

# Ukrae "Rae" Cho

Assistant Professor, Department of Cell Biology and Physiology, UNC Chapel Hill  
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## EDUCATION

Stanford University, Stanford, CA 2010-16  
Ph.D. in Chemical and Systems Biology  
Advisor: James K. Chen / Co-advisor: Pehr B. Harbury

Marine Biological Laboratory, Woods Hole, MA Spring 2015  
*Analytical and Quantitative Light Microscopy*

Seoul National University, Seoul, Korea 2005-10  
B.S. in Chemistry, *Summa cum laude* (graduated in 7 semesters) (military service: 2008-09)  
Advisor: Seung-bum Park

## POSITIONS

University of North Carolina at Chapel Hill, Chapel Hill, NC 2024-present  
Assistant Professor, Department of Cell Biology and Physiology  
UNC Lineberger Comprehensive Cancer Center / Cancer Cell Biology

Salk Institute for Biological Studies, La Jolla, CA 2017-23  
Postdoctoral Fellow, Molecular and Cell Biology Laboratory  
Advisor: Martin W. Hetzer\* / NIH K01 Co-mentor: P. Lorenzo Puri

\* Moved to IST Austria in 2022. Supervised by Tony Hunter in 2023.

## RESEARCH AND WORK EXPERIENCE

Postdoctoral Researcher, Hetzer Lab, Salk Institute for Biological Studies 2017-2023  
Studied how sublethal caspase activation facilitates cell differentiation. Discovered (1) caspase-mediated nuclear pore complex "trimming", (2) transient nuclear translocation of NES-containing proteins, and (3) genome-wide, FAK-mediated MBD2 dissociation in differentiating myoblasts. Received NIH/NIAMS K01 award (project number: K01 AR080828).

Ph.D. Student, Chen Lab, Stanford University 2011-16  
Built a next-generation time-resolved luminescence microscope that selectively visualizes long-lived lanthanide luminescence ( $\mu$ s-ms) over short-lived autofluorescence background (ns) to enable ultrasensitive, autofluorescence-free imaging in a whole zebrafish embryo. Worked closely with local companies (Stanford Photonics, IOS Optics, Spectra-Physics, JH Technologies, etc) to put together a custom imaging system. Received advanced microscopy training at MBL (2015) and a \$25,000 seed grant from Stanford ChEM-H (2014). Contributed to NIH MIRA (project number: GM127030, 2017) and NSF INSPIRE (award number: 1344038, 2013) proposals.

Ph.D. Rotation Student, Wandless Lab, Stanford University Fall 2010  
Engineered small molecule-dependent protein degrons. In collaboration with the laboratory of Prof. Stuart Kim at Stanford, demonstrated rapidity, reversibility, and tunability of the degrons in *C. elegans*. Published a first-author paper from three month-long rotation.

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|---|---------|
| Software Engineer, WISEfn, Seoul, Korea (alternative civilian service)  | 2008-09 |
| Developed web data extraction tools based on Microsoft SQL and Visual Basic. Trained non-programmers to understand and use relational database management system.   |         |
| Undergraduate Researcher, Park Lab, Seoul National University   | 2007    |
| Contributed to the development of pH sensors based on Seoul-Fluor. Explored Pd-catalyzed amination reactions to append pH-sensing moieties to the core fluorophore scaffold. Synthesized 10+ Seoul-Fluor derivatives and characterized their pH-dependent photophysical properties. |         |

## AWARDS AND HONORS

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| 1. NIH K01 Mentored Research Scientist Career Development Award, NIAMS                              | 2023-25 |
| 2. Travel Award (for 2021 Frontiers in Myogenesis), Society for Muscle Biology                      | 2021    |
| 3. Salk Career Advancement Award, Salk Society of Research Fellows                                  | 2021    |
| 4. Salk Proposal Writing Series - Best Proposal Award, Salk Postdoctoral Office                     | 2021    |
| 5. Salk Trainee Showcase Talk Award, Salk Society of Research Fellows                               | 2019    |
| 6. Glenn Foundation for Medical Research Postdoctoral Fellowship, AFAR                              | 2018-19 |
| 7. Seed Grant (\$25,000), Stanford ChEM-H   | 2014    |
| 8. Travel Grant (for EMBO Chemical Biology 2014), Stanford Biosciences Office of Graduate Education | 2014    |
| 9. Samsung Predoctoral Fellowship, Samsung Scholarship Foundation                                   | 2010-15 |
| 10. Kfas Predoctoral Scholarship, Korea Foundation of Advanced Studies (gratefully declined)        | 2009    |
| 11. Dean's List, College of Natural Sciences, Seoul National University                             | 2006    |
| 12. Presidential Scholarship, President of Korea  | 2005-10 |
| 13. Samsung Human-Tech Thesis Prize (Bronze Prize), Samsung Electronics                             | 2005    |

## PUBLICATIONS (\* denotes co-corresponding authorship)

- Chung, H. K., Liu, C., Casillas, E., McDonald, B., ..., **Cho, U. H.**, ... Kaech, S. M. \*, Wang, W. \* (2022). Multiomics atlas-assisted discovery of transcription factors enables specific cell state programming. *bioRxiv* 2023.01.03.522354.
- Cho, U. H.** \* and Hetzer, M. W. \* (2023). Caspase-mediated nuclear pore complex trimming in cell differentiation and endoplasmic reticulum stress. *eLife*. 12, RP89066.
- Cho, U. H.** and Hetzer, M. W. (2020). Nuclear periphery takes center stage: the role of nuclear pore complexes in cell identity and aging. *Neuron*, 106(6), 899-911.
- Cho, U.** \* and Chen, J. K. \* (2020). Lanthanide-based optical probes of biological systems. *Cell Chem. Biol.*, 27(8), 921-936.
- Ciepla, P., **Cho, U.**, and Chen, J. K. (2020). trLRET microscopy: ultrasensitive imaging of lanthanide luminophores. *Methods Enzymol.*, 640, 225-248.
- Cho, U.**, Riordan, D. P., Ciepla, P., Kocherlakota, K. S., Chen, J. K. \*, and Harbury, P. B. \* (2018). Ultrasensitive optical imaging with lanthanide lumiphores. *Nat. Chem. Biol.*, 14(1), 15-21.
- Cho, U.**, Zimmerman, S. M., Chen, L. C., Owen, E., Kim, J. V., Kim, S. K., and Wandless, T. J. (2013). Rapid and tunable control of protein stability in *Caenorhabditis elegans* using a small molecule. *PLOS ONE*, 8(8), e72393.

## TALKS (regional, national, or international)

1. Frontiers in Myogenesis Conference 2021, Society for Muscle Biology (Herradura, Costa Rica). Nov 2021
2. Salk Science at the Seaside 2019, Salk Institute for Biological Studies (La Jolla, CA). Oct 2019

## POSTER PRESENTATIONS (regional, national, or international)

1. **Cho, U.** and Hetzer, M. W. (2022, May). *Caspases facilitate cell differentiation by transiently trimming the nuclear pore complex*. Poster presented at the Twelfth Cold Spring Harbor meeting on Genome Organization and Nuclear Function, Cold Spring Harbor, NY.
2. **Cho, U.** and Hetzer, M. W. (2020, Apr). *Caspase-mediated transient shutdown of gene expression during cell differentiation*. Poster presented at the Eleventh Cold Spring Harbor meeting on Genome Organization and Nuclear Function (Virtual).
3. **Cho, U.** and Hetzer, M. W. (2019, Jun). *Nuclear Barrier Degeneration and Brain Aging*. Poster presented at the 32<sup>nd</sup> Annual Paul. F. Glenn / AFAR Conference on the Biology of Aging, Santa Barbara, CA.
4. **Cho, U.**, Kocherlakota, K. S., Riordan, D. P., Harbury, P. B., and Chen, J. K. (2014, Aug). *LRET-based Time-resolved Luminescence Imaging*. Poster presented at the Biannual EMBO Chemical Biology Conference, Heidelberg, Germany.
5. **Cho, U.**, Kocherlakota, K. S., and Chen, J. K. (2011, Sep). *Development of Lanthanide-binding Proteins for Time-resolved Luminescence Imaging*. Poster presented at the Seventh Annual NIH Director's Pioneer Award Symposium, Bethesda, MD.

## TEACHING

1. TA, CSB 260: Concepts and Applications in Chemical Biology, Stanford University Spring 2014
2. TA, BIO 188: Biochemistry 1, Stanford University Fall 2011
3. Instructor, AP Chemistry, Seoul Science High School 2006-07

## MENTORSHIP

1. Kenneth Kuhn (UCSD Ph.D. student) Spring 2022-present
2. Norah Al-Azzam (UCSD Ph.D. rotation student) Summer 2021
3. Jiawei Xu (UCSD Ph.D. rotation student → joined the Hetzer lab) Spring 2020
4. Madison Carmichael (UCSD undergraduate → Univ. of Utah, Mol. Biol. Ph.D. program) 2018-2020
5. Tom Robbins (Stanford Ph.D. rotation student) Fall 2012

## ADDITIONAL TRAINING

1. UCSD Scientific Ethics Course Oct 2023
2. Salk Research Rigor and Responsibility May 2021
3. Salk Proposal Writing Series Apr-Jun 2021
4. Salk Mentoring Training Series Feb-Mar 2020

## SERVICE AND LEADERSHIP POSITIONS

- Alumni Interviewer, Stanford Alumni Interview Program 2018-21  
Interviewed San Diego-based applicants in person and virtually (2-3 per year). Submitted brief reports & 24  
to the Office of Undergraduate Admission.

- President, Seoul Science High School Alumni Association in Silicon Valley 2013-14  
Organized biannual alumni gathering (20-30 members). Planned/guided the tour for >50 high school students visiting Stanford/Silicon Valley from Korea. Invited speakers from academic institutes and companies in the Bay Area.
- Team Captain, Stanford Korean Soccer Club 2012-13  
Recruited team members, led weekly practice sessions, and captained the team for Stanford intramural leagues and biannual SK Hynix-sponsored tournament for Korean teams based in the Bay Area.

## REFERENCES

**Martin W. Hetzer, Ph.D.** (Postdoctoral advisor)  
Professor and President  
IST Austria (2023 ~)  
Salk Institute for Biological Studies (~ 2022)  
martin.hetzer@ist.ac.at

**P. Lorenzo Puri, M.D.** (NIH K01 co-mentor)  
Professor and Director  
Development, Aging, and Regeneration Program  
Sanford Burnham Prebys Medical Discovery Institute  
lpuri@SBPdiscovery.org

**Thomas J. Wandless, Ph.D.** (Ph.D. rotation & committee)  
Professor  
Department of Chemical and Systems Biology  
Stanford University  
wandless@stanford.edu

**James K. Chen, Ph.D.** (Ph.D. advisor)  
Professor and Chair  
Department of Chemical and Systems Biology  
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jameschen@stanford.edu

**Pehr B. Harbury, Ph.D.** (Ph.D. co-advisor)  
Associate Professor  
Department of Biochemistry  
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**Tony Hunter, Ph.D.**  
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