



NANJING UNIVERSITY COLLABORATIVE INNOVATION CENTER OF ADVANCED MICROSTRUCTURES

WHERE MICROSTRUCTURES HAVE MACRO IMPACT

The Collaborative Innovation Center of Advanced Microstructures (CICAM), led by Nanjing University, was established under the 2011 Plan, an initiative of the Chinese Ministry of Education and Ministry of Finance to develop the innovation capacity of universities across the country. The plan was introduced as an important strategic measure in China's higher education system and through the establishment of Collaborative Innovation Centers has focused on four key categories: frontier science, industrial development, regional development and cultural heritage. In an evaluation by the Ministry of Education in early 2014, CICAM was rated top of all the Collaborative Innovation Centers considered.

CICAM concentrates on conducting interdisciplinary research on advanced and artificial microstructure materials where micro- to nano-scale features give rise to interesting properties, which can be exploited for a range of technological applications. Researchers at CICAM conduct fundamental research on advanced and artificial microstructures and also work to translate their findings into relevant applications. Through these efforts CICAM aims to establish itself as a leading centre in the field, producing research that catalyses Chinese industry and meets their technology needs. The centre

is also committed to training researchers and drawing prominent scientists from across the country to become a world-class scientific institution.

CICAM is the result of a partnership between several universities, research institutes and companies located in the Yangtze River Delta region, a thriving area for science and education in China with a very active high-tech industry. The partner institutions have a long history of cooperation in large research projects and are committed to sharing the responsibilities and benefits of CICAM.

THE STRENGTH OF COLLABORATIVE INNOVATION

CICAM's collaborative approach takes full advantage of the expertise cultivated in five established research platforms, including the National Laboratory of Solid State Microstructures at Nanjing University, to create an environment conducive to innovation on a par with that achieved by the international community.

CICAM is responsible for 60 major national research projects with a total research budget of RMB 380 million (approximately USD 62 million). Its research on dielectric superlattices and iron-based superconductors is among the strongest in the world. It has also yielded numerous important advances in the areas of optics, acoustic diodes, quantum integrated chips, high-temperature

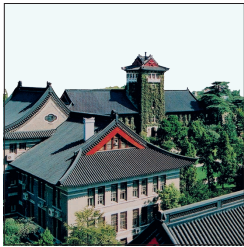
superconducting materials and their mechanisms, quantum spin Hall systems, entangled edge states, nanophotovoltaics, all-solid-state laser microstructures and micro-nanofabrication technologies. For example, CICAM researchers have designed a semiconductor laser array chip based on artificial microstructures, which entered into Huawei Technologies' industrial exploration programme on photonic integrated devices in 2013.

CICAM has attracted the attention of the scientific community for the high quality of its research as well as its implementation of novel and innovative training solutions for talented young scientists, such as personalized training for top students. An eight-year programme at the centre covering undergraduate-, masters- and PhD-level study has proved very successful.

Overall, CICAM delivers some of the best science conducted in China today. It is a dynamic centre for both research and researcher development, exploring novel approaches to artificial microstructures and producing original research to meet the country's core technology needs.



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profile feature



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The Collaborative Innovation Center of Advanced Microstructures (CICAM) was formally authenticated by the Ministry of Education of China in 2014. Here, we discuss CICAM's mission and development with three CICAM directors: Dingyu Xing of Nanjing University, Fuchun Zhang of Zhejiang University and Xingao Gong of Fudan University.

Q: Who founded the centre?

Nanjing University took the lead in founding CICAM in 2012, in partnership with Fudan University and Shanghai Jiao Tong University (both in Shanghai), Zhejiang University (in Hangzhou), the University of Science and Technology of China and the Hefei Institutes of Physical Science of the Chinese Academy of Sciences (both in Hefei) and the company Huawei Technologies. The cities of Shanghai, Hefei and Hangzhou are all connected to Nanjing by high-speed railway and lie in the economically dynamic region of the Yangtze River Delta. The five universities are ranked in the top ten institutions for physics research in China and are especially strong in the areas of condensed-matter physics and materials sciences. CICAM brings together many important leaders in the field of artificial microstructures, including a Nobel laureate, a member of the American Academy of Engineering, 16 academicians of the Chinese Academy of Sciences, 34 Changjiang endowed professors and 45 Distinguished Young Scholars of the Natural Science Foundation of China.

Q: Why was CICAM established?

Research and development into artificial microstructures lies at the forefront of modern physical science. As one of the most important and promising research areas in the 21st century, microstructures research is at the crossover of condensed-matter physics, materials science and information science. Designing and manufacturing artificial microstructures at various scales can reveal novel quantum effects, help advance science and technology for quantum manipulation and lead to new generations of materials, information and energy technologies.



Ding Yu Xing, Co-director,
Prof. of Nanjing University.



Fu Chun Zhang, Co-director,
Prof. of Zhejiang University.



Xin Gao Gong, Co-director,
Prof. of Fudan University.

Q: What advantages do collaborative innovation centres offer?

Collaborative innovation centres attract some of the most talented researchers. They also promote interdisciplinary research through bringing together researchers with expertise in different areas and sharing resources. CICAM will combine the research capabilities of the National Laboratory of Solid State Microstructures and the State Key Laboratory of Coordination Chemistry of Nanjing University, the High Magnetic Field Laboratory at the Hefei Institutes of Physical Science of the Chinese Academy of Sciences, the State Key Laboratory of Surface Physics of Fudan University, the Key Laboratory of Artificial Structures and Quantum Control of Shanghai Jiaotong University, the Center of Correlated Matter at Zhejiang University and Huawei Technologies' Noah's Ark Lab. In addition, CICAM receives support from five provincial key laboratories and 17 national researcher training centres.

Q: What are the main research focuses of CICAM?

Focusing on cutting-edge science, CICAM chose artificial bandgap materials, correlated electron systems and small quantum systems as its three main innovation areas. It established eight cross-institutional innovation platforms: essential facilities for microstructure research, artificial bandgap- and meta-materials, micro/nano-photonics, quantum phase transitions and quantum manipulation for correlated electron

materials, novel superconducting materials and unconventional mechanisms, mesoscopic physics and devices, magnetic nanostructures and spintronics, and functional microstructured devices and system integration. Huawei participates in the construction of the last platform, which is dedicated to converting the scientific achievements of CICAM into practical applications.

“CICAM brings together many important leaders in the field of artificial microstructures”

Q: How does CICAM plan to attract talented researchers?

CICAM will follow international standards for hiring, in line with the Association of American Universities. The centre will coordinate across its different institutions, but will establish an independent management authority for establishing positions based on its research progress. The principal investigators will report directly to the centre's directors. Employment at the centre will be contract based for the duration of the research projects and key researchers will receive international evaluation. CICAM will also provide many incentives to attract talented researchers, especially active young researchers. Once hired, researchers will receive generous non-competitive research funding from the centre.