

TAIWAN

# The capital of semiconductors

by Alessandro Gandolfi





At the Taipei Astronomical Museum a family prepare for the Cosmic Adventure exhibit: a journey through the solar system in the 25th century, by which time space tourism will probably have become a reality.



## HSINCHU, ASIA'S SILICON VALLEY, WHERE TAIWAN SCENTS THE FUTURE

**In 1980, following a trip to California, a group of Taiwanese visionaries set out to create a science park on a hill in Hsinchu. The idea was ambitious and had the backing of the Taipei government: to create Asia's own Silicon Valley. The project, however, required young and cultured minds.**

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Many youngsters who had left to study abroad were persuaded to return by, among other things, Spanish style houses that were built within the park. Forty years later, not only does that park still exist, but it is the heart of a planetary success: Taiwan has become the world's main centre for the production of semiconductors, essential elements for creating microchips. This strategic success story has become a particularly enticing proposition, especially for China.

The island is responsible, in fact, for two thirds of the total global production of microprocessors, the genuine technological heart of the modern world. Today, everything – smartphones, computers, cars, video games, the medical sector and, above all, the arms industry – depends on semiconductors, a product that is experiencing a ten per cent increase in demand every year.

In Hsinchu, the Science Park is a city within a city. In an area of 14 square kilometres, 565 companies employ 165 thousand people, generating thirty per cent of the country's total exports. Manufacturers include the famous TMC, Apple's supplier, a colossus with a turnover of 70 billion dollars that covers half of the microchip market. All of Hsinchu revolves around scientific development – companies, numerous universities and cutting-edge research centres – and by 2025 they expect

to be producing transistors measuring 2 nanometres, the diameter of DNA. Outside the city are freshwater reservoirs, essential for high tech industries: making a 20 cm wafer requires at least 7,500 litres of water.

Taiwan has always had a particular calling: scenting the future and investing in that direction, creating neither logos or brands and keeping a low profile by working "on behalf of third parties".

By doing so, the island has carved out a key role for itself in today's society, becoming an essential node that no one can ignore. Not even the superpowers. US president Joe Biden highlighted the importance of semiconductors in "the race to win the 21st century." In fact, the competition between the United States and China – taking in protectionist legislation, industrial espionage and coast-to-coast headhunting of talent – already features here in Taiwan.



Taipei. Students at the National Taiwan University work in the Intelligent Machinery and Mechatronic Control Lab.

Hsinchu. The Baoshan II reservoir outside the city. Hsinchu's semiconductor manufacturers, especially the TSMC, have substantial water requirements and use the water from the surrounding reservoirs, even though in recent years droughts have raised various questions about the sustainability of the water supply.





Taipei, Jianguo High School: at the Taipei Resource Center for the Gifted and Talented, Raymond Lin, aged 16, poses for a picture. Raymond is one of the school's "gifted" youngsters. He has been studying bioengineering and pharmacy since he was 12 years old.



Hsinchu. Employees from the Wistron NeWeb Corporation (WNC) play a game of basketball during their lunch break. WNC is a company specialized in software, hardware and mechanical design and has premises in the Hsinchu Science Park, Taiwan's "Silicon Valley".



Hsinchu. A student walks by the student accommodation at the National Tsing Hua University. One of the country's most prestigious universities, the NTHU is the alma mater of three Nobel Prize laureates.



Taipei. A visitor takes in the view at the Observation Deck, the observatory on the 89th floor of Taipei 1010, a skyscraper 509.2 metres high.

山頂的倒影會落在西面的牡丹花上，那朵牡丹  
在深夜的月光下顯得格外清晰。這座山  
的倒影會落在東面的一處山崖上。

In the evening, the shadow of Taipei 1010 lies on the petals of the peonies in the west, and the shadow of the mountain is reflected on the cliff on the east.



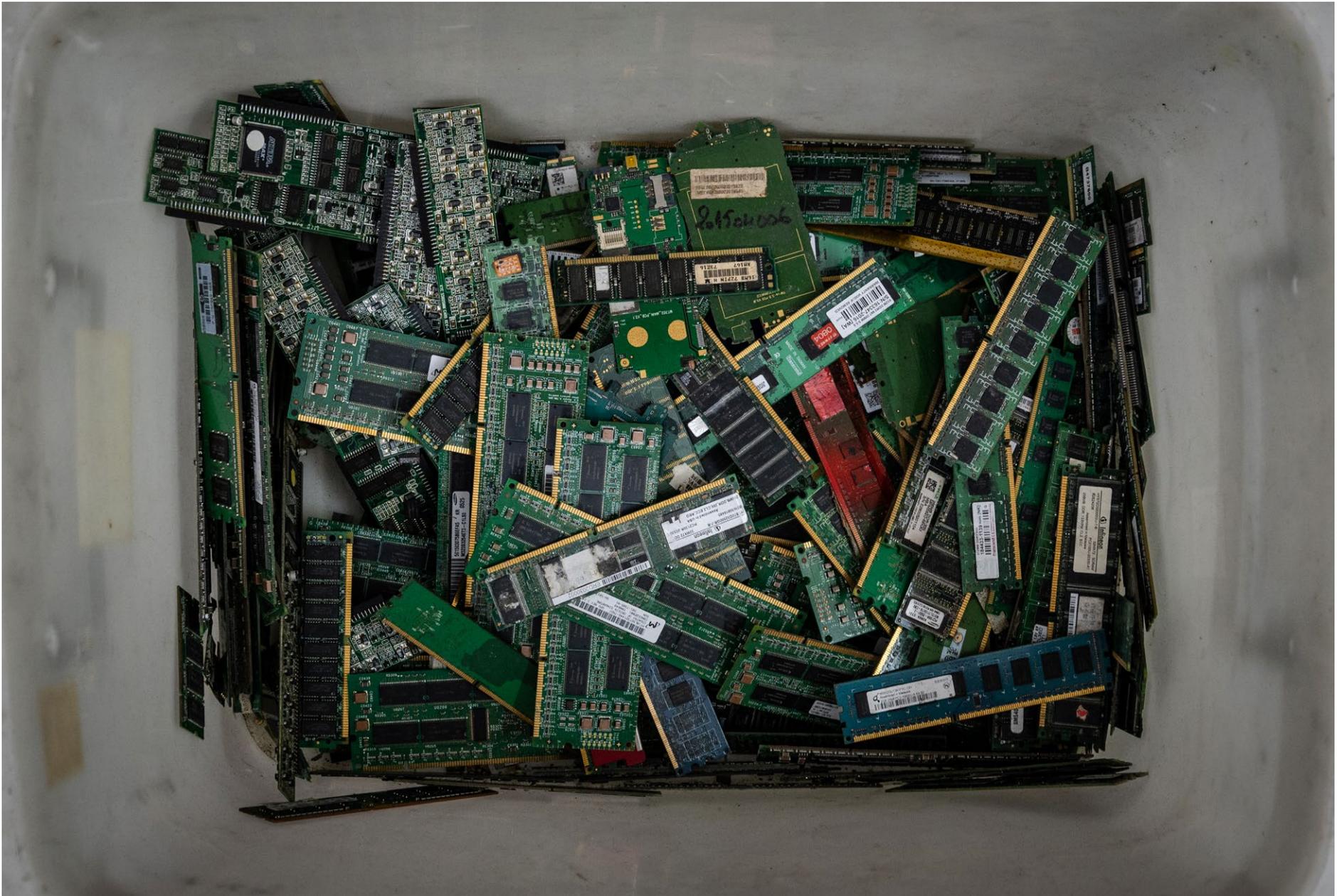
Hsinchu. Henry Lee, aged 18, studies Economics at the National Tsing Hua University. Here he is pictured in a common room at the student accommodation on campus.

Hsinchu. Homes built in the 1970s near the entrance to the Hsinchu Science Park. These European style houses were built to attract students who had studied in Europe and the USA, offering them homes that would resemble the lifestyles and architecture they experienced abroad.





Hsinchu. Just married, Ian Jiang and Teresa Tung have their photo taken outside the municipal offices. Ian works for CCP, a company with premises in the Hsinchu Science Park where it produces probes, connectors and network cables for the high-tech world.



Taipei. Electronic circuit boards with microprocessors are collected at the premises of UWin Nanotech in order to extract the gold they contain. The company has developed an innovative and clean system to extract gold from telephones, computers and other electronic devices.



Hsinchu. Students have lunch at the entrance to the College of Science at the National Tsing Hua University. One of the country's most prestigious universities, the NTHU is the alma mater of three Nobel Prize laureates.

Taipei, Taiwan's National Scientific Centre hosts a talk on science.



NTSEC TALK



SCIENCE





Hsinchu. Aerial view of the Hsinchu Science Park, a vast portion of the city to the east of the historic centre, the area is nicknamed Taiwan's "Silicon Valley".



Taipei. A young woman comments on her live stream channel from the stands of Reset the World, a huge electronic gaming fair held at Expo Dome.



Hsinchu. Scott Huang, associate researcher at the Hsinchu Science Park Bureau, poses for a photograph. Inspired by California's Silicon Valley and opened in 1980, the Science Park is home to hundreds of semiconductor, computer and telecommunications firms.

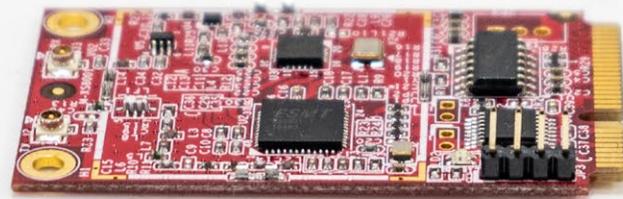


Hsinchu. The Satellite Operations Control Center at the National Space Organization (NSPO) that controls the activities of various Taiwanese Formosat satellites. The NSPO has premises at the Hsinchu Science Park.



Hsinchu. Workers at an electronics company take a break at the City Cafe in the heart of Hsinchu Science Park, Taiwan's "Silicon Valley".

Taipei. Circuit boards with microprocessors by the Taiwanese company ESMT (Elite Semiconductor Microelectronics Technology) on display at the Taitronics electronics fair.





Hsinchu. Brandon Chen, originally from Taoyuan, is involved in developing new technologies at Aspeed Technology, but in his lunch break on Wednesdays he does Zumba at the Hsinchu Science Park Hub. Aspeed Technology designs, produces and sells electronic chips and has premises at the park.



Hsinchu. A view of the buildings in the Zhubei area where many employees of the semiconductor companies in the Hsinchu Science Park live. The Hsinchu Biomedical Science Park and the Tai Yuen Hi-Tech Industrial Park also have premises in Zhubei.



Taipei. Students interact with a robot nurse at the Taitronics electronics fair.



Taipei. Jill Chen, vice president of MyGo, sits on a sofa in the middle of a large open-plan office. MyGo is a company that uses big data and artificial intelligence in the Taiwanese real estate market.

Taipei. A view of the Luzhou district in New Taipei. In the background is the Tamsui River.





Taipei. A visitor has her photo taken at the top of a colourful, futuristic staircase at the Taipei Astronomical Museum.

Hsinchu. Physics students Chen-Chuan Chuang, aged 24 (left) and Chen Yang Hong, aged 24, perform calculations in a classroom at the Physics department of the National Tsing Hua University. One of the country's most prestigious universities, the NTHU is the alma mater of three Nobel Prize laureates.

$$\begin{aligned}
 |\lambda\rangle &= e^{-\frac{\lambda^2}{2}} e^{\lambda a^\dagger} |0\rangle \\
 \langle\lambda| &= \langle 0| e^{\frac{\lambda^2}{2}} e^{\lambda^* a} \\
 \langle\lambda|\lambda\rangle &= e^{-\lambda^2} \langle 0| e^{\lambda^* a} e^{\lambda a} |0\rangle \\
 &= \sum_{n=0}^{\infty} \frac{(\lambda)^n (\lambda^*)^n}{n!} \langle 0| a^n a^n |0\rangle = \sum_{n=0}^{\infty} \frac{(\lambda)^n}{n!} \langle 0| \frac{1}{n!} (a^\dagger)^n |0\rangle \\
 &= \sum_{n=0}^{\infty} \frac{(\lambda)^n}{n!} \langle 0| \frac{1}{n!} (a^\dagger)^n |0\rangle = \sum_{n=0}^{\infty} \frac{(\lambda)^n}{n!} \langle 0| \frac{1}{n!} (a^\dagger)^n |0\rangle
 \end{aligned}$$

