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The Botanical Garden at Bogor, Java

In 1984 I had the opportunity to revisit the famous botanic garden at Bogor. The month was April, but as the climate in Bogor is very much the same throughout the year, without the monsoon changes found in other parts of the tropics, any month is suitable for a visit. Bogor is a small town south of Jakarta. Because of its higher elevation the air is cooler than in the capital.

When in the early 19th century living conditions in Jakarta (then called Batavia) were very unsanitary, those who could afford it would go to Bogor to recuperate. They called the place Buitenzorg (Free of Care). If the climate was good for people, it was certainly excellent for the vegetation of a tropical rain forest. Bogor has the highest rainfall in Java, with heavy rain in the afternon, while the temperature remains constant at 25^0C. Those are the conditions that made it possible for the botanic garden to become one of the greatest in the world. Indonesians call it the Kebun Raya, meaning the Great Garden.

When I arrived at the entrance, an elderly Javanese man approached me and asked in impeccable Dutch for permission to conduct me through the Kebun for a moderate fee. He was now 72 years old, had worked in the Kebun for 30 years and maintained that he knew all the plants. As it turned out, he was indeed very knowledgeable. That was a great help because the vegetation in the Kebun is extremely rich and varied. From the entrance a beautiful avenue, lined with the popular canari trees, their crowns uniting to form an arcade, leads directly to the palace where Governors-General, and later also President Sukarno, used to live. The park around the palace is not part of the Kebun.

The immediate impression of the vegetation is that trees and shrubs are preponderant over herbaceous plants, a fact which may be due to their greater resistance to the pelting rain. The garden is very much an arboretum. The trees are arranged according to their families. Some of them are very old and covered with epiphytes (plants that grow on the trees, but do not feed on them as parasites do). The most common epiphytes are ferns and orchids. Giant palms and screw pines (Pandanus) form two conspicuous sections. Large Pandanus species grow on the coasts, firmly anchored in the soil with characteristic prop roots. Elsewhere in the garden grow mangrove trees, which survive in oxygen-poor muddy coastal soil with respiratory roots. The huge bamboos, the lianas (on an island in the Ciliwong, a little river that runs alongside the garden), orchids and ferns in bath-houses, and the ponds with Lotus plants and the Victoria amazonica lily also deserve special mention. In the "forest garden" one can study an imitation of a tropical primeval forest. During the day the trees contain hundreds of giant bats (kalongs), flapping their wings.

I was pleased to see large groups of school children, surely a sign of education which, next to plant preservation and scientific studies, is one of the functions of a botanical garden.

When the Netherlands Indies were returned to Dutch rule in 1815, a professor from the Atheneum Illustre in Amsterdam (the forerunner of the University, which came into existence much later, in 1876) was sent to Java. His name was C. G. L. Reinwardt, and his task was to promote research in natural science in the tropics and to report on the practical implications of such studies. He arrived in October 1815, and within two years was able to recommend the establishment of a botanic garden at Bogor, to be named 's Lands Plantentuin.

When Reinwardt left in 1822, the number of plant species in the Kebun had already risen to 900. At that time research was mainly concerned with taxonomy. The new director, C. L. Blume, described more than a thousand species. Through the publications of the directors, the possibilities of Bogor became known to European botanists, but unfortunately no money was available after Blume left, and for the next ten years the garden was neglected. Luckily the project was saved in 1831 by

the appointment of a *hortulanus*, who turned out to be the right man in the right place.

J. E. Teijsman was a practical gardener who had little botanical knowledge but was eager to learn. He studied botany during the next six years, and finally, in 1837, put his new knowledge into practice by arranging plants following the principle of classification introduced by Linnaeus. That was the beginning of a truly scientific botanic garden. Teijsman was a man with an iron will; nothing could stop him from carrying out his ideas. When he occasionally found some of the trees that Reinwardt had planted at random, standing in the way of his planned systematic arrangements, he would cut them down. This brought him into conflict with his superiors, and even the Governor-General. When the latter asked him who he thought was in command, Teijsman replied that he was, as long as he had the job.

For the new arrangement of the plants Teijsman had much support from J. K. Hasskarl, who had been appointed in 1833 as assistant *hortulanus*. In those days herbaria were always attached to a university. In that respect the herbarium built up over the years in the Kebun was an exception, and a professor of botany at the University of Leiden decided to regularize things. So he told Teijsman that only plants for the Leiden herbarium should be cultivated and proposed to send an empty Wardian case to Buitenzorg and have it sent back to Leiden filled with his plants. A Wardian case is simply a closed glass box with a metal frame to keep plants alive in, a useful invention that made possible the collection of plants from all over the world. Teijsman was furious and promised that he would send it back empty. He won the battle.

In 1840 he started an additional experimental garden on the slope of the Gedeh, an extinct volcano near a place called Cibodas. Here he wanted to study quinine trees *(Cinchona),* raised from seeds that Hasskarl had smuggled out of South America. Quinine research was continued by F. Junghuhn, who moved the culture to the environment of Bandung where the soil was more suitable for growing these trees. Cibodas (White Brook) is situated at an altitude of about 4500 feet, 60 miles from Bogor. In 1866 it officially became a botanical garden for the study of the vegetation of higher altitudes.

Teijsman retired in 1869 when he was 60 years old, but he continued to collect plants for the Kebun until his death in 1882. He had a periodical named after him (Teijsmannia) and a memorial stone was erected in the rose garden of the Kebun in his honour.

Dr. R. H. C. C. Scheffer became the new director in 1869. He did much to promote the development of the Kebun, with additional emphasis on practical aspects and agriculture. He founded an experimental garden some distance away from the Kebun, and it was there that the first rubber trees *(Hevea)* were grown. Eventually an agricultural school was added. Scheffer also initiated a publication called the "Annales du Jardin Botanique de Buitenzorg", which became a very important periodical and published the results of numerous studies in systematic and general tropical botany.

Unfortunately, the intensity of the work in the tropics took too great a toll of Scheffer's health. He died in 1880, and Dr. Melchior Treub took over as director. Seldom has an appointment been as fruitful as this one. Under his direction the Kebun became an extremely complex organisation, in which scientific and economic botany received equal attention. Treub came from Voorschoten near The Hague, where his father was mayor. His parents came from Switzerland and spoke French at home. No wonder Melchior published much of his work in French, but he was also fluent in German, English, and of course Dutch. He studied at the University of Leiden, where he caried out a study on lichens which is now a classic, demonstrating that they are a symbiotic combination of a fungus and an alga. For this work he received a gold medal, and in 1873, when he presented the study as the subject of his doctoral thesis, he received his degree *summa cum laude.* In a few year he published a large number of scientific papers. He became a member of the Dutch Academy of Arts and Sciences when he was only 28 years old.

When he came to Buitenzorg, he realized the need to convince the Dutch government of the economic potential the garden could offer in the future. He demonstrated this abundantly in a series of publications that attracted the attention of botanists from all over the world. They were fascinated by the interesting problems the tropical vegetation offered. In order to make it attractive for botanists to come to Bogor and study these problems under acceptable

conditions, Treub founded well-equipped laboratories in 1889. He also succeeded in establishing the Buitenzorg Fund, which gave financial support to visiting botanists. As a result Bogor became a centre for the study of tropical flora, and the numerous publications that appeared made it famous. It should be noted that all this happened without cost to the institution.

Treub was not a taxonomist, but he had a general interest in plants and their distribution. When in 1883 the volcano Krakatau exploded, a thick layer of ash covered the area, completely obliterating all plant and animal life, while 30,000 people lost their lives. When Treub visited the area in 1886, however, he found there was already some regrowth. He organized an excursion every 10 years to investigate the progress in plant growth, and this was continued after his death.

For the garden at Cibodas, Treub acquired 1200 hectares of the primeval forest adjacent to the garden, covering an area that went right to the top of the mountain. It was then possible for botanists to walk out of the laboratory right into the jungle and study the natural plant formations at different elevations. In 1926 this forest was declared a nature reserve. That the hundreds of plants were labelled was of enormous assistance to visiting botanists. The laboratory annex guest-house had been established in 1891, and a new laboratory was built in 1920. Cibodas was well equipped.

Apart from the study of general botanical problems, Treub also turned his attention to important economic plants. Research was planned into their physiology and pathology; laboratories were built, first of all for rice and coffee, soon to be followed by other cultures. Lengthy reports were published in a new periodical called the *Mededeelingen*. W. Burck, who had been appointed assistant director in 1881, was the first to publish his work on *Hevea* trees in this journal. He did chemical research on rubber, then investigated the industrial problems connected with it. A zoological museum devoted to insects that damaged crops, and a pharmacological laboratory, were also established. Later on, experimental stations for different fields of research followed, for which Scheffer's experimental garden provided the material.

All in all it became too much for the Kebun personnel to handle. Treub reacted by persuading planters to organize experimental stations on their plantations, in collaboration with Bogor and always under his supervision. Again this was an arrangement which cost the Kebun nothing, because the planters themselves paid for the stations, which worked on sugar, tobacco, coffee, tea, cacao, rubber and, for a time, indigo (till eventually it became possible to synthesize that substance). However, most plantations were too far away from Bogor for efficient collaboration, and so the stations became independent.

The organization at Bogor became so complicated that even a man like Treub could no longer supervise it alone. He therefore suggested the formation of a new department that would encompass agriculture, veterinary services and forest management. The reorganization turned out to be extremely difficult, and many disputes with the staff had to be resolved, but Treub persisted, and finally succeeded in 1905 when the government instituted the Department of Agriculture. Gradually more and more divisions were added to it, such as fisheries, a museum of economic plants, industry, commerce, weights and measures and statistics.

There is no doubt that the hard work involved exhausted Treub. Like Scheffer, he was to pay the price for his astonishing achievements in the tropics; he died in 1910, only one year after he had retired to France, when he was only 60 years old. We remember him as a great scientist and organizer.

In 1942 the Japanese invasion put an end to further developments, but when I visited Bogor in 1984, I still found a department of Agriculture, very American-oriented and hampered by lack of money. Publication of the *Annales du Jardin Botanique de Buitenzorg* had been discontinued; in 1988 they were replaced by the English-language *Annales Bogorienses*, which unfortunately appear irregularly. In addition modern studies in tropical botany are published by the Rijks Herbarium of the University of Leiden in the important and excellent periodical named *Blumea*, which also has an English edition.

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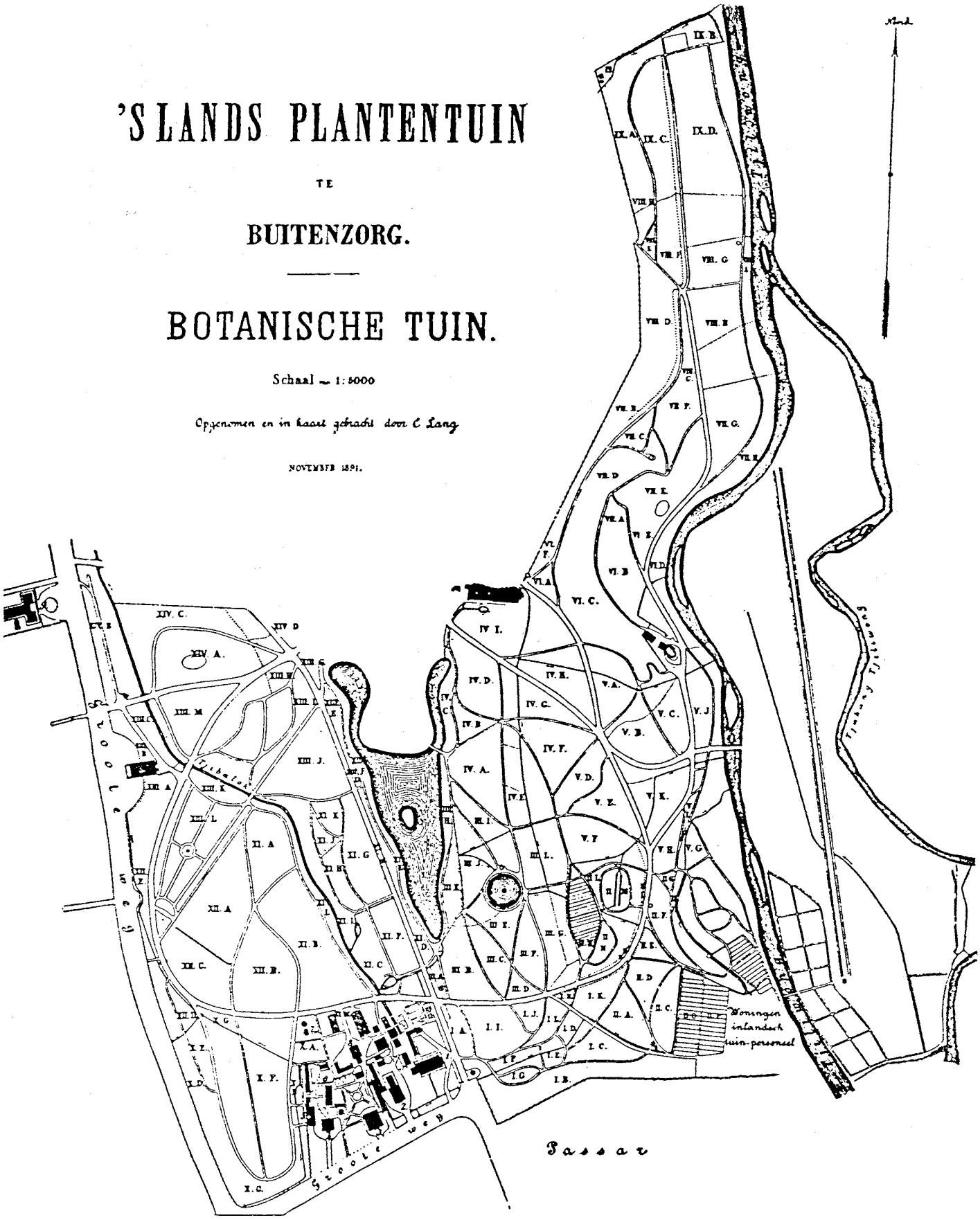
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