I am delighted to release the sixth issue of Yonsei Research Magazine, which introduces Yonsei University’s outstanding researchers and their achievements to the world.

When it comes to the challenge of changing the paradigm of global collaborative and converged research, Korean universities are no exception to the COVID-19 pandemic that has taken the world by storm and has left universities worldwide in a state of confusion. Yonsei University is responding to this challenge by writing a new chapter in convergence research by new modes of communication and sharing ideas among its constituents while maintaining its research focus. In 2021, we focused on strengthening the capacities of our research teams through the Yonsei signature research cluster program, clustering, and concentrating their research capabilities to develop them as global leaders in their fields.

Yonsei’s research community continues to expand. During the pandemic, the Yonsei Frontier Lab expanded its role as a research collaboration hub between Yonsei and the world’s researchers, resulting in a significant increase in video conferences and webinars with international institutions. As a result, the percentage of international collaboration in Yonsei University’s research projects increased by 40%, the highest among Korean universities.

Further, the consistent support for research capacity development is bearing fruit. Yonsei has taken 450 billion KRW (380 million USD) in R&D projects and owns about 4,500 valid patents registered domestically and/or internationally as of 2020. Yonsei’s faculty and research teams have published more than 7,000 high-impact findings in prestigious journals. We have also established the Graduate School of Artificial Intelligence to pioneer cutting-edge research for the future, won the bid to host K-NIBRT on our campus to train the world’s best bioprocessing researchers, and are pursuing the goal of becoming the third location outside of the United States, after Germany and Japan, to host an IBM quantum computing data center, all as part of our ongoing effort to enrich Yonsei’s research ecosystem.

It gives me immense pleasure to introduce the significant achievements and social contributions of Yonsei researchers through the Yonsei Research Magazine. I hope that the high-impact research achievements highlighted in the magazine will inspire even more researchers worldwide.

Thank you so much.

Seoung Hwan Suh
19th President of Yonsei University
YONSEI HISTORY

Yonsei University was founded in 1885 by visionaries who recognized the value of education that transcends racial and national boundaries. The pure passion and dedication of Yonsei’s founders to nurture future leaders in the service of humanity live on to this day. Over the past 137 years, approximately 350,000 people have earned a degree at Yonsei University, contributing to the development of society in the spirit of truth and freedom.

1885. 04
Gwanghyewon, Korea’s first modern hospital, is founded as a royal hospital.

1886.03
Chejungwon opens as the first medical school in Korea.

1892. 05
Yonsei University celebrates its 100th anniversary.

1904.09
Through a donation from Mr. L. H. Severance, the hospital is reconstructed, and the medical college is finalized.

1907.03
Wonju Campus starts the first residential college in Korea.

1917. 04
Chosun Christian College is accredited as Yonhi College, a private institution. Humanities, Mathematics and Physics, Business, Agriculture and Theology are newly accredited.

1918.10
International Campus officially opens.

1919. 04
Yonsei Cancer Center is opened.

1921.06
Yonsei ranks 79th in QS World University Rankings 2021.

1957. 01
Yonsei University and Severance Medical College merge to become Yonsei University.

1959. 04
Korean Language Institute is established.

1957.01
Chosun Christian College is accredited as Yonhi College, a private institution. Humanities, Mathematics and Physics, Business, Agriculture and Theology are newly accredited.

1959.04
Institute for Global Engagement & Empowerment (IGEE) is founded.

1957.10
Wonju Campus (College of Health Science) is established.

1978.04
Yonsei University celebrates its 100th anniversary.

2007.03
Wonju Campus starts the first residential college in Korea.

2007.10
Residential College (RC) education begins at the international campus.

2011.03
Residential College (RC) education begins at the international campus.

2014.04
Yonsei Cancer Center is opened.

2017.09
Institute for Global Engagement & Empowerment (IGEE) is founded.

2019.04
The Yonsei signature research cluster team in the field of energy materials is led by Prof. Jooho Moon (Materials Science and Engineering) and comprises of Prof. Cheolmin Park (Materials Science and Engineering), Seong-Ju Hwang (Materials Science and Engineering), Jong Hyeok Park (Chemical and Biomolecular Engineering), Jong Hak Kim (Chemical and Biomolecular Engineering), Hyoung-il Kim (Civil and Environmental Engineering), and Dongho Kim (Chemistry). The team plans to develop a green hydrogen production method through a tandem PV-PEC (photovoltaic-photoelectrochemical) multifunctional solar station that harnesses PV-based water electrolysis technology. Renewable energy such as solar energy has always faced the technical barrier of temporal variability and spatial availability, and PV-based water electrolysis is a technology that can overcome that barrier.

The tandem PV-PEC solar station being developed by Prof. Moon and his team will be built with a photovoltaic device located outside the water, a photoelectrochemical device located inside the water, and a catalytic anode based on a nano hybridized bond structure. The objective is to increase the production of hydrogen and dramatically improve the decomposition of environmental pollutants by harnessing the superior light absorption efficiency and operational stability of PV and PEC cells and enhancing the catalytic activity of the hybrid nanomaterials. Since the PV-PEC water electrolysis method of hydrogen production through the solar station developed by Prof. Moon’s team uses solar energy to split water to get hydrogen, no pollutants are emitted and any environmental pollutants in the water is decomposed in the production process. Thus the project is expected to offer a fundamental solution to reaching carbon neutrality by 2050 and developing sustainable energy.

For the success of the team’s research, Prof. Moon and his team will pursue international collaboration and exchanges with world renown researchers such as Prof. Akihiko Kudo of Tokyo University of Science and Prof. David Tilley of the University of Zurich, as well as invite them as seminar speakers. The multifunctional solar station to be developed through such global research cooperation is expected to become the first ever platform for utilizing solar energy to induce diverse electrochemical reactions.
Climate Crisis research team led by Prof. Hyun Mee Kim (Atmospheric Sciences) 
“Climate Science Research to Understand, Diagnose, Predict, and Adapt to Climate Change and Crisis”

The climate crisis arising from climate change is a highly critical and urgent issue faced by the global community. Recent reports by the Intergovernmental Panel on Climate Change (IPCC) show that the earth’s surface temperature rose by approximately 0.99 °C on average from 2001 to 2020 compared to the pre-industrial age from 1850 to 1900. The IPCC predicts that if this trend continues, the 1.5°C-limit of increase from the pre-industrial level temperature, which was recommended by the Paris Agreement (2015), is likely to be reached between 2021 to 2040. To limit the temperature increase within the recommended level of the Paris Agreement, worldwide CO₂ emissions must be reduced by at least 45% by 2030 compared to 2010 levels. Realistically speaking, however, achieving this goal is a huge challenge due to the current global industrial structure.

Prof. Hyun Mee Kim and her research team aim to establish a foundation of climate science that will help us better understand, diagnose, and predict climate change and crisis by broadening the current understanding of this phenomenon and facilitating adaptation to climate change/crisis from the perspective of atmospheric and climate sciences. The team will conduct comprehensive research to connect diverse areas of atmospheric sciences to the study of climate change and crisis. Based on investigations of the various factors that influence the climate and their correlation to climate change and crisis, the team will work to enhance climate modeling so that uncertainties are lessened and accuracy is improved when diagnosing and predicting climate change and crisis. Another objective is to provide climate change and crisis information that is closely connected to everyday life by analyzing the correlations between urban and atmospheric pollution and climate change. To this end, Prof. Kim’s research team has brought on-board experts specializing in almost all areas of atmospheric sciences. By pursuing converged research on climate crisis from diverse perspectives, the team is expected to set an important milestone in addressing the challenge of climate crisis.

The Yonsei signature research cluster team in the field of Artificial Intelligence is called the Y-AI Group. Headed by Prof. Kwanghoon Sohn (Electrical and Electronic Engineering), the Y-AI Group is comprised of Hong-Goo Kang (Electrical and Electronic Engineering), Sung-Hoon Lee (Electrical and Electronic Engineering), Bum-Sub Ham (Electrical and Electronic Engineering), and Jin-Young Yeo (Artificial Intelligence). The Y-AI Group brings together experts in the field of Artificial Intelligence (AI) using video, voice/audio, and natural language signals as well as in the area of high-speed computing processes. Through this research cluster, existing literature on single signal-based AI technology will be integrated to concentrate on further research into multiple signal-based AI technology; with the ultimate goal of developing a multiple signal-based universal social AI system through the effective convergence of software and hardware. Y-AI is working in close collaboration with 18 universities from ten countries, including the University of Illinois at Urbana-Champaign and the University of Surrey, as well as global enterprises such as Google, Facebook, Microsoft, and Qualcomm. Based on this global network, the group plans to co-organize workshops and international symposiums for active academic exchanges. The first event in launching such efforts was the successful AI International Symposium on October 28, 2021 attended by invited speakers from Facebook and co-organized by Y-AI and the BK Y-BASE education research team in the school of Electrical and Electronic Engineering. Y-AI will continue to pursue international collaborative research in applying state-of-the-art AI technologies in the development of a multiple signal-based universal social AI system that is innovative yet practical, which will spearhead the globalization of Yonsei University’s AI research.

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Electronic Materials research team led by Prof. Seongil Im (Physics)
“Multi-Dimensional Nanomaterials for Next-Generation Electronics Device Applications”

The Yonsei signature research cluster team in the field of electronic materials is headed by Prof. Seongil Im (device physics) of the Physics Department and joined by Prof. KwanPyo Kim (nanostructure and interface analysis via physics probing), Keun Su Kim (electronic band structure manipulation), Jong Ho Cho (next-generation materials and device fabrications), and Jong Hyun Ahn (next-generation devices using ultra-thin semiconductors). Prof. Im’s team will be conducting research on “Multi-Dimensional Nanomaterials for Next-Generation Electronics and Devices.” The research objective is to intricately combine low-dimensional (0D, 1D, 2D) nanomaterials that have different functions and structures, and to induce their active interaction so that a new hybrid system for regulating new properties and functionalities can be systematically constructed. For the precise combination of nanomaterials and effective induction of their interactions, a variety of combinations of low-dimensional nanomaterials will be attempted based on a fundamental understanding of nanomaterial combination research such as manipulation of interfacial structures of nanomaterials, elimination of physical/electrical interface defects and the phenomena of self-assembly and epitaxy. Such efforts are expected to lead to the development of systems suitable for next-generation electronic device applications.

Details of the research are as follows:
(1) Investigation of the self-assembly phenomena through a precise probing on the self-assembly structures of various 2D materials, 0D atoms and molecules, and 1D organic materials
(2) Active manipulation and fundamental analysis of electronic structures strongly coupled between 2D materials and assembled interfacial structures
(3) Manipulation of the interface defects formed in the nano hybrid system and in-depth analysis of system-dependent changes in properties
(4) Fabrication and application of flexible and wearable devices based on ultra-thin film 2D semiconductor materials and their hybrid systems
(5) Fabrication of artificial synapses and development of biomimetic wearable applications utilizing the hybrid systems of 2D organic materials.

Medicine & Life Sciences research team led by Prof. Jihyun F. Kim (College of Life Science and Biotechnology) and Sun Ha Jee (Graduate School of Public Health)
“Discovering the Secrets of Oral-Gastrointestinal Microbiome Axes in Health and Gastric and Colorectal Cancers”

The Yonsei signature research cluster team in the field of Medicine and Life Sciences is a multi-disciplinary collaborative research team comprised of Prof. Jihyun F. Kim (principal investigator) and Joon Young Hong from the College of Life Science and Biotechnology, Prof. Sun Ha Jee (co-lead) from the Graduate School of Public Health, Prof. Yong Chan Lee and Tae Il Kim from the College of Medicine, Prof. Na Young Song from the College of Dentistry, and Prof. Hye Jin Kim from Severance Checkup Health Promotion Center.

Gastric and colorectal cancers are two of the most common cancers in Korea, with their incidence in 2020 ranking first and fourth, respectively. Imbalance in intestinal microbiomes and carcinogenic microbes, such as Helicobacter pylori and Fusobacterium nucleatum, are now considered to be the leading direct or indirect causes of gastrointestinal cancers. The research objective is to develop a predictive model for gastric and colorectal cancer that integrates clinical, genome, and microbiome data. Based on the results of a large-scale study on cancer prevention in Koreans (KCPS-II) conducted by the Graduate School of Public Health, the research team will analyze the clinical data of healthy individuals and cancer patients visiting the Severance Checkup Health Promotion Center and Yonsei Cancer Center as well as the correlations between genome-wide association studies and oral-gastrointestinal microbiome, which might discover new oncogenic mutations, cancer-causing bacteria, and carcinogenic metabolic pathways. The research will be particularly meaningful as it is the first attempt at an integrated analysis of genetic and oral-gastrointestinal microbiome axes information of cancer patients in Korea. Based on its results, the research will improve the overall understanding of the pathogenesis of gastric and colorectal cancers, which may enable the early diagnosis of cancer as well as individualized treatments to improve the prognosis of patients. By networking with leading local and international microbiome research institutions, the research is also expected to enhance international competitiveness in this field.
The Yonsei signature research cluster team in the field of public administration explores ways to innovate public administration through digital technology. The team uses gamification for research subjects to enjoy their participation, which helps in collecting relevant data. The team is composed of Prof. Jung Wook Lee, Yoon Jik Cho, Sounman Hong, Sangyub Ryu, and Nara Park from the Department of Public Administration, all of whom are active researchers in various fields, including performance management and organization, human resource management, public finance, e-government, and bureaucracy.

The team developed an interactive digital comic entitled *Coffee of the Day*, by which they are conducting a study on how the personal traits and experiences of people influence their ethical behaviors and strategic decision-making. The results of the subjects’ decision-making will be analyzed in connection to their personal disposition and organizational experience that was surveyed in advance. Based on the analysis, the team is expected to provide meaningful implications. Furthermore, data collection through digital gamification not only creates significant academic value but also opens the possibility for industry-academia cooperation in software development.

Following the development of the single-player game, the team successfully concluded their first year of research. Building on its previous developmental experience, the team plans to develop a multi-player decision-making game to investigate more sophisticated and complicated decision-making processes. The research tools developed through this project will provide people working in the public and non-profit sectors with opportunities to indirectly experience several issues likely to arise in their own organizations. The project is expected to not only shed light on elaborating processes involved in decision-making but also support the education and training of administrative staff.

In order to investigate as many diverse psychological health indicators and predictive factors as possible, Prof. Kim’s team is taking into account comparative cultural indicators through collaboration with Columbia University, University of Illinois at Urbana-Champaign, New York State Psychiatric Institute, and Maryland University. Such studies and comparative analyses of psychological health models in a wider social context can play an important role in elaborating large-scale data systems.

The objective of this research is developing integrated functional indicators regarding the multiple dimensions of psychological health. More concretely, the team aims to develop a predictive model and data platform for multi-dimensional psychological health risks to be used in preventive psychological measures for campus life. Through the data on psychological health collected over the recent years, a model for classification/prediction of risk groups in university student cohorts will be developed, and the model used to identify any signs of psychological health issues in individuals and contribute to their speedy recovery. In addition, since the research is taking place under the special circumstances created by the COVID-19 pandemic, the team expects to discover psychological and adaptive characteristics that are specific to the age of untact. It will be an opportunity for detailed studies of how to support the psychological health of individuals in the untact age and which factors make for the best prediction of their psychological health, adaptation and recovery. The research is expected to have much implications regarding individual psychological health in rapidly changing societies.
School of Business interdisciplinary research team led by Prof. Boram Do (School of Business) “Next Normal: Responding to the Changing Human-Digital Relationship and New Business Paradigm”

Communication research team led by Prof. Namkee Park (Communication) “The Role and Impact of Communication Technology in a Risk Society”

Prof. Namkee Park heads this research team, which brings together his colleagues in the Faculty of Communication that includes Prof.s Yong-Chan Kim, Sang-Yup Lee, Jiyeon So, Jarim Kim, and Hyunjin Song. Prof. Namkee Park examines the ethical issues that may arise from the interaction between users and agents of artificial intelligence, how such issues develop in a risk society, and how they can be resolved. Prof. Yong-Chan Kim conducts interviews for his research “Risk Society and Local Communication Infrastructure: Examining How Local Independent Bookstores Function as Media.” Prof.s Jiyeon So and Hyunjin Song developed guidelines for scale item reduction based on the Item Response Theory and simulation inference and examine how repeated exposure to news articles on climate change influences message processing. Prof. Sang-Yup Lee conducts research on how media coverage of vaccine side effects and the partisanship of newspapers influence media receivers. Prof. Lee also partners with Prof. Song to conduct a case study on fact-checking by partisan news media based on the theme “Effects of Fact-Checking and Perceived Bias.” Prof. Jarim Kim, using the concept of psychological distance, explores the factors that can facilitate effective GIS-based communication amidst the recent surge in the utilization of the geographically referenced information of GIS. Together, the team will be conducting studies that investigate the role of communication technology in building and advancing a healthy society in one filled with diverse risks as well as how its members can take advantage of communication technology to overcome and eliminate risks in their society. More specifically, the team will be drawing conclusions to answer the following questions: 1) How do people use social networking services, such as Facebook and Instagram, to create and maintain relationships with others despite risks caused by the pandemic? 2) How do people perceive strangers through social media in the midst of risks? and 3) What kind of impact do AI-based communication services have on people’s mental health and well-being in the midst of risks? By taking full advantage of emerging research methodologies from various theoretical perspectives, the researchers expect to determine outcomes that can answer the call of the times.

The School of Business interdisciplinary research team is comprised of Prof. Boram Do, Seung Hyun Kim, Youngsok Bang, Kyung Lee, Sue Ryung Chang, and Jeonghye Choi. The final goal of the team is to understand the digital transition and business ecosystem changes being accelerated by COVID-19, and to explore ways for businesses to efficiently create and distribute social and economic values in this new business paradigm.

The research revolves around the three main areas of business administration – (1) humans/consumers, (2) information systems, and (3) organization management – and is conducted by three different teams of researchers specializing in each area. Firstly, the ‘digital experience’ team of marketing researchers examines changes in consumer experience and behavior induced by new technologies. Secondly, the ‘big data technology convergence’ team of information system researchers explores and utilizes diverse forms of data that have recently become accessible in order to seek ways to converge such data technology with business systems. Lastly, the ‘smart work’ team of organizational behavior researchers analyzes changes in employee experience and behavior, with the aim of finding new methods for change management and social value creation in the digital era.

The research is planned to span five years, and its results might garner global interest since the acceleration of digital transformation due to COVID-19 is a worldwide phenomenon. Furthermore, in light of the relatively fast recovery of Korean businesses, the research team is expected to emerge as an academic leader in the global community as it moves towards the Next Normal.
Prof. Yoosik Youm (Sociology)
"A Multi-Disciplinary and Multi-Dimensional Approach to Korean Adolescent Well-Being: Genetics-Brain-Social Network"

Research team led by Prof. Yoosik Youm (Sociology) "A Multi-Disciplinary and Multi-Dimensional Approach to Korean Adolescent Well-Being: Genetics-Brain-Social Network"

The research team will be conducting a convergent study on adolescent well-being in Korea. The research objective is to collect longitudinal data on adolescent genetics-brain-social network with a multi-disciplinary and multi-dimensional approach to build the database of the Korean Study of Adolescent Health (KSAH).

The team will be collecting genetic data, brain data, and social network data based on saliva, magnetic resonance imaging, and real-name based survey, respectively. Once the KSAH database is built, it will be possible to adopt a multi-disciplinary and multi-dimensional approach that encompasses the genetics-brain-social network aspects of adolescence in studies regarding the well-being of Korean adolescents, whose average scores on the subjective well-being scale has been one of the lowest among OECD countries.

The research team plan to publish the findings in world’s most cited multi-disciplinary scientific journals, which will not only not only significantly contribute to the existing literature but also provide insights to the mental health issues of Korean adolescents.

Prof. Justin Y. Jeon
"Development and Validation of Generation-Specific Sports and Leisure Programs to Promote Health"

The research team in the field of Sport Industry Studies is composed of Justin Y. Jeon, specialized in Exercise medicine, Chul Won Lee, specialized in Exercise medicine, Jinmoos Hee, specialized in Senior sports, Yong Jin Yoon, specialized in sports counselling, Jiun Song Lee, specialized in Sports management and marketing, Soren Brage from Cambridge University (Distinguished Prof. in the Department of Sport Industry Studies, Yonsei University) and Sun Ha Jee from the Graduate School of Public Health, Yonsei University (Adjunct Prof. in the Department of Sport Industry Studies, Yonsei University).

The research team will be collecting longitudinal data on adolescent genetics-brain-social network with a multi-disciplinary and multi-dimensional approach to build the database of the Korean Study of Adolescent Health (KSAH).

The team’s research objective is to identify the correlations among exercise, physical activity, leisure and health using big data, develop physical activity/exercise/leisure programs tailored to Korean diseases and generations, and validate the effectiveness of such programs. The team will be following all freshmen admitted into a high school in Seoul for three years, starting from 2022 until they graduate. The team will be collecting genetic data, brain data, and social network data based on saliva, magnetic resonance imaging, and real-name based survey.

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The Yonsei signature research cluster team in the field of economics is headed by Prof. Sangyup Choi and comprised of Prof. Sang-Hyun Kim, Myungkyu Shim, Hee-Seung Yang, Soojin Jo, and Youjin Hahn, who all boast vast experience and prolific research in their respective fields.

In the current age marked by disruptive social changes and increasing uncertainty, there is a growing need for non-normative research that strives to understand various phenomena in the real world based on advanced research methodologies, including machine learning, and experiments using large data, which will ultimately contribute to policy-making. In line with this trend, Prof. Choi and his team aim to strengthen their capacity for innovative research to produce pioneering research outcomes that will contribute to inclusive policy-making.

Breaking away from standardized subdisciplines such as microeconomics, macroeconomics, and econometrics, Prof. Choi’s team pursues collaborative and interdisciplinary research with fellow researchers from diverse fields. As a reflection of current trends in the field of economics, the team encourages outstanding students of Yonsei University to actively participate as research assistants and co-authors, thus nurturing their research capabilities. With “uncertainty” as the keyword and considering the synergies that can be created when combined with existing research, the team has selected the following three core subjects for its research:

1. The impact of rising economic and political uncertainty across the globe on the macroeconomy and global financial market
2. The impact of uncertainty brought on by accelerated changes in social structures due to COVID-19 on education, healthcare, and labor markets
3. The impact of an uncertain future created by new technologies during the 4th Industrial Revolution on labor markets and industrial structures

To facilitate efficient research in the three areas above, all team members will rely on their experiences working as researchers in leading universities and institutes worldwide to continuously pursue active cooperation and collaborative research with renowned scholars. Thus, the team is expected to produce extensive and influential research results.
Yonsei University Has the Most Leading Researchers Selected for State Sponsorship in 2021

Five Yonsei researchers among the 0.3% selected to receive government funding

In 2021, Yonsei University produced the largest number of researchers to be part of the Sponsorship for Leading Researchers program organized by the Ministry of Science and ICT (MSIT). Sponsorship for Leading Researchers is a program that the Korean government has been managing consistently since the 1990s. The program selects the top 0.3% of researchers in Korea to provide state funding for their research. The MSIT assessed the international competitiveness of 66 shortlisted candidates, held discussions with them and heard their presentations before deciding on 14 leading researchers in various fields including Natural Science, Life Science, Pharmacology, Medicine, Engineering, and ICT Convergence. Five Yonsei researchers were picked as leading researchers for five research projects in three fields, making Yonsei University the top university in Korea in terms of the number of leading researchers selected for the program. The total funding amounts to 32.4 billion KRW (267 million USD).

The research projects selected for Sponsorship for Leading Researchers in 2021 are as follows.

Prof. Ho Jeong Kwon (Biotechnology) – interpretation of the molecular sociological function of organelle communication using small-molecule compounds

Prof. Ho Jeong Kwon’s team aims to propose a new paradigm for discovering the molecular sociological network within cells using small-molecule compounds capable of controlling protein structures and functions. The research plan is to ▲ find small-molecule compounds capable of building and regulating the organelle communication expressive screening system; ▲ discover the target protein or adjacent proteinome in the small-molecule compound and analyzing its location and function; and ▲ investigate the molecular mechanism of organelle communication disrupted by the small-molecule compound. Prof. Kwon’s research is expected to present an innovative paradigm for discovering the mechanism of molecular communication in living cells, contribute to the development of novel therapeutic drugs, and shed light on the mechanism of protein regulation.

Prof. Keun Su Kim (Physics) – research on band structure control

Prof. Keun Su Kim’s team is researching the electronic band structure of 2D quantum materials. By artificially inducing topological phase transition, examining the unique topological quantum state protected by crystal symmetry, and analyzing quantum many-bodies interactions and complex particles, the team aims to uncover the mechanism of quantum phase transitions. By measuring and controlling band structures to study quantum states from the perspective of electronic structures, Prof. Kim will be looking to expand the perceptual framework of Condensed Matter Physics and offer insights into the mechanism of future quantum elements.

Prof. Sunghoon Kim (College of Pharmacy) – research on amino acid receptors and signaling

Prof. Sunghoon Kim’s research team is working on discovering the existence, mechanism and functional importance of the protein complex that detects the level of amino acids in a cell and regulates protein synthesis, signaling and metabolism. The research plan is to ▲ map amino acid signaling through the multi synthetase complex(MSC); ▲ discover the amino acid detection mechanism of the aminocyl-tRNA synthetase(ARS) that make up MSC; and ▲ prove the pathophysiological importance of the MSC as an amino acid receptor. Through this research, Prof. Kim aims to be the first to demonstrate the actual existence of such a systemic function, thus offering important information for maintaining homeostasis in diverse amino acids.

Prof. Jooho Moon (Materials Science and Engineering) – research on spin-green hydrogen

Prof. Jooho Moon’s research team aims to break through the current limitation in the efficiency of the solar-to-hydrogen (STH) process through reform and surface treatment of microstructures at the micro and nano levels, and to increase STH efficiency by significantly reducing overvoltage caused by the generation of oxygen in the water splitting process. The research plan is to ▲ develop a control system based on chiral perovskite materials with moisture stability; and ▲ materialize and develop a spin-green hydrogen production system based on chiral-induced spin selectivity(CISS). Prof. Moon’s research is anticipated to contribute to the development and performance enhancement of next-generation spintronics and enable dramatic improvement in the efficiency of water electrolysis by breaking through the limitations of the current nano-level STH strategy.

Prof. Taehoon Hong (Architecture & Architectural Engineering) – development of NEW LEARN CITY 4.0, a self-learning-based integrated management platform for human-centric smart green cities

Prof. Taehoon Hong’s research team is working on building a smart green city model through the monitoring, analysis, evaluation and application of data collected in real time on the built environment and energy performance of a city and the effective management of such data. The research will proceed based on technologies for ▲ monitoring the built environment and energy performance centered around the residents of the city; ▲ performance evaluation; ▲ performance application; and ▲ performance integration. The research will move beyond architectural management to develop technologies for its convergence and integration with ICT and economics, thus proposing a new paradigm for future research.

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Prof. Jooho Moon (Materials Science and Engineering) – research on spin-green hydrogen

Prof. Jooho Moon’s research team aims to break through the current limitation in the efficiency of the solar-to-hydrogen (STH) process through reform and surface treatment of microstructures at the micro and nano levels, and to increase STH efficiency by significantly reducing overvoltage caused by the generation of oxygen in the water splitting process. The research plan is to ▲ develop a control system based on chiral perovskite materials with moisture stability; and ▲ materialize and develop a spin-green hydrogen production system based on chiral-induced spin selectivity(CISS). Prof. Moon’s research is anticipated to contribute to the development and performance enhancement of next-generation spintronics and enable dramatic improvement in the efficiency of water electrolysis by breaking through the limitations of the current nano-level STH strategy.

Prof. Taehoon Hong (Architecture & Architectural Engineering) – development of NEW LEARN CITY 4.0, a self-learning-based integrated management platform for human-centric smart green cities

Prof. Taehoon Hong’s research team is working on building a smart green city model through the monitoring, analysis, evaluation and application of data collected in real time on the built environment and energy performance of a city and the effective management of such data. The research will proceed based on technologies for ▲ monitoring the built environment and energy performance centered around the residents of the city; ▲ performance evaluation; ▲ performance application; and ▲ performance integration. The research will move beyond architectural management to develop technologies for its convergence and integration with ICT and economics, thus proposing a new paradigm for future research.
Development of Next-Gen Obstructive Sleep Apnea Diagnostics Based on Two-Step Advanced AI and Flow Dynamics Characteristics Designed by KFDA as Korea’s 11th Innovative Medical Device

Laon Sleep – Medical Image-Assisted Detection and Diagnosis Software with Greater Time and Cost Savings and Increased Accuracy and Convenience

Obstructive sleep apnea is a disorder in which the airway gets blocked during sleep, causing breathing to stop or slow down. It requires active testing and treatment, as obstructive sleep apnea patients are more likely to develop other more severe illnesses such as cardiovascular diseases. Polysomnography (PSG) is currently used to diagnose sleep apnea, but this is a time- and effort-consuming method as it requires the patient to stay asleep for at least six hours with several sensors attached to the body, thus causing great inconvenience. Furthermore, since the test is conducted in an exam room that is different from the patient’s usual sleeping environment, inaccuracy of test results is another concern. Thus, despite the suffering caused by snoring and lack of sound sleep, the inconvenience and high cost of existing diagnostics for obstructive sleep apnea have deterred active diagnosis and possibly further treatment.

Collaboration among Mechanical Engineering, Medicine, and Dentistry researchers leads to patented innovative technology. Prof. Joon Sang Lee (Mechanical Engineering) has been leading research with Prof. Hyung Ju Cho (College of Medicine) and Yoon Jung Choi/Hwi Dong Jung (College of Dentistry) to develop a new method for diagnosing obstructive sleep apnea that offers more convenience to the patient while enhancing accuracy. Years of collaboration between Prof. Lee’s team and Yonsei University Severance Hospital’s medical staff since 2018 finally bore fruit with the birth of an innovative technology that converged two methods – autonomous medical image segmentation and prediction of flow behavior in the airway. The technology was recognized for its excellence and originality and patented both domestically and overseas. It was transferred in January 2021 to Laon People Co. Ltd., a tech company specializing in AI, which worked with Prof. Lee’s research team in co-developing Laon Sleep, the next-generation diagnostic device for obstructive sleep apnea.

Laon Sleep diagnoses obstructive sleep apnea by automatically extracting data on the shape of the patient’s airway from CT images and analyzing the flow changes and biometric data according to the detected airway shape based on AI. Through this technology, the accuracy of obstructive sleep apnea diagnosis will be improved while dramatically reducing the required time and inconvenience to the patient.

Emerging as the next-gen medical software platform leader for sleep disorders in May 2021, the Ministry of Food and Drug Safety designated Laon Sleep, a next-generation obstructive sleep apnea diagnostic device, as Korea’s 11th innovative medical device. In designating a new AI device as an innovative medical device, the government considers whether it is expected to dramatically improve safety and application compared to existing devices or treatments through technological advancement, and also how technology-intensive and open to rapid innovation it is. Laon Sleep was designated in recognition of its high technology intensity and potential for real social and economic impact.

Laon Sleep is expected to offer significant benefits to patients in terms of convenience and medical cost savings by simplifying procedures and greatly reducing the time taken for diagnosis of obstructive sleep apnea. In addition, Laon Sleep is poised to emerge as the next-generation medical software platform in the sleep apnea diagnosis and treatment market that is worth more than 1 trillion USD globally, thus becoming the technology that will lead this rapidly growing market.
Biochemistry Prof. Hyun woo Park’s Research Team Develops Innovative Technology for the Diagnosis and Treatment of Chronic Leukemia

The research team led by Prof. Hyun Woo Park (Biochemistry) has discovered the new signaling pathway of the oncogene FLT3 in chronic leukemia patients, some 40% of whom acquire post-chemotherapy drug resistance and thus enter a blast crisis that drastically lowers their survival. The team utilized this discovery to successfully develop new techniques for early diagnosis and improved anti-cancer therapy for chronic leukemia.

Discovery of drug resistance signaling factors in chronic leukemia patients in blast crisis

Leukemia patients are largely divided into acute myeloid leukemia (AML) and chronic myeloid leukemia (CML), and undergo targeted therapy specific to their oncogene mutation. CML is a form of blood cancer that develops due to oncogene mutation that triggers the infinite differentiation of leukocytes. Many patients acquired resistance to the first-generation targeted therapeutic drug Imatinib (Gleevec), which propelled the development of second- and third-generation drugs such as Dasatinib and Nilotinib. But patients who acquire resistance to even these drugs will advance to blast crisis (bc-CML) stage with a drastic drop in survival, leading to an urgent need to identify the factors causing resistance to targeted therapeutic drugs. Based on the observation that the prognosis and malignancy of bc-CML are similar to those of AML, Prof. Hyun Woo Park’s team made the first-ever discovery of the cause of drug resistance in bc-CML patients—the activation of TAZ-TEAD transcription factors of the AML oncogene FLT3 and Hippo signaling pathway. Studies of samples from CML patients led to the surprising finding that some 40% of bc-CML patients acquired drug resistance through FLT3, which in turn led to the discovery that suppressing FLT3 could help overcome drug resistance and induce hematological cancer cell death.

Hope for developing various diagnosis and treatment techniques to overcome drug resistance

Prof. Park’s research has enabled the development of various diagnosis and treatment techniques to overcome drug resistance acquired by bc-CML patients. First of all, the numerous drugs currently being developed or already approved for AML therapy can now be repurposed to pave the way for overcoming FLT3-mediated drug resistance in CML patients. Further steps can be taken to diagnose FLT3 expression in CML patients, which can be used as a drug resistance diagnostic marker for the combined prescription of CML drugs and FLT3 suppressors. In addition, the identification of TAZ-TEAD transcription factors and CD36 receptors as the signaling pathway of FLT3 has opened up the possibilities for overcoming drug resistance through the use of TAZ-TEAD binding inhibitors and CD36 receptor suppressors. Prof. Park’s team is currently in the process of optimizing techniques for detecting FLT3, TAZ and CD36 diagnostic markers in samples from CML patients in order to develop techniques for diagnosing drug resistance. The team is also planning clinical tests of BCR-ABL inhibitors and FLT3 suppressors to overcome drug resistance in the treatment of CML patients. Through all these efforts, the team is expected to offer hope to CML patients who are suffering because of the drug resistance they acquired in previous chemotherapy and also create the ripple effect of developing more diagnostic and therapeutic techniques applicable to other incurable diseases.

This research has been led by Ji-Eun Shin, a researcher on Prof. Park’s team. The results of this research have been patented in Korea and is awaiting patent approval in the United States and Europe. The team has also succeeded in large-scale technology transfer and is actively pursuing commercialization through translational research.
I CM is a biotech venture that develops gene therapy drugs to treat degenerative diseases that are based on the AAV(Adeno-Associated Virus). ICM was started by Prof. Dae-Won Kim (Dept. of Biochemistry, Yonsei University) in September 2012 as a subsidiary of Yonsei University’s technological holding company with the goal of developing first-in-class drugs for hard-to-cure degenerative musculoskeletal and sensory disorders.

Prof. Kim made the world’s first-ever discovery of the survival mechanism of cartilage cell growth. As the CEO of ICM, he is now leading an international team with a wealth of experience in genetic research to establish the technological platform for AAV gene therapy and develop first-in-class drugs to treat various degenerative disorders.

ICM signs on to transfer AAV gene therapy drug technology to LG Chem in 2020

ICM’s core business is the development of AAV gene therapy drugs for the treatment of various degenerative disorders in the musculoskeletal (joints), sensory (visual and auditory senses) and central nervous (brain and spinal cord) systems. Its main product, ‘ICM-203’, is used to treat osteoarthritis by promoting cartilage regeneration and suppressing synovial membrane inflammation. Based on its robust efficacy-proving preclinical data, ICM signed a technology transfer agreement (for exclusive rights in Korea and China) with LG Chem in December 2020, a testimony of its technological prowess in the field of AAV gene therapy. The drug is currently undergoing phase 1/2a clinical trials in Australia, and US FDA clinical trials are expected to begin in 2022.

ICM aims to develop first-ever DMOAD

ICM’s core pipeline focuses on ICM-203 for osteoarthritis, ICM-302 for retina disorders, and ICM-401 and -402 for auditory dysfunctions. Of these, ICM-203 has become the first to reach the preclinical (animal testing) stage, where it proved its efficacy in regenerating damaged cartilage and suppressing joint inflammation, thereby proving its potential as a DMOAD (Disease Modifying Osteoarthritis Drug). DMOAD refers to medication that not only addresses the clinical symptoms of arthritis but at the same time enhances joint functions by slowing down structural degeneration of the joints, thus making for fundamental osteoarthritis therapy. So far, no pharmaceutical has been officially approved by the authorities as a DMOAD yet.

ICM is seeking to expand its business through the development of first-in-class drugs to treat various hard-to-cure degenerative diseases including osteoarthritis. Up till now, it has attracted private investments from large venture capital funds amounting to 52 billion KRW (44 million USD) through four rounds of IR. ICM is expected to continue attracting attention as it gears up for its IPO, an unusual move for the subsidiary of a university technology holding company.
Hydrogen peroxide is widely utilized in daily life as well as various industrial and environmental processes. However, industrial production of hydrogen peroxide requires the input of toxic organic solvents and huge electrical power, which limits the energy efficiency of hydrogen peroxide processes. Due to the high demand for hydrogen peroxide in the chemical industry, the search for a more eco-friendly and sustainable way to produce hydrogen peroxide is of utmost importance. The photoelectrochemical (PEC) method for producing hydrogen peroxide using solar energy, water, and oxygen is a greener alternative to the conventional chemical-intensive method, but it has been assessed as not being efficient enough to be applied to industrial processes. To address this issue, the Korean research team led by Prof. Hyoung-Il Kim of Yonsei University conducted research to come up with a new PEC system for more efficient hydrogen peroxide production and published its results in the journal Energy & Environmental Science. The research began in 2018 and is the result of the campus-based development/collaboration efforts of the two leaders of science and technology in Korea – Yonsei University and POSTECH.

A conventional PEC cell is composed of a positively charged anode and a negatively charged cathode. Generally, hydrogen peroxide is generated on only one of these electrodes, that is, the cathode. But Prof. Kim’s team aimed at developing a “dual electrode” system that would enhance overall efficiency by simultaneously utilizing both the anode and cathode to generate hydrogen peroxide. Prof. Kim explained that the system that his team developed is “a practical and durable PEC system that utilizes durable and efficient photoanodes and highly selective cathodes for stable hydrogen peroxide production.”

The research that led to this “dual electrode PEC system” was being led as an ideal and eco-friendly new method for green hydrogen peroxide production that could become the launching pad for further advancement of solar-based PEC systems to bring us closer to a sustainable future.
Prof. Joohyuk Sohn’s Research Team
Charts New Path for Breast Cancer Patients through Genomics and Liquid Biopsy Research

Prolific clinical and translational research on genomics and liquid biopsy expected to create a new paradigm

The breast cancer research team coordinated by Prof. Joohyuk Sohn, College of Medicine, Yonsei University, (comprised of Prof. Seung-il Kim, Gun-Min Kim, Hyung-Seok Park, Min-Hwan Kim, So-Ho Park, Ji-Se Kim and Seul-Ki Kim, and about 30 researchers from relevant clinical research and lab teams) brings together prof. in the divisions of Medical Oncology and Breast Surgery to conduct clinical and translational research on topics such as the development of novel drugs for breast cancer. In particular, the team has a long-standing interest in genomics and liquid biopsy and has pursued translational research on these topics for some ten years. It is currently in its ninth year of in-depth research on liquid biopsy under Yonsei’s R&D project to nurture research-centered hospitals, and has also conducted joint research using liquid biopsy with Green Cross Genome Corporation for three years as part of the inter-ministerial Post-Genome Project for the past two years.

What sets Prof. Sohn’s breast cancer research team apart from other research teams in it that it uses the cancer tissue or blood of breast cancer patients collected from clinical trials and cohort studies to conduct its genome research. In other words, unlike conventional genome research, it studies the tissue and blood samples collected from proactive, ongoing clinical research. Since genome studies are carried out concurrently with clinical research, the team can make use of clear genetic data and high-quality tissue/blood samples to enhance the quality of genome sequencing, which in turn enables more sharply focused analysis of the WGS of the ctDNA collected through cohort studies to conduct its genome research. In other words, unlike conventional genome research, it studies the tissue and blood samples collected from proactive, ongoing clinical research. Since genome studies are carried out concurrently with clinical research, the team can make use of clear genetic data and high-quality tissue/blood samples to enhance the quality of genome sequencing, which in turn enables more sharply focused analysis of the WGS of the ctDNA collected through cohort studies to conduct its genome research. In other words, unlike conventional genome research, it studies the tissue and blood samples collected from proactive, ongoing clinical research. Since genome studies are carried out concurrently with clinical research, the team can make use of clear genetic data and high-quality tissue/blood samples to enhance the quality of genome sequencing, which in turn enables more sharply focused analysis of the WGS of the ctDNA collected through cohort studies to conduct its genome research. In other words, unlike conventional genome research, it studies the tissue and blood samples collected from proactive, ongoing clinical research. Since genome studies are carried out concurrently with clinical research, the team can make use of clear genetic data and high-quality tissue/blood samples to enhance the quality of genome sequencing, which in turn enables more sharply focused analysis of the WGS of the ctDNA collected through cohort studies to conduct its genome research. In other words, unlike conventional genome research, it studies the tissue and blood samples collected from proactive, ongoing clinical research. Since genome studies are carried out concurrently with clinical research, the team can make use of clear genetic data and high-quality tissue/blood samples to enhance the quality of genome sequencing, which in turn enables more sharply focused analysis of the WGS of the ctDNA collected through cohort studies to conduct its genome research.
Young Experimental Physicist Prof. Keun Su Kim Solves 60-year-old Puzzle Presented by Nobel Laureates

First-ever successfull observation of the electronic structure of liquid metals

Prof. Keun Su Kim is an up-and-coming researcher and member of the faculty of Yonsei University. After gaining admission in 2001 and majoring in Physics, he returned to his alma mater as a prof. in 2017. Since starting his job at Yonsei, he has risen to become one of the most promising and prominent researchers of Physics in Korea and beyond.

First-ever observation of the electronic structure of liquid metals, for which only theoretical models had existed

Scientists were only able to theoretically speculate about the electronic structure of liquid metal, the stuff that the robots in Terminator movies are made of. Although the 1960 Nobel laureate in Physics P.W. Anderson and N. F. Mott did come up with a theoretical model to describe the properties of liquid metal, the unusual property of “backward-bending” band-structure and pseudogap predicted by the theoretical model remained unobserved in experiments for more than half a century. But Prof. Keun Su Kim’s research team attracted much attention in the academia by succeeding in actual observation of the unusual band structure of liquid metals for the first time since it was theorized more than 60 years ago.

In the case of crystalline solid matter where the electrons are coherently aligned, it is relatively easy to describe the electronic and photonic properties of the matter. But in the case of matter made of liquids, glass, or amorphous solids where the electrons do not behave coherently, it becomes much more challenging to precisely predict the scientific properties of the matter. Prof. Kim’s team adopted a new method to investigate the behavior of electrons in liquid metals. Rather than using the conventional method of directly measuring the electronic properties of liquid metals, the team derived an idea from how alkali metal and observing the electronic structure at the interface of the insulator and dopant. Multiple resonance scattering of the electrons and ions from the atoms of the alkali metal occurs when the alkali-metal dopant interacts with the surface of black phosphorous. So the electrons on the surface of the black phosphorous will behave like those of a liquid metal. The research team utilized cutting-edge techniques such as synchrotron radiation and angle resolved photoelectron spectroscopy (ARPES) to take precise measurements of the black phosphorous electrons, and was able to observe for the first time the unusual band structure of free electrons bending backwards, with varying pseudogaps as predicted by the theoretical model of Anderson and Mott in the 1960s. High temperature superconductivity is one of the oldest unsolved puzzles in Physics, and it occurs when a crystalline insulator is doped by disordered heteratoms. As mysterious pseudogaps appear in the behavior of electrons in the process, understanding this pseudogap is expected to help solve the mystery of high temperature superconductivity. Thus the mechanism of pseudogaps discovered through Prof. Kim’s research could provide important clues in understanding high temperature superconductivity. The research was recognized for its academic and applicational value and published in the international journal Nature Materials in February 2020.

Discovery of a new kind of semiconductor based on the concept of “pseudospin”

Prof. Keun Su Kim also discovered a new kind of semiconductor based on the concept of “pseudospin” in 2020.

The unique approach of doping black phosphorous with alkali metal and observing the electronic structure at the interface of the insulator and dopant. Multiple resonance scattering of the electrons and ions from the atoms of the black phosphorous occurs when the alkali-metal dopant interacts with the surface of black phosphorous. So the electrons on the surface of the black phosphorous will behave like those of a liquid metal. The research team utilized cutting-edge techniques such as synchrotron radiation and angle resolved photoelectron spectroscopy (ARPES) to take precise measurements of the black phosphorous electrons, and was able to observe for the first time the unusual band structure of liquid metals. The research was recognized for its academic and published in Nature in August 2021.

Prof. Kim’s research was supported by Yonsei University’s signature research cluster program and the Ministry of Science and ICT’s Fundamental Research Project. The Yonsei signature research cluster program was launched this year to nurture research capabilities in areas that may become Yonsei’s signature research.

Focused funding in selected areas where Yonsei researchers have the potential to produce world-class research achievements has led to remarkable results. Yonsei University will continue to focus on discovering and supporting young researchers like Prof. Keun Su Kim.
Yonsei University’s Performance Is Introduced in Nature Index’s Special Korean Issue
Positioning as a university leading sustainable future

Yonsei University’s innovative education and research performance were reported in the special Nature Index 2020 South Korean issue published on May 28, 2020. Yonsei University confirmed its status as a world-class research institution by being listed as Korea’s 3rd (147th globally) in Nature Index’s educational institution ranking announced recently, following Seoul National University (59th) and KAIST (70th). Concurrently, Yonsei University was listed 47th in THE Global Impact Ranking that assesses a university’s social impact, proving that it is taking the lead in advancing a sustainable future through research performance.

Nature Index’s special Korean issue introduced Yonsei University’s various social participation activities. In particular, international health research that contributes to the universal health coverage of developing countries by utilizing industrial waste, student-led social innovation activities like developing an app that helps the blind shop online, and Global Sustainable Development Forum that acts as a platform for activities like developing an app that helps the blind shop online, and Global Sustainable Development Forum that acts as a platform for seeking solutions to global challenges were highlighted.

This was the first time since 1993, which was about 30 years ago, that Nature has focused on addressing Korean research performance. This special issue sheds a specific light on the research strategy of Korea that was reported in the special Nature Index 2020 South Korean issue published on May 28, 2020. Yonsei University confirmed its status as a world-class research institution by being listed as Korea’s 3rd (147th globally) in Nature Index’s educational institution ranking announced recently, following Seoul National University (59th) and KAIST (70th). Concurrently, Yonsei University was listed 47th in THE Global Impact Ranking that assesses a university’s social impact, proving that it is taking the lead in advancing a sustainable future through research performance.

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The evaluation criteria of the FT Ranking include program composition, teaching method, instructor team, trainees’ level, new technology and learning effect, educational program follow-up, educational facilities, etc., and also reflect the results of the graduates’ survey. Among those, Sangnam Institute of Management ranked 25th globally in the program follow-up evaluation, which can be interpreted that companies made steady effort to incorporate necessary requirements even after the program had finished, and this resulted in winning favorable evaluation.

Sangnam Institute of Management opened in March 1999 by the fund donation of LG Group’s deceased Honorary President, Ja Kyung Koo, and has greeted its 20th anniversary last year. For the past 20 years, Sangnam Institute of Management has made immense contributions to advancing Korean executive education by fostering talents that reflect the demands of the industry and effectively supplying the changing management techniques through industrial-academic cooperation.

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The 2nd-Stage Construction Project for the International Campus Signed Targeting the embodiment of a University-Centered “Academy-Research-Industry-Medicine Innovation Cluster”

Yonsei University and Incheon Metropolitan City have entered into an agreement on the 2nd Stage Construction Project for Yonsei University International Campus to create the Songdo Severance Hospital and Yonsei Science Park (YSP). The signing ceremony was held on December 18, 2020, by contactless/online method with the participation of key personnel, including President Seung-Hwan Seo and Incheon Mayor Nam-Chun Park.

Yonsei University will be newly supplied 141,292m$^2$ as the 2nd-stage campus site in addition to the existing 1st-stage campus site. The gist of the 2nd-stage project is building the Songdo Severance Hospital and creating the Yonsei Science Park (YSP) on 387,777m$^2$, which is the total of the site to be developed for the 1st stage and the new 2nd-stage site. If the last ten years of the International Campus focused on education and globalization, the coming ten years will be planned to create “a university-centered innovation cluster” with a focus on research and industrial-academic cooperation.

According to the agreement, Incheon City will aid an additional 500 billion won to build and operate the Yonsei Science Park (YSP), and Yonsei University will use this as the basis for building the Songdo Severance Hospital and industrial-academic infrastructure and creating the Science Park by attracting national projects and private investment.

The Yonsei Science Park (YSP) will consist of the six zones of convergence education, convergence research, start-up venture, industrial-academic cooperation, future innovation, and communication innovation. The emphasis is on building the virtual circle of “education-research-cooperation” through high-tech infrastructure, excellent research manpower, and an optimization operation system. Here, Songdo Severance Hospital will not perform traditional functions of the Songdo Bio Health Valley but also function as a regional base hospital for industry-medicine innovation cluster that lives up to its name. The Yonsei Science Park (YSP) on 387,777m$^2$, which is the total of the site to be developed for the 1st stage and the new 2nd-stage site.

Yonsei University is exerting efforts on all levels to strengthen the social responsibility of the university through cultivating “innovative leaders with a spirit of community” under the core values of challenge and excellence, creation and innovation, and coexistence and engagement. Launched in 2017, the Institute for Global Engagement strives to pursue challenging research and knowledge to resolve universal issues that the earth and humanity are facing and sustainable development by the lead of Honorary Director Ban Ki-moon. Every February, it has held GEEF on an international scale to raise global awareness on the importance of sustainable development. Thanks to these endeavors, Yonsei University has ranked as Korea’s No. 1 and the world’s No. 47 in the 2020 world university influence evaluation of the Times Higher Education (THE), the only global ranking that assesses the efforts of universities for sustainable development goals of the UN. Honorary Director Ban Ki-moon emphasized the importance of “sustainability based on solidarity with another” in his closing address. The event came to an end with his message that “cooperation, collaboration, and innovation that surpass borders must lead the progress of sustainable development goals set by the UN and the Paris Agreement on climate change”.

“GEEF 2021,” the Global Engagement & Empowerment Forum on Sustainable Development Wraps Up in Great Success

Yonsei University is exerting efforts on all levels to strengthen the social responsibility of the university through cultivating “innovative leaders with a spirit of community” under the core values of challenge and excellence, creation and innovation, and coexistence and engagement. Launched in 2017, the Institute for Global Engagement strives to pursue challenging research and knowledge to resolve universal issues that the earth and humanity are facing and sustainable development by the lead of Honorary Director Ban Ki-moon. Every February, it has held GEEF on an international scale to raise global awareness on the importance of sustainable development. Thanks to these endeavors, Yonsei University has ranked as Korea’s No. 1 and the world’s No. 47 in the 2020 world university influence evaluation of the Times Higher Education (THE), the only global ranking that assesses the efforts of universities for sustainable development goals of the UN. Honorary Director Ban Ki-moon emphasized the importance of “sustainability based on solidarity with another” in his closing address. The event came to an end with his message that “cooperation, collaboration, and innovation that surpass borders must lead the progress of sustainable development goals set by the UN and the Paris Agreement on climate change”.

GEEF is cohosted by Yonsei University’s Institute for Global Engagement, Ban Ki-moon Foundation for a Better Future, and Austria Ban Ki-moon Center for Global Citizens, and this year’s event was officially sponsored by POSCO, Pihngman-Hiland Korea, and Hanbil Motors.

The Mirae Campus Student Participation Team Wins Multiple International Design Awards

The “re.do studio” team made up of Jaemoon Choi (4th year), a student in the Division of Design and Art, Mirae Campus, and the students Donghui Hwang and Inhwan Kim of Konkuk University won Gold at the IDA (International Design Awards), after being awarded Bronze in August 2020 and Gold in December at the 2020 Spark International Design Award, one of the world-class international design awards.

The Spark International Design Award is a design competition screened by design experts of globally famous companies like IDEO, McLaren, and Sembhozer with the goal of "Promoting better life through better design." It is counted as one of the global-level design contests along with the world top three design contests, IF IDEA, and Red Dot, and is held to congratulate the contributions of designers in smart and sustainable multidisciplinary fields and discover new talents.

The “re.do studio” team began with winning Bronze by submitting “Pump” that allows easy use of bottled water purifier at the Spark International Design Award last August 2020 and then won Gold in the December competition with the design of the “Balance-backpack” that can easily and accurately adjust the backpack straps on both sides with one stop. Afterward, they also won Gold at the IDA in January 2021 with the “Balance-backpack” that won them Gold in the Spark International Design Award, thereby proving their excellent design capacities with the performance of accomplishing three wins at well-known global design awards in a short period of time.

The student Jaemoon Choi revealed, ‘Children in the growth phase may develop spinal deformity when backpack straps on both sides differ, so to fix this problem, we designed the ‘Balance-backpack’ that can easily and accurately adjust those.”

Yonsei University Signs a Tripartite MOU with the Ireland NIBRT & Korea Health and Industry Development Institute

Yonsei University signed a tripartite MOU for establishing the K-NIBRT (National Institute for Bioprocessing Research & Training) with the Korea Health Industry Development Institute (Director Soonmoon Eom) and the Ireland NIBRT (CEO Darrin Morrissey) on March 10, 2021.

The MOU was signed including Yonsei University, which had been selected as the operating subject of the bioprocess educational program in October 2020, as the follow-up measure for the cooperation on fostering bio workforce between the Development Institute and the NIBRT in June 2020. The three institutions will mutually cooperate as partners in building an advanced Korean-style bioprocess educational system, such as adopting the NIBRT’s educational programs, building a K-NIBRT bioprocess workforce training center, and collaborating for education and international exchange in bio-industrial fields.

The K-NIBRT will officially open in 2024 with the goal of constructing a professional workforce training system for the best biomanufacturing process in the Asia-Pacific Region by introducing the educational system of the Ireland NIBRT, the world’s top biomanufacturing workforce training institution, to Korea. Prior to the official opening, pilot education reflecting advanced bioprocess trends and Korean companies’ demands will commence in Yonsei University’s International Campus from July 2021.

Once a full-fledged adoption agreement is signed based on this MOU, K-NIBRT will conduct global cooperation as the global partner of the Ireland NIBRT and a certificate with the same effect as the NIBRT one can be acquired by completing the education of the K-NIBRT. The Ireland NIBRT has started with government-led investment for fostering biomedicine talents and is currently providing field education for trainees of diverse spectrums, from high-school graduates to master’s, PhD students and beyond, in the entire course of pharmaceutical and bioprocesses, including medicine production, good manufacturing practice (GMP), and quality control (QC). President Seung Hwan Seo stated, “We will do our best in building a curriculum that suits the Korean demands and circumstances by promptly adopting the advanced curriculum of the pharmaceutical powerhouse Ireland and tailoring it to Korea’s national competency standards (NCS).”
Yonsei University Achieves Its Best Ranking Yet in the QS World University Rankings

Yonsei University has won its best ranking yet by being listed as the 79th on the QS World University Rankings 2022 that was announced by QS (Quacquarelli Symonds), a global university ranking agency of the U.K., on June 9, 2021. This is six steps up from the last year’s 85th ranking and is an even more significant evaluation in that it was achieved when rankings of a majority of chief Korean universities fell compared to the last year.

Yonsei University showed the tendency of being stagnant in the 100th ranking range up to 2019 but has rapidly risen to the 83th last year and is now indicating a drastic upward trend by entering the top 70 as of this year. The QS World University Rankings’ evaluation indicators consist of the following 6 metrics: academic reputation (40%), graduate’s reputation (10%), citations per faculty (20%), faculty/ student ratio (20%), international faculty ratio (5%), and international student ratio (5%). Yonsei University has raised the ranking by elevating in all indicators of reputation, research, educational environment, etc., excluding the internationalization indicator that cannot avoid a fall due to the COVID-19 situation. Yonsei University has continued investment for improving the research indicator through continual research support policy. Particularly, the researcher all-cycle support policy has been established to discover and support leading researchers and intensity support through the Future-Leading Research Initiative, and the ratio of international joint studies with excellent overseas universities is continuously increased through the Yonsei Frontier Lab to enhance world-class research capacity. Yonsei University has achieved the best record in primary overseas university ranking since its foundation and is planning to continue the uptrend in the future by reinforcing its research competitiveness through discovering and attracting outstanding researchers and supporting promising future fields.

Achieves the Best Ranking of All Time in THE World University Rankings

Yonsei University broke its previous records by being listed as No. 111 in the 2022 THE World University Rankings announced by the TBE (Times Higher Education), a global university evaluating agency in the U.K. This is 36 steps up from No. 147 in the previous year and is even more meaningful when considering the fact that most of the top universities in Korea had their rankings fall compared to the last year. Especially, Yonsei University was the only one among major private universities that have raised its ranking and was also ranked 4th in Korean ranking, rising three steps compared to the last year. THE is the most reputable world university ranking agency along with QS (Quacquarelli Symonds), and in this year’s evaluation, the rankings of 1,682 universities in 99 nations across the world were made announced. The evaluation items of THE are comprised with five areas of educational conditions (30%), research performance (30%), paper citation (30%), internationalization (7.5%), and industrial-academic cooperation (2.5%).

Yonsei University had its scores go up in most indicators, rising by 4.5 points in research performance, by 2.7 points in educational conditions, by 1.7 points in paper citation, etc., and thereby elevated in the overall ranking. While the score fell by a small margin in industrial-academic cooperation, it still maintains a top global level and did not significantly influence the overall ranking. Internationalization obtained the same score as the last year.

In the QS World University Rankings 2022 in June 2021, Yonsei University also recorded the highest ranking (79th) since its opening. It was the only one to go up in ranking amid the general ranking drop of major private universities in Korea. The upward trend will continue from now on as well through strengthening research competitiveness to discover and attract outstanding researchers and support promising future fields, etc.

Breaks the Record of Papers Selected in the 2021 International Conference on Computer Vision and Pattern Recognition (CVPR)

A total of 20 papers from Yonsei University have been selected in the recent International Conference on Computer Vision and Pattern Recognition (CVPR). CVPR is the world’s top academic conference in the field of artificial intelligence (AI), and among Korean universities, those that have participated every year to prove their excellence in the AI field. Yonsei University has achieved the best performance so far with 20 papers, followed by Seoul National University with 17 papers. Yonsei University’s record at this time has been accomplished by the cooperation between outstanding students and prof. in the field of research, and through the establishment of the School of Electrical and Electronic Engineering, which played a momentous role in the field of computer vision along with the European Conference on Computer Vision. CVPR is counted as one of the top 3 conferences in the field of computer vision as No. 1 throughout SCI journals and conferences in all areas of engineering with a Google Scholar h-index of 299. It is hosted by the international IEEE and the nonprofit Computer Vision Foundation and is counted as one of the top 3 conferences in the field of computer vision along with the European Conference on Computer Vision (ECCV) and International Conference on Computer Vision (ICCV).

Meanwhile, Yonsei University has lately adopted AI technology as a signature research area, providing utmost research support at a school level. The Yonsei signature research cluster program supports intramural convergence and international joint studies in research fields that can reach a global level, and in the AI field, there is ongoing research on multiple signal-based general social AI technology.

Cooperation with IBM for Quantum Computing-Based Research & Education

Yonsei University published the plan to establish the IBM Quantum Computing Data Center with IBM on October 25, 2021. Once the center is founded on the Performance Park, which Yonsei University is currently planning to create on the International Campus, Korea will become the fourth nation in the world to possess an IBM quantum computing data center installed with the IBM Quantum System One Computer after the U.S., Germany, and Japan.

Yonsei University and IBM are planning to cooperate for quantum computing research, including academic studies on quantum computing, software development using quantum computing, and providing quantum computing resources required in the industries. Moreover, as an IBM quantum hub connecting industries, universities, and institutes in Korea, Yonsei University will work on fostering a quantum computing ecosystem to collaborate with leading organizations interested in quantum computing research, including corporations, universities, research centers, medical institutions, start-ups, and governmental agencies. This is expected to reinforce Korean education and studies on quantum computing, application development for utilizing quantum computing, and so forth. Ultimately, Korea will obtain a great opportunity to develop and cultivate the national quantum technological capacities of the next generation following its successes in the semiconductor, electronics, and automobile technology industries.

With this, Yonsei University joins the global community of the IBM Quantum Network, consisting of nearly 170 members such as the Fortune 500 Companies, start-ups, academic institutions, research centers, etc. The Network & IBM Quantum Team studies how quantum computing can be utilized across diverse industries and fields, including finance, energy, chemistry, material science, optimization, and machine learning.