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### PROFESSIONAL EXPERIENCES

<b>Professor</b>	<b>2017. 09 – Present</b>	<b>Dept. of Biological Sciences, KAIST</b>
Associate Professor	2012. 03 – 2017. 08	Dept. of Biological Sciences, KAIST
Group Leader	2013. 05 – 2017. 06	Center for Cognition and Sociality, IBS
Assistant Professor	2008. 02 – 2012. 02	Dept. of Biological Sciences, KAIST
Co-Investigator	2005. 11 – 2008. 01	Dept. of Chemical and Systems Biology, Stanford
Senior Research Scientist	2003. 11 – 2008. 01	Dept. of Chemical and Systems Biology, Stanford
Research Associate II	2002. 11 – 2003. 10	Dept. of Molecular Pharmacology, Stanford University
Post-doc.	2000. 05 – 2002. 10	Dept. of Molecular Pharmacology, Stanford University
Post-doc.	1999. 11 – 2000. 04	Dept. of Cell Biology, Duke University

### EDUCATION

<b>Ph.D.</b>	1996. 3 - 1999. 8	Gyeongsang National University, Biochemistry (Advisor; Moo Je Cho, Ph.D.)
<b>M.S.</b>	1994. 3 - 1996. 2	Gyeongsang National University, Biochemistry (Advisor; Moo Je Cho, Ph.D.)
<b>B.S.</b>	1987. 3 - 1994. 2	Gyeongsang National University, Agricultural Chemistry (3 Years Military Service)

### HONORS AND FELLOWSHIP

2022	<b>Prize of academic excellence</b>	KAIST
2021	<b>S-OIL Outstanding THESIS AWARD</b>	The Korean Academy of Science and Technology
2020	<b>Red Ribbon Lecture Award</b>	KSMCB Winter Conference 2020
2019	<b>The author of the Month (October)</b>	Nature Methods
2015, 2016, 2017	<b>The year KAIST KI Research</b>	KAIST Institute
2017	<b>Scientist of the Month</b>	Korea Ministry of Education, Science and Technology
2017	<b>Top 25 Selected Researches of 5 years</b>	Institute for Basic Science
2016	<b>KAIST KI Excellent Research Award</b>	KAIST Institute
2016	<b>2015 KAIST Top 10 Selected Researches</b>	KAIST
2009	<b>Gyeongsang PEOPLE</b>	Gyeongsang National University
2009	<b>Outstanding FDC PA</b>	KAIST
2003	<b>KOSEN AWARD</b>	The Global Network of Korean Scientists & Engineers
1999	<b>KOSEF FELLOWSHIP</b>	Korea Science and Engineering Foundation (KOSEF)
1999	<b>BEST Ph.D. THESIS</b>	The Korean Society for Molecular Biology
1998	<b>BEST POSTER</b>	'98 Korea-Japan Joint Symposium of Molecular Biology
1997	<b>BEST THESIS</b>	The Korean Society for Biochemistry

## Breakthroughs in biology and medicine have followed the development of novel technologies creating new avenues of investigation and therapeutics.

My group have been developing new bio-imaging, optogenetics and chemogenetics technologies to study important biological phenomena and cellular functions in various cells and animals. We are conducting researches by applying our technologies in cell growth, cell migration, cell death, cancer cell metastasis and brain functions, which are regulated through signaling pathways composed of a variety of secondary messengers and numerous signaling proteins. By developing new bio-imaging and optogenetics/chemogenetics technologies, the complex cellular processes in living cells and animals can be studied at the molecular, cellular and animal levels.

**"Our ultimate goal is to provide new paradigms for future therapeutics through chemogenetics, optogenetics, *in vivo* stem cell and cell therapy."**

### Molecular Optogenetic toolbox (Heo group) Receptors

OptoTrks	Optogenetic activation of TrkA, B, C Application in axon specification	<i>Nature Comm. (2014)</i> <i>Cell Chem. Biol. (2019); JMB (2020)</i>
OptoFGFR	Optogenetic activation of FGFR1 Application in cell migration	<i>Chem. Biol. (2014)</i> <i>PNAS (2016)</i>
Other OptoRTKs and OptoReceptors	Optogenetic activation of TGFβR Various receptors including other RTKs (Receptor Tyrosine Kinases)	<i>ACS Syn. Biol. (2018)</i> <i>BBRC (2020)</i> <i>Science Advances (2020)</i>

### Intracellular proteins and molecules

LARIAT	Various intracellular proteins Applications in fly development Applications in cell migration	<i>Nature Methods (2014)</i> <i>Nature Comm. (2017)</i> <i>PNAS (2016)</i>
IM-LARIAT mRNA optogenetics Ras/Rho sensors CRY2clust Optobody PA-Flp recombinase Opto-vTrap	Diverse intracellular membranes mRNA optogenetic modulation Intensiometric Ras/Rho biosensors Super sensitive optogenetic oligomerization Antibody (intrabody and nanobody) Transcranial genetic manipulation Optogenetic inhibition of synaptic transmission	<i>Nature Chemical Biology (2016)</i> <i>Nature Cell Biology (2020)</i> <i>Nature Comm. (2019)</i> <i>Nature Comm. (2017)</i> <i>Nature Methods (2019)</i> <i>Nature Comm. (2019)</i> <i>Neuron (accepted)</i>

### Second messengers

OptoSTIM1 monSTIM1 (Monster)	Control of Ca <sup>2+</sup> channel & mouse memory Ultra-light sensitive optoSTIM1 variant	<i>Nature Biotechnology (2015)</i> <i>Nature Comm. (2020)</i>
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## RESEARCH AREAS

**Synthetic cell biology & Optogenetic Medicine**  
RNA optogenetics & Antibody optogenetics

Bio-imaging (molecule, cell and *in vivo* imaging)  
Optogenetics (molecule, cell and *in vivo* optogenetics) & Optogenetic therapeutics  
Chemogenetics (molecule, cell and *in vivo* chemogenetics) & Chemogenetic therapeutics  
Molecular and cellular therapeutics & In vivo stem cell biology\  
mRNA therapeutics

## PUBLICATIONS

Co-first author\*  
Co-corresponding author#

### Research period as a PI (2008 - present)

#### 2022

Jongryul Hong, Yeonji Jeong, **Won Do Heo**#

*The neurotrophic receptor tyrosine kinase in MEC-mPFC neurons contributes to remote memory consolidation.*

**Journal of Neuroscience**. 2022 July 21. doi:10.1523/JNEUROSCI.2433-21.2022 .

Shen Y, Zhou M, Cai D, Filho DA, Fernandes G, Cai Y, de Sousa AF, Tian M, Kim N, Lee J, Necula D, Zhou C, Li S, Salinas S, Liu A, Kang X, Kamata M, Lavi A, Huang S, Silva T, **Heo WD**, Silva AJ.  
*CCR5 closes the temporal window for memory linking.*

**Nature**. 2022 Jun;606(7912):146-152. doi: 10.1038/s41586-022-04783-1.

Yu D, **Heo WD**.

*Optogenetic Activation of Intracellular Nanobodies.*

**Methods Mol Biol**. 2022;2446:595-606. doi: 10.1007/978-1-0716-2075-5\_31.

Shen Y, Luchetti A, Fernandes G, **Heo WD**, Silva AJ.

*The emergence of molecular systems neuroscience.*

**Mol Brain**. 2022 Jan 4;15(1):7. doi: 10.1186/s13041-021-00885-5.

#### 2021

YoungJu Jo\*, Hyungjoo Cho\*, Wei Sun Park\*, Geon Kim, Donghun Ryu, Young Seo Kim, Moosung Lee, Sangwoo Park, Mahn Jae Lee, Hosung Joo, HangHun Jo, Seongsoo Lee, Sumin Lee, Hyun-seok Min, **Won Do Heo**#, and YongKeun Park#

*Label-free multiplexed microtomography of endogenous subcellular dynamics using generalizable deep learning.*

**Nature Cell Biology**. 2021 Dec 07. doi: 10.1038/s41556-021-00802-x.

Joungha Won, Yuriy Pankratov, Minwoo Wendy Jang, Sunpil Kim, Yeonha Ju, Sangkyu Lee, Seung Eun Lee, Arie Kim, Soowon Park, C. Justin Lee# and **Won Do Heo**#

*Opto-vTrap, an optogenetic probe for reversible inhibition of vesicular release, synaptic transmission and behavior.*

**Neuron**. 2021 Nov 30. doi: 10.1016/j.neuron.2021.11.003.

Yuchao Li, Heeyoung Lee, **Won Do Heo**, Zhike Zi#

*Revisiting the Role of TGF beta Receptor Internalization for Smad Signaling: It is Not Required in Optogenetic TGF beta Signaling Systems.*

**ADVANCED BIOLOGY.** 2021 Oct;5(10). doi: 10.1002/adbi.202101008.

Hae-Eun H. Park, Wooseon Hwang, Seokjin Ham, Eunah Kim, Ozlem Altintas, Sangsoon Park, Heehwa G. Son, Yujin Lee, Dongyeop Lee, **Won Do Heo**, Seung-Jae V. Lee<sup>#</sup>  
*A PTEN variant uncouples longevity from impaired fitness in *Caenorhabditis elegans* with reduced insulin/IGF-1 signaling.*

**Nature Communications.** 2021 Sep 24. doi: 10.1038/s41467-021-25920-w.

Mariana De Niz, Reto Caldelari, Gesine Kaiser, Benoit Zuber, **Won Do Heo**, Volker T. Heussler, Carolina Agop-Nersesian<sup>#</sup>

*Hijacking of the host cell Golgi by *Plasmodium berghei* liver stage parasites.*

**Journal of Cell Science.** 2021 May 20. doi: 10.1242/jcs.252213.

Sun-Gyun Kim\*, Suho Lee\*, Yangsik Kim, Jieun Park, Doyeon Woo, Dayeon Kim, Yan Li, Wangyong Shin, Hyunjeong Kang, Chaehyun Yook, Minji Lee, Kyungdeok Kim, Junyeop Daniel Roh, Jeseung Ryu, Hwajin Jung, Seung Min Um, Esther Yang, Hyun Kim, Jinju Han, **Won Do Heo**, Eunjoon Kim<sup>#</sup>  
*Tanc2-mediated mTOR inhibition balances mTORC1/2 signaling in the developing mouse brain and human neurons.*

**Nature Communications.** 2021 May 11;12(1):2695. doi: 10.1038/s41467-021-22908-4.

Prashanta Silwal\*, Jin Kyung Kim\*, Sang Min Jeon, June-Young Lee, Young Jae Kim, Yi Sak Kim, Yeji Seo, Jihye Kim, Soo Yeon Kim, Min Joung Lee, Jun Young Heo, Mi-Ja Jung, Hyun Sik Kim, Dong-Wook Hyun, Jeong Eun Han, Jake Whang, Yang Hoon Huh, Sang-Hee Lee, **Won Do Heo**, Jin-Man Kim, Jin-Woo Bae & Eun-Kyeong Jo<sup>#</sup>

*Mitofusin-2 boosts innate immunity through the maintenance of aerobic glycolysis and activation of xenophagy in mice*

**Communications Biology.** 2021 May 10;4(1):1-17. doi: 10.1038/s42003-021-02073-6.

Jung Eun Kim, Sujin Chae, Sungsoo Kim, Yeon-Joo Jung, Myoung-Goo Kang, **Won Do Heo**, Daesoo Kim<sup>#</sup>  
*Cerebellar 5HT-2A receptor mediates stress-induced onset of dystonia.*

**SCIENCE ADVANCES.** 2021 Mar 03. doi: 10.1126/sciadv.abb5735.

Joungha Won, Hasan Hüseyin Kazan, Jea Kwon, Myungsun Park, Mehmet Ali Ergun, Sureyya Ozcan, Byung Yoon Choi, **Won Do Heo**<sup>#</sup> and C. Justin Lee<sup>#</sup>

*Ultimate COVID-19 Detection Protocol Based on Saliva Sampling and qRT-PCR with Risk Probability Assessment.*

**Exp Neurobiol.** 2021 Feb 28;30(1):13-31. doi: 10.5607/en20063.

In Young Choi\*, HoTae Lim\*, Alex Huynh, James Schofield, Hyeon Jin Cho, Hosuk Lee, Peter Andersen, Joo Heon Shin, **Won Do Heo**, Sang-Hwan Hyun, Yong Jun Kim, Yohan Oh<sup>#</sup>, Hyesoo Kim<sup>#</sup>, Gabsang Lee<sup>#</sup>  
*Novel culture system via wirelessly controllable optical stimulation of the FGF signaling pathway for human and pig pluripotency.*

**Biomaterials.** 2021 Feb; 269, 120222. doi: 10.1016/j.biomaterials.2020.120222.

Jisu Park\*, Hyunwoo Choi\*, Young Doo Kim, Seo-Hyun Kim, Youbin Kim, Youngdae Gwon, Dong Young Lee, Sung-Hye Park, **Won Do Heo**, Yong-Keun Jung<sup>#</sup>.

*Aberrant role of ALK in tau proteinopathy through autophagosomal dysregulation.*

**MOLECULAR PSYCHIATRY.** 2021 Jan 15 doi: 10.1038/s41380-020-01003-y.

## 2020

Seokhwi Kim, Nury Kim, Jinsu Lee, Sungsoo Kim, Jongryul Hong, Seungkyu Son, **Won Do Heo**  
*Dynamic Fas signaling network regulates neural stem cell proliferation and memory enhancement.*

**Sci Adv** . 2020 Apr 22;6(17):eaaz9691. doi: 10.1126/sciadv.aaz9691. eCollection 2020 Apr.

Davis B, Backus K, Winter G, Chica R, Li D, Lee SY, He C, Weeks A, Overall C, Hagihara S, Thuronyi B, Kamat S, Chen LL, Guerrero RH, Yao S, Mahal LK, Voigt C, Woo C, Strauss E, Kikuchi K, Dore T, Radford S,

Li XD, **Heo WD**, Superti-Furga G, Deans T, Belousov V, Matthews M, Jackson C, Malek S, Waldmann H, Rising A, Jewett M, Stamou D, Parker E, Murakami M, Polizzi K, Hamachi I, Erb T, Joo C, Uesugi M, Prinjha R, Rechavi G, Solano R, Schulman B, David Y, Oslund, R.

*Voices of chemical biology*

**Nature Chemical Biology**. 2020 Dec 16. doi: 10.1038/s41589-020-00714-1

Lee YR, Khan K, Armfield-Uhas K, Srikanth S, Thompson NA, Pardo M, Yu L, Norris JW, Peng Y, Gripp KW, Aleck KA, Li C, Spence E, Choi TI, Kwon SJ, Park HM, Yu D, **Heo WD**, Mooney MR, Baig SM, Wentzensen IM, Telegrafi A, McWalter K, Moreland T, Roadhouse C, Ramsey K, Lyons MJ, Skinner C, Alexov E, Katsanis N, Stevenson RE, Choudhary JS, Adams DJ, Kim CH<sup>#</sup>, Davis EE<sup>#</sup>, Schwartz CE<sup>#</sup>.

*Mutations in FAM50A suggest that Armfield XLID syndrome is a spliceosomopathy.*

**Nature Communications**. 2020 Jul 23;11(1):3698. doi: 10.1038/s41467-020-17452-6.

Choi B<sup>\*</sup>, Cha M<sup>\*</sup>, Eun GS, Lee DH, Lee S, Ehsan M, Chae PS, **Heo WD**, Park Y, Yoon TY<sup>#</sup>.

*Single-molecule functional anatomy of endogenous HER2-HER3 heterodimers.*

**Elife**. 2020 Apr 8;9:e53934. doi: 10.7554/eLife.53934.

Na Yeon Kim, Sangkyu Lee<sup>#</sup>, Nury Kim, Hyerim Park and **Won Do Heo**<sup>#</sup>.

*Optogenetic control of mRNA localization and translation in live cells.*

**Nature Cell Biology**. 2020 Feb 17. doi: 10.1038/s41556-020-0468-1.

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Jongryul Hong, **Won Do Heo**<sup>#</sup>

*Optogenetic modulation of TrkB signaling in the mouse brain.*

**Journal of Molecular Biology**. 2020 Jan 18. <https://doi.org/10.1016/j.jmb.2020.01.010>.

*This article was recommended by the faculty of 1000.*

Eury Kwon, **Won Do Heo**<sup>#</sup>.

*Optogenetic tools for dissecting complex intracellular signaling pathways.*

**Biochem Biophys Res Commun**. 2020 Jan 14. <https://doi.org/10.1016/j.bbrc.2019.12.132>.

Sungsoo Kim<sup>\*</sup>, Taeyoon Kyung<sup>\*</sup>, Jae-Hee Chung, Nury Kim, Sehoon Keum, Jinsu Lee, Hyerim Park, Ho Min Kim, Sangkyu Lee<sup>#</sup>, Hee-Sup Shin<sup>#</sup>, **Won Do Heo**<sup>#</sup>.

*Non-invasive optical control of endogenous Ca<sup>2+</sup> channels in awake mice.*

**Nature Communications**. 2020 Jan 10;11(1):210. doi: 10.1038/s41467-019-14005-4.

*This article was introduced in Commentary of Cell Calcium.*

Doyeon Kim, Sangwon Jang, Jeongah Kim, Inah Park, Kyojin Ku, Mijung Choi, Sukwon Lee, **Won Do Heo**, Gi Hoon Son, Han Kyoung Choe, Kyungjin Kim<sup>#</sup>.

*Kisspeptin Neuron-Specific and Self-Sustained Calcium Oscillation in the Hypothalamic Arcuate Nucleus of Neonatal Mice: Regulatory Factors of its Synchronization.*

**Neuroendocrinology**. 2020 Jan 15. doi:10.1159/000505922.

Kim S, Shin J, Oh H, Ahn S, Kim N, **Heo WD**<sup>#</sup>.

*An inducible system for in vitro and in vivo Fas activation using FKBP-FRB-rapamycin complex.*

**Biochem Biophys Res Commun**. 2019 Dec 24. doi: 10.1016/j.bbrc.2019.12.072. [Epub ahead of print].

## 2019

Doyeon Woo, Yeji Seo, Nury Kim, Hyeonjin Jung, Sang-Min Park, Sangkyu Lee, Heeyoung Lee, Kwang-Hyun Cho<sup>#</sup>, **Won Do Heo**<sup>#</sup>.

*Local activation of BDNF-TrkB receptor generates actin waves and initiates to acquire axonal characteristics.*

**Cell Chemical Biology (Cover Article)**. 2019 Oct 24. doi: 10.1016/j.chembiol.2019.10.006.

*This article was introduced in the preview of Cell Chemical Biology.*

Yu D, Lee H, Hong J, Jung H, Jo Y, Oh BH, Park BO<sup>#</sup>, **Heo WD**<sup>#</sup>.

*Optogenetic activation of intracellular antibodies for direct modulation of endogenous proteins.*

**Nature Methods.** 2019 Oct 14. doi: 10.1038/s41592-019-0592-7.

*This article was highlighted by Nature Methods.*

*Won Do Heo was selected as the month author of Nature Methods.*

Hyunjin Jung, Seong-Wook Kim, Minsoo Kim, Jongryul Hong, Ji Hye Kim, Sungsoo Kim, Yunju Lee, Daseuli Yu, Jihoon Kim, Doyeon Woo, Hee-Sup Shin, Byung Ouk Park<sup>#</sup>, **Won Do Heo**<sup>#</sup>.

*Noninvasive optical activation of Flp recombinase for genetic manipulation in deep mouse brain regions.*

**Nature Communications.** 2019 Jan 18;10(1):314. doi: 10.1038/s41467-018-08282-8.

*This article was highlighted by Nature Communications.*

Jihoon Kim, Sangkyu Lee, Kanghoon Jung, Won Chan Oh, Nury Kim, Seungkyu Son, Youngju Jo, Hyung-Bae Kwon<sup>#</sup> & **Won Do Heo**<sup>#</sup>.

*Intensiometric biosensors visualize the activity of multiple small GTPases in vivo.*

**Nature Communications.** 2019 Jan 14;10:211. doi: 10.1038/s41467-018-08217-3.

Lee JH<sup>\*</sup>, Kim J<sup>\*</sup>, Park JH, **Heo WD**<sup>#</sup>, Lee GM<sup>#</sup>.

*Analysis of Golgi pH in CHO cells using ratiometric pH-sensitive fluorescent proteins.*

**Biotechnol Bioeng.** 2019 Jan 13. doi: 10.1002/bit.26920. [Epub ahead of print].

## 2018

Hyun Yong Koh, Se Hoon Kim, Jaeson Jang, Hyunguk Kim, Sungwook Han, Jae Seok Lim, Geurim Son, Junjeong Choi, Byung Ouk Park, **Won Do Heo**, Jinju Han, Hyunjo Jenny Lee, Daeyoung Lee, Hoon-Chul Kang, Minho Shong, Se-Bum Paik, Dong Seok Kim, Jeong Ho Lee<sup>#</sup>.

*BRAF somatic mutation contributes to intrinsic epileptogenicity in pediatric brain tumors.*

**Nature Medicine.** 2018 Nov;24(11):1662-1668. doi: 10.1038/s41591-018-0172-x. Epub 2018 Sep 17.

Sang H Lee<sup>#</sup>, Seung Min Shin, Peng Zhong, Hyun-Taek Kim, Dong-Il Kim, June Myoung Kim, **Won Do Heo**, Dae-Won Kim, Chang-Yeol Yeo, Cheol-Hee Kim, Qing-song Liu.

*Reciprocal control of excitatory synapse numbers by Wnt and Wnt inhibitor PRR7 secreted on exosomes.*

**Nature Communications.** 2018 Aug 24;9(1):3434. doi: 10.1038/s41467-018-05858-2.

Dorothy Truong, Kirsten C. Boddy, Veronica Canadien, Danielle Brabant, Gregory D. Fairn, Vanessa M. D'Costa, Etienne Coyaud, Brian Raught, Dolores Pérez-Sala, Wei Sun Park, **Won Do Heo**, Sergio Grinstein, John H. Brumel.

*Salmonella exploits host Rho GTPase signalling pathways through the phosphatase activity of SopB.*

**Cell Microbiol.** 2018 Oct;20(10):e12938. doi: 10.1111/cmi.12938. Epub 2018 Aug 3.

Jihoon Kim, and **Won Do Heo**.

*Synergistic Ensemble of Optogenetic Actuators and Dynamic Indicators in Cell Biology.*

**Mol Cells.** 2018 Aug 29;41(9):809~917. doi.org/10.14348/molcells.2018.0295. [Epub ahead of print].

Li Y<sup>\*</sup>, Lee M<sup>\*</sup>, Kim N, Wu G, Deng D, Liu X, **Heo WD**<sup>#</sup>, Zi Z<sup>#</sup>.

*Spatiotemporal Control of TGF- $\beta$  Signaling with Light.*

**ACS Synth Biol.** 2018 Feb 16;7(2):443-451. doi: 10.1021/acssynbio.7b00225. Epub 2018 Jan 12.

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## 2017

Kim K, Park WS, Na S, Kim S, Kim T, **Heo WD**, Park Y.

*Correlative three-dimensional fluorescence and refractive index tomography: bridging the gap between molecular specificity and quantitative bioimaging.*

**BIOMEDICAL OPTICS EXPRESS.** 2017 Dec 1;8(12):5688-5697. doi: 10.1364/BOE.8.005688

Won SY<sup>\*</sup>, Kim CY<sup>\*</sup>, Kim D, Ko J, Um JW, Lee SB, Buck M, Kim E, **Heo WD**<sup>#</sup>, Lee JO<sup>#</sup>, Kim HM<sup>#</sup>.

*LAR-RPTP Clustering Is Modulated by Competitive Binding between Synaptic Adhesion Partners and Heparan Sulfate.*

**Front Mol Neurosci.** 2017 Oct 13;10:327. doi: 10.3389/fnmol.2017.00327. eCollection 2017.

Park H\*, Kim NY\*, Lee S, Kim N, **Heo WD**.  
*Optogenetic protein clustering through fluorescent protein tagging and extension of CRY2.*  
**Nature Communications**. 2017 Jun 23;8(1):30. doi: 10.1038/s41467-017-00060-2.  
Qin X\*, Park BO\*, Liu J, Chen B, Cadamuro V, Belguise K, **Heo WD**#, Wang X#.  
*Cell-matrix adhesion and cell-cell adhesion differentially control basal myosin oscillation and Drosophila egg chamber elongation.*  
**Nature Communications**. 2017 Apr 13;8:14708. doi: 10.1038/ncomms14708.

## 2016

Nguyen TT\*, Park WS\*, Park BO, Kim CY, Oh Y, Kim JM, Choi H, Kyung T, Kim CH, Lee G, Hahn KM, Meyer T, **Heo WD**.  
*PLEKHG3 enhances polarized cell migration by activating actin filaments at the cell front.*  
**PNAS**. 2016 Sep 6;113(36):10091-6. doi: 10.1073/pnas.1604720113. Epub 2016 Aug 23.  
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*Heparan sulfate proteoglycan synthesis in CHO DG44 and HEK293 Cells.*  
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*Release of infectious hepatitis C virus from Huh7 cells occurs via a trans-Golgi network to endosome pathway independent of VLDL.*  
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*Neurotrophin-3 Regulates Synapse Development by Modulating TrkC-PTP $\sigma$  Synaptic Adhesion and Intracellular Signaling Pathways.*  
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## 2015

Kyung T\*, Lee S\*, Kim JE, Cho T, Park H, Jeong Y-M, Kim D, Shin A, Kim S, Baek J, Kim J, Kim NY, Woo D, Chae S, Kim C-H, Shin H-S, Han Y-M#, Kim D#, **Heo WD#**.  
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**Nature Biotechnology (Cover Article).** 2015 Oct;33(10):1092-6. doi: 10.1038/nbt.3350. Epub 2015 Sep 14.  
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Yoon J\*, Lee M\*, Lee K, Kim N, Kim JM, Park J, Yu H, Choi C, Heo WD#, Park Y#.  
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Kim J, Jo H, Hong H, Kim MH, Kim JM, Lee JK, **Heo WD**, Kim J.  
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Sohn YS, Shin HC, Park WS, Ge J, Kim CH, Lee BL, **Heo WD**, Jung JU, Rigden DJ, Oh BH.  
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*A novel copper-chelating strategy for fluorescent proteins to image dynamic copper fluctuations on live cell surfaces.*  
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