on Fano-like interference
R. Ghaffarivardavagh#, J. Nikolajczyk#, S. Anderson, and X. Zhang*
Physical Review B, 2019, **99**(2): 024302

Horn-like space-coiling metamaterials toward simultaneous phase and amplitude modulation
R. Ghaffarivardavagh#, J. Nikolajczyk#, R.G. Holt, S. Anderson, and X. Zhang*
Nature Communications, 2018, **9**: 1349

IV. Artificial Intelligence for Medical Imaging & MRI

Few-shot deployment of pretrained MRI transformers in brain imaging tasks
M. Li#, G. Shen#, C.W. Farris, and X. Zhang*
Frontiers in Artificial Intelligence, 2026, **9**: 1771088

Magnetic resonance image processing transformer for general accelerated image restoration
G. Shen#, M. Li#, S.W. Anderson, C.W. Farris, and X. Zhang*
Scientific Reports – Nature, 2025, **15**: 40064

Regularization by neural style transfer for MRI field-transfer reconstruction with limited data
G. Shen#, Y. Zhu, M. Li#, R. McNaughton#, H. Jara, S.B. Andersson, C.W. Farris, S.W. Anderson, X. Zhang*
Frontiers in Artificial Intelligence, 2025, **8**: 1579251

Learning to reconstruct accelerated MRI through K-space cold diffusion without noise
G. Shen#, M. Li#, C.W. Farris, S.W. Anderson, and X. Zhang*
Scientific Reports – Nature, 2024, **14**: 21877

Attention hybrid variational net for accelerated MRI reconstruction
G. Shen#, B. Hao, M. Li#, C.W. Farris, I.C. Paschalidis, S.W. Anderson, and X. Zhang*
APL Machine Learning, 2023, **1**(4): 046116

V. Diatom-Enabled Functional Materials

Diatom Cribellum-inspired hierarchical metamaterials: Unifying perfect absorption towards subwavelength color printing
X. Xie#, Y. Huang#, Z. Yang#, A. Li#, and X. Zhang*
Advanced Materials, 2024, **36**(33): 2403304

Diatom frustule-inspired metamaterial absorbers: the effect of hierarchical pattern arrays
A. Li#, X. Zhao#, G. Duan#, S.W. Anderson, and X. Zhang*
Advanced Functional Materials, 2019, **29**(22): 1809029

Silica nanowire growth on *Coscinodiscus Species* diatom frustules via vapor-liquid-solid process
A. Li#, X. Zhao#, S. Anderson, and X. Zhang*
Small, 2018, **14**(47): 1801822

Towards uniformly oriented diatom frustule monolayers: Experimental and theoretical analyses
A. Li#, W. Zhang#, R. Ghaffarivardavagh#, X. Wang#, S.W. Anderson, and X. Zhang*
Microsystems & Nanoengineering – Nature, 2016, **2**: 16064

Biologically enabled micro- and nanostencil lithography using diatoms
J. Cai#, X. Wang#, A. Li#, S.W. Anderson, and X. Zhang*
Extreme Mechanics Letters, 2015, **4**: 186-192

Recent Principal Patents (all as Lead Inventor)

- Air-transparent selective sound silencer using ultra-open metamaterial
  United States (US10947876B2, US11846217B2, US12352190B2)
  Japan (JP7607933B2, JP7778418B2) Australia (AU2019314515B2)
  South Korea (KR102770784B1) European Patent Office (EP3830404B1)
  China (CN112867860B) Canada (CA3108530A1);
  WIPO (PCT) (WO2020028838A1)
  Mexico (MX2021001366A, MX2024009330A, MX2024009331A, MX2024009332A)
- Apparatus for improving magnetic resonance imaging
  United States (US10324152B2, US10884089B2)
  Japan (JP7219477B2) Australia (AU2018279078B2)
  South Korea (KR102569416B1) China (CN110678769B)
  European Patent Office (EP3635424A4) Canada (CA3062191A1)
  WIPO (PCT) (WO2018226946A1)

- Nonlinear and smart metamaterials useful to change resonance frequencies
  United States (US11219384B2, US12085629B2, US20240377488A1)
  Japan (JP7671997B2) China (CN114929103B)
  European Patent Office (EP4041074A4) Australia (AU2020361502B2)
  Canada (CA3157009A1) South Korea (KR20220074961A)
  WIPO (PCT) (WO2021072039A1)
- Apparatus and method for noise reduction using phased-array ultra-open metamaterials
  WIPO (PCT) (WO20250170988A1)
- Thermal imager using metamaterials
  United States (US8450690B2)
- Electromagnetic composite-based reflecting terahertz waveplate
  United States (US9551820B2)

Recent Notable Media Recognitions

Making the World a Lot Quieter
WSJ: No More Noise: Metamaterials Can Make the World a Quieter Place
This Smarter Sound Shield Blocks More Noise—Without Blocking Air
Magnetic Metamaterial Can "Turn Up the Volume" of MRI
Speeding Up MRI Scans to Save Lives
This Bizarre Looking Helmet Can Create Better Brain Scans
Unleashing the Power of Metamaterials to Improve MRI Imaging
American Scientist: Custom-Tuned Materials
Revolutionizing MRI Restoration with Transformer Technology
Making MRI More Globally Accessible: How Metamaterials Offer Affordable, High-Impact Solutions
Ultra-Open Acoustic Metamaterial Silencer (YouTube)
Magnetic Metamaterial Can "Turn Up the Volume" of MRI (YouTube)
Speeding Up MRI Scans to Save Lives (YouTube)
This Bizarre Looking Helmet Can Create Better Brain Scans (YouTube)

Publications Featured on Journal Covers:

Reconfigurable quasi-BIC terahertz metasurfaces, *Advanced Optical Materials* **14**(9), 2026.
Battery-free wireless sensing system, *Advanced Science* **12**(14), 2025.
Diatom Cribellum-inspired hierarchical metamaterials, *Advanced Materials* **36**(33), 2024.
Wearable coaxially-shielded metamaterial for MRI, *Advanced Materials* **36**(31), 2024.
Computational-design enabled wearable and tunable metamaterials, *Advanced Science* **11**(26), 2024.
Steady-state monitoring of oxygen in a high-throughput organ-on-chip platform, *Analyst* **148**(15), 2023.
Auxetics-inspired tunable metamaterials for MRI, *Advanced Materials* **34**(6), 2021.
Tunable toroidal response in a reconfigurable metamaterial, *Advanced Optical Materials* **9**(22), 2021.
Nonreciprocal magnetic coupling using nonlinear meta-atoms, *Advanced Science* **7**(19), 2020.
Intelligent metamaterials for magnetic resonance imaging, *Advanced Materials* **31**(49), 2019.
Graphene nanofluids as thermal management materials, *ACS Applied Nano Materials* **2**(11), 2019.
Diatom frustule-inspired metamaterial absorbers, *Advanced Functional Materials* **29**(22), 2019.
Ultra-broadband all-silicon metamaterial absorbers, *ACS Photonics* **6**(4), 2019.
Silicon nanowires on Coscinodiscus Species diatom frustules, *Small* **14**(47), 2018.
Electromechanically tunable metasurface transmission waveplate, *Optica* **5**(3), 2018.
Voltage-tunable THz metamaterials, *Microsystems & Nanoengineering* **2**(3-4), 2016.
Tunable meta-liquid crystals, *Advanced Materials* **28**(8), 2016.
Terahertz field electron emission, *Applied Physics Letters* **107**(23), 2015.
Micro- and nano-lithography aided by unicellular algae, *Extreme Mechanics Letters* **4**, 2015.
3D terahertz metamaterials, *Journal of Micromechanics & Microengineering* **22**(4), 2012.
Metamaterial silk composites at terahertz frequencies, *Advanced Materials* **22**(32), 2010.

Research Highlights by Science and Nature

Reconfigurable metasurfaces, *Science* **360**.
Metamaterials to see in THz, *Science* **334**.
Metamaterial Persian carpets, *Nature* **456**.
Near-perfect 'black', *Nature* **453**.
Filling the THz gap, *Science* **320**.

Honors/Awards at Boston University

The Hariri Institute for Computing's Focused Research Program (2024)
Nanoscience & Nanotechnology Award (2006, 2008, 2009, 2013, 2014, 2015)
The Ignition Award (2018, 2020)
Technology Development Award (2004, 2008)
Berman Future of Light Prize Award (2009, 2013)
Materials Science Innovation Grant Award (2016)
Schlumberger Research Fellowship Award (2015, 2016)
Nanotechnology Pilot Grant Award (2018)
Dean's Catalyst Award (2009, 2012, 2016)
The President's Award (2007, 2012)
The Provost's Award (2008)
SPRInG Award (2002)

Best Paper/Best Poster Awards

2020: *Microsystems & Nanoengineering* (Nature Partner Journal) – Highly Cited Paper Award
2020: *Springer Nature 2019 Highlights* – One of the Most Popular Articles of the Year
2013: International Workshop on Optical Terahertz Science and Technology – Best Poster Award
2013: ASME Global Congress on Nanoengineering for Medicine & Biology – Outstanding Paper Award
2011: International Conference on Surface Plasmon Photonics – Best Poster Award
2011: *Journal of Physics D: Applied Physics* – 2010 Highlights
2010: IEEE Sensors Conference – Best Poster Award
2009: *Journal of Micromechanics & Microengineering* – 2008 Highlights
2009: *Journal of Physics D: Applied Physics* – 2008 Highlights
2008: ASME Society-Wide Micro and Nanotechnology Poster Forum – Best Paper Award

Best Dissertation Awards (Advisor: Xin Zhang)

2023: BU College of Engineering PhD Societal Impact Award (Ke Wu)
2019: BU Mechanical Engineering Best Dissertation Award (Guangwu Duan)
2013: BU Mechanical Engineering Best Dissertation Award (Ping Du)
2012: BU Mechanical Engineering Best Dissertation Award (Kebin Fan)
2011: BU Engineering Best Dissertation Award (Xiaoyu (Rayne) Zheng)
2011: Ebner Graduate Thesis with Greatest Commercial Potential (Bradley Kaanta)
2010: BU Engineering Best Dissertation Award (Hu (Tiger) Tao)
2009: Ebner Graduate Thesis with Greatest Commercial Potential (Benjamin Hansen)

Mentoring and Training

- Mentored approximately 30 Ph.D. students, 30 M.S. students, 40 postdoctoral and visiting scholars, and more than 100 undergraduate researchers.
- **Program Leadership and Broadening Participation:**
  Director, National Science Foundation Research Experiences for Undergraduates (REU) Site (~100 total participants) and Research Experiences for Teachers (RET) Site (~60 total participants), with more than 80% participation from underrepresented groups across both programs.
- **Trainee Honors and Recognition:**
  Former trainees have received 8 Best Dissertation Awards, more than 20 Best Paper and Poster Awards, and more than 10 prestigious fellowships, including fellowships from the National Science Foundation, National Institutes of Health, Draper Laboratory, and Schlumberger.
- **Early-Career Faculty Awards Earned by Former Trainees:**
  NSF CAREER Award; DARPA Young Faculty Award; ONR Young Investigator Award; AFOSR Young Investigator Award.
- **First and Current Positions of Former PhD Graduates and Postdoctoral Fellows:**
  - **University Faculty:** University of California, Berkeley | University of California, Los Angeles | University of Texas at Austin | Ohio State University | Virginia Tech | Miami University | Boston

University School of Medicine | Tsinghua University | Shanghai Jiao Tong University | Nanjing University | Huazhong University of Science and Technology | Hong Kong Polytechnic University
- **National Laboratories:** Lawrence Livermore National Laboratory | MIT Lincoln Laboratory | Fermi National Accelerator Laboratory | Draper Laboratory
- **Hospitals and Research Centers:** Massachusetts General Hospital | Brigham and Women's Hospital | Boston Medical Center | MIT Media Lab
- **Industry:** Apple | Amazon | Meta | OpenAI | Tesla | ASML | Analog Devices | Keysight | Marvell Technology | Agilent | GE Global Research | GE Renewable Energy | Medtronic | Merck | BioNTech | PerkinElmer | Entegris | Fraunhofer | Aramco | Western Digital
- **Startups:** Accion Systems | Argo AI | Cambridge Electronics | Lilliputian | RayVio | Primetaz

Synergistic Activities

Director, NSF Research Experiences for Undergraduates (REU Site), Boston University (2015-present):
Leads a long-standing National Science Foundation undergraduate research program hosting 10–12 students annually in mentored research experiences, with a strong emphasis on expanding access for students from institutions with limited research infrastructure, including two- and four-year colleges nationwide.

Director, NSF Research Experiences for Teachers (RET Site), Boston University (2015-present):
Directs an annual National Science Foundation program engaging 10–12 high school and community college educators in immersive laboratory research experiences, prioritizing participation from teachers serving under-resourced schools, low-income communities, English language learners, and students with disabilities.

Associate Director, Boston University Nanotechnology Innovation Center (BUnano, 2016-present):
Provides strategic leadership for a campus-wide interdisciplinary research center uniting more than 60 faculty members across 10 departments, advancing collaborative research and technology translation in medicine, manufacturing, energy, sustainability, environmental monitoring, and advanced computing.

Professional Leadership and Recognition:
Fellow of seven major professional societies, including the American Association for the Advancement of Science (AAAS), American Institute for Medical and Biological Engineering (AIMBE), American Physical Society (APS), American Society of Mechanical Engineers (ASME), Institute of Electrical and Electronics Engineers (IEEE), National Academy of Inventors (NAI), and Optica, reflecting broad interdisciplinary recognition for research excellence, education, mentorship, outreach, and professional service.

Global Visibility and Public Engagement:
Research on metamaterials has been featured in more than 300 media outlets worldwide, including BBC, The Wall Street Journal, WIRED, Fast Company, Smithsonian Magazine, and Business Insider, attracting engagement from hundreds of companies, including numerous Fortune 500 firms, and contributing to the formation of award-winning startup ventures.

Summary of Media Coverage

Metamaterials that enable highly efficient, air-permeable sound silencing and noise reduction

"Though less publicized than its notorious air and water counterparts, noise pollution is a growing problem," [*Geek.com*]. Prof. Xin Zhang and her team at Boston University "have recently made a remarkable discovery," [*Bold Business*]; "have created a new kind of material," [*Smithsonian*]; "have come up with a solution that outperforms them all," [*Gizmodo*]; and "have done the seemingly impossible," [*ASME*]. Their breakthrough innovation, described as "shape blocking sound," [*Alliant*], is "quite a feat of metamaterial design," [*Fabbaloo*], which "could help bring peace and quiet to our lives," [*Digital Trends*]. "Whether at work, in health or in transport, this soundproofing ring could change our lives," [*Business Insider*], specifically by enabling the ability "to curtail noise from aircraft, fans and HVAC systems without interfering with the airflow," [*Smithsonian*]. As highlighted by *The Wall Street Journal*, "there are all kinds of mechanical applications that would benefit from lightweight, see-through

soundproofing that can stop noise, but still allow air to flow freely. And that's what Zhang's team did," [*The Wall Street Journal*]. Prof. Zhang's innovative "metamaterials block noise without hindering air flow," [*Design News*], unlocking "endless applications for the technology in different fields," [*SolidSmack*]. Described as a "ring of silence," [*Thomas Insights*], and "a meta-material to end noise pollution," [*Plastics the mag*], Prof. Zhang's invention is "as cool as it sounds!" [*Mashable*]. "The potential uses are endless," [*Built in Boston*], and "there's really no limit to the possibilities," [*Fast Company*]. Acclaimed as "the strongest sound insulation research in history!" [*TechOrang*], it's no wonder "the industry is crazy!" [*L'Usine nouvelle*]. Experts suggest "this could be a whole new industry," [*Fabbaloo*], and even predict "we may finally have a 3DPrinter popular hit," [*WIRED*]. Additionally, "the structure is also very lightweight and looks beautiful," [*Mashable*]. Ultimately, Prof. Zhang's discovery "could have a significant impact on architecture and design," [*Hunker*], ushering in "a new (and quiet) era of acoustics," [*Discoveries News*]. Beyond engineering applications, even wellness and mindfulness industries—already worth billions—"may also benefit from these advances," [*Future Science News*]. Clearly, "the future is coming, and it's just the right volume," [*Curiosity*].

Metamaterials that boost the signal-to-noise ratio and improve MRI performance

"MRI is a complicated imaging modality and improving it requires a deep understanding of the physics involved," [*Healthcare-in-Europe*]. Prof. Xin Zhang's metamaterials "boost MRI performance without increased magnetic field," [*Electronic Design & Microwaves & RF*]; "allow for more possibilities and the chance to simplify the technology," [*Science Times*]; and are said to "revolutionize MRI and medical imaging," [*Sathel Energia & MedImaging.net*]. "Shortening MRI examinations is paramount to maximizing the capacity. Not to mention revenue, as well as the overall patient experience of this powerful imaging technology," [*EurekAlert!*]. The "arrangement of this metamaterial is truly groundbreaking and innovative," [*NIH*]; it's an "additive technology," [*Pioneering Minds*], which could "potentially making the modality more widely available for patients at lower costs," [*HealthImaging*]. With this breakthrough, "crisper MRI now possible," [*Medgadget*], achieved using "tiny structures that could end up making a massive impact," [*Radiology Business*], thereby "making the entire MRI process faster, safer, and more accessible to patients around the world," [*Phys.org*]. "Not bad for a few coils of wire," [*Physics World*], especially as "cost effective MRIs might soon become a reality," [*MDDI*]. This work is considered a "quantum leap" [*Radiology Business*], representing a "substantial improvement in image quality for the first time," [*NIH*]. Clearly, "things will get seamless very soon," [*Times Tech Pharm*]. There's even potential for "the metamaterial being used with ultra-low field MRI," [*EurekAlert!*], a method that "uses magnetic fields that are thousands of times lower than the standard machines currently in use," [*Phys.org*]. Ultimately, "this would open the door for MRI technology to become widely available around the world," [*Science Daily*].

Metamaterial helmet that improves MRIs and creates better brain scans

"You can keep your hat on (in the MRI). If I told you an MRI revolution was coming, you probably wouldn't expect it to come dressed like this," [*Medical Republic*]. "It may look like a bizarre bike helmet, or a piece of equipment found in Doc Brown's lab in Back to the Future, yet this gadget made of plastic and copper wire is a technological breakthrough with the potential to revolutionize medical imaging," [*Imaging Technology News*]. "Despite its playful look, the device is actually a metamaterial, packing in a ton of physics, engineering and mathematical know-how," [*Science Daily*]. *Medgadget* praised the device as a "funky helmet enhances MRI brain scans," noting: "What if a simple device, made from plastic and copper wire, could help with all of these issues, and look like a goofy toy for kids in the process? Look no further," [*Medgadget*]. As *The Optimist Daily* highlights, "thanks to the playful design, the piece of headwear looks like it's straight from a mad scientist's laboratory, but there is a method to the madness. The uses of these magnificent metamaterials spread far and wide," [*The Optimist Daily*]. What's more, the technology is "raising the floor beyond all expectations," [*Medhealth Outlook*]. "There is hope among the researchers that the technology will eventually have enough in the tank to work with low-field MRI scanners. Assuming the said goal is realized, people living in underdeveloped areas will also end up getting a fair shot at reaping its benefits," [*Medhealth Outlook*].

Journal Papers

Cover Images

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*#denotes graduate students/postdocs supervised by Prof. Xin Zhang; *denotes corresponding author by X. Zhang.*

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