



# Chugugi : The World's First Rain Gauge

Chugugi, completed in 1442, was the world's first rain gauge, and has yet to be improved upon by modern science. It allowed precise measurements of rainfall to be taken all around the country over a period of 400 years. The Confucian values of Korea encouraged an understanding of nature, but the rain gauge was also useful for agricultural purposes. The invention of the Chugugi came to be ascribed erroneously to China, owing to the use of the Chinese dating system in the inscription on a surviving model. Although the historical texts of China and Korea show it was a Korean invention, this is not currently recognized in Chinese textbooks that mention the rain gauge.

On 18 August 1441, a new system of rain measurement was invented in Korea, marking a turning point in the history of meteorology. Conceived by Sejong's eldest son Munjong, and developed in collaboration with other scientists, the world's first rain gauge has yet to be superseded by modern scientific instruments.

Trials of the rain gauge, made in 1441, revealed a number of shortcomings with the prototype. These were corrected, and the design was finalized on May 8 of the following year. The recalibrated rain gauge (31.9cm in height, 14.9cm

in diameter) was given the official title "Chugugi." It was distributed to the local authorities throughout the country, together with a manual for its use and manufacture. The technical specifications of the 1442 rain gauge were as follows:

- (1) The rain gauge called Chugugi is made of iron.
- (2) Its height is 1 cha 5 chi [31.9 cm], and its diameter 7 chi [14.9 cm].
- (3) Measurements are taken when the rain has stopped.
- (4) The chuchok ruler measures the water level.
- (5) The date and times of rainfall must be recorded, with details of the beginning and ending times.
- (6) The water level must be measured accurately in cha (303 mm), chi (30.3 mm) and pun (3.03 mm).

The recorded rainfall was then reported in a prescribed manner, giving details of the month, location, time of day and type of rain<sup>27</sup>. The level of water was also recorded in a prescribed manner. With the invention of the Chugugi, the scientists of King Sejong had found a way to measure natural phenomena quantitatively with scientific instrumentation. Under this established regime of rainfall measurement, meteorological data from across the country

<sup>27</sup>) Rainfall was classified according to 8 categories: minor rain (미우); delicate rain (세우); light rain (소우); moderate rain (하우); damaging rain (쇄우); running rain (취우); heavy rain (대우); ferocious rain (폭우).

was collected for over 400 years. Sejong's scientists made similar measurements of the wind, with a specially designed anemometer. This worked by means of a flag-shaped cloth, which indicated the direction and the speed of the wind. In the first half of the 15th century, no other nation was monitoring weather conditions with precision and on nationwide basis.

The invention of the Chugugi was due in part to the Confucian ideals of the Choson dynasty, and the desire to understand the laws of nature. It was also partly an effort by the government to take a more scientific approach to agriculture. Although the Chugugi was a unique concept developed by King Sejong's scientists, today the invention is erroneously ascribed to China. The rain gauges made during the reign of King Sejong were all lost during the Imjin War (1592~1598), and the few surviving examples are from the 18th century; this is where the confusion begins.

The world was first introduced to the Chugugi in 1910, when a Japanese scholar called Wada Yuji (1859~1918), realizing its importance, included the best photograph of a rain gauge he could find in a dissertation on Korean meteorological observations. He was at the time running a

meteorological station in Chemulpo, Korea. Originally a physics graduate from Tokyo University and a meteorological official from Japan's Ministry of Interior, Wada Yuji had studied meteorology in France from July 1889 to March 1891. Written in French, his paper was entitled "The Rain Gauge of 15th Century Korea," and was sent to his academic acquaintances in France. This was how Chugugi came to be known in Europe.<sup>28</sup>

In 1911, the paper was published in the January issue of the British scientific journal *Nature*, and in the same year an English translation appeared in the 37th issue of the *Quarterly Journal of the Royal Meteorological Society*. Although the Chugugi had now been brought to the world's attention, the photograph in the original dissertation was of a model from 1770. Still the most widely used picture of Chugugi in publications today, it bears the inscription 'Konryung Kyongin Owoljo' (建隆庚寅五月造).

When the Chinese scholars saw the picture, they naturally assumed that the gauge was originally from China, and had then been sent to Korea. 'Konryung' in the inscription refers to Ching dynasty, and 'Kyongin Owoljo' means it was made in the 5th month of the year Kyongin (1770). Unaware that Koreans used both Korean dynasties and Chinese dynasties to refer to specific periods, the scholars concluded that the device was of Chinese origin. As a result, Chinese and Taiwanese textbooks today introduce Sejong's Chugugi as an invention of China, and this view is accepted by western scholars. There is no reference to Chugugi in Chinese literature, nor any historical evidence of a similar instrument being used in China to measure rainfall. In the Royal Annals of the Choson Dynasty, there is a clear record of how the Chugugi was designed by Sejong's son Munjong in the period from May 1441 to June 1442, and how models were distributed by the government to each of the Provinces. Currently, however, the history of the Chugugi stands uncorrected.



A Chugugi model from 1770

28) Song-rae Pak, "How the Chugugi had become the Chinese Invention," *History for Tomorrow* 18. (2004): 98-110.