MEETING OF MINDS FOR AN INNOVATIVE CULTURE

Today's rapid scientific development is blurring the lines between disciplines. The pressing need to meet society's grand challenges calls for increased cross-disciplinary collaborations. Bridging and combining these disciplines is vital for academic and technological innovation.

At Northwestern Polytechnical University (NPU), the exploration of emerging interdisciplinary fields is based on existing academic strengths. New interdisciplinary programmes in emerging fields are taking shape, with a flood of original research and application results in the pipeline.

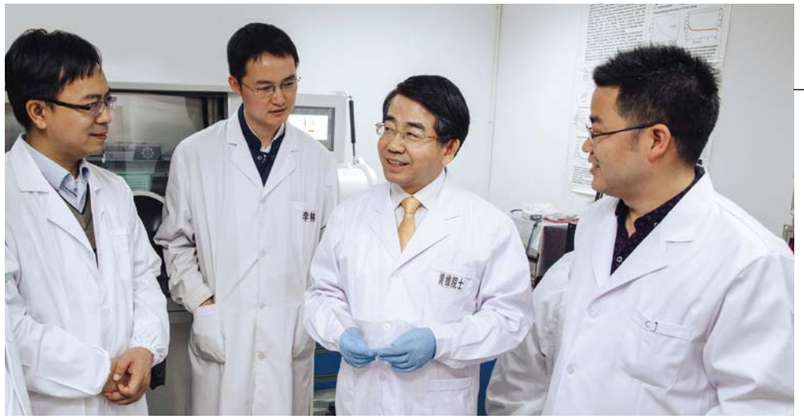
Flexible electronics

One new growth area is flexible electronics, a highly interdisciplinary field integrating organic electronics, plastic electronics, printed electronics, nanoelectronics and bioelectronics. With applications in digital displays, memory computation, data encryption, bio-sensor, medicine and health, as well as renewable energy, flexible electronics emerges as a disruptive technology of information systems in the post-PC era.

To address pivotal scientific issues and technical difficulties ranging from flexible optoelectronic materials, semiconductor properties and device mechanisms, to device fabrication and integration, the Xi'an municipal government reached an agreement with NPU in 2017 to establish the Institute of Flexible Electronics (IFE). Now IFE has 40 talented academics and multiple provincial research platforms. Its major research directions include materials and devices that are organic optoelectronic, nano-optoelectronic, bioelectronic, or for advanced energy use.

Led by Huang Wei, a member of the Chinese Academy of Sciences, the IFE group, and collaborators recently discovered a colour-tuneable, all-inorganic, perovskite nanocrystal scintillator, a luminescent material that has applications in radiation detection. They reported, in their *Nature* paper, the utility of the material in examining electronic circuit boards under low-dose X-ray illumination.

Aiming to become a world-class institute, IFE is developing partnerships with top universities and institutes around the world. By gathering a high-calibre scientific research team, it is poised to become a national base that integrates cutting-edge research, talent development, and industry incubation for flexible electronics.



Huang Wei (second from the right) led the IFE group that discovered a luminescent material with applications in radiation detection.

Audio and speech processing

As a main application of artificial intelligence technologies, speech processing is a good example of a multidisciplinary field that integrates different techniques, including audio signal and language processing, audio coding, source separation, speech recognition and synthesis, and speech enhancement. The technology is widely applied in voice communication, smart devices, human-machine interactions, and the Internet of Things.

NPU established an audio, speech and language processing group in the early 1990s to conduct in-depth research on speech recognition, synthesis, and signal processing, voiceprint/emotion recognition, and multimodal human-machine interactions. The group later evolved into the Shaanxi Provincial Key Laboratory of Speech & Image Information Processing (SAIIP). Now, NPU's world-calibre researchers have made theoretical and applicable breakthroughs in audio and speech processing, having attracted funding from the National Natural Science Foundation of China and a variety of local, national, and international industries.

Brain science

Brain research is another emerging interdisciplinary field at NPU. Its neuroinformatics team has been engaged in cross-disciplinary research for decades, involving neural information processing, brain and cognition, artificial intelligence, brain-computer interface and brain-controlled technologies. In 2015, NPU established the Brain Decoding Research Center to unravel the principles of brain computation and the analysis of brain imaging.

Researchers in the neuroinformatics team have developed the first multimodal brain-controlled system by combining human intelligence with artificial intelligence. This new system has fewer leads and enables control over external devices, such as drones, robots and unmanned vehicles, realizing effective brain-computer interactions.

Special environmental biology and biomedical engineering

With expertise in aeronautics and astronautics, NPU has also developed the interdisciplinary programme of space biology, which bridges special environments and biology. The research team has established simulation-based experimental platforms to conduct research on the biological effects of weightlessness at body, cell and molecule levels.

The team has established ground-based experimental platforms to study the biological effects of weightlessness at organism, cellular and molecular levels. It has led the space life science experiment project for China's first cargo spacecraft, Tianzhou-1, to study the long-term effect of microgravity on bone cells. ■

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Sending the right signals for talent

To promote emerging interdisciplinary fields and disruptive technologies, NPU has dynamic systems to attract talent with global outlooks. It has a designated programme where researchers receive policy, system and research budget support. Examples are the new specialty research institutes of flexible electronics, unmanned systems, aerospace dynamics, internet innovation, and cultural relic protection. The university is also building institutes across the country, such as in Shenzhen, Qingdao and the Yangtze River Delta region. Its flexible hiring policies enable recruits to be based in centres outside Xi'an, providing an open, diverse and flexible model for gathering the right people.

NPU has also launched the Ao Xiang Talents Programme to build platforms for attracting and cultivating renowned researchers. The programme plans to bring young scholars (the Ao Xiang Overseas Talents Project) and to support the growth of existing young faculty, providing them 1 to 3 million RMB's startup research funding. By piloting a tenure system, the university has high academic standards, accompanied with competitive compensation packages, to motivate its faculty and encourage initiative. With one of the largest total and per person research budgets in the country, NPU also has resources for cutting-edge research. Academic leaders are provided with a competitive annual salary, along with other benefits, including excellent education opportunities for their children.

NPU is committed to providing an open and inclusive academic environment, with the most supportive mechanisms and services for talented researchers to achieve their potential.