Shengyuan A. Yang **Curriculum vitae** yangshengyuan@um.edu.mo

Career Achievements

- **Scientific achievements:** Discovered a series of topological phases and their material realizations; Discovered fundamental effect of anomalous spatial shift in interface scattering; Developed extended semiclassical theory for electron dynamics; Complete classification of all emergent particles in crystals; Opened the field of topological crystals with gauge structures; Discovered a series of nonlinear response effects.
- **Over 14000** citations, h-index of **64**, and i10 index of **181** (Google Scholar)
- **Over 200** peer-reviewed papers, including **5** Nature, **1** Nat. Materials, **1** Nat. Nanotech., **26** PRL, **11** Nat. Comm., **96** Physical Review (including **83** PRB), **2** JACS, **5** ACS Nano, **9** Nano Lett., **6** Adv. Mater.
- **Over SGD 6.5M** research grant

Academic Qualifications

2005 – 2011	**PhD** in Physics, The University of Texas at Austin, Austin, USA *Berry Phase Related Effects in Ferromagnetic Metal Materials* (Advisor: Qian Niu)
2002 – 2005	**BSc** in Mathematics/Physics with First Class Honours, The University of Hong Kong, Hong Kong
2001 – 2002	Electrical Engineering, Tsinghua University, Beijing, China

Professional Experience

2023 – present	**Professor,** University of Macau, Macau SAR
2020 – 2023	**Associate Professor**, Singapore University of Technology and Design, Singapore
2013 – 2020	**Assistant Professor**, Singapore University of Technology and Design, Singapore
2011 – 2013	**Imaging Geophysicist**, CGG US Services, Houston, USA

Awards, Services & Activities

World Scientific Medal and Prize for Outstanding Physics Research 2021

SUTD Excellence in Research Award 2020

National Science Foundation Fellowship 2005

Division Editor (Condensed Matter Physics), Frontiers of Physics, 2022 – present

Editorial Board, International Journal of Modern Physics B, Modern Physics Letters B, 2023 – present

Guest Editor, Chinese Physics B (2019); Frontiers in Physics (2021); Frontiers of Physics (2018)

Management Committee, Materials Research Society of Singapore, 2018 – 2020

Student Development Committee, Qian Sanqiang Talent Class, Chongqing University, 2019 – present

Organizing Committee, The 16th China-Singapore Joint Physics Symposium (2018, 2021); Institute of Physics Singapore Annual Meeting (2019); The International Symposium on Berry Phase Effects in Condensed Matter (2018, 2023); The 1st Silkroad 2D Conference (2018)

Grant Assessor for Research Grants Council of Hong Kong (2023); National Science Centre Poland (2021); European Research Council (2020); Czech Science Foundation (2018)

30/9/2023

Book Proposal Reviewer for Cambridge University Press 2020

Research Grants

- Co-PI, *Quantum modelling of carrier tunnelling injection in 2D semiconductor device contact heterostructures*, Singapore MOE AcRF Tier 2, S$507,507, 2022 – 2025
- PI, *Explore novel platform and mechanism for electric manipulation of valleytronics*, Singapore MOE AcRF Tier 2, S$460,820, 2021 – 2024
- PI, *Explore novel nonsymmorphic topological metals and their physical properties*, Singapore MOE AcRF Tier 2, S$525,450, 2019 – 2022
- Team-PI, *The next generation of spintronics with 2D heterostructures*, Singapore NRF CRP, S$3.271M, 2020 – 2025
- Co-PI, *AI assisted design of topological devices with ultra-low power dissipation*, A*STAR-NTU-SUTD AI Partnership Grant, S$330,000, 2019 – 2020
- PI, *Explore anomalous scattering shift at spin/pseudospin-orbit-coupled junctions*, Singapore MOE AcRF Tier 2, S$505,710, 2018 – 2021
- PI, *Explore topological semimetals for novel transport effects and phase transitions*, Singapore MOE AcRF Tier 2, S$423,176, 2016 – 2019
- PI, *Exploring novel effects in Weyl and Dirac semimetals and superconductors*, Singapore MOE AcRF Tier 1, S$99,381, 2016 – 2018
- PI, *Explore lanthanide-doped perovskite oxide materials for biomedical applications*, SUTD-ZJU Collaboration Pilot Project, S$49,750, 2016 – 2017
- Co-PI, *Capacitive mixing batteries: harvesting blue energy from water salinity gradient*, Singapore MOE AcRF Tier 2, S$509,000, 2015 – 2018
- Co-PI, *Magnetically doped two-dimensional MoS_2: Towards high performance spintronics applications*, AFOSR, S$50,000, 2015 – 2016
- PI, SUTD start-up research grant, S$100,000, 2013 – 2016

Selected Journal Publications

- Cong Xiao, Weikang Wu, Hui Wang, Yue-Xin Huang, Xiaolong Feng, Huiying Liu, Guang-Yu Guo, Qian Niu, and **S. A. Yang**, "Time-Reversal-Even Nonlinear Current Induced Spin Polarization," *Phys. Rev. Lett.* **130**, 166302 (2023).
- Jian Gou, Hua Bai, Xuanlin Zhang, Yu Li Huang, Sisheng Duan, A. Ariando, **S. A. Yang**, Lan Chen, Yunhao Lu, and Andrew Thye Shen Wee, "Two-dimensional ferroelectricity in a single-element bismuth monolayer," *Nature* **617**, 67 (2023).
- Yue-Xin Huang, Xiaolong Feng, Hui Wang, Cong Xiao, and **S. A. Yang**, "Intrinsic Nonlinear Planar Hall Effect," *Phys. Rev. Lett.* **130**, 126303 (2023).
- Qiangbing Guo, Xiao-Zhuo Qi, Lishu Zhang, Meng Gao, Sanlue Hu, Wenju Zhou, Wenjie Zang, Xiaoxu Zhao, Junyong Wang, Bingmin Yan, Mingquan Xu, Yun-Kun Wu, Goki Eda, Zewen Xiao, **S. A. Yang**, Huiyang Gou, Yuan Ping Feng, Guang-Can Guo, Wu Zhou, Xi-Feng Ren, Cheng-Wei Qiu, Stephen J. Pennycook, and Andrew T. S. Wee, "Ultrathin quantum light source with van der Waals $NbOCl_2$ crystal," *Nature* **613**, 53 (2023).
- Xing-Guo Ye, Huiying Liu, Peng-Fei Zhu, Wen-Zheng Xu, **S. A. Yang**, Nianze Shang, Kaihui Liu, and Zhi-Min Liao, "Control over Berry Curvature Dipole with Electric Field in WTe_2," *Phys. Rev. Lett.* **130**, 016301 (2023).
- Qiaolu Chen, Fujia Chen, Yuang Pan, Chaoxi Cui, Qinghui Yan, Li Zhang, Zhen Gao, **S. A. Yang**, Zhi-Ming Yu, Hongsheng Chen, Baile Zhang, and Yihao Yang, "Discovery of a maximally charged Weyl point," *Nature Communications* **13**, 7359 (2022).

- Byoung-Uk Sohn, Yue-Xin Huang, Ju Won Choi, George F. R. Chen, Doris K. T. Ng, **S. A. Yang**, and Dawn T. H. Tan, "A topological nonlinear parametric amplifier," *Nature Communications* **13**, 7218 (2022).
- Gui-Geng Liu, Zhen Gao, Qiang Wang, Xiang Xi, Yuan-Hang Hu, Maoren Wang, Chengqi Liu, Xiao Lin, Longjiang Deng, **S. A. Yang**, Peiheng Zhou, Yihao Yang, Yidong Chong, and Baile Zhang, "Topological Chern vectors in three-dimensional photonic crystals," *Nature* **609**, 925 (2022).
- Cong Xiao, Huiying Liu, Weikang Wu, Hui Wang, Qian Niu, and **S. A. Yang**, "Intrinsic Nonlinear Electric Spin Generation in Centrosymmetric Magnets," *Phys. Rev. Lett.* **129**, 086602 (2022).
- Qiangsheng Lu, Jacob Cook, Xiaoqian Zhang, Kyle Y. Chen, Matthew Snyder, Duy Tung Nguyen, P. V. Sreenivasa Reddy, Bingchao Qin, Shaoping Zhan, Li-Dong Zhao, Pawel J. Kowalczyk, Simon A. Brown, Tai-Chang Chiang, **S. A. Yang**, Tay-Rong Chang, and Guang Bian, "Realization of unpinned two-dimensional dirac states in antimony atomic layers," *Nature Communications* **13**, 4603 (2022).
- Z. Y. Chen, **S. A. Yang**, and Y. X. Zhao, "Brillouin Klein bottle from artificial gauge fields," *Nature Communications* **13**, 2215 (2022).
- Haoran Xue, Zihao Wang, Yue-Xin Huang, Zheyu Cheng, Letian Yu, Y. X. Foo, Y. X. Zhao, **S. A. Yang**, and Baile Zhang, "Projectively Enriched Symmetry and Topology in Acoustic Crystals," *Phys. Rev. Lett.* **128**, 116802 (2022). (Featured in Physics)
- Qile Li, Chi Xuan Trang, Weikang Wu, Jinwoong Hwang, Nikhil Medhekar, Sung-Kwan Mo, **S. A. Yang**, and Mark T Edmonds, "Large magnetic gap in a designer ferromagnet-topological insulator-ferromagnet heterostructure," *Advanced Materials* **34**, 2107520 (2022).
- Shengdan Tao, Xuanlin Zhang, Jiaojiao Zhu, Pimo He, **S. A. Yang**, Yunhao Lu, and Su-Huai Wei, "Designing Ultra-flat Bands in Twisted Bilayer Materials at Large Twist Angles: Theory and Application to Two-Dimensional Indium Selenide," *J. Am. Chem. Soc.* **144**, 3949 (2022).
- Hao Chen, Weikang Wu, Jiaojiao Zhu, Zhengning Yang, Weikang Gong, Weibo Gao, **S. A. Yang**, and Lifa Zhang, "Chiral Phonon Diode Effect in Chiral Crystals," *Nano Lett.* **22**, 1688 (2022).
- Cong Chen, Xu-Tao Zeng, Ziyu Chen, Y. X. Zhao, Xian-Lei Sheng, and **S. A. Yang**, "Second-Order Real Nodal-Line Semimetal in Three-Dimensional Graphdiyne," *Phys. Rev. Lett.* **128**, 026405 (2022).
- Huiying Liu, Jianzhou Zhao, Yue-Xin Huang, Weikang Wu, Xian-Lei Sheng, Cong Xiao, and **S. A. Yang**, "Intrinsic Second-Order Anomalous Hall Effect and Its Application in Compensated Antiferromagnets," *Phys. Rev. Lett.* **127**, 277202 (2021).
- Zhi-Ming Yu, Zeying Zhang, Gui-Bin Liu, Weikang Wu, Xiao-Ping Li, Run-Wu Zhang, **S. A. Yang**, and Yugui Yao, "Encyclopedia of emergent particles in three-dimensional crystals," *Science Bulletin* **67**, 375 (2022).
- L. B. Shao, Q. Liu, R. Xiao, **S. A. Yang**, and Y. X. Zhao, "Gauge-Field Extended $k \cdot p$ Method and Novel Topological Phases," *Phys. Rev. Lett.* **127**, 076401 (2021).
- Qinghai Tan, Abdullah Rasmita, Si Li, Sheng Liu, Zumeng Huang, Qihua Xiong, **S. A. Yang**, K. S. Novoselov, and Wei-bo Gao, "Layer-engineered interlayer excitons," *Science Advances* **7**, eabh0863 (2021).
- Shen Lai, Huiying Liu, Zhaowei Zhang, Jianzhou Zhao, Xiaolong Feng, Naizhou Wang, Chaolong Tang, Yuanda Liu, K. S. Novoselov, **S. A. Yang**, and Wei-bo Gao, "Third-order nonlinear Hall effect induced by the Berry-connection polarizability tensor," *Nature Nanotechnology* **16**, 869 (2021).
- Y. X. Zhao, Cong Chen, Xian-Lei Sheng, and **S. A. Yang**, "Switching Spinless and Spinful Topological Phases with Projective *PT* Symmetry," *Phys. Rev. Lett.* **126**, 196402 (2021).
- Meng Huang, Shanshan Wang, Zhaohao Wang, Ping Liu, Junxiang Xiang, Chao Feng, Xiangqi Wang, Zengming Zhang, Zhenchao Wen, Hongjun Xu, Guoqiang Yu, Yalin Lu, Weisheng Zhao, **S. A. Yang**, Dazhi Hou, and Bin Xiang, "Colossal Anomalous Hall Effect in Ferromagnetic van der Waals $CrTe_2$," *ACS Nano* **15**, 9759 (2021).
- Hao Chen, Weikang Wu, Jiaojiao Zhu, **S. A. Yang**, and Lifa Zhang, "Propagating Chiral Phonons in Three-Dimensional Materials," *Nano Lett.* **21**, 3060 (2021).

- Binbin Wang, Wei Xia, Si Li, Kang Wang, **S. A. Yang**, Yanfeng Guo, and Jiamin Xue, "One-Dimensional Metal Embedded in Two-Dimensional Semiconductor in $Nb_2Si_{x-1}Te_4$," *ACS Nano* **15**, 7149 (2021).
- Fengxian Ma, Yalong Jiao, Weikang Wu, Ying Liu, **S. A. Yang**, and Thomas Heine, "Half-Auxeticity and Anisotropic Transport in Pd Decorated Two-Dimensional Boron Sheets," *Nano Lett.* **21**, 2356 (2021).
- Y. X. Zhao and **S. A. Yang**, "Index Theorem on Chiral Landau Bands for Topological Fermions," *Phys. Rev. Lett.* **126**, 046401 (2021).
- Y. X. Zhao, Yue-Xin Huang, and **S. A. Yang**, "Z_2-projective translational symmetry protected topological phases," *Phys. Rev. B Rapid Comm.* **102**, 161117 (2020).
- Yihao Yang, Zhen Gao, Xiaolong Feng, Yue-Xin Huang, Peiheng Zhou, **S. A. Yang**, Yidong Chong, Baile Zhang, "Ideal Unconventional Weyl Point in a Chiral Photonic Metamaterial," *Phys. Rev. Lett.* **125**, 143001 (2020).
- Kai Wang, Jia-Xiao Dai, L. B. Shao, **S. A. Yang**, and Y. X. Zhao, "Boundary Criticality of *PT*-Invariant Topology and Second-Order Nodal-Line Semimetals," *Phys. Rev. Lett.* **125**, 126403 (2020).
- Ying Liu, Zhi-Ming Yu, Cong Xiao, and **S. A. Yang**, "Quantized Circulation of Anomalous Shift in Interface Reflection," *Phys. Rev. Lett.* **125**, 076801 (2020).
- Cong Chen, Zhida Song, Jian-Zhou Zhao, Ziyu Chen, Zhi-Ming Yu, Xian-Lei Sheng, and **S. A. Yang**, "Universal Approach to Magnetic Second-Order Topological Insulator," *Phys. Rev. Lett.* **125**, 056402 (2020).
- Zhi-Ming Yu, Shan Guan, Xian-Lei Sheng, Weibo Gao, and **S. A. Yang**, "Valley-Layer Coupling: A New Design Principle for Valleytronics," *Phys. Rev. Lett.* **124**, 037701 (2020).
- Xian-Lei Sheng, Cong Chen, Huiying Liu, Ziyu Chen, Zhi-Ming Yu, Y. X. Zhao, and **S. A. Yang**, "Two-Dimensional Second-Order Topological Insulator in Graphdiyne," *Phys. Rev. Lett.* **123**, 256402 (2019).
- Yihao Yang, Jian-ping Xia, Hong-xiang Sun, Yong Ge, Ding Jia, Shou-qi Yuan, **S. A. Yang**, Yidong Chong, and Baile Zhang, "Observation of a topological nodal surface and its surface-state arcs in an artificial acoustic crystal," *Nature Communications* **10**, 5185 (2019).
- T. Y. Yang, Q. Wan, D. Y. Yan, Z. Zhu, Z. W. Wang, C. Peng, Y. B. Huang, R. Yu, J. Hu, Z. Q. Mao, Si Li, **S. A. Yang**, Hao Zheng, Jin-Feng Jia, Y. G. Shi, and N. Xu, "Directional massless Dirac fermions in a layered van der Waals material with one-dimensional long-range order," *Nature Materials* **19**, 27 (2020).
- Jing Zhang, Luojun Du, Shun Feng, Run-Wu Zhang, Bingchen Cao, Chenji Zou, Yu Chen, Mengzhou Liao, Baile Zhang, **S. A. Yang**, Guangyu Zhang, and Ting Yu, "Enhancing and controlling valley magnetic response in MoS_2/WS_2 heterostructures by all-optical route," *Nature Communications* **10**, 4226 (2019).
- Zhi-Ming Yu, Weikang Wu, Yu Xin Zhao, and **S. A. Yang**, "Circumventing the no-go theorem: A single Weyl point without surface Fermi arcs," *Phys. Rev. B Rapid Comm.* **100**, 041118 (2019).
- Fangdong Tang, Yafei Ren, Peipei Wang, Ruidan Zhong, John Schneeloch, **S. A. Yang**, Kun Yang, Patrick A. Lee, Genda Gu, Zhenhua Qiao, and Liyuan Zhang, "Three-dimensional quantum Hall effect and metal-insulator transition in $ZrTe_5$," *Nature* **569**, 537 (2019).
- Zhi-Ming Yu, Weikang Wu, Xian-Lei Sheng, Yu Xin Zhao, and **S. A. Yang**, "Quadratic and cubic nodal lines stabilized by crystalline symmetry," *Phys. Rev. B Rapid Comm.* **99**, 121106 (2019).
- James L. Collins, Anton Tadich, Weikang Wu, Lidia C. Gomes, Joao N. B. Rodrigues, Chang Liu, Jack Hellerstedt, Hyejin Ryu, Shujie Tang, Sung-Kwan Mo, Shaffique Adam, **S. A. Yang**, Michael. S. Fuhrer, and Mark T. Edmonds, "Electric-field-tuned topological phase transition in ultrathin Na_3Bi," *Nature* **564**, 390 (2018).
- Zhi-Ming Yu, Ying Liu, Yugui Yao, and **S. A. Yang**, "Unconventional Pairing Induced Anomalous Transverse Shift in Andreev Reflection," *Phys. Rev. Lett.* **121**, 176602 (2018).
- Peng Li, Weikang Wu, Yan Wen, Chenhui Zhang, Junwei Zhang, Senfu Zhang, Zhi-Ming Yu, **S. A. Yang**, A. Manchon, and Xi-xiang Zhang, "Spin-momentum locking and spin-orbit torques in magnetic nano-heterojunctions composed of Weyl semimetal WTe_2," *Nature Communications* **9**, 3990 (2018).

- Weikang Wu, Ying Liu, Si Li, Chengyong Zhong, Zhi-Ming Yu, Xian-Lei Sheng, Yu Xin Zhao, and **S. A. Yang**, "Nodal surface semimetals: Theory and material realization," *Phys. Rev. B* **97**, 115125 (2018).
- Si Li, Ying Liu, Shan-Shan Wang, Zhi-Ming Yu, Shan Guan, Xian-Lei Sheng, Yugui Yao, and **S. A. Yang**, "Nonsymmorphic-symmetry-protected hourglass Dirac loop, nodal line, and Dirac point in bulk and monolayer X_3SiTe_6 (X=Ta, Nb)," *Phys. Rev. B* **97**, 045131 (2018).
- Shan-Shan Wang, Ying Liu, Zhi-Ming Yu, Xian-Lei Sheng, and **S. A. Yang**, "Hourglass Dirac Chain Metal in Rhenium Dioxide," *Nature Communications* **8**, 1844 (2017).
- Peng Li, Yan Wen, Xin He, Qiang Zhang, Chuan Xia, Zhi-Ming Yu, **S. A. Yang**, Zhiyong Zhu, Husam N. Alshareef, and Xi-Xiang Zhang, "Evidence for topological type-II Weyl semimetal WTe_2," *Nature Communications* **8**, 2150 (2017).
- Yunwei Zhang, Weikang Wu, Yanchao Wang, **S. A. Yang**, and Yanming Ma, "Pressure-Stabilized Semiconducting Electrides in Alkaline-Earth Metal Subnitrides," *J. Am. Chem. Soc.* **139**, 13798 (2017).
- Ying Liu, Zhi-Ming Yu, and **S. A. Yang**, "Transverse Shift in Andreev Reflection," *Phys. Rev. B Rapid Comm.* **96**, 121101 (2017).
- Chengyong Zhong, Yuanping Chen, Zhi-Ming Yu, Yuee Xie, Han Wang, **S. A. Yang**, and Shengbai Zhang, "Three-dimensional Pentagon Carbon with a genesis of emergent fermions," *Nature Communications* **8**, 15641 (2017).
- Shan Guan, Zhi-Ming Yu, Ying Liu, Gui-Bin Liu, Liang Dong, Yunhao Lu, Yugui Yao, and **S. A. Yang**, "Artificial gravity field, astrophysical analogues, and topological phase transitions in strained topological semimetals," *npj Quantum Materials* **2**, 23 (2017).
- Si Li, Zhi-Ming Yu, Ying Liu, Shan Guan, Shan-Shan Wang, Xiaoming Zhang, Yugui Yao, and **S. A. Yang**, "Type-II nodal loops: Theory and material realization," *Phys. Rev. B Rapid Comm.* **96**, 081106 (2017).
- Liyan Zhu, Shan-Shan Wang, Shan Guan, Ying Liu, Tingting Zhang, Guibin Chen, and **S. A. Yang**, "Blue Phosphorene Oxide: Strain-tunable Quantum Phase Transitions and Novel 2D Emergent Fermions," *Nano Lett.* **16**, 6548 (2016).
- Zhi-Ming Yu, Yugui Yao, and **S. A. Yang**, "Predicted Unusual Magnetoresponse in Type-II Weyl Semimetals," *Phys. Rev. Lett.* **117**, 077202 (2016).
- Zhenhua Qiao, Yulei Han, Lei Zhang, Ke Wang, Xinzhou Deng, Hua Jiang, **S. A. Yang**, Jian Wang, and Qian Niu, "Anderson Localization from Berry-Curvature Interchange in Quantum Anomalous Hall Systems," *Phys. Rev. Lett.* **117**, 056802 (2016).
- Yao Wang, Shan-Shan Wang, Yunhao Lu, Jianzhong Jiang, and **S. A. Yang**, "Strain-Induced Isostructural and Magnetic Phase Transitions in Monolayer MoN_2," *Nano Lett.* **16**, 4576 (2016).
- Yuanping Chen, Yuee Xie, **S. A. Yang**, Hui Pan, Fan Zhang, Marvin L. Cohen, and Shengbai Zhang, "Nanostructured Carbon Allotropes with Weyl-like Loops and Points," *Nano Lett.* **15**, 6974 (2015).
- **S. A. Yang**, Hui Pan, and Fan Zhang, "Chirality-dependent Hall Effect in Weyl Semimetals," *Phys. Rev. Lett.* **115**, 156603 (2015).
- Dazhi Hou, Gang Su, Yuan Tian, Xiaofeng Jin, **S. A. Yang**, and Qian Niu, "Multivariable Scaling for the Anomalous Hall Effect," *Phys. Rev. Lett.* **114**, 217203 (2015).
- **S. A. Yang**, Hui Pan, and Fan Zhang, "Dirac and Weyl Superconductors in Three Dimensions," *Phys. Rev. Lett.* **113**, 046401 (2014).
- Yang Gao, **S. A. Yang**, and Qian Niu, "Field Induced Positional Shift of Bloch Electrons and Its Dynamical Implications," *Phys. Rev. Lett.* **112**, 166601 (2014).
- Wang Yao, **S. A. Yang**, and Qian Niu, "Edge States in Graphene: From Gapped Flat-Band to Gapless Chiral Modes," *Phys. Rev. Lett.* **102**, 096801 (2009).
- **S. A. Yang**, Geoffrey S. D. Beach, Carl Knutson, Di Xiao, Qian Niu, Maxim Tsoi, and James L. Erskine, "Universal Electromotive Force Induced by Domain Wall Motion," *Phys. Rev. Lett.* **102**, 067201 (2009).