Hee Ryung LEE

Postdoctoral Research Fellow
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Key Skills

- Matlab
- C / C++
- Fortran

- Mueller Polarimeter
- SHG / TPEF
- Ellipsometer
- Spin Coater
- Vacuum Evaporator
- Solar simulator
- Impedance spectroscope
- EQE
- SEM
- XRD
- 4-points probe

Language

Korean

English

French

Education

Oct. 2017 - Mar. 2021 **PhD of Physics (Optics)**
LPICM[1], École Polytechnique, Palaiseau, France
- Dissertation: "Studies of scattering anisotropic media with Mueller polarimetry: Towards digital histology and optical biopsy of tissue"
- Research: Mueller polarimetry, Non-linear Optics (SHG/TPEF), Optical system, Monte Carlo modeling, and Image processing
- **5** peer-reviewed journal papers, **3** conference proceedings, and participation on **6** international conferences

Feb. 2016 - Sept. 2017 **Master of Science and Technology** (Dual master's degree program)
LPICM, École Polytechnique, Palaiseau, France
- Courses: Nanomaterials and electronics applications, Optoelectronics, Analog and digital microelectronic devices, Flat panel display, Physics of silicon solar cells, Semiconductors and devices.
- **2** peer-reviewed Journal papers

Mar. 2015 - Jan. 2016 **Master of Engineering** (Dual master's degree program)
ADRC[2], Kyung Hee University (KHU), Seoul, Republic of Korea
- Thesis: "Fabrication and stability improvement of Perovskite solar cells"
- **2** peer-reviewed journal papers and participation on **1** international conferences

Mar. 2009 - Feb. 2015 **Bachelor of Science**
Department of Information display, KHU, Seoul, Republic of Korea
- Major: Optics, Electromagnetism, Semiconductor, and Chemistry

Professional Experience

Mar. 2021 - Current **Postdoctoral Research Fellow**
Center for Healthcare Robotics, Korea Institute of Science and Technology, Seoul, Republic of Korea
- Participate in 4 projects
- Build optical systems (e.g., Fluorescence macroscope, 3D stereo wide-field macroscope, and Mueller polarimeter), Image processing and analysis, and Fabrication of phantom biological sample.

Dec. 2019 **Research Exchange**
School of Computer Sciences, Victoria University, Wellington, New Zealand
- Subject: Non-invasive polarimetric diagnostic of biological tissue aided by artificial neural networks

Feb. 2019 - Apr. 2019 **Research Exchange**
Department of Biomedical Engineering, Florida International University, Miami, Florida, USA, Feb.-Apr. 2019
- Subject: Studies of polarimetric and non-linear optical properties (SHG/TPEF) of mouse's cervix

Oct. 2018 **Organization of international Optics conference**
- Biophotonics and Optical Angular Momentum (BIOAM 2018)

Apr. 2017 - Aug. 2017 **Master Research Internship**
LPICM, École Polytechnique, Université Paris-Saclay, France
- Thesis: "Monte Carlo simulations of polarized light interaction with anisotropic scattering media"

Mar. 2016 - Aug. 2016 **Master Research Internship**
LPICM, École Polytechnique, Université Paris-Saclay, France
- Thesis: "Optimization and characterization of perovskite solar cells by solution /evaporation process"

[1] Laboratoire Physique des Interfaces et des Couches Minces, [2] Advanced Display Research Center

Interests

July. 2012 - Aug. 2012 **Summer Internship Program**
LPICM, École Polytechnique, Université Paris-Saclay, France
- Lectures: Semiconductor, English

Feb. 2010 - Nov. 2011 **Military Service**
Driver in the ROK army, Cheor-won, Republic of Korea

Dec. 2009 - Jan. 2010 **Winter Internship Program**
Kun Shan University, Tainan, Taiwan
- Lectures: Electromagnetic Circuit, English

July. 2009 - Aug. 2009 **Winter Internship Program**
Display Tech. Company (DTC), Anseong, Gyeonggi-do, Republic of Korea
- Works on manufacture of the LCD panels

Scientific Publications

(h-index: 8 (Google Scholar), ORCID number: https://orcid.org/0000-0001-7263-4190)

Peer-reviewed Journals

1. **H. R. Lee**, I. Saytashev, L. V. Nguyen Du, M. Mahendroo, J. Ramella-Roman, T. Novikova, "Mueller matrix imaging for collagen scoring in mice model of pregnancy," Sci. Rep., vol. 11, no. 15621, May 2021
2. P. Schucht*, **H. R. Lee***, M. H. Mezouar, E. Hewer, A. Raabe, M. Murek I. Zubak, J. Goldberg, E. Kövari, A. Pierangelo, T. Novikova, "Visualization of White Matter Fiber Tracts of Brain Tissue Sections with Wide-field Imaging Mueller Polarimetry," IEEE Trans. Med. Imaging, vol. 39, no. 12, pp. 4376-4382, Aug. 2020.
3. **H. R. Lee**, P. Li, T. S. H. Yoo, C. Lotz, F. K. Groeber-Becker, S. Dembski, E. Garcia-Caurel, R. Ossikovski, H. Ma, and T. Novikova, "Digital histology with Mueller microscopy: how to mitigate an impact of tissue cut thickness fluctuations," *J. Biomed. Opt.*, vol. 24, no. 7, pp.076004, Jul. 2019.
4. **H. R. Lee**, C. Lotz, F. K. Groeber-Becker, S. Dembski, E. Garcia-Caurel, R. Ossikovski and T. Novikova, "Tissue Phantom analysis through transmission Mueller polarimetry and differential Mueller matrix formalism: a concise review," *Asian J. Phys.*, 2020, vol. 29, nos 1&2, pp. 01-11, Jan. 2020.
5. P. Li, **H. R. Lee**, S. Chandel, C. Lotz, F. K. Groeber-Becker, S. Dembski, R. Ossikovski, H. Ma, and T. Novikova, "Analysis of tissue microstructure with Mueller microscopy: logarithmic decomposition and Monte Carlo modeling," *J. Biomed. Opt*, vol. 25, no. 1, pp. 015002, Jan. 2020.
6. H. Jun, **H. R. Lee**, D. Tondelier, B. Geffroy, P. Schulz, J.-É. Bourée, Y. Bonnassieux, S. Swaraj "Soft X-ray characterization of halide perovskite film by scanning transmission X-ray microscopy," Sci.Rep., vol. 12, no. 1, pp. 1-11, Mar. 2022
7. A. Marronnier, **H. R. Lee**, H. Lee, M. Kim, C. Eypert, J.-P. Gaston, G. Roma, D. Tondelier, B. Geffroy, and Y. Bonnassieux, "Electrical and optical degradation study of methylammonium-based perovskite materials under ambient conditions," *Sol. Energy Mater. Sol*, vol. 178, pp. 179–185, May 2018.
8. H. J. Lee, S. Gaiaschi, P. Chapon, A. Marronnier, **H. R. Lee**, J.-C. Vanel, D. Tondelier, J.-E. Bourée, Y. Bonnassieux, and B. Geffroy, "Direct Experimental Evidence of Halide Ionic Migration under Bias in CH3NH3PbI3–xClx-Based Perovskite Solar Cells Using GD-OES Analysis," *ACS Energy Lett.*, vol. 2, no. 4, pp. 943–949, Apr. 2017.
9. J. Kim**, H. R. Lee**, H. P. Kim, T. Lin, A. Kanwat, A. R. bin Mohd Yusoff, and J. Jang, "Effects of UV-ozone irradiation on copper doped nickel acetate and its applicability to perovskite solar cells," *Nanoscale*, vol. 8, no. 17, pp. 9284–9292, Apr. 2016.
10. J. Kim, **H. R. Lee**, S. J. Lee, W. J. da Silva, A. R. bin Mohd Yusoff, and J. Jang, "Graphene oxide grafted polyethylenimine electron transport materials for highly efficient organic devices," *J. Mater. Chem. A*, vol. 3, no. 44, pp. 22035–22042, Nov. 2015.

Conference Proceedings

1. **H. R. Lee**, C. Lotz, F. K. Groeber-Becker, S. Dembski, E. Garcia-Caurel, R. Ossikovski, and T. Novikova, "Mueller microscopy of full thickness skin models combined with image segmentation," Proc. SPIE 11076, Advances in Microscopic Imaging II, 1107615, July. 2019.
2. **H. R. Lee**, T. S. H. Yoo, P. Li, C. Lotz, F. K. Groeber-Becker, S. Dembski, E. Garcia-Caurel, R. Ossikovski, and T. Novikova, "Mueller microscopy of anisotropic scattering media: theory and experiments," Proc. SPIE 10677, Unconventional Optical Imaging, 1067718, May. 2018.
3. T. S. Yoo, T. Genova-Hristova, **H. R. Lee**, E. Borisova, I. Terziev, E. Garcia-Caurel, R. Ossikovski, and T. Novikova, "Polarized light histology of tissue and differential Mueller matrix formalism," Proc. SPIE 10484, Advanced Biomedical and Clinical Diagnostic and Surgical Guidance Systems XVI, 1048412, Apr. 2018.

*: co-first author

Conferences (only related to PhD thesis)

Oral presentations

1. **H. R. Lee,** I. Saytashev, V. N. Du Le, M. Mahendroo, J. Ramella-Roman, T. Novikova, "Detection of cervical collagen remodeling with Mueller polarimetry in mice model of pregnancy," SPIE BiOS, San Francisco, California, USA, Mar. 2022
2. **H. R. Lee,** M. Kim, A. Jobart-Malfait, D. Lamarque, T. Novikova, "Automated analysis of polarimetric images for the diagnostics of gastric biopsies.^^ SPIE European Conferences on Biomedical Optics, Dec. 2021, Online
3. O. Roriguez-Núñez, P. Schucht, **H. R. Lee,** M. H. Mezouar, E. Hewer, A. Raabe, M. Murek, I. Zubak, J. Goldberg, E. Kövari, A. Pierangelo, T. Novikova, "Retardance map of brain white matter: a potential game changer for the intra-operative navigation during brain tumor surgery," SPIE European Conferences on Biomedical Optics, Dec. 2021, Online
4. T. Novikova, P. Schucht, **H. R. Lee,** M. H. Mezouar, E. Hewer, A. Raabe, M. Murek, I. Zubak, J.Goldberg, E. Kövari, A. Pierangelo, "Wide-field imaging of brain white matter fiber tracts with Mueller polarimetry in backscattering configuration,5, SPIE BiOS, Mar. 2021, Online
5. A. Doronin, **H. R. Lee,** I. Meglinski, A. Bykov, T. Novikova, "Cloud-based online application for imitation of polarized light propagation in turbid scattering media," SPIE Optical Engineering + Applications, Aug. 2020, Online
6. **H. R. Lee,** I. Saytashev, **C.** Lotz, F. K. Groeber-Becker, S. Dembski, R. Ossikovski, J. C. Ramella-Roman, and T. Novikova, "Post-processing of multimodal microscopic images of tissue histological cuts for biomedical diagnostic,SPIE Photonics Europe, Apr. 2020, Online
7. **H. R. Lee,** P. Li, H. Ma, C. Lotz, F. K. Groeber-Becker, S. Dembski, R. Ossikovski, and T. Novikova, "Digital histology of tissue with Mueller polarimetric microscopy",SPIE Photonics West BIOS, San Francisco, CA, USA, Mar. 2020.
8. A. Doronin, **H. R. Lee,** T. Novikova, N. Vera, J. P. Stafbrelli, A. Bykov, I. Meglinski, "GPU-accelerated online Monte Carlo (MC) application for imitation of twisted light propagation in turbid tissue-like scattering media," SPIE BiOS, San Francisco, California, USA, Mar. 2020
9. **H. R. Lee,** C. Lotz, F. K. Groeber-Becker, S. Dembski, E. Garcia-Caurel, R. Ossikovski, and T. Novikova, "Mueller microscopy of full thickness skin models combined with image segmentation,5 SPIE European Conferences on Biomedical Optics, Munich, Germany, Jun. 2019.
10. **H. R. Lee,** T. S. H. Yoo, P. Li, C. Lotz, F. K. Groeber-Becker, S. Dembski, E. Garcia-Caurel, R. Ossikovski, and T. Novikova, "Mueller microscopy of anisotropic scattering media: theory and experiments,SPIE Photonics Europe 2018, Strasbourg, France, Apr. 2018.
11. T. S. Yoo, T. Genova-Hristova, **H. R. Lee**, E. Borisova, I. Terziev, E. Garcia-Caurel, R. Ossikovski, T . Novikova, "Polarized light histology of tissue and differential Mueller matrix formalism",SPIE BiOS, San Francisco, California, USA, Apr. 2018

Poster presentations

1. **H. R. Lee,** A. Doronine, and T. Novikova, "A cross-validation study of sever Monte Carlo (MC) models for simulation of polarized light propagation in turbid tissue-like scattering media," SPIE Photonics West BIOS, San Francisco, CA, USA, Mar. 2020.
2. **H. R. Lee,** J. Park, A. Lindberg, J.-F. Arruabarrena, J. -C. Vanel, E. Garcia-Caurel, T. Novikova, R. Ossikovski, "Mueller polarimetry de théorie vers F application",Les Rencontres de la Cancérologie Fran^aise, Paris, France, Nov. 2018.
3. **H. R. Lee,** T. S. H. Yoo, P. Li, C. Lotz, F. K. Groeber-Becker, S. Dembski, E. Garcia-Caurel, R. Ossikovski, and T. Novikova, "Digital Histology with Mueller Polarimetry",2nd International Workshop on Biophotonics and Optical Angular Momentum (BIOAM-2018), Palaiseau, France, Oct. 2018.

Pedagogical activities

1. **Tutor for master students**
   LPICM, École Polytechnique, France
   - Mueller polarimetry and image processing (Apr. 2020 - Aug. 2020)
   - Fabrication and characterization of the Perovskite-based solar cells, (Apr. 2019 - Aug. 2019)
   - Circuit intégrés analogiques et numérique, (Oct.2017 - Dec. 2017)
2. **Student Chapter of Optics (SCOP)**
   École Polytechnique, France (2018 - 2020)
3. **Association des Scientifique Coréens en France (ASCOF)**
   France (2016 - 2020)
4. **President of Junior student council**
   Kyung Hee University, Republic of Korea (Mar. 2013 - Feb. 2014)
5. **Voluntary Service**
   Congo, English translator (2012)

Awards and Distinctions

1. **2020 SPIE Optics and Photonics Education Scholarship**
2. **NanoSaclay travel grant**
   French National Research Agency, Ref. #: ANR-10-LABX-0035
   2018, 2019, and 2020
3. **SPIE student travel grant**
   ECBO conference (2019)
4. **PhD Scholarship, Doctoral school "Interfaces"**
   Paris-Saclay University, France (Oct. 2017-Sept. 2020)
5. **Full Scholarship**
   Kyung Hee University, Republic of Korea (Mar. 2009 - Feb. 2015)
6. **Excellence award**
   Department of Information Display, Kyung Hee University, Republic of Korea (2012)
7. **Gold lion award (**over 200 hours of voluntary service)
   Kyung Hee University, South Korea