



The First Mover in Environmental Safety

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KIST Europe

2019

ANNUAL REPORT

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KIST



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KIST Europe Forschungsgesellschaft mbH

KIST Europe
Korea Institute of
Science and Technology

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K I S T
E U R O P E
A N N U A L
R E P O R T

Director's Greeting

Dear Readers,

With over 24 years of successful operations under our belt, KIST Europe has now reached full adulthood. Since its initial launch in Saarbrücken, Germany back in 1996, KIST Europe has accomplished its mission of facilitating joint research among high-tech R&D institutes throughout Korea and the EU. Its success is due to the men and women on its staff, all of whom come from different cultural and ethnic backgrounds but are united in their pursuit of excellence and their commitment to further enhancing their capabilities and expertise.

It is with great pleasure that we present you with this annual report summarizing our research activities and notable achievements for 2019. In it, you will find detailed examples of the diverse forms of collaboration we engage in, as well as evidence of our specialized expertise in conducting open, innovative research.

And for any research institutes seeking an experienced collaborator for upcoming joint research projects, or any business organizations wishing to expand into the Korean and/or European markets, KIST Europe is the ideal partner for making such goals a reality—as evidenced in this report, which outlines the significant role we play in fostering S&T cooperation between Korea and the EU.

I wish to personally thank everyone who has consistently supported and contributed to the work we do at KIST Europe. It is only through your help that our success is possible. Particular gratitude goes out to the Saarland government and Saarland University for always standing by our side. I hope our partnership only continues to strengthen in the years ahead.

Lastly, I wish to express heartfelt appreciation to the staff at KIST Europe for their hard work and valuable contributions. Their dedication is unparalleled.

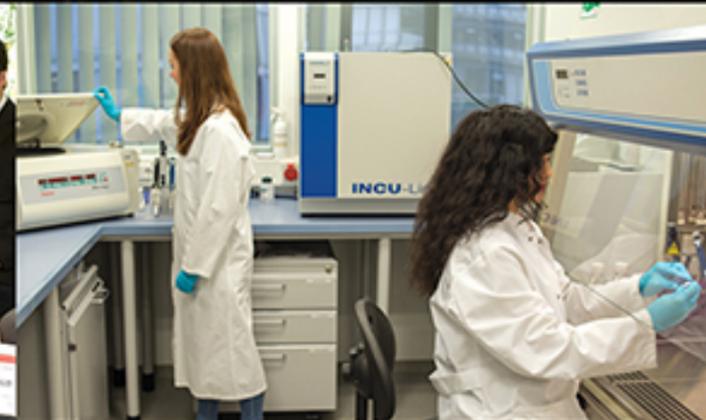
Sincerely,



Dr. Junkyung Kim
Director, KIST Europe



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History

The official visit of the 14th Korean President KIM, Youngsam to Germany

Mar 1995

1st building completion (providing 5,275 m² with 4 stories)

Apr 2004

2nd building completion (providing 2,069 m² with 3 stories)

Apr 2010

Inauguration of 8th Director (Dr. Junkyung Kim)

Dec 2017

Feb 1996

Foundation of KIST Europe

Apr 2006

10th Anniversary

May 2016

20th Anniversary

Contacts



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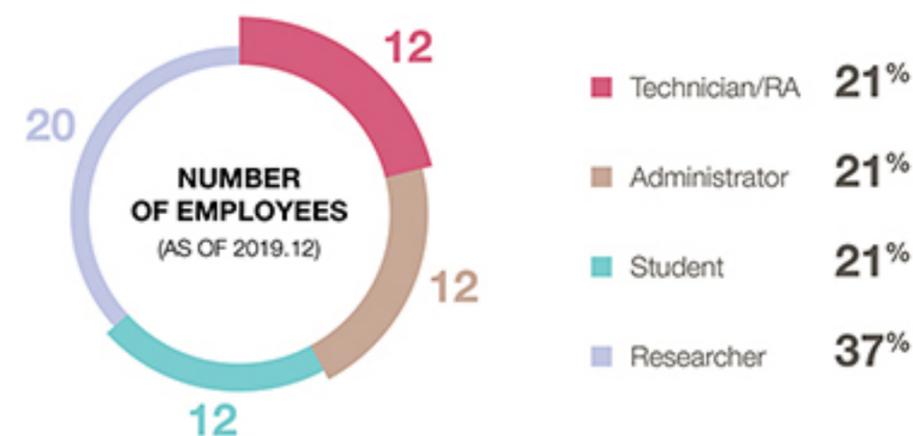
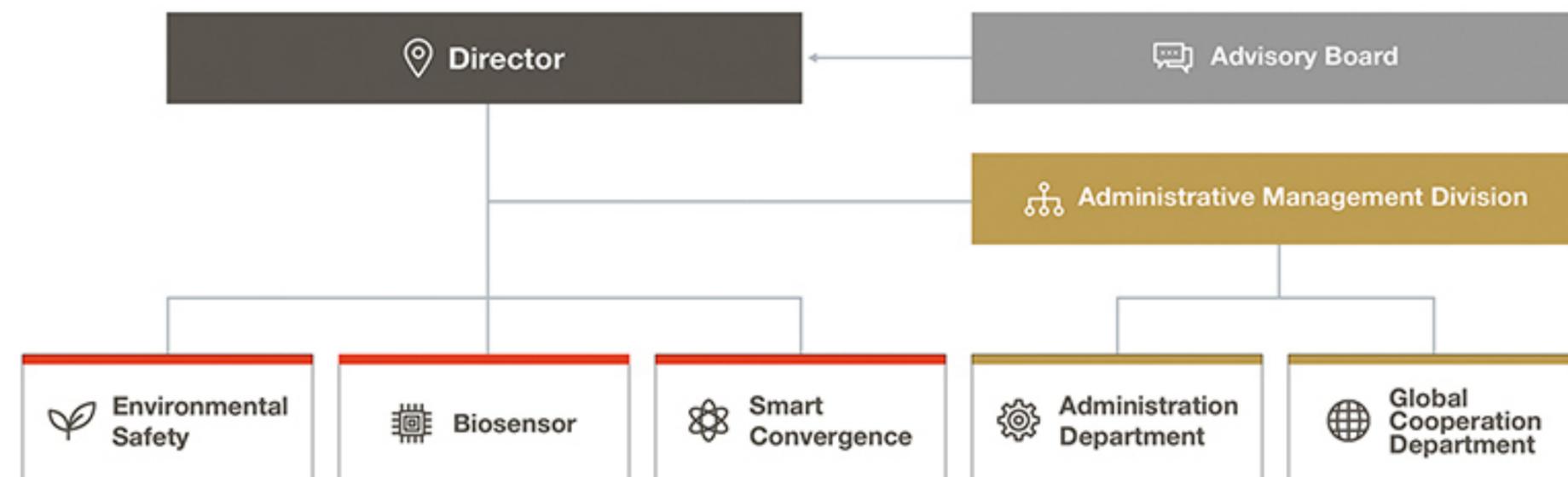


Dr. Jeongho Seo

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Administrative Management Division

Organization & Peoples



Capacity

■ Concentration on core research themes

Development of core research themes based on internal research capacities and concentrations

■ Expansion of research infrastructure to the strengthen core research capacities



Open R&D

■ Launching a global test-bed platform to stimulate R&D cooperation

Establishment of an on-site open Lab., the so-called Global Test-Bed, which provides the opportunity for feasibility studies in the area of technology convergence from both countries

■ Expansion of cooperation with EU

Promotion of joint R&D between excellent research institutes in Korea and EU



Industry Support

■ Support for improved sustainability and industrial competitiveness

Support Korean and EU industries in complying with chemical regulations such as the EU and Korean REACH



■ The First Mover in Environmental Sustainability

- Research on animal-free risk assessment
- Platform-based global cooperation

Korean Members (as of December 2019)



Dr. Byung Gwon Lee
(Chairman)

President,
Korea Institute of Science and
Technology



Heekwon Jung

Director General of the International
Cooperation Bureau,
Korean Ministry of Science and ICT



Dr. You Seung Kim

Former President of KIST,
Korea Institute of Science and
Technology



Dr. Myung Soo Kim

Former President of KRISS,
Korea Research Institute of Standards
and Science



Joohan Kim

President,
Daegu National Science Museum

German Members (as of December 2019)



Jürgen Lennartz

Head of Saarland State Chancellery



Prof. Dr. Manfred Schmitt

President,
University of Saarland



Prof. Dr. Andreas Schäffer

Director of Institute for Environmental
Research,
RWTH Aachen



Prof. Dr. Rolf Müller

Managing Director,
Helmholtz Institute for Pharmaceutical
Research Saarland(HIPS)



Dr. Wolfgang Wahlster

Chief Executive Advisor,
German Research Centre for Artificial
Intelligence (DFKI)

How to find KIST Europe

From Frankfurt Airport

By train directly from Frankfurt Airport Station to Saarbrücken Main Station by fast train (ICE/IC) or local train (RE/RB). For more information, see: www.bahn.de (English version available)

Information for the navigation system

Stuhlsatzenhausweg 97
66123 Saarbrücken, Germany
GPS Coordinates:
N 49° 15' 32,0" E 07° 02' 25,4"



Completion of Guest House Construction : November 2020 (official opening could be January 2021)

Ground Floor



Lobby, Office, Machinery rooms etc.

Guest Rooms



12 Single Rm. (24m²) / 15 Single Rm. (18m²)
Prof., Guest Researchers, Students, Interns etc.

Apartment



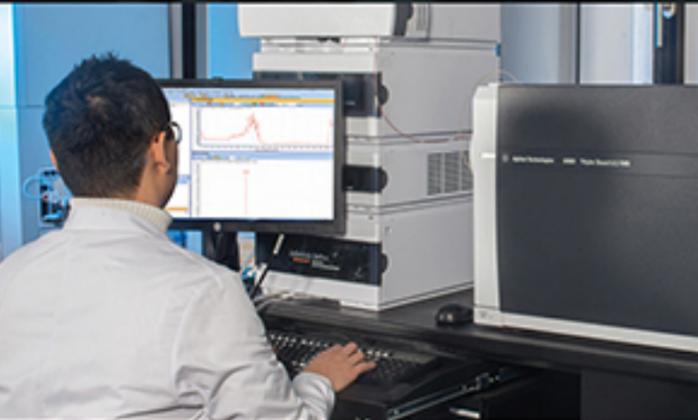
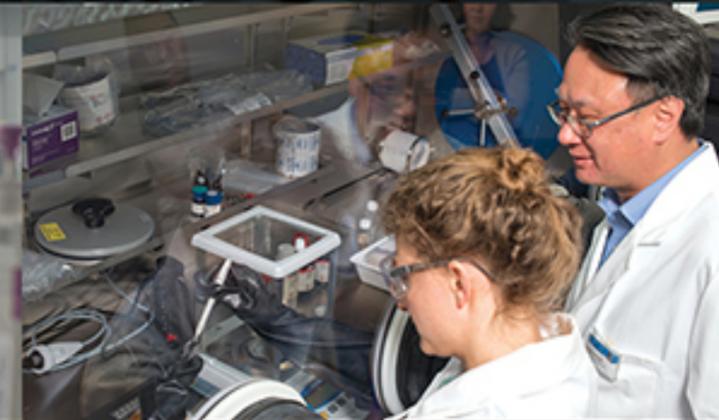
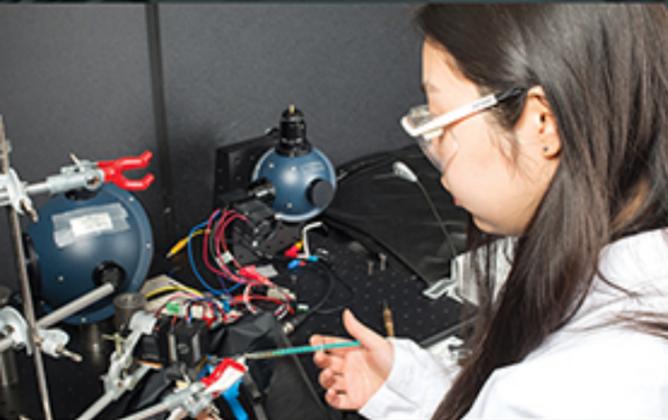
4 Apartments [2 Apt.(40m²) / 2 Apt. (60m²)]
Prof. or Guest Researchers with Family

Accommodation for guest-researchers, cooperation-partners, research assistance, students & interns

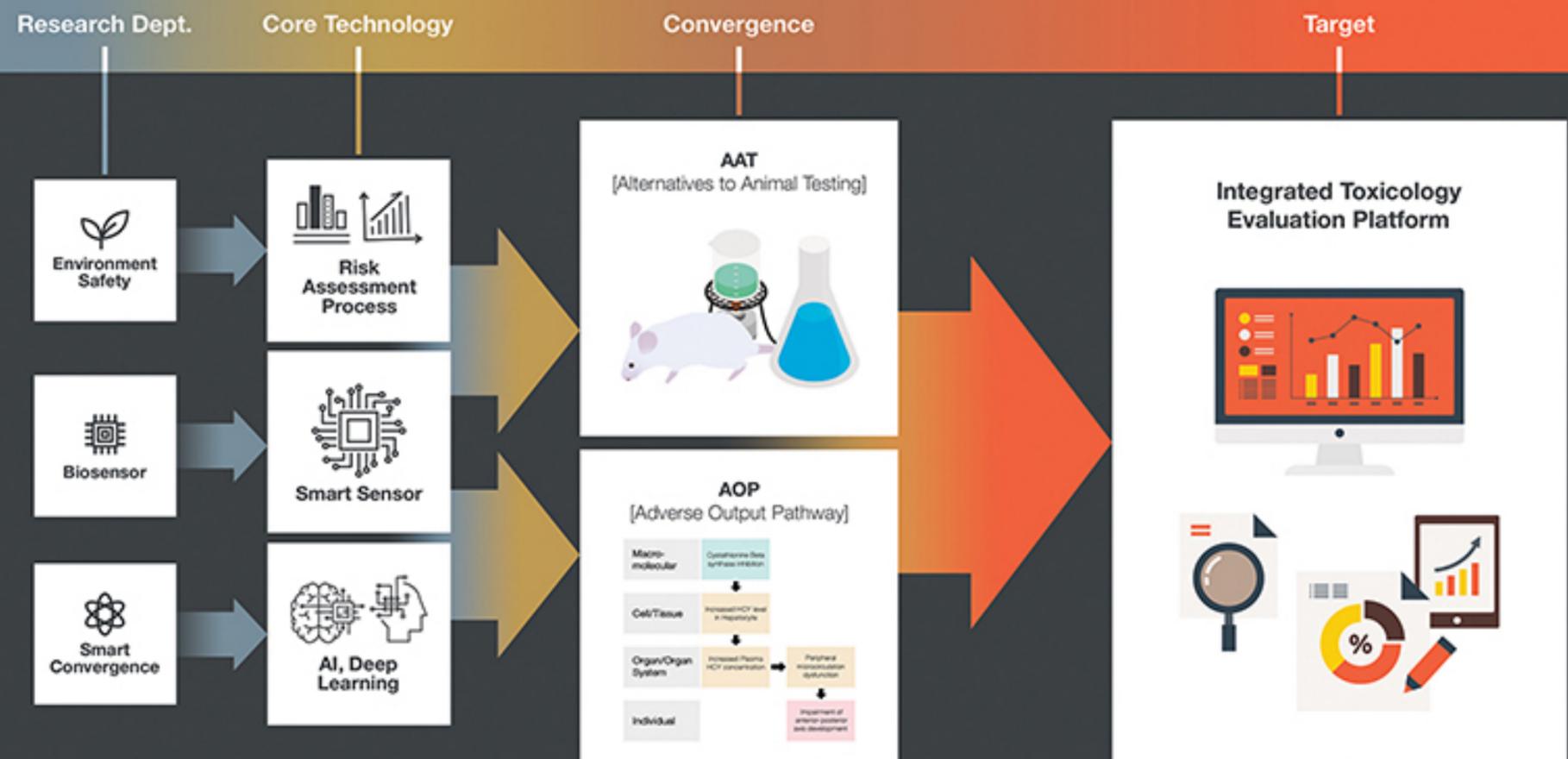
Joint Use with neighbouring research institutes



Research with **PASSION**

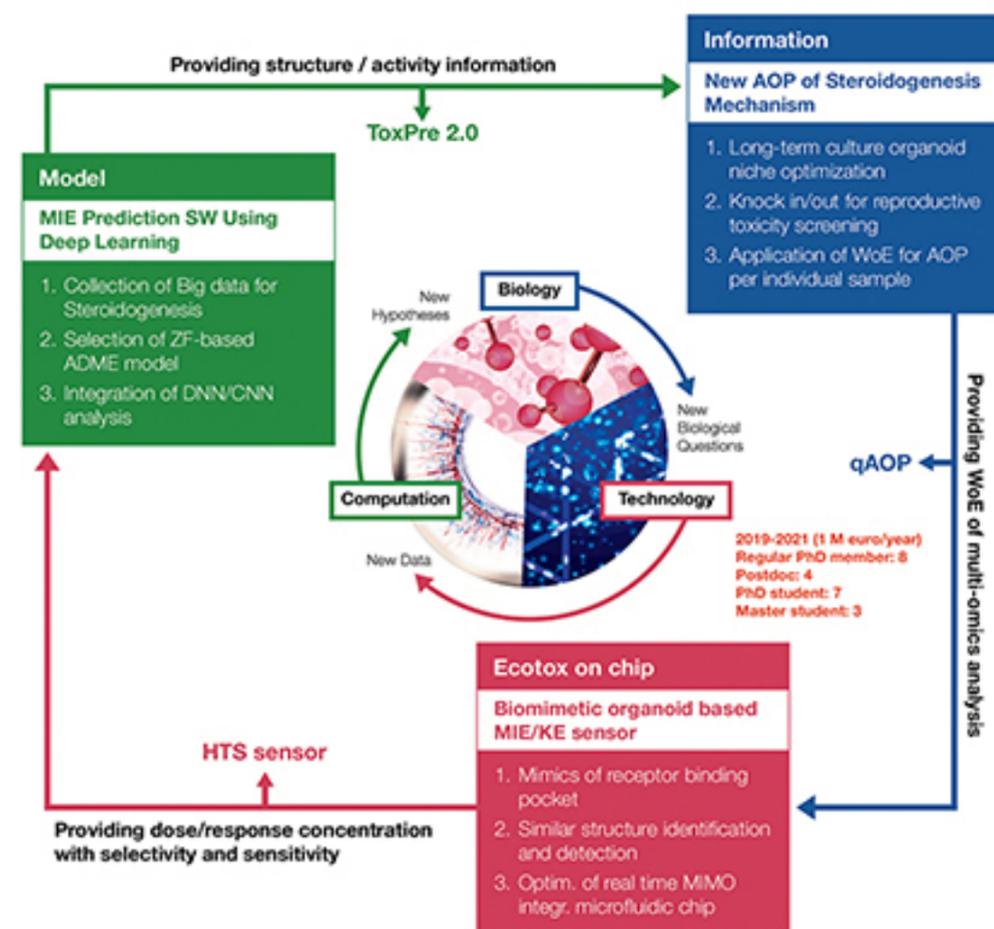


Integration of all possible capacities among KIST Europe Researchers



Theme

Development of Environmental Steroidogenesis AOP Framework



What is Adverse Outcome Pathway (AOP)?

- AOP is associated with toxicity pathways and regulatory applications
- AOP network is the functional unit of endpoint prediction
- Molecular initiating event or early key event is essential for alternatives to animal testing
- AOP facilitates the multidisciplinary studies through the needs for network building

Status of AOP Development

OECD AOP Network developed so far

- 270 AOPs (user defined)
- 750 Key Events
- 1000 Key Event Relationships

Definition of AOP

- Relationship of adverse outcomes from the molecular to population level

Key Event(KE)



AOPs included in OECD* Workplan (*Organization for Economic Cooperation and Development)

Graphic representation for 3 applied AOPs

Reg. Nr.	Aop : 289	Aop : 292	Aop : 297
Title	Inhibition of 5 α -reductase leading to impaired fertility in female fish	Inhibition of tyrosinase leads to decreased population in fish	Inhibition of retinaldehyde dehydrogenase leads to population decline
PJT. Nr. in OECD Workplan	1.81	1.78	1.77
Graphic			

Expected effect and Applicability

- Apply to OECD Test Guideline
- Apply to Integrating models for toxicity prediction
- Apply to (Q)SAR Toolbox for environmental regulation

Papers



Stimulus-Responsive Anti-Oxidizing Drug Crystals and their Ecological Implication

Byoung Soo Kim^{1,2}, Jiayu Leong^{1,3}, Seung Jung Yu⁴, Younghak Cho⁴, Chang Gyun Park⁵, Da-Hye Kim⁵, Eunkyung Ko^{1,2}, Sung Gap Im⁶, Jonghwi Lee⁶, Young Jun Kim⁵, Hyunjoon Kong^{1,2}

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⁶ Department of Chemical Engineering and Materials Science, Chung-Ang University, Seoul, 156-756, Republic of Korea.

Abstract

Various antioxidants are being used to neutralize the harmful effects of reactive oxygen species (ROS) overproduced in diseased tissues and contaminated environments. Polymer-directed crystallization of antioxidants has attracted attention as a way to control drug efficacy through molecular dissolution. However, most recrystallized antioxidants undertake continuous dissolution independent of the ROS level, thus causing side-effects. This study demonstrates a unique method to assemble antioxidant crystals that modulate their dissolution rate in response to the ROS level.

We hypothesized that antioxidants recrystallized using a ROS-labile polymer would be triggered to dissolve when the ROS level increases. We examined this hypothesis by using catechin as a model antioxidant. Catechin was recrystallized using polyethylenimine cross-linked with ROS-labile diselenediylbis-(ethane-2,1-diyl) -diacrylate. Catechin recrystallized with the ROS-labile polymer displays accelerated dissolution proportional to the H₂O₂ concentration. The ROS-responsive catechin crystals protect vascular cells from oxidative insults by activating intracellular glutathione peroxidase expression and, in turn, inhibiting an increase in the intracellular oxidative stress. In addition, ROS-responsive catechin crystals alleviate changes in the heart rate of *Daphnia magna* in oxidative media. We propose that the results of this study would be broadly useful for improving the therapeutic efficacy of a broad array of drug compounds.



Figure 6 Cardioprotective effects of catechin from H₂O₂-induced oxidative stress in *Daphnia magna* model. (–), (d) Representative optical microscope (OM) images of *Daphnia magna*: before treatment (d-1), after exposure to 0.05 mM H₂O₂ solution without catechin (d-2), with pure catechin crystals (d-3), catechin recrystallized with PEI (Catechin-PEI) (d-4), and catechin recrystallized with PEI-diselenide (Catechin-PEI-diselenide) (d-5), respectively.

Adapted, by permission, from Byoung Soo Kim, Jiayu Leong, Seung Jung Yu, Younghak Cho, Chang Gyun Park, Da-Hye Kim, Eunkyung Ko, Sung Gap Im, Jonghwi Lee, Young Jun Kim, and Hyunjoon Kong, "Stimulus-Responsive Anti-Oxidizing Drug Crystals and their Ecological Implication", *Small*, 15(21), 1900766, Copyright © 2019 by John Wiley & Sons, Inc.



The synthesis of vitellogenin on three-dimensional (3D) spheroid culture of Zebrafish liver cell

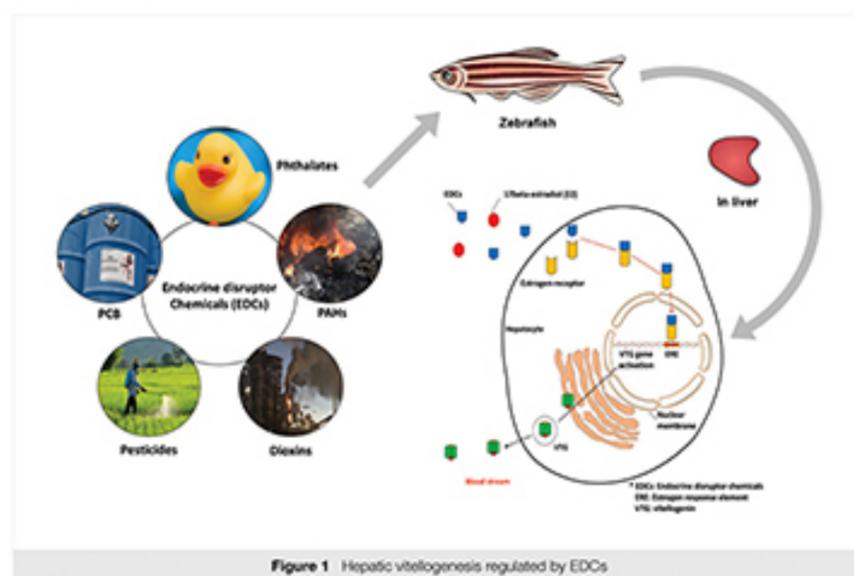


Chang Gyun Park^{1,2}, Chang Seon Ryu¹, Andreas Manz^{1,2}, Young Jun Kim^{1,*}

¹ Korea Institute of Science and Technology Europe, Saarbrücken, Germany

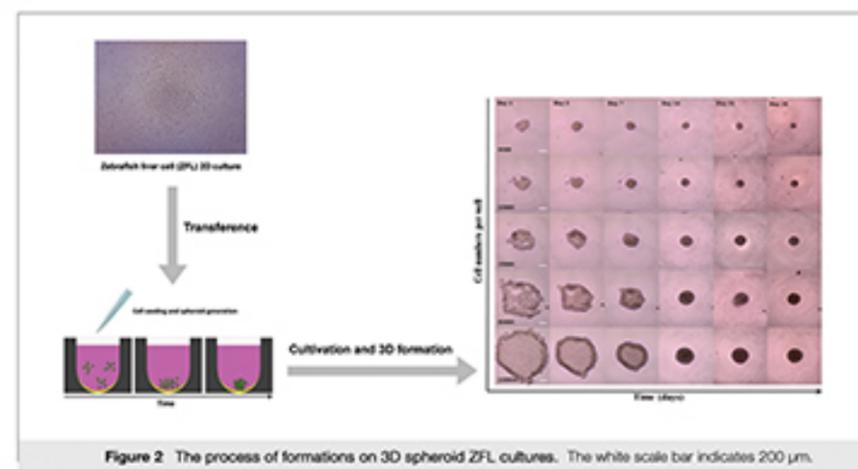
² University of Saarland, Saarbrücken, Germany

Introduction



- The endocrine disruptor chemicals (EDCs) cause critical adverse effects in ecosystem [1].
- These events result in skewed sex ratio, early stage maturity in uterine, follicle deformation and population decrease [2].
- However, because of ethical concerns, zebrafish (in vivo) experiments are restricted by OECD 3R regulations [3].
- Therefore, precise and reliable in vitro tests are required for assessing EDCs.

Materials & Methods



Conclusion

- The 3D ZFL spheroid cultures in conditions of 5000 and 10000 cells are viable for 28 days and synthesize vitellogenin compared to conventional ZFL cell monolayer culture.
- This culture system has a possibility that it can be used as a chronic assessment in vitro model for endocrine disorder.

SCIENTIFIC REPORTS

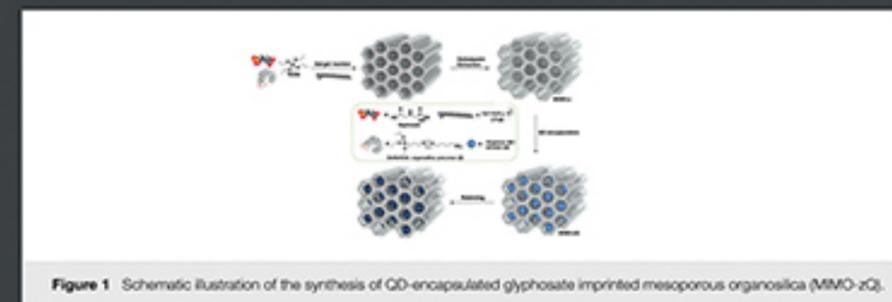
Advanced method for fabrication of molecularly imprinted mesoporous organosilica with highly sensitive and selective recognition of glyphosate

Youngdo Kim¹, Jaeho Lee¹ & Ik-soo Shin²

¹Biosensor and Materials Group, Korea Institute of Science and Technology Europe, Universität des Saarlandes Campus E7 1, 66123, Saarbrücken, Germany. ²Department of chemistry, college of natural Science, Soongsil University, Seoul, 06978, Republic of Korea. Correspondence and requests for materials should be addressed to Y.K.

Abstract

In this study, we synthesized molecularly imprinted mesoporous organosilica (MIMo) in the presence of a new precursor having a zwitterionic functional group and an imprint molecule, namely, glyphosate (MIMo-z). the precursor-glyphosate complex engaged in a typical base-catalyzed sol-gel reaction and the introduced zwitterion group remained intact in the framework after the extraction process had been completed, to test the rebinding performance of the target molecule, graphene quantum dots were encapsulated (MIMo-zQ) into pores and the fluorescence intensity change was monitored according to the concentration of glyphosate. When the MIMo-zQ suspension was diluted into the glyphosate solutions, notable fluorescence quenching occurred, right down to sub-nanomolar levels of concentration: $9.2 \pm 0.18\%$ quenching at 0.1 nM (0.017 ppb, 17 pg/mL), this result is one of the best reported to date for sensing using MIMo, the synthesized probe also exhibited a distinct signal compared to a series of competing compounds, aminomethylphosphonic acid and glycine: $4.3 \pm 0.019\%$ and $3.7 \pm 0.041\%$ quenching at 100 nM.



Reprinted from Youngdo Kim, Jaeho Lee, and Ik-soo Shin, "Advanced method for fabrication of molecularly imprinted mesoporous organosilica with highly sensitive and selective recognition of glyphosate", Scientific reports 9, 1-8, Copyright 2019 Creative Commons BY 4.0.



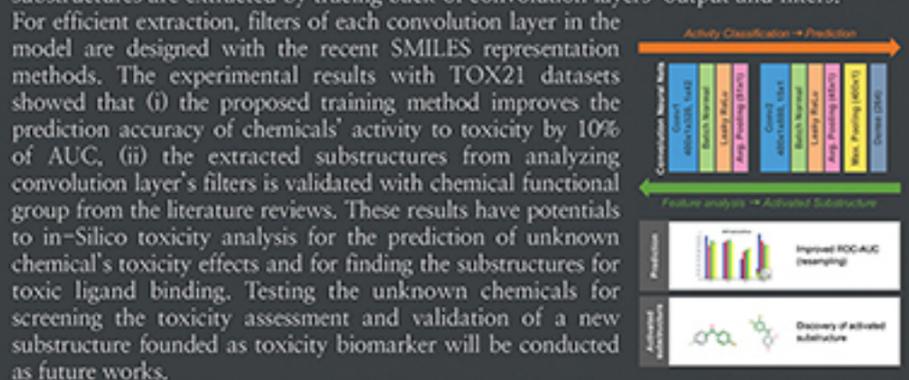
Convolution neural networks for training the unbalanced toxicity assessment data and analyzing chemical functional group

*Y. O. Lee¹, Y. Kim²

¹ KIST Europe, Smart Convergence Group, Saarbrücken, Germany; ² KIST Europe, Environmental Safety Group, Saarbrücken, Germany

Abstract

Deep learning models with the capability of the automated feature extraction have been developed and outperformed the traditional statistical models in the toxicity prediction recently. However, there is little consideration of data imbalance between 'active' and 'inactive' chemicals in the dataset, and efficient extraction of the activated substructure of the chemicals. In this study, the methods of training the models in the data-imbalanced conditions and interpreting the chemical substructures highly related to the toxicity from the model are proposed with convolution neural networks. First, a convolution neural network is designed to predict the binary outcome of chemicals: 'active' or 'inactive' to toxicity in the given ligands. Second, a hybrid method of oversampling of active chemicals and down-sampling of inactive chemicals is utilized for training the model in the imbalanced data conditions in order to prevent overfitting. Third, the activated substructures are extracted by tracing back of convolution layers' output and filters.



Reprinted from Abstracts of the 55th Congress of the European Societies of Toxicology (EUROTOX 2019), TOXICOLOGY SCIENCE PROVIDING SOLUTIONS, Vol 314 S1, supplement, Yong Oh Lee, Youngjun Kim, Convolution neural networks for training the unbalanced toxicity assessment data and analyzing chemical functional group (P04-G21), S107, Copyright 2019, with permission from Elsevier

ENVIRONMENTAL SAFETY



Dr. Young Jun KIM

Group Leader

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Objectives

The Environmental Safety Group contributes to the protection of human health and the environment from hazardous chemicals and mixtures of these chemicals. This group also contributes to enhancing the national competitiveness of the chemical industry by ensuring high safety standards for products.

R&D Areas

Alternative Toxicity & Ecotoxicity Assessments

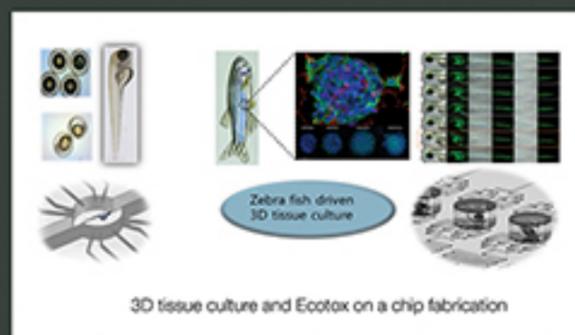
- 3D tissue mimic for high-throughput toxicity screening
- Development of Alternatives to Animal Testing (AAT) systems for chronic toxicity screening
- Development of environmental risk assessment tools and modelling methodologies

Mathematical Biology & Computational Toxicology

- Development of analytical models for mechanism-based toxicity prediction
- Quantitative in silico approach for ecotoxicity screening
- ADMET/QSAR modelling and industrial application

Development of Metabolomics and their Application to Biomarker Discovery

- Targeted/pseudo-targeted metabolomic of chemicals
- Metabolite identification and reaction phenotype



3D tissue culture and Ecotox on a chip fabrication



Food chain metabolomics monitoring and analysis

Achievements 2019

Journals

In-Hyuk Baek, Hyung-Seop Han, Seungyun Baik, Volkhard Helms, and Young Jun Kim. "Detection of Acidic Pharmaceutical Compounds Using Virus-Based Molecularly Imprinted Polymers." *Polymers* 10.9 (2018): 974.
Web of Science Core Collection: SCIE **2018 JIF: 3.164**

In-Hyuk Baek, Young Jun Kim, Seungyun Baik, and Jongwoon Kim. "Investigation of the synergistic toxicity of binary mixtures of pesticides and pharmaceuticals on *Aliivibrio fischeri* in major river basins in South Korea." *International journal of environmental research and public health* 16.2 (2019): 208.
Web of Science Core Collection: SCIE, SSCI **2018 JIF: 2.468**

Chang-Beom Park, Jae-Woong Jung, Dong-Hyuk Yeom, Jiye Jang, Jin-Woo Park, and Young Jun Kim. "Interactive effects between components in binary mixtures of zinc sulfate and iron oxide nanoparticles on *Daphnia magna*." *Molecular & Cellular Toxicology* 15.3 (2019): 315-323.
Web of Science Core Collection: SCIE **2018 JIF: 1.830**

Chang-Beom Park, Jae-Woong Jung, Minjeong Baek, Baekkyoung Sung, Jin-Woo Park, Yohan Seol, Dong-Hyuk Yeom, June-Woo Park, and Young Jun Kim. "Mixture toxicity of metal oxide nanoparticles and silver ions on *Daphnia magna*." *Journal of Nanoparticle Research* 21.8 (2019): 166.
Web of Science Core Collection: SCIE, SSCI **2018 JIF: 2.009**

Daekyung Kim, Li Wencheng Yukihiko Matsuyama, Kichul Cho, Yasuhiro Yamasaki, Satoshi Takeshita, Kenichi Yamaguchi, and Tatsuya Oda. "Extremely high level of reactive oxygen species (ROS) production in a newly isolated strain of the dinoflagellate *Karenia mikimotoi*." *European Journal of Phycology* 54.4 (2019): 632-640.
Web of Science Core Collection: SCIE **2018 JIF: 2.526**

Jihoon Park, and Chungsik Yoon. "Model Algorithms for Estimates of Inhalation Exposure and Comparison between Exposure Estimates from Each Model." *Journal of Korean Society of Occupational and Environmental Hygiene* 29.3 (2019): 358-367.
Web of Science Core Collection: ETC

Journals

Jihoon Park, Mijin Park, and Chungsik Yoon. "Methodologies for Inhalation Exposure Assessment of Engineered Nanomaterial-containing Consumer Spray Products." *Journal of Environmental Health Sciences* 45.5 (2019): 405-425.

Web of Science Core Collection: ETC

Kichul Cho, Sang-Moo Lee, Dae-Hyun Cho, Jina Heo, Yong Jae Lee, and Hee-Sik Kim. "Novel biological method for controlling bacterial contaminants using the ciliate *Colpoda* sp. HSP-001 in open pond algal cultivation." *Biomass and Bioenergy* 127 (2019): 105258.

Web of Science Core Collection: SCIE **2018 JIF:** 3.537

Kichul Cho, Chang Seon Ryu, Seongho Jeong, and Young Jun Kim. "Potential adverse effect of tyrosinase inhibitors on teleosts: A review." *Comparative Biochemistry and Physiology Part C: Toxicology & Pharmacology* (2019): 108655.

Web of Science Core Collection: SCIE **2018 JIF:** 2.697

Byoung Soo Kim, Jiayu Leong, Seung Jung Yu, Younghak Cho, Chang Gyun Park, Da-Hye Kim, Eunkyung Ko, Sung Gap Im, Jonghwi Lee, Young Jun Kim, and Hyunjoon Kong. "Stimulus-Responsive Anti-Oxidizing Drug Crystals and their Ecological Implication." *Small* 15.21 (2019): 1900765.

Web of Science Core Collection: SCIE **2018 JIF:** 10.856

Da-Hye Kim, Chang Gyun Park, Sang Hun Kim, and Young Jun Kim. "The effects of mono-(2-Ethylhexyl) phthalate (MEHP) on human estrogen receptor (hER) and androgen receptor (hAR) by YES/YAS in vitro assay." *Molecules* 24.8 (2019): 1558.

Web of Science Core Collection: SCIE **2018 JIF:** 3.060

Da-Hye Kim, Chang Gyun Park, and Young Jun Kim. "Characterizing the potential estrogenic and androgenic activities of two disinfection byproducts, mono-haloacetic acids and haloacetamides, using in vitro bioassays." *Chemosphere* 242 (2020): 125198.

Web of Science Core Collection: SCIE **2018 JIF:** 5.108

Ki-Eun Kim, Jongwoon Kim, Hyunpyo Jeon, Sanghun Kim, and Yeonseung Cheong. "Enhancement of Occupational Exposure Assessment in Korea through the Evaluation of ECETOC TRA according to PROCs." *Korean Journal of Environmental Health Sciences* 45.2 (2019): 173-185.

Lilian H.J. Richter, Jennifer Herrmann, Anastasia Andreas, Yu Mi Park, Lea Wagmann, Veit Flockerzi, Rolf Müller, and Markus R. Meyer. "Tools for studying the metabolism of new psychoactive substances for toxicological screening purposes—A comparative study using pooled human liver S9, HepaRG cells, and zebrafish larvae." *Toxicology letters* 305 (2019): 73-80.

Web of Science Core Collection: SCIE **2018 JIF:** 3.499

Byung-Jin Lim, Sa Rang Han, In-Chan Choi, Jo-Hee Yoon, Jay-Jung Lee, Se-Uk Cheon, and Kichul Cho. "Evaluation of physico-chemical parameters regulating zooplankton community structure in the Geum River, Korea." *Iranian Journal of Fisheries Sciences* (2019).

Web of Science Core Collection: SCIE **2018 JIF:** 0.495

Marie-Léonie Bohlen, Hyun Pyo Jeon, Young Jun Kim, and Baeckkyoung Sung. "In Silico Modeling Method for Computational Aquatic Toxicology of Endocrine Disruptors: A Software-Based Approach Using QSAR Toolbox." *Journal of visualized experiments: JoVE* 150 (2019).

Web of Science Core Collection: SCIE **2018 JIF:** 1.108

Azam Omid, Maranda Esterhuizen-Londt, and Stephan Pflugmacher. "Interspecies interactions between *Microcystis aeruginosa* PCC 7806 and *Desmodesmus subspicatus* SAG 86.81 in a co-cultivation system at various growth phases." *Environment international* 131 (2019): 105052.

Web of Science Core Collection: SCIE **2018 JIF:** 7.943

Azam Omid, Maranda Esterhuizen-Londt, and Stephan Pflugmacher. "Desmodesmus subspicatus co-cultured with microcystin producing (PCC 7806) and the non-producing (PCC 7005) strains of *Microcystis aeruginosa*." *Ecotoxicology* 28.7 (2019): 834-842.

Web of Science Core Collection: SCIE **2018 JIF:** 2.460

Jayoung Park, Minjeong Kwak, Nam Woong Song, and Jaeseok Kim. "Effect of colloidal nanoparticle concentration on sizing analysis with an electrospray scanning mobility particle sizer." *Applied Nanoscience* 10.1 (2020): 329-336.

Web of Science Core Collection: SCIE **2018 JIF:** 3.198

Stephan Pflugmacher, Amalia Sulk, Sanghun Kim, and Maranda Esterhuizen-Londt. "Translocation of the cyanobacterial toxin microcystin-LR into guttation drops of *Triticum aestivum* and remaining toxicity." *Environmental Pollution* 253 (2019): 61-67.

Web of Science Core Collection: SCIE **2018 JIF:** 5.714

Quynh-Giao Tran, Kichul Cho, Su-Bin Park, Urim Kim, Yong Jae Lee, and Hee-Sik Kim. "Impairment of starch biosynthesis results in elevated oxidative stress and autophagy activity in *Chlamydomonas reinhardtii*." *Scientific reports* 9.1 (2019): 1-9.

Web of Science Core Collection: SCIE **2018 JIF:** 4.011

Quynh-Giao Tran, Kichul Cho, Urim Kim, Jin-Ho Yun, Dae-Hyun Cho, Jina Heo, Su-Bin Park, Ji Won Kim, Yong Jae Lee, Rishiram Ramanan, and Hee-Sik Kim. "Enhancement of β -carotene production by regulating the autophagy-carotenoid biosynthesis seesaw in *Chlamydomonas reinhardtii*." *Bioresource technology* 292 (2019): 121937.

Web of Science Core Collection: SCIE **2018 JIF:** 6.669

Sangjun Choi, Ju-Hyun Park, Seo-Yeon Bae, So-Yeon Kim, Hyejeong Byun, Hyunseok Kwak, Sungho Hwang, Jihoon Park, Hyunhee Park, Kyong-Hui Lee, Won Kim, and Dong-Uk Park. "Characteristics of PM10 levels monitored for more than a decade in subway stations in South Korea." *Aerosol and Air Quality Research* 9 (2019): 2746-2756.

Web of Science Core Collection: SCIE **2018 JIF:** 2.735

YounJung Jung, Gabriele Schaumann, Seungyun Baik, and George Metreveli. "Effects of hydrophobicity-based fractions of Pony Lake Fulvic Acid on the colloidal stability and dissolution of oppositely charged surface-coated silver nanoparticles." *Environmental Chemistry* (2019)

Web of Science Core Collection: SCIE **2018 JIF:** 2.193

Oral Presentations

Marie-Léonie Bohlen. "Using the OECD QSAR Toolbox as an in silico modeling method for computational aquatic toxicology of endocrine disruptors", EUSAAT 2019, 12 Oct. 2019, Johannes Kepler Universität Linz

Young Jun Kim. "Physical Chemical Properties of TiO2 nanomaterials", OECD WPMN Meeting, 22 Feb. 2019, Paris

Young Jun Kim, and Changseon Ryu. "Development of Adverse Outcome Pathway for the reproductive impairment in fish", US EPA, 10 Jul. 2019, Duluth. Lecture.

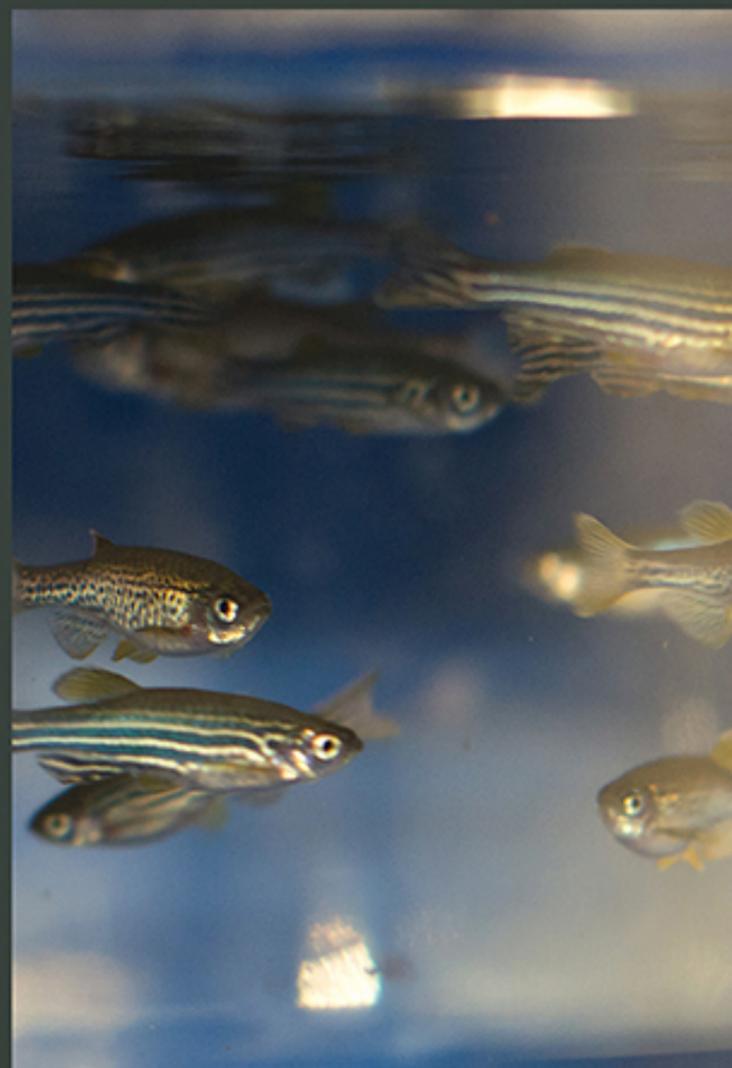
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Baeckkyoung Sung. "OECD QSAR Toolbox for in silico ecotoxicology modeling", OECD Meeting, 2 May 2019, Paris

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Marie-Léonie Bohlen. "The Biocidal Products Regulation", 18th International Fresenius Conference, 2-3 Apr. 2019, Novotel Düsseldorf City West

Marie-Léonie Bohlen, and Baeckkyoung Sung. "A bioinformatic software-assisted analysis on the acute ecotoxicity of endocrine disrupting chemicals", KSIAM 2019, 17-18 May 2019, Yonsei University, Seoul

Jasmin Gebauer-Barrett, Kichul Cho, and Baeckkyoung Sung. "Sustained release of silica nanoparticles from biodegradable gelatin microgels", 5th Keele Nanopharmaceutics Symposium, 5 Jul. 2019, University of Keele, Newcastle-under-Lyme

Seongho Jeong, Ki Eun Kim, Changseon Ryu, and Baeckkyoung Sung. "Quantitative in vitro exposure system to analyze the toxic effects of ultrafine particulate aerosols on mammalian cell cultures", EKC 2019, 15-19 Jul. 2019, Wirtschaftsuniversität Wien

Dahye Kim. "Estrogenic and androgenic activities of disinfection byproducts (DBPs) by the yeast bioassay", SETAC EUROPE 29th Annual Meeting, 26-30 May 2019, Messukeskus Expo and Convention Centre, Helsinki

Ki Eun Kim, Hyun Pyo Jeon, Jang Pyo Cheong, and Sanghun Kim. "A study on the addition of new PROCs, confirmed through evaluation of Korean occupational exposure of ECETOC TRA for applying Korean-REACH (K-REACH)", ISES ISIAQ 2019, 18-22 Aug. 2019, Žalgiris Arena, Kaunas

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Ki Eun Kim, Jayoung Park, and Hyun Pyo Jeon. "Comparison of the behavior of TiO₂, CeO₂, and SiO₂ engineered nanoparticles in sewer networks using SWNano model", NANO Korea 2019, 2-5 Jul. 2019, KINTEX, Goyang-Si

Ki Eun Kim, Jayoung Park, Hyun Pyo Jeon, Sanghun Kim, and Dong Soo Lee. "Estimating the distribution of TiO₂, CeO₂, ZnO and SiO₂ nanoparticles with various forms when released to waste water treatment plant through sewers", SETAC EUROPE 29th Annual Meeting, 26-30 May 2019, Messukeskus Expo and Convention Centre, Helsinki

Young Jun Kim, and Changseon Ryu. "Introduction of environmental safety Group", Hannover Messe 2019, 1-5 Apr. 2019, Messagelände Hannover

Chang Gyun Park. "The validation of vitellogenin synthesis on 3D spheroid zebrafish liver cell", 3D Culture, Organoid & Tox Screening Europe 2019, 13-14 Jun. 2019, Rotterdam Marriott Hotel

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Proceedings

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Sari S. Rasheed, Yu Mi Park, Anastasia Andreas, Jennifer Herrmann, and Rolf Müller. "Zebrafish as a model in anti-infective drug discovery at HiPS", HiPS Symposium 2019, 27-28 Jun. 2019, Universität des Saarlandes, Saarbrücken

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Yohan Seol, Minjeong Baek, Dahye Kim, and Young Jun Kim. "Adverse effects of mono(2-ethylhexyl)-phthalate on Daphnia magna in acute and chronic test", SETAC EUROPE 29th Annual Meeting, 26-30 May 2019, Messukeskus Expo and Convention Centre, Helsinki



Analytical Methods

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Molecular & Cellular Toxicology

Published: 26 June 2019

Interactive effects between components in binary mixtures of zinc sulfate and iron oxide nanoparticles on *Daphnia magna*

Chang-Beom Park, Jae-Woong Jung, Dong-Hyuk Yeom, Jiye Jang, Jin-Woo Park & Young Jun Kim
Molecular & Cellular Toxicology volume 15, pages 315–323 (2019)

Abstract

Backgrounds

The concern in the toxicological impact of nanomaterials on aquatic organisms has grown, due to the high adsorption capacity for (in) organic compounds in the aquatic environment. In order to evaluate the toxicity of mixtures composed with metal ion and metal oxide nanoparticles and the interaction between components in binary mixtures, we tested the mixture toxicity of iron oxide nanoparticles (i.e., PVP-Fe₃O₄ NPs) and zinc sulfate (ZnSCU) on *Daphnia magna*.

Methods

The toxicity of binary mixtures with different concentration-combinations were identified by the effective concentration values (EC_{xmix}) based on the concentration-response curves. Concentration addition index (CAI) and effect addition index (EAI) were applied for examining the interaction between components in binary mixtures.

Results

The findings from this study implied the ZnSO₄ had a high toxic effect on *D. magna* more than PVP-Fe₃O₄ NPs and the synergistic toxicity in binary mixtures were depended on the toxic effects of ZnSO₄ and their exposure concentration rather than those of PVP-Fe₃O₄ NPs. Interestingly, the antagonistic effects between ZnSO₄ and PVP-Fe₃O₄ NPs in binary mixtures showed in the high concentration-combinations suggesting that antagonism in toxicity may be due to the high adsorption capacity of PVP-Fe₃O₄ NPs for organic compounds.

Conclusion

In this study, synergistic- and antagonistic effects in binary mixtures with various concentration combinations will provide important information for elucidating the toxicity mechanism of mixtures composed inorganic compounds and metal oxide nanoparticles (MONPs). However, in order to conduct the risk assessment of environmental nanoparticle, further studies regarding the mixture toxicity of nanomaterials with environmentally relevant concentrations and the interaction between components will be required.

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Journal of Visualized Experiments

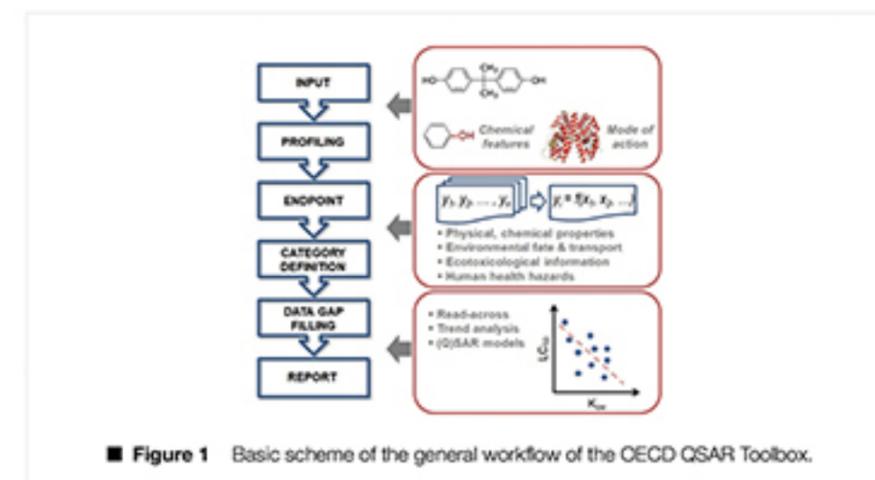
Video Article

In Silico Modeling Method for Computational Aquatic Toxicology of Endocrine Disruptors: A Software-Based Approach Using QSAR Toolbox

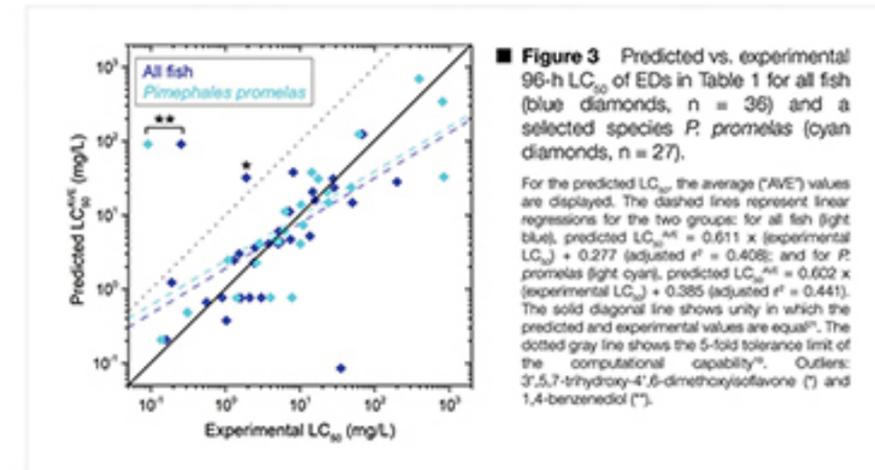
Marie-Léonie Bohlen¹, Hyun Pyo Jeon¹, Young Jun Kim¹, Baekkyoung Sung¹¹KIST Europe Forschungsgesellschaft mbH

Abstract

Computational analyses of toxicological processes enables high-throughput screening of chemical substances and prediction of their endpoints in biological systems. In particular, quantitative structure-activity relationship (QSAR) models have been increasingly applied to assess the environmental effects of a plethora of toxic materials. In recent years, some more highlighted types of toxicants are endocrine disruptors (EDs, which are chemicals that can interfere with any hormone-related metabolism). Because EDs may significantly affect animal development and reproduction, rapidly predicting the adverse effects of EDs using in silico techniques is required. This study presents an in silico method to generate prediction data on the effects of representative EDs in aquatic vertebrates, particularly fish species. The protocol describes an example utilizing the automated workflow of the QSAR Toolbox software developed by the Organization for Economic Co-operation and Development (OECD) to enable acute ecotoxicity predictions of EDs. As a result, the following are determined: (1) calculation of the numerical correlations between the concentration for 50% of lethality (LC₅₀) and octanol-water partition coefficient (K_{ow}), (2) output performances in which the LC₅₀ values determined in experiments are compared to those generated by computations, and (3) the dependence of estrogen receptor binding affinity on the relationship between K_{ow} and LC₅₀.



■ Figure 1 Basic scheme of the general workflow of the OECD QSAR Toolbox.



■ Figure 3 Predicted vs. experimental 96-h LC₅₀ of EDs in Table 1 for all fish (blue diamonds, n = 36) and a selected species *P. promelas* (cyan diamonds, n = 27).

For the predicted LC₅₀, the average (AVE) values are displayed. The dashed lines represent linear regressions for the two groups: for all fish (light blue), predicted LC₅₀^{AVE} = 0.611 × (experimental LC₅₀) + 0.277 (adjusted r² = 0.408); and for *P. promelas* (light cyan), predicted LC₅₀^{AVE} = 0.602 × (experimental LC₅₀) + 0.385 (adjusted r² = 0.441). The solid diagonal line shows unity in which the predicted and experimental values are equal[®]. The dotted gray line shows the 5-fold tolerance limit of the computational capability[®]. Outliers: 3',5,7-trihydroxy-4',6-dimethoxyisoflavone (?) and 1,4-benzenediol (?).

Reprinted from Marie-Léonie Bohlen, Hyun Pyo Jeon, Young Jun Kim, and Baekkyoung Sung, "In Silico Modeling Method for Computational Aquatic Toxicology of Endocrine Disruptors: A Software-Based Approach Using QSAR Toolbox", *Journal of Visualized Experiments: JoVE*, Copyright © 2019 Creative Commons Attribution-NonCommercial-NoDerivs 3.0 Unported License



BIOSENSOR



Dr. Jaeho LEE

Group Leader

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Objectives

The Biosensor group performs various environment-related tasks based on multidisciplinary research.

The group mainly focuses on the development of sensors for the assessment of the eco-toxicity of chemicals and for the detection of harmful substances with high selectivity and sensitivity.

We are also supporting the research to identify chemical toxicity through Alternatives to Animal Testing (AAT).

In addition to sensor development, we conduct energy related research to secure our living environment by means of informatic technologies as well as experimental activities.

R&D Areas

Biosensors and Microfluidics

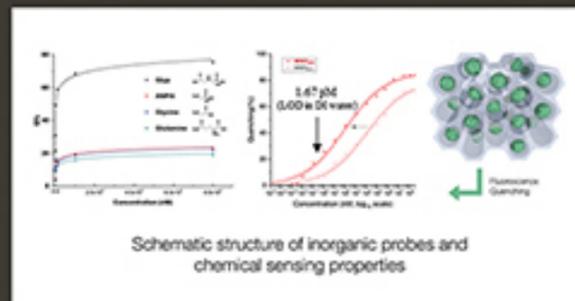
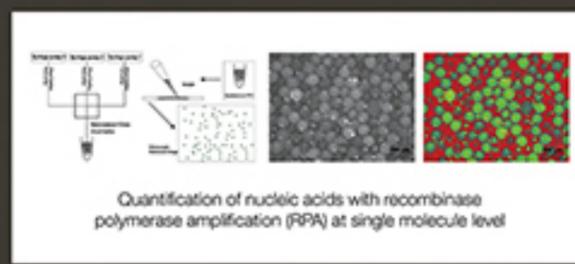
- Biomimicking inorganic probe materials
- Probe materials using gene modified bacteriophages
- Development of optical, electrical, and electrochemical sensing methods
- Microfluidic platform for sensing system integration

Magnetic Materials

- Controlling magnetic particles in various fluidic environments for fine-particle toxicity testing

Energy Storage

- Heat and gas fluid simulation for optimization of hydrogen energy storage system



Achievements 2019

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Leon Abelmann. "Observation and control of MSR-1 and MC-1 in microfluidic systems and in a magnetic OD meter", Korea-EU MTB Workshop 2019, 12 Jul. 2019, Chateau de Cadarache

Ruiyong Chen. "Utilizing ionic liquids for redox flow batteries", Bunsentagung 2019, 1 Jun. 2019, Friedrich-Schiller-Universität, Jena

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Poster Presentations

Leon Abelmann, Alveena Mir, Xabi Murgia, Claus-Michael Lehr, and Nuriye Korkmaz. "Magneto-tactic bacteria as model system for steerable self-propelled targeted drug delivery across biological barriers", HIPS Symposium 2019, 26-27 Jun. 2019, Universität des Saarlandes, Saarbrücken

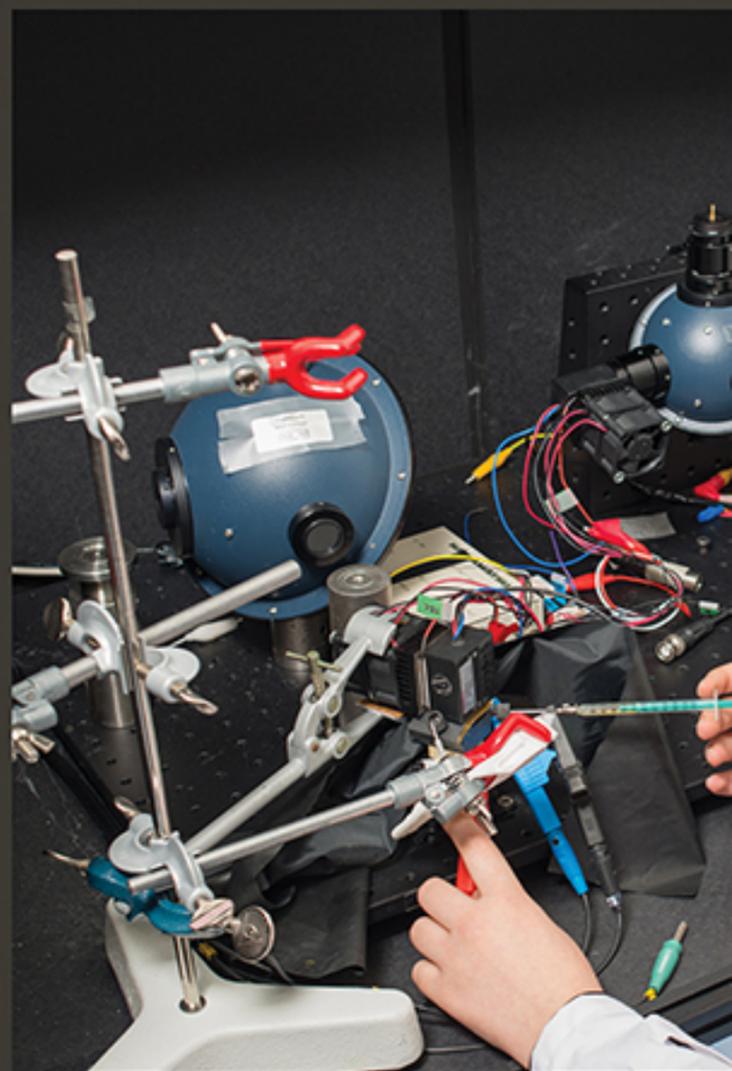
Zhifeng Huang, Rolf Hempelmann, and Ruiyong Chen. "Aqueous electrolyte with concurrent electrochemical and temperature stability window for redox flow battery", Bunsentagung 2019, 30 May - 1 Jun. 2019, Friedrich-Schiller-Universität, Jena

Nuriye Korkmaz, Kim Kristin Kessler, Lisann Müller, Changhyun Hwang, and Yuliya E. Silina. "Engineered filamentous bacteriophages for selective metal ion binding", NanoTR-15, 3-6 Nov. 2019, Kervansaray Lara Convention Center & Resort Hotel, Antalya

Miguel Solsona, Hans Keizer, Hans L. de Boer, Wouter Olthuis, Leon Abelmann, and Albert van den Berg. "THE MAGNUS FORCE ON SPINNING MICROPARTICLES", MicroTAS 2019, 27-31 Oct. 2019, Congress Center Basel

Proceedings

Miguel Solsona, Hans Keizer, Hans L. de Boer, Wouter Olthuis, Leon Abelmann, and Albert van den Berg. "THE MAGNUS FORCE ON SPINNING MICROPARTICLES", MicroTAS 2019





Sensors and Actuators B : Chemical

Volume 288, 1 June 2019, Pages 678-682

Precise definition of starting time by capillary-based chemical initiation of digital isothermal DNA amplification

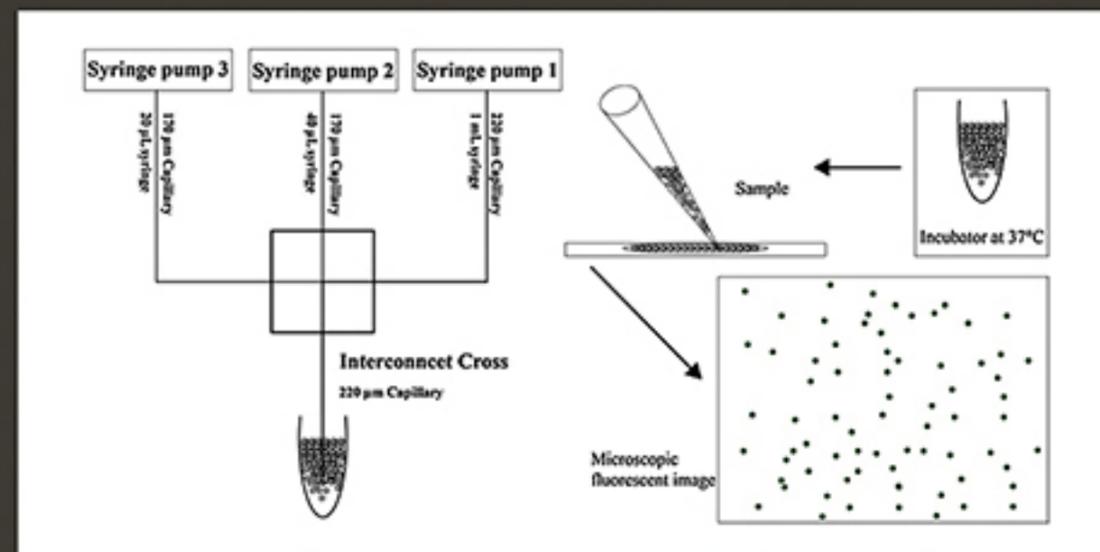
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Abstract

Digital polymerase chain reaction is a sensitive and reproducible method to assess the presence or absence of the amplification of individual target molecules confined in isolated compartments; this is used for the quantification of nucleic acids. In this paper, the precise definition of the start time of recombinase polymerase amplification (RPA) is proposed to achieve the digital quantification of nucleic acids at the single molecule level. RPA is a sequence-specific isothermal amplification method. Since the reaction will start immediately albeit slowly at room temperature following the addition of the chemical initiator (magnesium acetate), the number of false positives in digital RPA is increased if all reagents are mixed prior to compartmentalization. A capillary-based setup is described here to control the initiation of RPA reactions by encapsulating the chemical initiator to each reaction compartment using shear force when passed through a cross connector. Thousands of independent compartments are generated. The performance of digital droplet RPA (ddRPA) was validated by counting the positive application results of target molecules (Avian virus DNA) confined in the partitions. The ddRPA capillary-based setup provides a simple nucleic acid quantification method without thermal cycling. Potential applications in clinical and academic research under resource-limited settings can be envisaged. The ability to initiate chemical reaction compartments by the encapsulation of a chemical initiator using similar capillaries can be applied to a broader range of applications.



ADVANCED MATERIALS INTERFACES

First published: 18 July 2019

A thermodynamic description of turbulence as a source of stochastic kinetic energy for 3D self-assembly

P.A. Löthman^{1, 2}, T.A.G. Hageman^{1, 2}, M.C. Elwenspoek², G.J.M. Krijnen², M. Mastrangeli³, A. Manz¹, and L. Abelmänn^{1, 2}

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² University of Twente, Enschede, The Netherlands
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 * These authors contributed equally to this work.

Abstract

The extent to which one can use a thermodynamic description of turbulent flow as a source of stochastic kinetic energy for 3D self-assembly of magnetically interacting macroscopic particles is investigated. It is confirmed that the speed of the objects in the flow field generated in this system obeys the Maxwell-Boltzmann distribution, and their random walk can be defined by a diffusion coefficient following from the Einstein relation. However, it is discovered that the analogy with Brownian dynamics breaks down when considering the directional components of the velocity. For the vectorial components, neither the equipartition theorem nor the Einstein relation is obeyed. Moreover, the kinetic energy estimated from the random walk of individual objects is one order of magnitude higher than the value estimated from Boltzmann statistics on the interaction between two spheres with embedded magnets. These results show that introducing stochastic kinetic energy into a self-assembly process by means of turbulent flow can to a great extent be described by standard thermodynamic theory, but anisotropies and the specific nature of the interactions need to be taken into account.

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ENERGY

Volume 172, 1 April 2019, Pages 26-35

Optimization of local porosity in the electrode as an advanced channel for all-vanadium redox flow battery

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^b KIST Europe, Korea Institute of Science and Technology, Campus E71, Saarbrücken 66123, Germany
^c School of Mechanical Engineering, Chung-Ang University, Seoul 06974, South Korea

Abstract

Experimental and numerical studies have been carried out to improve the flow distribution by optimizing the local porosity of the electrodes of the all-vanadium redox flow batteries (VFBs) to increase the energy efficiency at high current density. We control the local porosity by inserting extra layer of electrode at inlet and outlet, and the flow field of electrolyte is analyzed numerically. First, the flow field of electrolyte is analyzed numerically to understand distribution of electrolyte in the electrode. Then, the charge and discharge curve is analyzed to understand the effect of local porosity of electrode on the energy efficiency. At 50-mA/cm², the energy efficiency is the highest when using electrode with uniform porosity. At 150-mA/cm², however, the energy efficiency of the cell using the electrode with low porosity at inlet is similar to that using the uniform electrode which is 66.6%. Lastly, we suggest an empirical equation for optimal local porosity distribution of the electrode according to current density. Using the empirical equation, we can increase the energy efficiency of the cell to 67.7% at 150-mA/cm². This study shows the possibility of increase of the energy efficiency of VFBs by controlling local porosity of the electrode.

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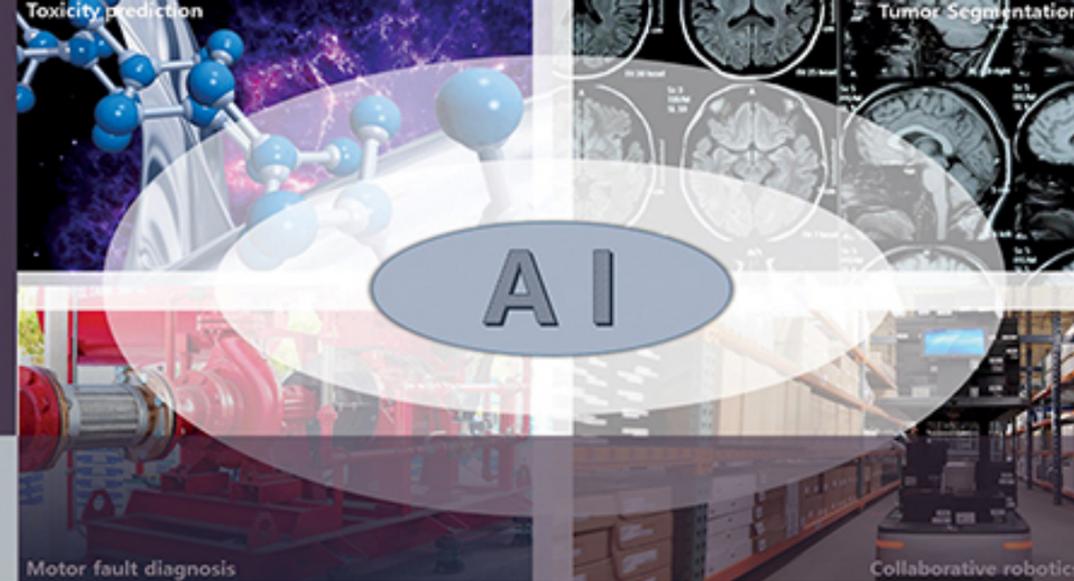
SMART CONVERGENCE



Dr. Yong Oh LEE

Group Leader

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Objectives

The Smart Convergence group is pursuing the improvement of efficiency and effectiveness of model-based prediction methods using artificial intelligence (AI) in various engineering fields. Our research ranges from scientific studies to practical applications, where AI is not widely applied, but has the potential to enhance the performance.

R&D Fields

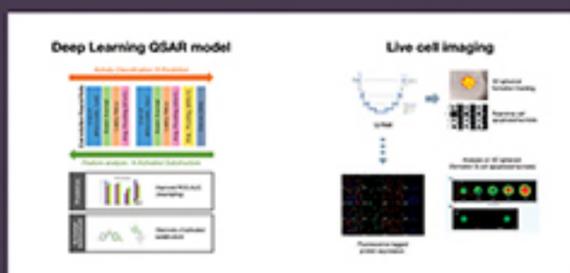
Deep Learning Applications

- Toxicity prediction: QSAR and behavior patterns in Alternatives to Animal Testing (AAT)
- Cell and medical image segmentation
- Motor faults diagnosis and prognosis
- Worker's intensity recognition in the collaborative robotics

Data augmentation in data imbalance

- Generative Adversarial Networks (GANs) for the minority class augmentation
- Feature augmentation with interpretable machine learning

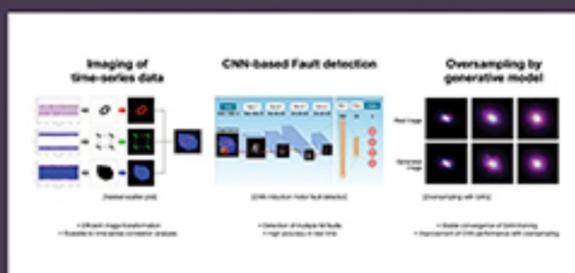
1 AI in Bioinformatics



Computational Toxicology

- Deep learning QSAR model (improved ROC-AUC with balanced sensitivity and specificity)
- Discovery of structure alert with interpretable feature maps

2 AI in Smart Factory



Development of fault detection and diagnosis for induction motor by using deep learning

- Imaging method for the correlation of time series data (e.g., current, vibration)
- Convolutional Neural Networks (CNN)-based induction fault detection
- Oversampling by Generative model for data imbalance

Achievements 2019

Journals

Sungho Suh, Haebom Lee, Jun Jo, Paul Lukowicz, and Yong Oh Lee. "Generative oversampling method for imbalanced data on bearing fault detection and diagnosis." *Applied Sciences* 9.4 (2019): 746.
Web of Science Core Collection: SCIE **2018 JIF: 2.217**

Oral Presentations

Yunmin Cho. "Automated Inspection of Printed Labels Using Real-Time Object Detection", KCC 2019, 26-28 Jun. 2019, International Convention Center Jeju

Marco Hüster. "Industrial Intelligence and Predictive Maintenance", Industrie 4.0 IBM Unplugged 2019, 3-5 Jun. 2019, Berlin

Jongwoon Hwang. "The future of manufacturing", Horizon Europe & the world, 5 Feb. 2019, ING-MARNIX, Brussels

Jongwoon Hwang. "Industry 4.0 & KIST Europe", Hannover Messe 2019, 1-5 Apr. 2019, Messegelände Hannover

Jongwoon Hwang. "Open Innovation - Overview, Success Story & Suggestion", KEIT Open Forum at EKC 2019, 18 Jul. 2019, Wirtschaftsuniversität Wien

Yong Oh Lee. "Generative Adversarial Networks for Oversampling on Data-driven Fault Diagnosis", PHM Korea 2019, 12 Apr. 2019, Le Méridien Seoul

Yong Oh Lee. "5α-reductase inhibitor classification model development based on machine learning and deep learning algorithms", EKC 2019, 18 Jul. 2019, Wirtschaftsuniversität Wien

Chanhee Park. "Deep Learning Based Fault Diagnosis of Bearing in Mechanical Systems with Nested Scatter Plot using Stator Current Signals", EKC 2019, 18 Jul. 2019, Wirtschaftsuniversität Wien

using Stator Current Signals", EKC 2019, 18 Jul. 2019, Wirtschaftsuniversität Wien

Proceedings

Sungho Suh, Haebom Lee, Yong Oh Lee, Paul Lukowicz, and Jongwoon Hwang. "ROBUST SHIPPING LABEL RECOGNITION AND VALIDATION FOR LOGISTICS BY USING DEEP NEURAL NETWORKS", ICIP 2019

Yong Oh Lee, and Young Jun Kim. "Convolution neural networks for training the unbalanced toxicity assessment data and analyzing chemical functional group", EuroTOX 2019

Chanhee Park. "Fault Diagnosis of Rotating Machines with Overlaid Distribution Image", Korea Society of Mechanical Engineers Annual Conference 2019



Generative Oversampling Method for Imbalanced Data on Bearing Fault Detection and Diagnosis

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²Department of Computer Science, TU Kaiserslautern, 67663 Kaiserslautern, Germany; paul.lukowicz@cs.uni-kl.de (P.L.)
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 †These authors contributed equally to this work.

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Abstract

In this study, we developed a novel data-driven fault detection and diagnosis (FDD) method for bearing faults in induction motors where the fault condition data are imbalanced. First, we propose a bearing fault detector based on convolutional neural networks (CNN), in which the vibration signals from a test bench are used as inputs after an image transformation procedure. Experimental results demonstrate that the proposed classifier for FDD performs well (accuracy of 88% to 99%) even when the volume of normal and fault condition data is imbalanced (imbalance ratio varies from 20:1 to 200:1). Additionally, our generative model reduces the level of data imbalance by oversampling. The results improve the accuracy of FDD (by up to 99%) when a severe imbalance ratio (200:1) is assumed.

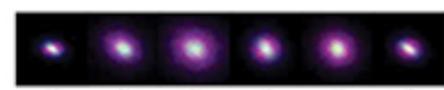


Figure 7 Images of bearing fault data. (a) Contaminant, (b) outer high, (c) outer medium, (d) outer low, (e) inner high, and (f) inner medium.

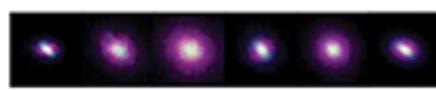


Figure 10 Generated images of bearing fault data using the Wasserstein generative adversarial networks with gradient penalty on the DCGAN architecture model (DCWGAN-GP). (a) Contaminant, (b) outer high, (c) outer medium, (d) outer low, (e) inner high, and (f) inner medium.

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Robust Shipping Label Recognition and Validation for Logistics by Using Deep Neural Networks

Sungho Suh ; Haebom Lee ; Yong Oh Lee ; Paul Lukowicz ; Jongwoon Hwang

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² Department of Computer Science, TU Kaiserslautern, 67663 Kaiserslautern, Germany
³ German Research Center for Artificial Intelligence (DFKI), 67663 Kaiserslautern, Germany

Abstract

Shipping labels are widely used in logistics. It is important to ensure the quality of printing label and to verify contents of the shipping label on the package. We developed a verification and recognition method for various types of shipping labels by using deep neural networks. The experimental results showed 96% recognition accuracy in rotation-invariant conditions. Also, we introduce Google Maps API for validating the address which can reduce the cost of returning packages due to the invalid address. To train and evaluate the method, we have generated and collected 25 different types of shipping label dataset. We plan to release the dataset on our website.

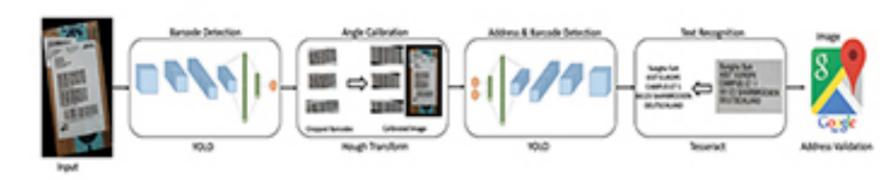
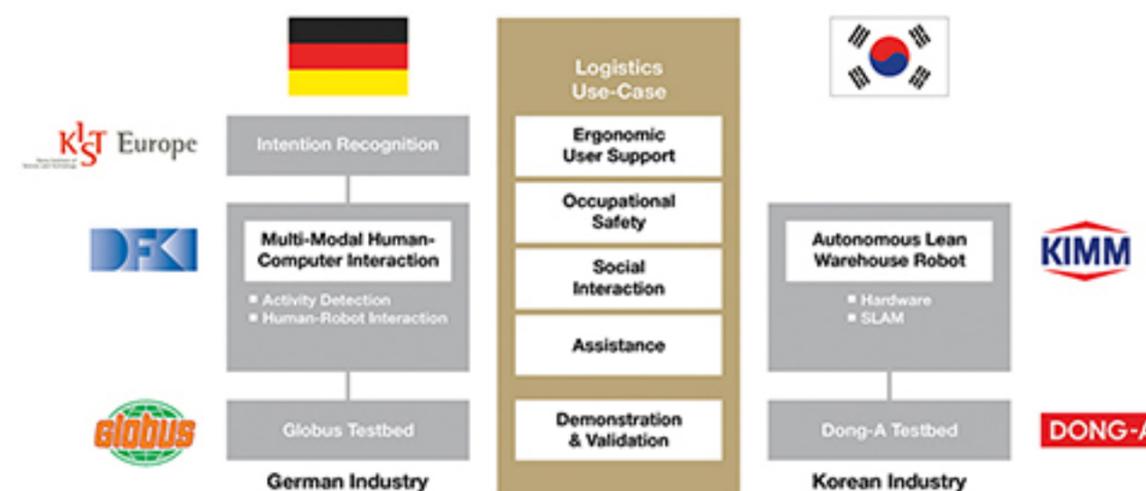


Figure 1 System overview

© [2019] IEEE. Reprinted, with permission, from [Robust Shipping Label Recognition and Validation for Logistics by Using Deep Neural Networks, 2019 IEEE International Conference on Image Processing (ICIP)]

SOUTH KOREA-GERMANY JOINT PROJECT WALL-ET: WAREHOUSE AUTONOMOUS LEAN LOGISTICS ENTITY FOR TRANSPORTATION

The project of WALL-ET is aiming to develop a friendly transport robot, which can be used in the domains of Industry 4.0 as well as future retail. The robot will be able to assist workers in a warehouse and customers in a supermarket. KIMM will develop a robot, designed to safely avoid collisions with users and equipped with a height-adjustable table to support ergonomic loading and unloading together with users. KIST Europe will develop modules for advanced intention recognition, which will be used to recognize the intentions of a human, in order to support them. DKFI will develop solutions for human-to-machine communication integrating speech, gestures, facial expressions, etc. This allows both, customers and employees, to interact with the robot and to establish an effective human-robot collaboration. The complete system will be specified, deployed and tested on site together with the industrial partner Dong-A P&T and the German retailer Globus.



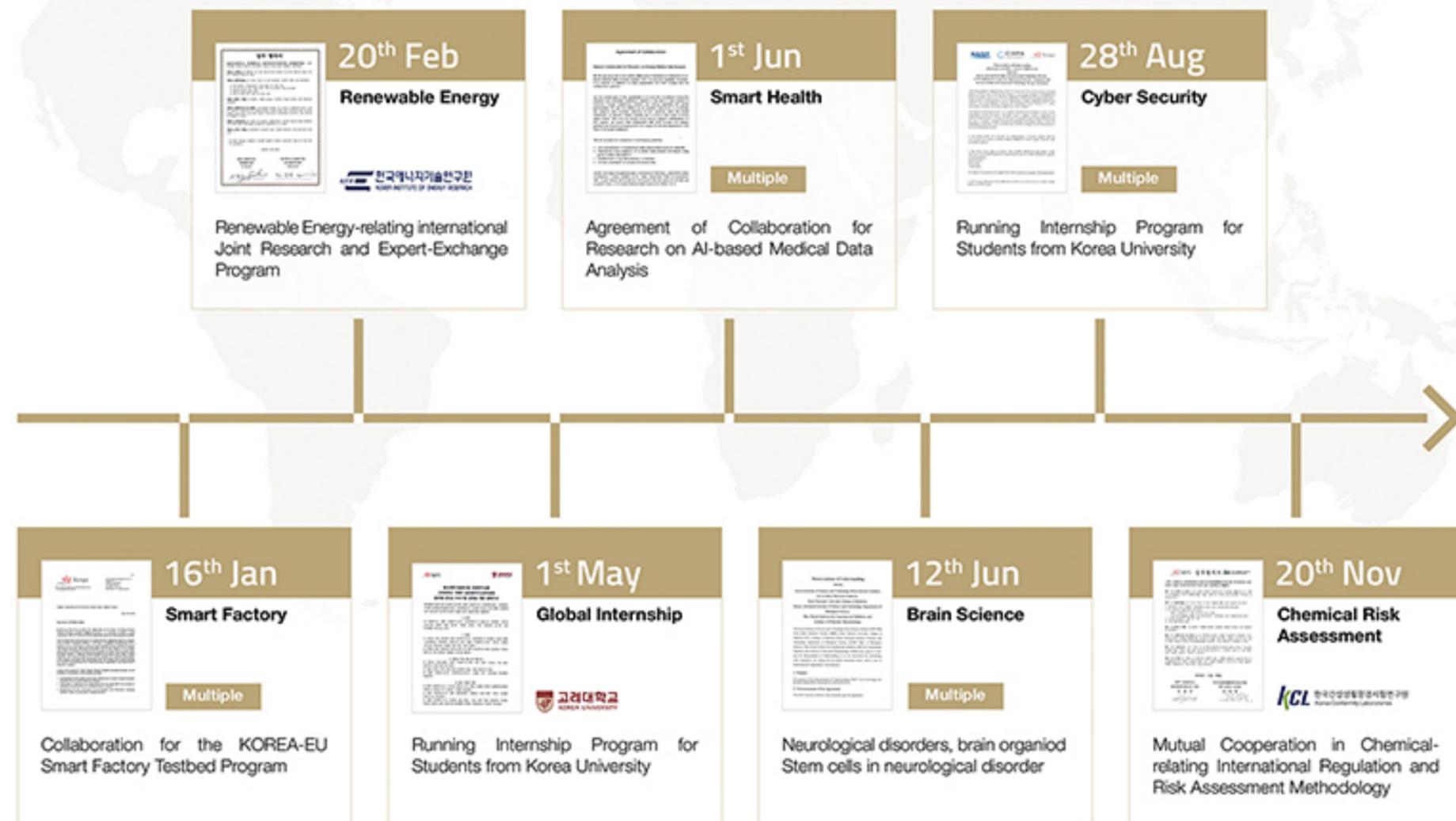
SMARTFACTORYKL AT HMI 2019 AI-BASED PREDICTIVE ANALYTICS

The Smart Convergence Group of the KIST Europe has been a member of the SmartFactory KL Consortium hosted by the German Institute of Artificial Intelligence (DFKI) since 2016. In the HMI2020, SmartFactory KL Consortium showed various use-cases on modular production lines with each member's expertise, and KIST Europe exhibited AI-based real-time facility status analysis technology in collaboration with IBM and Mettler Toledo. For Mettler Toledo's Industrial weighing facility, IBM Watson cloud and machine learning servers are utilized to collect and process data, such as time, vibration (bandwidth and amplitude), stable positioning time and weight, to diagnose the current condition based on convolutional neural networks model, and to predict the failure. The developed technology has the advantage in applicability to real time facility monitoring system through fast learning and data processing. Also, it showed high reliability with 99.2 of prediction accuracy.





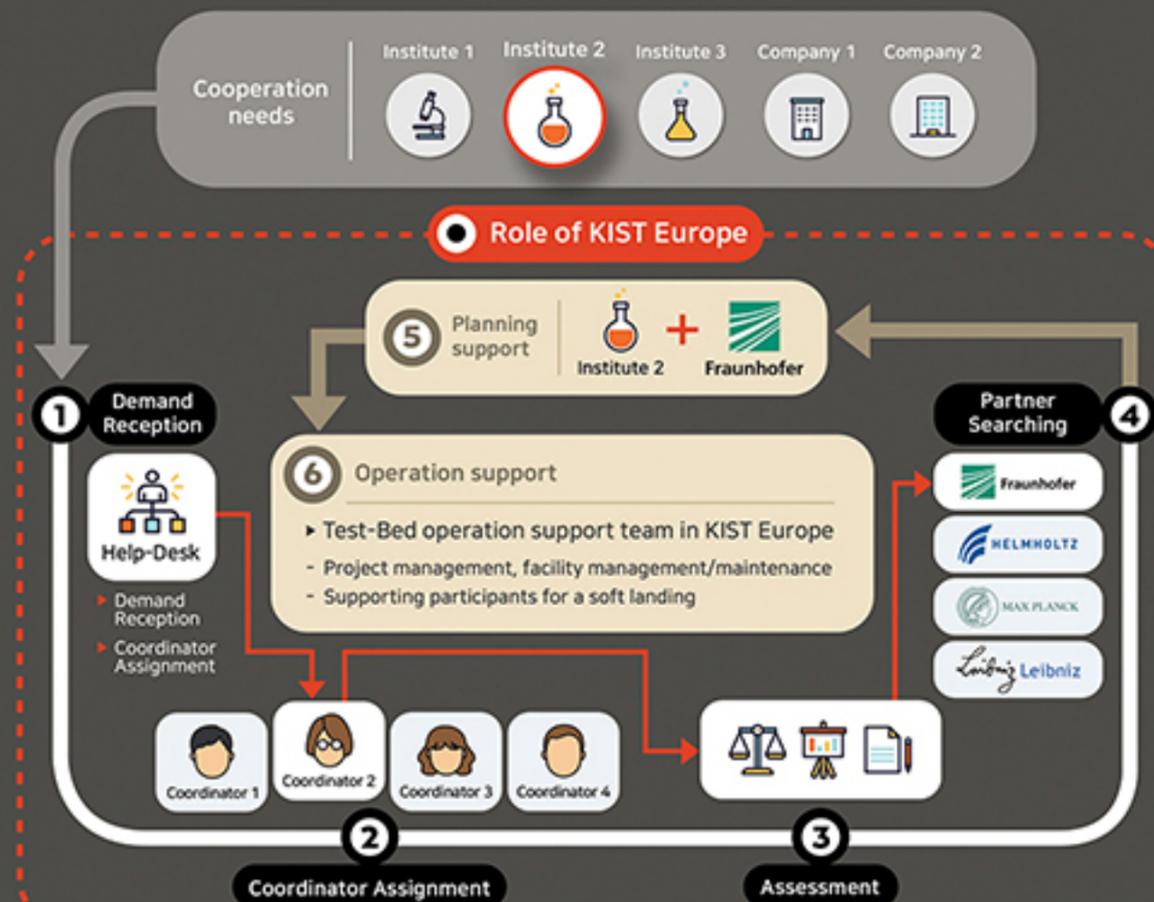
Cooperation Agreements



Cooperation Platform

Open R&D Platform, KIST Europe Korea-EU R&D Cooperation Initiative

Supporting process of Cooperation Initiative



Definition of Cooperation Initiative

- Platform for the on-site feasibility research on topics with high demand in Korea and Countries in the EU
- Researchers from both countries could participate in this research with the support of the infrastructure at KIST Europe

Category of Cooperation Initiative

- 1 in KIST Europe** (Role of KIST Europe: Infra-Sharing)
- 2 by KIST Europe** (Role of KIST Europe: Partner-Searching)
- 3 with KIST Europe** (Role of KIST Europe: Joint-Research)

Contact Point

Global Cooperation Department
Dr. Jeongho Seo
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j.seo@kist-europe.de

1 Cooperation in Smart Factory

■ **Topic** Collaboration for the Korea-EU Smart Factory Test-bed Program

■ **Cooperation Agreement** MoU at 16th Jan 2019

■ **Participants** 8 Organizations

Korean Side	European Side
KIST Europe	DFKI (Ger)
ETRI	CIIRC CTU (Cze)
KIMM	CVUT (Cze)
KITECH	ZeMA (Ger)

Activities for communication

- International workshop for Korea-EU Smart Factory Test-Bed planning on collaborative robotics
- Date/Place : 29th May 2019 / KIST Europe



2 Supporting for Collaboration in Brain Science

■ **Topic** Neurological disorders, stem cells in neurological disorder, brain organiod

■ **Cooperation Agreement** MoU at 19th Jun 2019

■ **Participants** 6 Organizations

Korean Side	European Side
KIST	MPI (Ger)
KBRI	IMBA (Aus)
Seoul National University	
KAIST	

Activities for communication

- International workshop for discussion and review of cooperation area in computational neuroscience and stem cell based cure
- Date/Place : 18th Jul 2019 / Vienna, Austria





3 Cooperation in Smart Healthcare

■ **Topic** Research collaboration on AI-based medical data analysis

■ **Cooperation Agreement**
MoU at 14th Jun 2019 / Saarland University

■ **Participants** 5 Partners

Korean Side	European Side
KIST Europe	Saarland University (Ger)
KIST	
Ajou University	
Yonsei University	

Activities for communication

- International workshop for cooperation in diagnosis method of Wilms Tumor based-on AI
- Date/Place : 14th Jun 2019 / Saarland University



MoU Ceremony for the international cooperation in the field of Cyber Security

Date: 28. Aug 2019
Place: Conference Room, KIST Europe



4 Facilitating of Collaboration in Cyber Security

■ **Topic** System Security, Web Security, Cryptography

■ **Cooperation Agreement** MoU at 28th Aug 2019 / CISPA

■ **Participants** 3 Partners

Korean Side	European Side
KAIST	CISPA (Ger)
KIST Europe	

Activities for communication

- International workshop for discussion and review of cooperation areas in cyber and software security
- Date/Place : 28th Aug 2019 / Saarbrücken

1 Co-Hosting of Korea-Eu Innovation Program

Date/Place 2nd - 12th Jul 2019 / Belgium, Luxembourg, and Germany

Co-Hosting Institute



KIRD

Korea Institute of Human Resources Development in Science and Technology



KIST Europe



KEREC

Korea-EU Research Centre

Topic European Case Study on R&D Cooperation for developing local economy in Korea

- Collaborations between industry, universities and research organizations

Participants

20 Persons working in policy and strategy fields at government



Visited Institutes

In Germany

- German University of Administrative Sciences Speyer
- Karlsruhe Institute of Technology
- KIST Europe
- Science Park at Saarland University
- DFKI (German Research Center for Artificial Intelligence)
- AWSi (August-Wilhelm Scheer Institut)
- Office for Environmental Protection Stuttgart
- Heidelberg University
- Allianz Industrie 4.0
- Steinbeis Foundation

In Belgium

- Vlaams Instituut voor Biotechnologie
- KEREC

In Luxembourg

- Luxinnovation



2 Participation in the EKC 2019

Date/Place 15th - 19th Jul 2019 / Vienna, Austria

Main Organiser

KOSEAA
(Korean Scientists and Engineers Association in Austria)

Topic

- Science, Technology and Humanity; Advancement and sustainability
- Development of friendships among Korean scientists in Europe

Activities Operation of the publicity booth with KIST, Open & Close Session

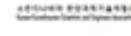
Participants

Approx. 700 scientists

Main Organiser



Co-organiser



3 Participation in the KEMST Forum in Poland

Date/Place 20th - 22nd Sep 2019 / Warsaw, Poland

Topic

- Expert Discussion on Material and Source Proprietary Technology
- Current R&D Trend of Carbon Material Highly Sensitive and Selective Molecular Sensing with Modified Mesoporous Silica
- KEMST: Korean Expert Community on Material Science and Technology in Europe





Source : SFB 1027, University of Saarland

1 Participation in Cell Physics Conference at Saarland University

- Date/Place** 9th-11th Oct 2019 / Saarbrücken, Germany
- Topic**
 - Cell Mechanis & Mechanobiology
 - Cytoskeleton
 - Cellular Self-Organization
 - Cell Adhesion
 - Cell Membrane & Membrane Proteins
 - Cancer & Immune Response
- Activities**
 - Poster Presentation and Introduction of KIST Europe



2 Participation in Global Renewable Energy Forum

- Date/Place** 21st Nov 2019 / Bonn, Germany
- Topic** Renewable Energy Policies and Hydrogen Energy
- Organizers and Partners**



1 Industrial Support for entry into the european market



- Daegu Chamber of commerce and industry**
- Date/Place** 20th May 2019 / Saarbrücken, Germany
- Topic**
 - Introduction on KIST Europe's role and gwSaar (Saarland Economic Promotion Corporation)
 - Consulting on cooperative business with German industries
 - Participants : 14

Ulsan Chamber of commerce and industry

- Date/Place** 21st May 2019 / Saarbrücken, Germany
- Topic**
 - Supporting for Korean Start-up companies at Start-up Pitch Festival
 - Consulting on Technological Collaboration and networking with EU
 - Participants : 10

2 Participation in 2019 VeKNI Annual Committee

- Date/Place** 5th - 6th Oct 2019 / Essen, Germany
- Activities**
 - Introduction of KIST Europe's research areas and Global Test-Bed Platform
 - Participation in the 2019 Fall Conference
 - Scholarship awarding
 - Networking with Korean researchers in Germany



3 Hosting of the 1st Korea-German Environmental Policy Workshop

- Date/Place** 16th Dec 2019 / Saarbrücken, Germany
- Topic** Policy & Technology for Climate Protection in European Union and Korea
- Co-Host Organization** Korean Embassy in Bonn



1 Cooperative talk with delegation from Indonesian government

- **Date/Place** 27th Jul 2019 / Saarbrücken, Germany
- **Topic**
Introduction on KIST Europe and collaborative works with German government
- **Participants** 36

2 In-Cosmetic Workshop

- **Date/Place** 3rd Apr 2019 / Paris, France
- **Topic**
 - Consulting on EU REACH and BPR regulations at Korean global companies
 - Introduction about risk assessment of chemical mixtures



3 Running of Help-Desk for REACH/BPR

- **Date/Place** 3rd Jul 2019 / Ilsan, Korea
- **Topic**
Consulting on Nanosafety Technology to Korean cosmetic and ingredient manufacturers
- **Activities** Operation of a publicity booth with KIST

4 Others

■ **UST* Graduation** (University of Science and Technology, Korea)

■ **Date/Place** 30th Jan 2019



Name (Degree) : Hyun Ah Kwon (Master)
Major : Energy & Environment Technology
Thesis : Deriving ecotoxicity data of pentachlorophenol with *Daphnia magna* by solvent spiking and passive dosing

■ **Date/Place** 4th Sep 2019



Name(Degree) : Yohan Seol (Master)
Major : Energy & Environment Technology
Thesis : Assessment of the oxidative and reproductive effects of mono(2-ethylhexyl) phthalate on *Daphnia magna*

Global Internship Program on MOU

From Korean Universities	Korea University Kyunghee University Hanyang University
From European Universities	ESCOM (France)
Students on individual Interview/Contact level	Seoul National University KAIST Keimyung University Ehwa Womans University The University of British Columbia (Canada)



Support for Kyunghee University Summer School

- **Date/Place** 2nd Jul 2019 / Saarbrücken, Germany
- **Topic** Introduction on KIST Europe and its role in Germany



Overview

Total Number of Guests
-
233



Public Office	69
Public Institution	67
Korean University	25
Foreign University	19
Industry	23
NGO	2
Others	28



Environmental Safety Group	24
Biosensor & Material Group	12
Smart Convergence Group	35
KIST Europe	162

Visit of the delegation from the Korean Embassy in Bonn, Germany

- Date/Place** 7th ~ 8th Feb 2019 / Saarbrücken, Germany
- Delegation** Korean Embassy in Bonn : Mr. Doo Young Lee (Consul General)
Dr. Jin Hyung Kim (Science Attaché)
- Schedule**
7th Feb Visiting state government of Saarland (Head of the State Chancellery)
8th Feb City hall (Mayor of Saarbrücken), KIST Europe
- Purpose** Promoting future research cooperation between Germany and Korea in field of the 4th Industrial revolution



Visit of the Chairperson at National Research Council of Science & Technology (NST)

- Date/Place** 15th Nov 2019 / KIST Europe, Saarbrücken
- Delegation**
- NST : Prof. Kwangyun Wohn (Chairperson),
Mr. Youngun Jung (International Cooperation Team)
- Purpose** Report on KIST Europe's current research & management plan
- Prof. Dr. Kwangyun Wohn**
+ Chairperson at National Research Council of Science & Technology (NST)
+ Professor at Korea Advanced Institute of Science and Technology (KAIST)



Visit of the congressman from German Federal Government

- Date/Place** 7th Mar 2019 / KIST Europe, Saarbrücken
- Purpose** Discussion on utilization of collaborative activities between Korea and Germany on the parliamentary level
- Thomas Lutze**
+ Member of the party 'Die Linke' at the Federal Parliament in Berlin
+ German-Korean Parliamentary Group



Imprint



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