

Curriculum Vitae of Christian Wiraja

Current Position : Research Fellow, School of Chemical & Biomedical Engineering,
Nanyang Technological University
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Academic qualifications

<u>Year</u>	<u>Awarding Institution</u>	<u>Qualifications</u>
2013-2017	Nanyang Technological University	Ph.D (Bioengineering) (CGPA: 4.58/5)
2009-2013	Nanyang Technological University	B.Eng (Bioengineering, minor in Computing) (CGPA: 4.63/5)

Professional Experiences

Brigham & Women's Hospital / Harvard Medical School USA Feb 2020 – present
Exchange Research Scholar

- Development of nucleic acid-based nanotechnology for monitoring kidney organoid development, disease modelling and drug nephrotoxicity testing

School of Chemical & Biomedical Engineering, NTU Aug 2017 – present
Research fellow

- Development of topical nucleic acid-based nanotechnology for non-invasive, melanoma diagnosis and therapeutic (Technical Disclosure obtained)
- Evaluation of chemical probe and nucleic acid nanotechnology for early scar diagnosis and tracking of organoid development (in collaboration with Northwestern University, USA)
- Experience in mice handling, topical and systemic application of nanoparticles, *In Vivo* Imaging System (IVIS), histological analysis, 2/3D stem cell culture for cell therapy, confocal microscopy, flow cytometry, high throughput assay, polymerase chain reaction (PCR), gel electrophoresis, microfluidic technology
- Assist in grant preparation, tutorial/experimental modules and research activities of undergraduate and doctoral students

SIMTech A-STAR Singapore Jan 2012 – Jun 2012
Intern as Product and Innovation Designer

- Designed and developed with a team of 4 engineers, a novel medical device utilizing microfluidic technologies for early detection of skeletal muscle injuries
- Designed, implemented, and tested alongside an electrical engineer, a programmed droplet generator based on the principle of piezoelectricity

Research Interest:

Nucleic acid therapeutic and diagnostic, Transdermal drugs, Cell therapy, Tissue Engineering, Microfluidic technology

Awards and Recognition

- 2020 Special Issue Editors for Polymers (MDPI); Topic Editors for Biosensors (MDPI)
- 2019 Outstanding Reviewer Awards Winner: Technologies (MDPI)
- 2019 Finalist of Falling Walls Lab Singapore
- 2019 Best Poster: 10th International Conference on Materials for Advanced Technologies (ICMAT)
- 2018 NTU SCBE Best Thesis Award "Non-invasive Nanosensor Monitoring of mRNA expression for Regenerative Medicine Application"
- 2012/2013 NTU Undergraduate Research Experience on Campus (URECA)

List of Publications

(Total publication: 36 peer-reviewed articles (12 as first author); 1 book chapter; Citation: 452; Hirsch Index: 14, # co-first)

- 1) **Christian Wiraja**[#], Siantoputri ME[#], Liu S, Shum HC, Xu C. Unraveling Framework Nucleic Acid–Skin Cell Interactions with a Co-Culture System. *Advanced Biosystems*. 2020 Jan;4(1):1900169. (Highlighted as journal cover)
- 2) Min Wang, Han Y, Yu X, Liang L, Chang H, Yeo DC, **Wiraja C**, Wee ML, Liu L, Liu X, Xu C. Upconversion Nanoparticle Powered Microneedle Patches for Transdermal Delivery of siRNA. *Advanced Healthcare Materials*. 2020 Jan;9(2):1900635.
- 3) Daniel Lio, Chenghao Liu, Myo M. S. Oo, **Christian Wiraja**, Melissa H. Y. Teo, Mengjia Zheng, Sharon W. T. Chew, Xiaomeng Wang, and Chenjie Xu*. "Transdermal delivery of small interfering RNAs with topically applied mesoporous silica nanoparticles for facile skin cancer treatment." *Nanoscale* 11, no. 36 (2019): 17041-17051.
- 4) **Christian Wiraja**, David C. Yeo, and Chenjie Xu*. "Framework Nucleic Acids: A Paradigm Shift in Transdermal Drug Delivery." *SLAS TECHNOLOGY: Translating Life Sciences Innovation* (2019): 2472630319848679.
- 5) **Christian Wiraja**[#], Ying Zhu[#], Daniel Lio, David C. Yeo, Mo Xie, Weina Fang, Qian Li, Mengjia Zheng, Maurice Van Steensel, Lihua Wang, Chunhai Fan*, Chenjie Xu*. "Framework Nucleic Acids as Programmable Carrier for Transdermal Drug Delivery". *Nature communications* 10.1 (2019): 1-12. (*Editors' highlight for Therapeutics*)
- 6) **Christian Wiraja**[#], David C. Yeo[#], Daniel Lio, Mengjia Zheng, and Chenjie Xu*. "Functional Imaging with Nucleic Acid-based Sensors: Technology, Application and Future Healthcare Prospects." *ChemBioChem* 20.4 (2019): 437-450.
- 7) David Yeo, **Christian Wiraja**, Qingqing Miao, Xiaoyu Ning, Kanyi Pu*, and Chenjie Xu*. "Anti-scarring drug screening with near-infrared molecular probes targeting fibroblast activation protein- α ." *ACS Applied Bio Materials* 1.6 (2018): 2054-2061.
- 8) Mengjia Zheng, **Christian Wiraja**, David C. Yeo, Hao Chang, Daniel Chin Shiuan Lio, Wei Shi, Kanyi Pu, Amy S. Paller, and Chenjie Xu*. "Oligonucleotide Molecular Sprinkler for Intracellular Detection and Spontaneous Regulation of mRNA for Theranostics of Scar Fibroblasts." *Small* 14.49 (2018): 1802546.
- 9) Lio, Daniel Chin Shiuan, Chenghao Liu, **Christian Wiraja**, Beiying Qiu, Chee Wai Fhu, Xiaomeng Wang*, and Chenjie Xu*. "Molecular beacon-gold nanosensors for Leucine-rich alpha-2-glycoprotein-1 (Lrg1) detection in pathological angiogenesis." *ACS sensors* 3.9 (2018): 1647-1655.
- 10) Min Wang, **Christian Wiraja**, Meiling Wee, David Yeo, Lianzhe Hu*, and Chenjie Xu*. "Hairpin-structured probe conjugated nano-graphene oxide for the cellular detection of connective tissue growth factor mRNA." *Analytica chimica acta* 1038 (2018): 140-147.
- 11) Amy S. Paller*, D. Yeo, **C. Wiraja**, C. Mirkin, and C. Xu. "1063 Topically applied NanoFlares to measure gene expression in vivo: Proof-of-concept." *Journal of Investigative Dermatology* 138.5 (2018): S180.
- 12) **Christian Wiraja**[#], David C. Yeo, Khek-Chian Tham, Sharon WT Chew, Xinhong Lim, and Chenjie Xu*. "Real-Time Imaging of Dynamic Cell Reprogramming with Nanosensors." *Small* 14.17 (2018): 1703440.
- 13) Yeo, David C., **Christian Wiraja**, Amy S. Paller*, Chad A. Mirkin*, and Chenjie Xu*. "Abnormal scar identification with spherical-nucleic-acid technology." *Nature Biomedical Engineering* 2.4 (2018): 227.
- 14) Karahan, Hüseyin Enis, **Christian Wiraja**, Chenjie Xu, Jun Wei, Yilei Wang, Liang Wang, Fei Liu, and Yuan Chen*. "Graphene Materials in Antimicrobial Nanomedicine: Current Status and Future Perspectives." *Advanced healthcare materials* (2018): 1701406.

- 15) Malathi Mathiyazhakan, **Christian Wiraja**, and Chenjie Xu*. "A Concise Review of Gold Nanoparticles-Based Photo-Responsive Liposomes for Controlled Drug Delivery." *Nano-Micro Letters* 10.1 (2018): 10.
- 16) Qingqing Miao, David C. Yeo, **Christian Wiraja**, Jianjian Zhang, Xiaoyu Ning, Chenjie Xu*, and Kanyi Pu*. "Near-Infrared Fluorescent Molecular Probe for Sensitive Imaging of Keloid." *Angewandte Chemie* 130.5 (2018): 1270-1274.
- 17) Li Min Tay, **Christian Wiraja**, Yingnan Wu, Zheng Yang, Eng Hin Lee, Chenjie Xu*. "The effect of temporal manipulation of TGF β 3 and FGF2 on the derivation of proliferative chondrocytes from Mesenchymal Stem Cells – a study monitored by qRT-PCR and Molecular Beacon based Nanosensors." *Journal of Biomedical Materials Research Part A* 106.4 (2018): 895-904.
- 18) **Christian Wiraja**[#], Pan Jin[#], Jinmin Zhao[#], Jinlu Zhang, Li Zheng*, and Chenjie Xu*. "Nitric oxide nanosensors for predicting the development of osteoarthritis in rat model." *ACS Applied Materials & Interfaces* 9, no.30 (2017): 25128-25137.
- 19) Shiyong Liu, David C. Yeo, **Christian Wiraja**, Hong Liang Tey, Milan Mrksich, and Chenjie Xu*. "Peptide Delivery with Poly (ethylene glycol) Diacrylate Microneedles through Swelling Effect." *Bioengineering & translational medicine* 2.3 (2017): 258-267.
- 20) Jiayin Fu, **Christian Wiraja**, Hamizan B. Muhammad, Chenjie Xu, and Dong-An Wang*. "Improvement of endothelial progenitor outgrowth cell (EPOC)-mediated vascularization in gelatin-based hydrogels through pore size manipulation." *Acta Biomaterialia* 58 (2017): 225-237.
- 21) Kathyayini Sivasubramanian, Malathi Mathiyazhakan, **Christian Wiraja**, Paul Kumar Upputuri, Chenjie Xu*, and Manojit Pramanik*. "Near-infrared light-responsive liposomal contrast agent for photoacoustic imaging and drug release applications." *Journal of Biomedical Optics* 22, no. 4 (2017): 041007-041007.
- 22) Lifeng Wang, Keming Xu, Xiaochun Hou, Yiyuan Han, Shiyong Liu, **Christian Wiraja**, Cangjie Yang, Jun Yang, Mingfeng Wang, Xiaochen Dong*, Wei Huang*, and Chenjie Xu*. "Fluorescent Poly (glycerol-co-sebacate) Acrylate Nanoparticles for Stem Cell Labeling and Longitudinal Tracking." *ACS Applied Materials & Interfaces* 9, no. 11 (2017): 9528-9538.
- 23) **Christian Wiraja**[#], Li Min Tay[#], David C. Yeo, Yingnan Wu, Zheng Yang, Yon Jin Chuah, Eng Hin Lee, Yuejun Kang, Chenjie Xu*. "Noninvasive Monitoring of Three-Dimensional Chondrogenic Constructs Using Molecular Beacon Nanosensors." *Tissue Engineering Part C: Methods* 23, no. 1 (2017): 12-20.
- 24) **Christian Wiraja**[#], Jiayin Fu[#], Ruiqi Chong, Chenjie Xu* and Dong-An Wang*. "Real-time and non-invasive monitoring of embryonic stem cell survival during the development of embryoid bodies with smart nanosensor." *Acta Biomaterialia* 49 (2017): 358-367.
- 25) Hui Min Tay, David C. Yeo, **Christian Wiraja**, Chenjie Xu*, and Han Wei Hou*. "Microfluidic Buffer Exchange for Interference-free Micro/Nanoparticle Cell Engineering." *JoVE (Journal of Visualized Experiments)* 113 (2016): e54327-e54327.
- 26) **Christian Wiraja**, Malathi Mathiyazhakan, Fatemeh Movahedi, Paul Kumar Upputuri, Yingying Cheng, Manojit Pramanik, Liang Yang, David Laurence Becker, and Chenjie Xu*. "Near-infrared light-sensitive liposomes for enhanced plasmid DNA transfection." *Bioengineering & Translational Medicine* 1, no. 3 (2016): 357-364.
- 27) Xiaochun Hou, Shiyong Liu, Min Wang, **Christian Wiraja**, Wei Huang, Peggy Chan, Timothy Tan, and Chenjie Xu*. "Layer-by-Layer 3D Constructs of Fibroblasts in Hydrogel for Examining Transdermal Penetration Capability of Nanoparticles." *Journal of Laboratory Automation* (2016): 2211068216655753.

- 28) Natasha Kumar, **Christian Wiraja**, Kannan Palanisamy, Enrico Marsili*, and Chenjie Xu*. "Heat shock mediated labelling of *Pseudomonas aeruginosa* with quantum dots." *Colloids and Surfaces B: Biointerfaces* 142 (2016): 259-265.
- 29) Min Wang, Xiaochun Hou, **Christian Wiraja**, Libo Sun, Zhichuan J. Xu, and Chenjie Xu*. "Smart Magnetic Nanosensors Synthesized through Layer-by-Layer Deposition of Molecular Beacons for Noninvasive and Longitudinal Monitoring of Cellular mRNA." *ACS applied materials & interfaces* 8, no. 9 (2016): 5877-5886.
- 30) **Christian Wiraja**, David C. Yeo, Mark SK Chong, and Chenjie Xu*. "Nanosensors for Continuous and Noninvasive Monitoring of Mesenchymal Stem Cell Osteogenic Differentiation." *Small* 12, no. 10 (2016): 1342-1350.
- 31) Huseyin E. Karahan, Li Wei, Kunli Goh, **Christian Wiraja**, Zhe Liu, Chenjie Xu, Rongrong Jiang, Jun Wei*, and Yuan Chen*. "Synergism of Water Shock and a Biocompatible Block Copolymer Potentiates the Antibacterial Activity of Graphene Oxide." *Small* 12, no. 7 (2016): 951-962.
- 32) David C. Yeo, **Christian Wiraja**, Yingying Zhou, Hui Min Tay, Chenjie Xu*, and Han Wei Hou*. "Interference-free micro/nanoparticle cell engineering by use of high-throughput microfluidic separation." *ACS applied materials & interfaces* 7, no. 37 (2015): 20855-20864.
- 33) David C. Yeo, **Christian Wiraja**, Yon Jin Chuah, Yu Gao, and Chenjie Xu*. "A Nanoparticle-based Sensor Platform for Cell Tracking and Status/Function Assessment." *Scientific reports* 5 (2015).
- 34) **Christian Wiraja**, David C. Yeo, Sing Yian Chew, and Chenjie Xu*. "Molecular beacon-loaded polymeric nanoparticles for non-invasive imaging of mRNA expression." *Journal of Materials Chemistry B* 3, no. 30 (2015): 6148-6156.
- 35) **Christian Wiraja**, David C. Yeo, Daniel Lio, Louai Labanieh, Mengrou Lu, Weian Zhao, and Chenjie Xu*. "Aptamer technology for tracking cells' status & function." *Molecular and cellular therapies* 2, no. 1 (2014): 1.
- 36) David C. Yeo, **Christian Wiraja**, Athanasios Sakis Mantalaris, and Chenjie Xu*. "Nanosensors for regenerative medicine." *Journal of biomedical nanotechnology* 10, no. 10 (2014): 2722-2746.

Book Chapters

Christian Wiraja, Mark SK Chong, Yanwan Liao, Sharon WT Chew, and Chenjie Xu. "Multi-Functional Biomaterials for Bone Tissue Engineering." In *Smart Materials for Tissue Engineering*, pp. 169-193. Royal Society of Chemistry, 2017.

Technical Disclosure

- CH Fan, CJ Xu, **C Wiraja**, LH Wang, W Li, M Xie, "Controllable transdermal drug delivery preparation based on framework nucleic acid and application thereof", 2018, Shanghai Institute of Applied Physics, Chinese Academy of Sciences.
- CJ Xu, D Yeo, **C Wiraja**, "A Nanoparticle-based Sensor Platform to Track and Assess Cell Status and/or Function", TD/206/14, NTUitive Pte Ltd.

Teaching experience

- Demo Tutor for BG4215 "Biomedical Nanotechnology" course 2018
- Tutor for CH1003 "Introduction to Chemistry" course 2016

Mentorship

- Maria Esterlita Siantoputri (Undergraduate Research Experience on Campus) 2018-2019
- Xiao Yu Ning, B.Eng 2017-2018
- Silvana Toh Hwei Jing, Nur Farahin Binte Nasrun, Cham Hui Ting, Ng Wei Kai, B.Eng 2016-2017
- Chew Wan Ting Sharon, Xing Jie, Ratty Meera Darshini, Wang Dier, B.Eng 2015-2016
- Yingying Zhou, Aaron Li, Candice Goh, B.Eng 2014-2015

Social Activities

- Voluntary reviewer for MDPI journals: Polymers, Materials, Molecules, Biosensors 2019-present
- Treasurer & secretary, Young adult fellowship, Bukit Batok Presbyterian Church 2018-2019
- Event coordinator, Young adult fellowship, Bukit Batok Presbyterian Church 2015-2017
- Logistics & Fellowship Committee, Indonesian student Christian fellowship, NTU 2011-2013
- Sports/Social Committee, SCBE school club, NTU 2010-2012