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REN YI (REN BONIAN) 1840–1895

Ren Yi (initially named Run, also *zi* Bonian, *hao* Xiaolou, and Ciyuan) was one of the most brilliant painters of the nineteenth-century Shanghai school. Ren Bonian was a native of Shanyin (modern Shaoxing) in Zhejiang Province. His father, Ren Hesheng (*zi* Songyun), a small-businessman dealing in grain, moved the family from Shanyin to Xiaoshan. Ren Bonian's son, Ren Jinshu, wrote in an inscription that his grandfather also practiced traditional Chinese portraiture and taught Ren Bonian this professional skill. Around 1861, the Taiping Uprising (1851–1864) swept through Zhejiang Province, and Ren Bonian's father died during the conflict. It is said that Ren Bonian himself was forced to join the troops as a flag bearer, but he managed to flee from the Taiping troops and return to Xiaoshan in early 1862.

There is a famous anecdote recorded by the modern master Xu Beihong (1895–1953), who credits it to the Shanghai artist Wang Yiting (1867–1938), about how Ren Bonian, with his humble background, became one of the most influential artists in Shanghai. Although recent research has disproved its veracity, its wide circulation among artists who admired him attests to the accuracy of its portrayal of Ren Bonian's precocious technical brilliance. The story relates that after his father's death, Ren Bonian made a living on the streets in Shanghai by selling painted folding fans to which he had added forged signatures of the famous painter Ren Xiong (1823–1857) (to whom he was unrelated, despite sharing a surname). One day Ren Xiong came upon Ren Bonian peddling his wares and was so impressed by his clever forgeries that he asked about the artist. Only after

Ren Bonian proclaimed that they were done by his uncle did Ren Xiong reveal his identity. Despite this awkward encounter, Ren Xiong is said to have appreciated Ren Bonian's talent and even sent him to study painting with Ren Xun (1835–1893), Ren Xiong's younger brother. The reliability of this anecdote, however, is brought into question by the fact that Ren Xiong died in 1857. If Ren Bonian went to Shanghai after his father's death in 1862, then it would have been impossible for him to have met Ren Xiong at that time. Regardless of this chronological discrepancy, Ren Bonian did in fact closely associate himself with Ren Xun in painting style, particularly during his early career.

Ren Bonian sojourned in the Ningbo area between 1865 and 1868, then traveled to Suzhou with Ren Xun in 1868 before finally moving to Shanghai in the winter of that year. Ren Xun introduced many prominent artists and patrons to him, including Yao Xiaofu (son of Yao Xie [1805–1864]) during his Ningbo period and Hu Gongshou (1823–1886), Sha Fu (1831–1906), Jiang Shinong, and others during his Suzhou period. These connections helped Ren Bonian tremendously in his early career in Shanghai. In particular, Hu Gongshou, as the leader of the art world in Shanghai at that time, introduced many opportunities to Ren and helped him find employment and lodging in the Gushangshi (Scent of Antiquity) fan shop when he first moved to Shanghai. In appreciation, Ren called his studio Yihe Xuan (literally, Studio of Relying on the Crane), which evoked the name of Hu's studio, Jihe Xuan (Studio of the Visiting Crane).

To compensate for his humble background and lack of proper literary training, Ren Bonian took the flower-and-bird literati painter Zhang Xiong (1803–1886) as his teacher on the advice of Hu Gongshou. Ren also made connections by means of his portrait skills. From the late 1860s and throughout his career in Shanghai, Ren produced approximately fifty portraits of fellow artists, friends, and patrons. In fact, it was quite fashionable in late nineteenth-century Shanghai to use portraits as a way of self-promotion. People would invite prominent figures to inscribe poems or colophons on their portraits to show off their social network and would sometimes even publish the inscriptions in the newly established media of the time—the newspaper. By contributing portraits to this trend, Ren participated in the social network-building of the mainstream art world in Shanghai, and he became quite famous in the early 1870s.

Living in Shanghai, one of the most cosmopolitan cities in the world at the time, Ren Bonian absorbed and transformed many different international stimuli into his art, including Western painting techniques, photography, and even Japanese woodblock ukiyo-e prints. He was said to have learned Western pencil sketch techniques from his

friend Liu Dezhai, who worked in the Roman Catholic establishment in the Xujiahui area of Shanghai. Ren's art in the 1870s gradually evolved from the stiffer and more rigid forms and brushwork inherited from the style of the seventeenth-century artist Chen Hongshou via Ren Xun and Ren Xiong, to become more energetic and fluent in expression during the 1880s. His mature works from the late 1870s show a liberation of brushwork. By using impressionistic and quick brushwork along with unexpected compositions, he delivered a dramatic sense of movement that fit perfectly with the pace and content of urban life in Shanghai during this era of change.

SEE ALSO *Chinese Painting (guohua)*; *Ren Xiong: Shanghai School of Painting*; *Wang Zhen (Wang Yiting)*; *Xu Beihong*.

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RESEARCH IN ENGINEERING

China's rise as an economic power has paralleled its gain in engineering prowess. Engineering, or applied science and technology, is a broad discipline that includes mechanical engineering, civil engineering, electrical engineering, chemical engineering, electronic engineering, biomedical engineering, and, by extension, the profession of those working in these disciplines.

EDUCATION AND RESEARCH INSTITUTIONS

Over 1 million new engineering undergraduates, half with bachelor degrees, have graduated in China every year since 2005, more than in any other country. Important engineering research is also being conducted in China's educational institutions, research institutes, and enterprises. The Chinese Academy of Sciences encompasses a number of engineering institutes. These include the Institute of Engineering Thermophysics, engaged in research related to power engineering, and the Institute

of Process Engineering, focusing on the motion, transfer, and reaction of substances in physical, chemical, and biological conversion processes. In fact, the Institute of Engineering Thermophysics is an offshoot of another engineering-related establishment, the Institute of Mechanics, which contributed to the development of China's strategic-missile program. Other Chinese Academy of Sciences institutes, especially those in high technology, also do engineering-related research. In addition, during the 1950s many research-and-development institutes were established within industrial ministries, and some later became parts of larger enterprises or became enterprises themselves.

China's leading engineering universities include Tsinghua, Shanghai Jiaotong, Zhejiang, and Tongji. Many of them have expanded the scope of their teaching and research to become more science-oriented and comprehensive by offering courses and programs in the natural sciences, social sciences, and humanities. Nevertheless, certain engineering fields remain strong in these universities: Tsinghua and Tongji are well known for their architecture and civil engineering programs, Shanghai Jiaotong is strong in shipbuilding, and Zhejiang in optical engineering, and so on. There also are universities that focus on specific engineering specialties, such as aeronautics and astronautics, mining, chemical engineering, information engineering, and agricultural and forestry engineering.

As of 2008, China had established 141 “national engineering research centers” at educational institutions and research institutes, integrating modern engineering technology into the solutions for problems in agriculture, information and communications, manufacturing, medicine and health, resource exploration, energy, light industry and textiles, materials, construction, and the environment.

At the top of China's engineering hierarchy is the Chinese Academy of Engineering, which is not only an honor society but also the nation's highest consultancy in engineering and technology matters. Unlike the Chinese Academy of Sciences, the Chinese Academy of Engineering does not have affiliated research entities; instead, it comprises only honorary members (*yuanshi*), who are elected every two years from among the entire engineering community. These outstanding engineers help draw the road map for the nation's engineering strategy and solve engineering-related problems.

ENTERPRISE-LEVEL RESEARCH

Much of China's engineering research is being carried out at the firm level. Enterprises operating in China—state-owned, private, and foreign-invested—conduct engineering research to manufacture new products, to improve production processes and capabilities, and to assimilate imported