

CURRICULUM VITAE

Yu Shimojo, Ph.D.

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Education

- Mar. 2023 Ph.D. in Biomedical Engineering, Division of Sustainable Energy and Environmental Engineering, Graduate School of Engineering, Osaka University, Japan
- Mar. 2020 M.Eng., Division of Sustainable Energy and Environmental Engineering, Graduate School of Engineering, Osaka University, Japan (1 year early completion)
- Mar. 2019 B.Eng., Division of Sustainable Energy and Environmental Engineering, Faculty of Engineering, Osaka University, Japan

Professional Training and Employment

- Jun. 2023-Present Guest Researcher, Graduate School of Engineering, Osaka University, Japan
- Apr. 2023-Present Research Fellow (PD), Japan Society for the Promotion of Science, Japan
- Apr. 2023-Present Postdoctoral Fellow, Department of Dermatology, Graduate School of Medicine, Osaka Metropolitan University, Japan
- Apr. 2021-Mar. 2023 Research Fellow (DC2), Japan Society for the Promotion of Science, Japan
- Apr. 2020-Mar. 2023 Specially appointed researcher, Office of Management & Planning, Osaka University, Japan

Research Interests

Tissue optics, ultrashort pulsed laser, laser-tissue interactions, numerical modeling and simulation, selective photothermolysis, laser and light-based treatments, photodynamic therapy

Experimental Skills

- Numerical simulation of light transport and thermal diffusion: Proficient in numerical modeling and simulation of laser-tissue interactions to evaluate laser and light-based treatments
- *Ex vivo* experiment using human samples and animal models: Proficient in laser irradiation experiments to evaluate laser-induced thermal damage to tissues and measurements of optical properties of tissues
- Mouse experiment: Experienced in creating mouse models of multi-drug resistant bacteria infected cutaneous ulcers for the investigation of the efficacy of photodynamic therapy
- Cell experiments: Experienced in cell culture, the generation of stable cell line, and the investigation of

phototoxicity

- Bacteria experiments: Experienced in performing *in vitro* experiments of bacterial control using photodynamic therapy
- Optical setup development: Proficient in developing optical setup for laser irradiation experiments and spectroscopic measurement
- Spatial light modulation: Experienced in wavefront shaping for focusing light into scattering media
- Photoacoustic measurement: Experienced in measuring photoacoustic signals of a tissue-mimicking phantom
- Scanning electron microscopy
- Fluorescence microscopy
- Immunofluorescence staining
- ELISA and Cell viability assays
- CAD and 3D printing
- Matlab and Python programmings: Utilized for performing image and data processings
- C and Cuda programmings: Utilized for performing numerical simulations of light transport and thermal diffusion
- R programming: Utilized for performing meta analysis and systematic review

Honors and Awards

1. International Travel Award, American Society for Photobiology (Jul. 2024)
2. Best Poster Presentation Award, The 5th meeting of Comprehensive Understanding of Scattering and Fluctuated Fields and Science of Clairvoyance (May 2023)
3. The Encouragement Prize for Article Presentations Abroad, Association for the Advancement of Manufacturing & Technology (Apr. 2022)
4. Grant Program for Technology Exchanges, NAKATANI FOUNDATION for advancement of measuring technologies in biomedical engineering (Dec. 2021)
5. Scholarship Loan Forgiveness for Academic Excellence, Japan Student Services Organization (Jun. 2021)
6. Grant Program for Technology Exchanges, Life Science Foundation of JAPAN (Jan. 2021)
7. Best Oral Presentation Award for Young Scientists, Japan Society for Laser Surgery and Medicine (Oct. 2020)
8. Scholarship Loan Forgiveness for Academic Excellence, Japan Student Services Organization (Jun. 2020)
9. KONICA MINOLTA Science and Technology Foundation Award, The Optical Society of Japan (Dec. 2019)
10. Grant Program for Technology Exchanges, NAKATANI FOUNDATION for advancement of

measuring technologies in biomedical engineering (Mar. 2019)

Grant and Fundings

1. Grant-in-Aid for Early-Career Scientists, Japan Society for the Promotion of Science KAKENHI, No. 24K19832, Development of a safety evaluation model for laser and light-based treatments based on three-dimensional cultured human skin optical models, FY2024–2027, Amount ~42,000 USD (4,680,000 JYP), PI.
2. Collaborative Research Project with Milbon Co., Ltd., Construction of evaluation systems for the effects of ultraviolet rays on human skin and artificial skin, FY2023–2024, PI.
3. Grant-in-Aid for JSPS Fellows, Japan Society for the Promotion of Science KAKEN, No. 23KJ1825, Clinical demonstration of a computational laser treatment system using ultrashort pulsed laser, FY2023–2026, Amount ~42,000 USD (4,680,000 JYP) + Salary (~118,000 USD, 13,032,000 JYP), PI.
4. Strategic Basic Research Programs, Japan Science and Technology Agency, ACT-X, No. JPMJAX21K7, Development of non-contact and non-invasive robot-assisted laser surgery system, FY2021–2024, Amount ~92,000 USD (10,118,000 JYP), PI.
5. Grant-in-Aid for JSPS Fellows, Japan Society for the Promotion of Science KAKEN, No. 21J11059, Computational evaluation method for picosecond laser skin treatment, FY2021–2023, Amount ~14,000 USD (1,500,000 JYP) + Salary (~22,000 USD, 2,400,000 JYP), PI.
6. Collaborative Research Project with Integral Corporation, Preclinical evaluation of a novel optical fiber for laser treatment of benign prostatic hyperplasia, FY2020, Co-investigator.

Professional Societies

- American Society for Photobiology, Member (2024–Present)
- The Japan Photodynamic Association, Member (2023–Present)
- American Society for Laser Medicine and Surgery, Member (2022–Present)
- SPIE, Member (2022–Present)
- The Optical Society of Japan, Member (2019–Present)
- The Laser Society of Japan, Member (2018–Present)
- Japan Society for Laser Surgery and Medicine, Member (2018–Present)

Services

- Reviewer of *IEEE Transactions on Biomedical Engineering* (Aug. 2024)
- Reviewer of *Journal of Innovative Optical Health Sciences* (Jun. 2024)

Publications (peer review, *corresponding author)

1. [H. Watabe, Y. Shimojo*], A. Shingu, H. Ito, H. Fukuhara, M. Miyake, K. Inoue, K. Fujimoto, T. Nishimura*: Measurement of tissue optical properties in the 400–700 nm range to assess light penetration depths for laser treatment of upper tract urothelial carcinomas. *Journal of Biomedical Optics*, under review.

2. **Y. Shimojo***, T. Nishimura, D. Tsuruta, T. Ozawa, T. Kono: *In silico* evaluation of nanosecond laser treatment of pigmented lesions based on skin optical properties using a model of melanosome disruption threshold fluence. ***Lasers in Surgery and Medicine***, in press.
3. **Y. Shimojo***, T. Nishimura*, D. Tsuruta, T. Ozawa: Ultralow radiant exposure of a short-pulsed laser to disrupt melanosomes with localized thermal damage through a turbid medium. ***Scientific Reports***, **14**, 20112 (2024).
4. R. Teranishi, T.Ozawa*, B. Katayama, **Y. Shimojo**, N. Ito, K. Awazu, D. Tsuruta: Effect of photodynamic therapy with 5-aminolevulinic acid and EDTA-2Na against mixed infection of methicillin-resistant *Staphylococcus aureus* and *Pseudomonas aeruginosa*. ***Photodermatology, Photoimmunology & Photomedicine***, **40**, e12959 (2024).
5. **Y. Shimojo***, T. Nishimura, D. Tsuruta, T. Ozawa, H.H.L. Chan, T. Kono: Wavelength-dependent threshold fluences for melanosome disruption to evaluate the treatment of pigmented lesions with 532-, 730-, 755-, 785-, and 1064-nm picosecond lasers. ***Lasers in Surgery and Medicine***, **56**, 404–418 (2024).
6. H. Imanishi, T. Nishimura*, **Y. Shimojo**, K. Awazu: Deep learning based depth map estimation of protoporphyrin IX in turbid media using dual wavelength excitation fluorescence. ***Biomedical Optics Express***, **14**, 5254–5266 (2023).
7. **Y. Shimojo***, K. Sudo, T. Nishimura*, T. Ozawa, D. Tsuruta, K. Awazu: Transient simulation of laser ablation based on Monte Carlo light transport with dynamic optical properties model. ***Scientific Reports***, **13**, 11898 (2023).
8. Y. Takai*, T. Nishimura*, **Y. Shimojo**, K. Awazu: Artificial neural network-based determination of denoised optical properties in double integrating spheres measurement. ***Journal of Innovative Optical Health Sciences***, **16**, 2350012, (2023).
9. Y. Miyoshi*, T. Nishimura*, **Y. Shimojo**, K. Okayama, K. Awazu: Endoscopic image-guided laser treatment system based on fiber bundle laser steering. ***Scientific Reports***, **13**, 2921 (2023).
10. **Y. Shimojo***, T. Nishimura*, T. Ozawa, D. Tsuruta, K. Awazu: Nonlinear absorption-based analysis of energy deposition in melanosomes for 532-nm short-pulsed laser skin treatment. ***Lasers in Surgery and Medicine***, **55**, 305-315 (2023).
11. T. Nishimura*, T. Suzuki, **Y. Shimojo**, R. Teranishi, T. Ozawa, D. Tsuruta, K. Awazu: Mathematical modelling for antimicrobial photodynamic therapy mediated by 5-aminolaevulinic acid: an *in vitro* study. ***Photodiagnosis and Photodynamic Therapy***, **40**, 103116 (2022).
12. K. Sudo*, **Y. Shimojo**, T. Nishimura*, K. Awazu: Three-dimensional transient simulation of CO₂ laser tissue vaporization and experimental evaluation with a hydrogel phantom. ***Journal of Innovative Optical Health Sciences***, **15**, 2250016 (2022). [Selected as Feturead Article 2022]
13. **Y. Shimojo***, T. Nishimura*, H. Hazama, N. Ito, K. Awazu: Incident fluence analysis for 755-nm picosecond laser treatment of pigmented skin lesions based on threshold fluences for melanosome disruption. ***Lasers in Surgery and Medicine***, **53**, 1096–1104 (2021).
14. T. Nishimura*, Y. Takai, **Y. Shimojo**, H. Hazama, N. Ito, K. Awazu: Determination of optical properties

in double integrating sphere measurement by artificial neural network based method. *Optical Review*, **28**, 42–47 (2021).

15. **Y. Shimojo***, T. Nishimura*, H. Hazama, T. Ozawa, K. Awazu: Measurement of absorption and reduced scattering coefficients in Asian human epidermis, dermis, and subcutaneous fat tissues in the 400- to 1100-nm wavelength range for optical penetration depth and energy deposition analysis. *Journal of Biomedical Optics*, **25**, 045002 (2020).
16. **Y. Shimojo***, T. Nishimura, H. Hazama, N. Ito, K. Awazu: Picosecond laser-induced photothermal skin damage evaluation by computational clinical trial. *Laser Therapy*, **29**, 61–72 (2020).

Proceedings (peer review)

1. T. Kikuchi, K. Watanabe, **Y. Shimojo**, H. Kawamura, E. Kinoshita, L. Ito, T. Ozawa: Establishment of a novel and highly effective hair growth theory enabled by hair follicle stem cells. *IFSCC Magazine*, **27**, 165–169 (2023).
2. **Y. Shimojo**, T. Nishimura, K. Awazu: Quantitative evaluation of light distribution in skin tissue for short-pulsed laser treatment using Monte Carlo simulation combined with nonlinear absorption model of melanin. *Proceedings of SPIE*, 12377 (2023).
3. Y. Shimojo, T. Nishimura: Incident fluence model based on tissue optical properties and threshold fluence for melanosome disruption for 755-nm picosecond laser treatment of benign pigmented lesions. *Lasers in Surgery and Medicine*, 54(S34), S19 (2022).
4. Y. Takai, **Y. Shimojo**, T. Nishimura, K. Awazu: Artificial neural network based method to estimate optical properties in biological tissues for noise reduction. *Proceedings of Biophotonics Congress: Biomedical Optics 2022*, JM3A.3 (2022).
5. **Y. Shimojo**, T. Nishimura, K. Awazu: Two-level model of melanin absorption in picosecond laser skin treatment. *Proceedings of SPIE*, 11958 (2022).
6. **Y. Shimojo**, T. Nishimura, H. Hazama, K. Awazu: Experimental analysis of morphological change in melanin for multiscale modeling of picosecond laser skin treatment. *Proceedings of SPIE*, 11640 (2021).
7. **Y. Shimojo**, T. Nishimura, H. Hazama, T. Ozawa, K. Awazu: Computational evaluation of ethnic differences in photothermal damage induced by laser skin treatments. *Proceedings of Biophotonics Congress: Biomedical Optics 2020*, JTU3A.1 (2020).
8. **Y. Shimojo**, T. Nishimura, H. Hazama, N. Ito, K. Awazu: *In silico* evaluation of thermal skin damage caused by picosecond laser irradiation. *Proceedings of Biophotonics Congress: Optics in the Life Sciences Congress 2019*, DS1A.7 (2019).

Presentations

1. **[Invited] Y. Shimojo**, T. Nishimura, D. Tsuruta, T. Ozawa: Evaluation of laser ablation-induced thermal damage by computational simulation of light and heat transfer in tissue with dynamic optical properties model. SPIE Photonics West BiOS (Oral, San Francisco, Jan. 2025, in future).
2. **[Invited] Y. Shimojo**, T. Nishimura, D. Tsuruta, T. Ozawa: *In silico* evaluation of the effect of skin type

- on light dosimetry for photodynamic therapy. The 42nd American Society for Photobiology Biennial Meeting (Oral, Chicago, Jul. 29th 2024).
3. **Y. Shimojo**: Computational laser treatment based on multiscale analysis of picosecond laser-tissue interaction. The Global Young Scientists Summit 2024 (Poster, Singapore, Jan. 11th 2024).
 4. T. Kikuchi, K. Watanabe, **Y. Shimojo**, H. Kawamura, E. Kinoshita, L. Ito, T. Ozawa: Establishment of a novel and highly effective hair growth theory fulfilled by hair follicle stem cells. The 33rd IFSCC Congress (Oral, Barcelona, Sep. 5th 2023).
 5. Y. Watanabe, **Y. Shimojo**, T. Nishimura, K. Awazu: Numerical analysis of laser tissue vaporization by spatial light irradiation for control of photo-thermal interaction. European conferences on Biomedical optics 2023 (Poster, Munich, Jun. 25th, 2023).
 6. **Y. Shimojo**, T. Nishimura, K. Awazu: Quantitative evaluation of light distribution in skin tissue for short-pulsed laser treatment using Monte Carlo simulation combined with nonlinear absorption model of melanin. SPIE Photonics West BiOS (Oral, San Francisco, Jan. 28th 2023).
 7. **Y. Shimojo**, T. Nishimura: Incident fluence model based on tissue optical properties and threshold fluence for melanosome disruption for 755-nm picosecond laser treatment of benign pigmented lesions. The 41st Annual Conference of the American Society for Laser Medicine and Surgery (Oral, Online, Apr. 28th 2022).
 8. Y. Takai, **Y. Shimojo**, T. Nishimura, K. Awazu: Artificial neural network based method to estimate optical properties in biological tissues for noise reduction. Biophotonics Congress: Biomedical Optics (Poster, Online, Apr. 26th 2022).
 9. **Y. Shimojo**, T. Nishimura, K. Awazu: Two-level model of melanin absorption in picosecond laser skin treatment. SPIE Photonics West BiOS (Oral, Online, Feb. 21st 2022).
 10. **Y. Shimojo**, T. Nishimura, H. Hazama, K. Awazu: Experimental analysis of morphological change in melanin for multiscale modeling of picosecond laser skin treatment. SPIE Photonics West BiOS (Oral, Online, Mar. 6th 2021).
 11. **Y. Shimojo**, T. Nishimura, H. Hazama, T. Ozawa, K. Awazu: Computational evaluation of ethnic difference in photothermal damage induced by laser skin treatments. Biophotonics Congress: Biomedical Optics (Poster, Online, Apr. 21st 2020).
 12. **Y. Shimojo**, T. Nishimura, H. Hazama, N. Ito, K. Awazu: *In silico* evaluation of thermal skin damage caused by picosecond laser irradiation. Biophotonics Congress: Optics in the Life Sciences Congress (Oral, Tucson, Apr. 14th 2019).

Languages

- English (IELTS Score: 6.5)
- Japanese (Native)