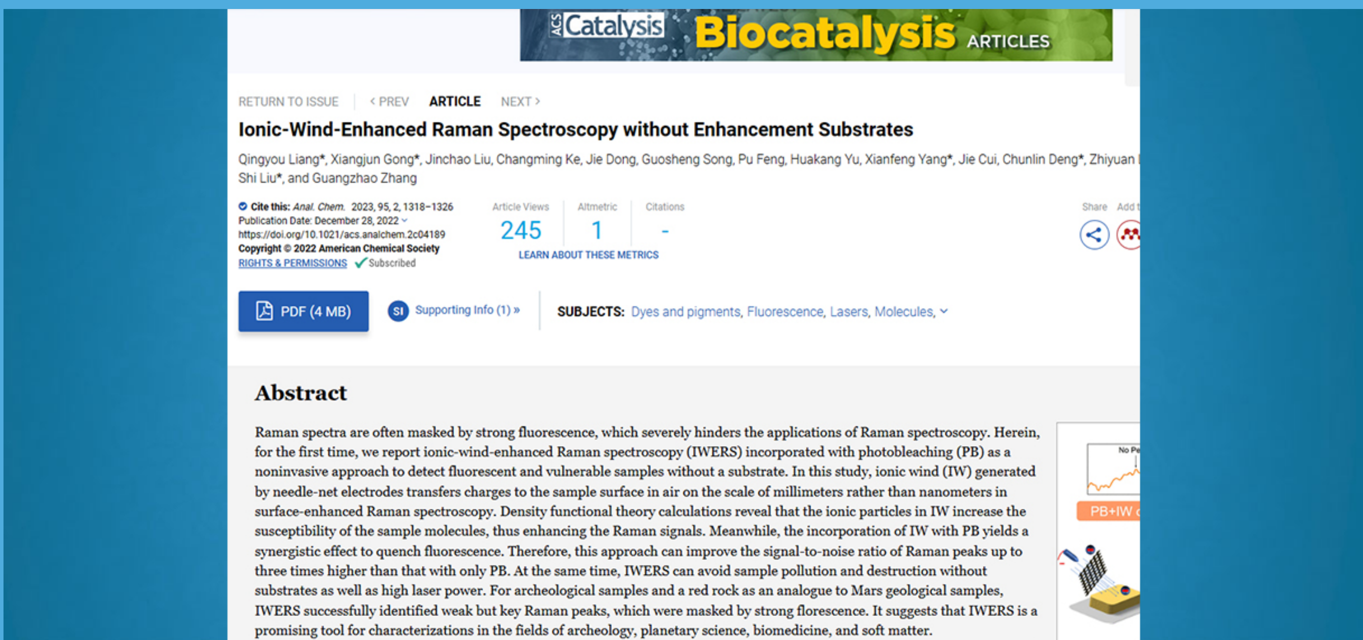
SOUTH CHINA UNIVERSITY OF TECHNOLOGY

ISSUE 1, 2023
2023年第一期

SCUT Newsletter 华工新闻快讯



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Ionic-Wind-Enhanced Raman Spectroscopy without Enhancement Substrates

Qingyou Liang*, Xiangjun Gong*, Jinchao Liu, Changming Ke, Jie Dong, Guosheng Song, Pu Feng, Huakang Yu, Xianfeng Yang*, Jie Cui, Chunlin Deng*, Zhiyuan Shi Liu*, and Guangzhao Zhang

Cite this: *Anal. Chem.* 2023, 95, 2, 1318–1326
Publication Date: December 28, 2022
https://doi.org/10.1021/acs.analchem.2c04189
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Abstract

Raman spectra are often masked by strong fluorescence, which severely hinders the applications of Raman spectroscopy. Herein, for the first time, we report ionic-wind-enhanced Raman spectroscopy (IWERS) incorporated with photobleaching (PB) as a noninvasive approach to detect fluorescent and vulnerable samples without a substrate. In this study, ionic wind (IW) generated by needle-net electrodes transfers charges to the sample surface in air on the scale of millimeters rather than nanometers in surface-enhanced Raman spectroscopy. Density functional theory calculations reveal that the ionic particles in IW increase the susceptibility of the sample molecules, thus enhancing the Raman signals. Meanwhile, the incorporation of IW with PB yields a synergistic effect to quench fluorescence. Therefore, this approach can improve the signal-to-noise ratio of Raman peaks up to three times higher than that with only PB. At the same time, IWERS can avoid sample pollution and destruction without substrates as well as high laser power. For archeological samples and a red rock as an analogue to Mars geological samples, IWERS successfully identified weak but key Raman peaks, which were masked by strong florescence. It suggests that IWERS is a promising tool for characterizations in the fields of archeology, planetary science, biomedicine, and soft matter.

1. Analytical and Testing Center of South China University of Technology (SCUT) and other Institutes Propose an Original Enhancement Method for Raman Spectroscopy

华南理工大学分析测试中心等单位提出原创的拉曼光谱增强方法

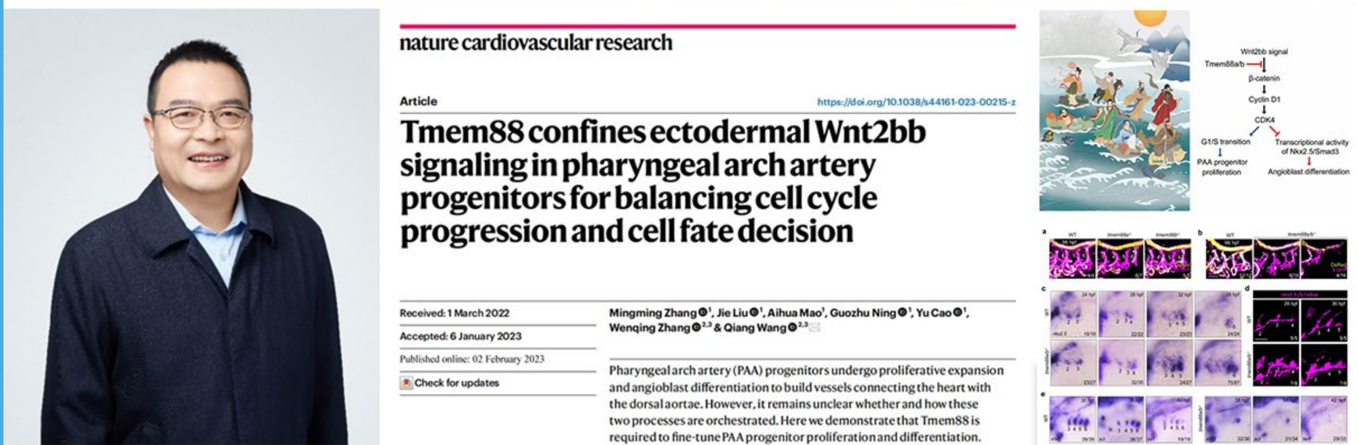
On January 7, a paper titled *Ionic-wind-enhanced Raman Spectroscopy without Enhancement Substrates* was published in Analytical Chemistry, a leading journal in *analytical chemistry*. The first author and corresponding author of the paper is Liang Qingyou, senior engineer of SCUT's Analytical and Testing Center, with co-corresponding authors Prof. Gong Xiangjun and Prof. Deng Chunlin from

SCUT's School of Materials Science and Engineering as well as Prof. Yang Xianfeng from the Analytical and Testing Center. The collaborative institutes include Westlake University, Sun Yet-sun University, and the National Museum of China.

1月7日，文章Ionic-wind-enhanced Raman spectroscopy without enhancement substrates在分析化学领域顶级刊物Analytical Chemistry发表。本研究成果第一作者兼通讯作者为分析测试中心梁庆优高级工程师，共同通讯作者为材料科学与工程学院龚湘君教授与邓春林教授、分析测试中心杨贤锋教授级高级工程师，合作单位包括西湖大学、中山大学、中国国家博物馆等。

Raman scattering is a non-elastic scattering phenomenon of light. The various energy interactions between incident photons and different vibrational modes of sample molecules form the Raman spectroscopy. Such spectroscopy is very sensitive to the non-polar vibration between molecules, which can effectively characterize the molecular structure, and measure physical parameters such as stress and temperature. However, due to the fact that the intensity of Raman light is several orders of magnitude lower than fluorescence, Raman spectra are often masked by strong fluorescence. Ionic-wind-enhanced Raman spectroscopy (IWERS) can significantly improve the signal-to-noise ratio of Raman peaks while achieving totally non-destructive, non-polluting, and contactless Raman spectra detection, meeting the stringent requirements of cutting-edge research fields, thus adding a new tool to the Raman spectra toolbox. The IWERS method has extensive application potential and is expected to play an important role in fields such as archaeology, planetary science, biomedicine, and soft matter.

拉曼散射（Raman scattering）是光的一种非弹性散射现象，入射光子与样品分子不同振动模式之间交换不同能量从而形成拉曼光谱（Raman spectroscopy）。拉曼光谱对于分子间的非极性振动非常敏感，可有效表征分子结构，也可测量应力、温度等物理参数。但由于拉曼光的强度比荧光低好几个数量级，因此拉曼光谱受荧光的干扰非常严重。离子风增强拉曼光谱（Ionic-wind-enhanced Raman spectroscopy, IWERS）可以在显著提高拉曼谱峰信噪比的同时，实现完全无损、无污染、无接触的拉曼光谱检测，满足前沿领域的苛刻要求，从而为拉曼光谱的工具箱提供了新的工具。IWERS方法有广泛应用的潜力，有望在文物考古、行星科学、生物医学、软物质等领域发挥重要作用。


nature cardiovascular research

Article

https://doi.org/10.1038/s44161-023-00215-z

Tmem88 confines ectodermal Wnt2bb signaling in pharyngeal arch artery progenitors for balancing cell cycle progression and cell fate decision

Received: 1 March 2022

Accepted: 6 January 2023

Published online: 02 February 2023

Check for updates

Mingming Zhang[1], Jie Liu[1], Aihua Mao[1], Guozhu Ning[1], Yu Cao[1], Wenqing Zhang[2,3] & Qiang Wang[2,3]

Pharyngeal arch artery (PAA) progenitors undergo proliferative expansion and angioblast differentiation to build vessels connecting the heart with the dorsal aortae. However, it remains unclear whether and how these two processes are orchestrated. Here we demonstrate that Tmem88 is required to fine-tune PAA progenitor proliferation and differentiation.

2. Prof. Wang Qiang and His Team from SCUT Elucidate the Regulatory mechanism

underlying the Balance Control of the Proliferation and Angioblast Differentiation of Arch Artery Progenitor Cells

华南理工王强教授团队解析弓动脉祖细胞增殖和分化的平衡调控机制

On February 2, a research team led by Prof. Wang Qiang from the School of Medicine of SCUT published a paper online entitled *Tmem88 Confines Ectodermal Wnt2bb Signaling in Pharyngeal Arch Artery Progenitors for Balancing Cell Cycle Progression and Cell Fate Decision on Nature Cardiovascular Research*. This study finds that the proliferation and angioblast differentiation of PAA progenitors manifest an inverse relationship, and are delicately regulated by cell-cycle machinery downstream of the TMEM88-Wnt pathway. This study further reveals a key role for TMEM88 in governing the delicate balance between PAA progenitor proliferative expansion and angioblast differentiation. Dr. Zhang Mingming from the Institute of Zoology of the Chinese Academy of Sciences is the first author of the paper, with Prof. Wang Qiang from the School of Medicine of SCUT as the corresponding author, and SCUT as the corresponding institute.

2月2日，华南理工大学医学院王强教授课题组在《自然-心血管研究》（Nature Cardiovascular Research）在线发表了研究论文"Tmem88 confines ectodermal Wnt2bb signaling in pharyngeal arch artery progenitors for balancing cell cycle progression and cell fate decision"（Tmem88通过限制外胚层Wnt2bb信号平衡弓动脉祖细胞增殖和分化）。该研究发现弓动脉祖细胞的增殖和向成血管细胞分化呈负相关，并且受到Tmem88-Wnt信号通路下游细胞周期蛋白质机器的精密调控，从而揭示了弓动脉祖细胞增殖和分化的平衡调控分子机制。中国科学院动物研究所张明明博士为论文第一作者，华南理工大学医学院王强教授为论文通讯作者，华南理工大学为该论文通讯单位。

The arch artery connects the heart and dorsal aorta of vertebrate embryos and is an important component of embryonic blood circulation. During embryonic development, the progenitor cells of the arch artery first proliferate and differentiate into angioblasts, and further mature into vascular endothelial cells, which eventually connect with the dorsal aorta to form functional vascular structures. These transient embryonic blood vessels undergo extensive remodeling, leading to the development of the aorta, pulmonary artery, carotid artery, subclavian artery and other great arteries. It is fair to say that the cellular and molecular mechanisms underlying the development of arch artery that this study focuses on are at the forefront of current biomedical research, and have important scientific significance and practical value.

弓动脉连接脊椎动物胚胎心脏和背主动脉，是胚体血液循环的重要组成部分。在胚胎发育过程中，弓动脉祖细胞增殖、分化为成血管细胞，并进一步成熟为血管内皮细胞，最终与背主动脉连接，形成功能性血管结构，随后经历剧烈的重塑，最终形成主动脉、肺动脉、颈动脉和锁骨下动脉等大动脉血管。可以说，此项研究所关注的弓动脉发育的细胞和分子机制，是当前生命医学研究领域的前沿，具有重要的科学意义和现实需求。

3. SCUT Attends Third Meeting of China-South Africa High-level People-to-People Exchange Mechanism and Signs Cooperation Agreements

华南理工大学应邀出席中南高级别人文交流机制第三次会议并签署合作协议

On February 16, the third meeting of China-South Africa High-level People-to-People Exchange Mechanism was held in Cape Town, South Africa. SCUT Party Secretary Zhang Xichun, together with his delegation, was invited to attend the meeting in South Africa.

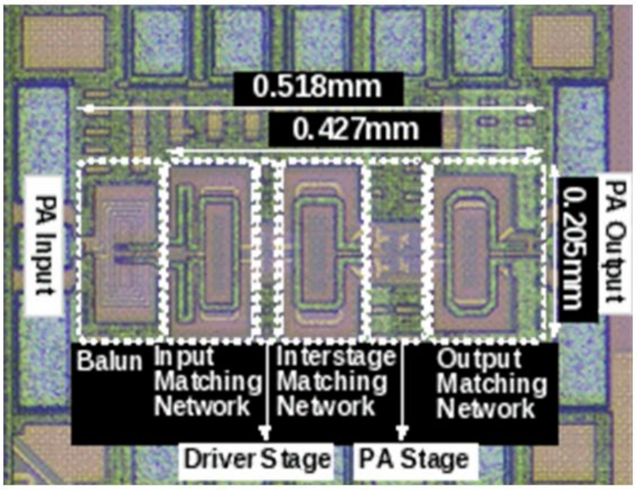
2月16日，中南高级别人文交流机制第三次会议在南非开普敦举办，华南理工大学党委书记章熙春应邀率团前往南非参加会议。

During his visit, Zhang Xichun held quadripartite talks with heads of the Management Committee of Musina Makhado Special Economic Zone (MMSEZ), South African Energy Metallurgical Base (Pty) Ltd., and South African PlatiStone Holdings (Pty) Ltd., with a memorandum of cooperation signed on jointly building the "Green High-Performance Asphalt Material R&D Industrial Park Project"; and tripartite talks with the Management Committee of Musina Makhado Special Economic Zone (MMSEZ) and South African Energy Metallurgical Base (Pty) Ltd., with a memorandum of cooperation signed on jointly building the "Education and Scientific Research Park Project", reaching a consensus on matters related to cooperation on the two parks. The pragmatic and distinctive cooperation projects on education research between SCUT and South Africa have won special support and high recognition.

访问期间，章熙春与穆希纳马卡度经济特区管理委员会、南非能源冶金基地有限公司以及南非普拉提道路材料控股有限公司等负责人举行了四方会谈，签署了共建"绿色高性能沥青材料研发产业园区"合作备忘录；与穆希纳马卡度经济特区管理委员会、南非能源冶金基地有限公司举行三方会谈，并签署共建"教育科研园区"合作备忘录，就两个园区合作相关事项达成一致意向。华南理工大学与南非务实且极具特色的教育科研合作项目，受到特别支持及高度肯定。

The China-South Africa High-level People-to-People Exchange Mechanism, as the first high-level people-to-people exchange mechanism established between China and African countries, is known to cover education, culture, science and technology, tourism and many other fields. Educational and youth exchanges, above all, are an important part of people-to-people exchanges. The first and second meetings of the Mechanism were held in Pretoria (2017) and in Beijing (2018), respectively. This meeting marks the first offline event for face-to-face communications between countries after the pandemic.

据悉，中南高级别人文交流机制大会是中国与非洲国家建立的首个高级别人文交流机制，涵盖教育、文化、科技、旅游等多个领域，其中教育交流和青年交流是人文交流的重要内容。第一届及第二届中南人文交流机制大会分别于2017年和2018年在比勒陀利亚和北京召开，此次会议是疫情之后首个国与国之间线下举行的面对面交流活动。



4. SCUT Professors Win IEEE Award for Contributions to International Standards

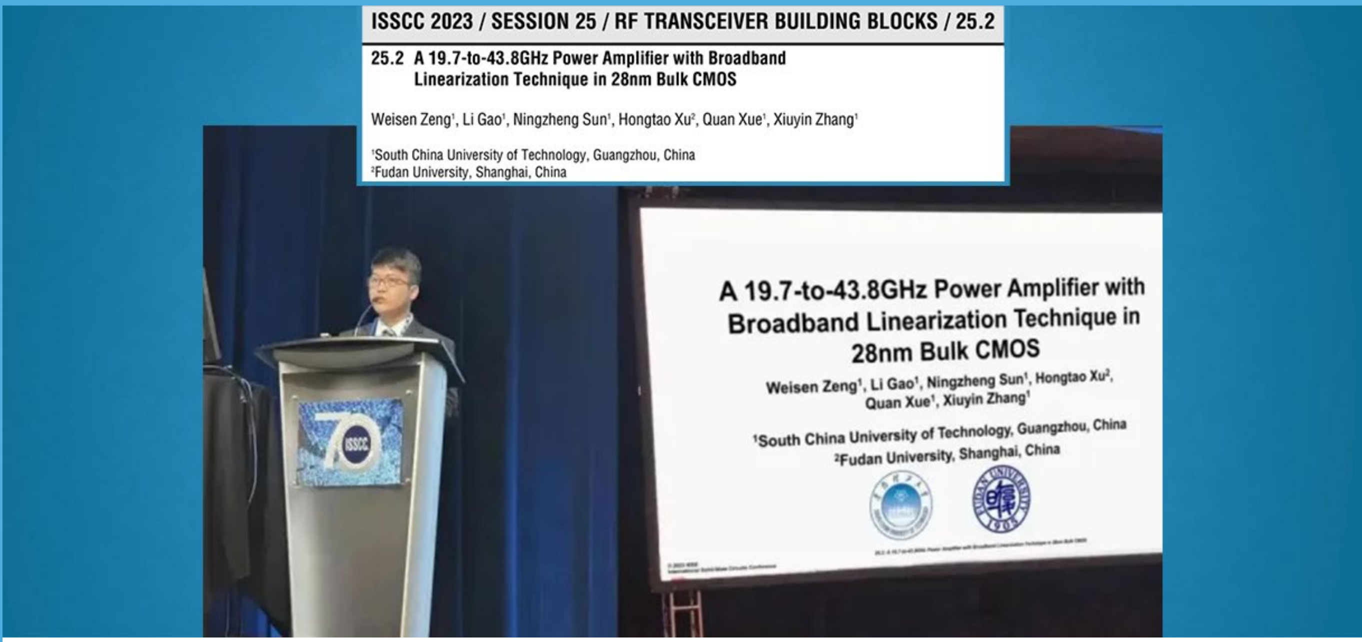
贡献国际标准制定　华南理工两教授获IEEE表彰

Professor Zhu Jizhong and Professor Liu Mingbo from the School of Electric Power Engineering, SCUT won the International Award of the Institute of Electrical and Electronics Engineers (IEEE) Standards Association in recognition of their positive and significant contributions to the publication of *IEEE P2781 Guide for Load Modeling and Simulations for Power Systems*.

华南理工大学电力学院朱继忠教授和刘明波教授荣获国际电气和电子工程师协会（IEEE）"国际标准贡献奖"。该奖项表彰了他们为《电力系统负荷建模与仿真》IEEE国际标准（IEEE　P2781　"Guide for Load Modeling and Simulations for Power Systems"）发布所作出的积极而重要的贡献。

IEEE P2781 is known to be a new load modeling methodology adapted to the operation and planning of new power systems in the context of the rapid development of the IoT technology. Different from traditional practice, the standard uses big data analysis and artificial intelligence to model the meter's load in detail with data from IoT sensors without the need for customer surveys. The *IEEE Guide for Modeling and Simulations for Power Systems* was officially published on September 30, 2022.

据了解，IEEE　P2781标准是在物联网技术的快速发展背景下制定的一种适应新型电力系统运行与规划的新负荷建模方法。区别于传统方法，该标准运用了大数据分析和人工智能方法，在无需客户调查的情况下通过物联网传感器获得的数据可对电表的负荷进行详细建模。《电力系统负荷建模与仿真》IEEE国际标准于2022年9月30日正式出版发布。



5. SCUT's Research Output on RF Chip Presented at Top-level Conference on Integrated Circuits

华南理工射频芯片研究成果在集成电路领域顶级会议上发表

At the IEEE International Solid-State Circuits Conference (ISSCC 2023), held in San Francisco from February 19 to 23, a research team led by Prof. Xiuyin Zhang from the School of Electronic and Information Engineering, SCUT presented a paper entitled *A 19.7-43.8GHz Power Amplifier with Broadband Linearization Technique in 28nm Bulk CMOS*. The presentation was made at the conference by Ph.D student Weisen Zeng as the first author, with Prof. Xiuyin Zhang as the corresponding author. This is the first time that a paper has been published in ISSCC with SCUT as the affiliation of the first author.

2月19日至23日，2023年IEEE国际固态电路会议(IEEE International Solid-State Circuits Conference, ISSCC 2023)在旧金山举行，华南理工大学电子与信息学院章秀银教授课题组在会议上发表了题为"A 19.7—43.8GHz Power Amplifier with Broadband Linearization Technique in 28nm Bulk CMOS"（《基于28nm Bulk CMOS的19.7-43.8GHz 宽带线性化功率放大器》）的论文，博士生曾伟森作为第一作者在大会上做了现场报告，章秀银教授为通信作者。这是华南理工大学首次以第一单位在ISSCC上发表论文。

The power amplifier is one of the core components of 5G mm-Wave communications. In the paper, a broadband matching circuit design methodology based on magnetoelectric coupling and broadband linearization technique is proposed. Then, a 19.7-43.8GHz ultra-broadband mm-Wave power amplifier is realized in 28nm Bulk CMOS. The power amplifier enables linear operation on a bandwidth of nearly one octave, covering the mainstream FR2 bands in 5G mm-Wave wireless standards. Its performance has reached the advanced international level using the same processes. This has provided an innovative design concept for the design of power amplifiers for the 5G mm-Wave communication system.

功率放大器是5G毫米波通信的核心技术之一。该论文提出了基于磁电耦合的宽带匹配电路设计方法和宽带线性化技术，在28nm Bulk CMOS实现了19.7-43.8GHz的超宽带毫米波功率放大器。它可以在近一个倍频程的带宽上实现线性操作，涵盖5G毫米波无线标准中主流的FR2频段，性能达到了相同工艺下的国际先进

水平，为毫米波5G通信系统中功率放大器的设计提供了一种创新性设计思路。

6. Singaporean Prime Minister Lee Hsien Loong Visits China-Singapore International Joint Research Institute

新加坡总理李显龙来访中新国际联合研究院

On March 28, Singaporean Prime Minister Lee Hsien Loong paid a visit to the China-Singapore International Joint Research Institute (CSIJRI), which was jointly established by Nanyang Technological University (NTU), South China University of Technology (SCUT) and China-Singapore Guangzhou Knowledge City (CSGKC).

3月28日，新加坡总理李显龙到访了由新加坡南洋理工大学、华南理工大学和中新广州知识城共同建立的中新国际联合研究院(CSIJRI)（以下简称"研究院"）。

Lee Hsien Loong was briefed on CSIJRI's development, and inquired about progress in promoting scientific and technological cooperation and talent exchanges between the two countries. He also inspected innovation achievements in artificial intelligence and other key fields, met the researchers there, and encouraged CSIJRI to contribute more applications of innovative achievements to society.

李显龙听取了研究院发展概况介绍，询问和了解研究院在两国科技合作、人才交流等方面的情况。他考察了人工智能等若干重点领域的创新成果，与科研人员深入交流，鼓励研究院为社会提供更多的创新成果应用。

Established in 2015, CSIJRI is a world-class research institute integrating innovation, research translation, incubation and commercialization. Taking innovation as its top priority and leveraging the research strengths and innovative talent resources of China and Singapore, CSIJRI aims to realize the exchanges of research achievements and talent resources, and in turn establish an important platform for mutual learning and sharing of renovation experiences between the two countries. At present, CSIJRI focuses on accelerating development in six fields: artificial intelligence, life and health, new energy, new materials, environmental restoration, green buildings and smart cities.

中新国际联合研究院成立于2015年，是一家集技术创新、科技成果转化、企业孵化及产业化于一体的世界级研究机构。研究院以创新为首要任务，依托中新两国的科研优势及创新人才资源，实现科研成果、人才资源的双向流动，打造两国科技创新互学互鉴的重要平台。目前，研究院重点聚焦和推进人工智能、生命健康、新能源、新材料、环境修复、绿色建筑和智慧城市等六大领域。。

Produced by: International Office, SCUT

Advisor: Prof. Xu Xiangmin, Vice President

Chief Editor: Yao Min, Director, International Office

Deputy Chief Editor: Huang Fei, Deputy Director, International Office

Copy Editors: Chen Wei, Zhang Jihong

Proofreader: Paul Winning

Designer: JOYO Advertising

Issue Date：April，2023

制作：华南理工大学国际交流与合作处

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发布时间：2023年4月