BOSSCHA OBSERVATORY — FROM TEA TO ASTRONOMY

K.A. van der Hucht
Space Research Organization Netherlands, Utrecht, The Netherlands.
E-mail: fam_vanderhucht@hotmail.com

Abstract: The Bosscha Observatory (Figure 1) in Lembang, now part of the Institut Teknologi Bandung, is the only professional astronomical institute in all of Indonesia. Because of its equatorial location, it provides access to both the Northern and Southern Hemispheres. This is a unique circumstance. January 1, 2023 marked the centennial of the official inauguration of this Observatory. The remarkable thing is that it came into being thanks to a private East Indies initiative. It took seven years before it received any Government funding. The initiative to establish the Bosscha Observatory came from two members of a remarkable family of tea growers, characterized by a high standard of ethical and scientific attitude in life. This paper describes the events leading up to the establishment of the Observatory, and its history and scientific achievements through 1928.

Keywords: Bosscha Observatory; Lembang; Dutch East Indies; Indonesia; K.A.R. Bosscha; R.A. Kerkhoven; J.G.E.G. Voûte; 64-cm Zeiss twin refractor.

Editorial Note: Recently Bosscha Observatory celebrated its centennial, and we could not let this momentous moment in Indonesian and SE Asian astronomical history pass without saluting it in this journal. We do so with this paper, an English version of an article by van der Hucht and Kerkhoven (1982) that was published in *Zenit* (the Dutch monthly magazine for amateur astronomers) on the 60th Anniversary of Bosscha Observatory, and has been translated into English for *JAHH* by P.C. van der Kruit. Meanwhile, various research papers have been published on the history of Indonesian astronomy since 1982, and we mention these here in a separate 'Notes' Section and list them in a 'Supplementary References'.

1 BACKGROUND

Scientific research in the Dutch East Indies received a tremendous boost with the founding in 1920 of the Technical University in Bandung (TH Bandung), formally the Koninklijk Instituut voor Hooger Technisch Onderwijs in Nederlandsch-Indië, not coincidentally the same year in which the Nederlandsche-Indische Sterrenkundige Vereeniging (Dutch-East-Indies Astronomical Society) was founded. Prior to that, for

Figure 1: Bosscha Observatory, near Lembang, in Java, Indonesia. This 1933 painting by R. Wenghart is currently at Leiden Observatory.

centuries and in all kinds of fields, scientific research had been going on in the Dutch East Indies, of which we will mention here only a few examples. The scale on which this research was carried out was of course related to the size of the European population in the East Indies, which in 1850, for example, numbered no more than 30,000.

The overwhelming wealth of vegetation led the German Professor Reinwardt to found the 's Lands Plantentuin (National Botanical Garden) at Bogor in 1817. The wealth of active volcanoes in Java also led to early geological research, such as that of the extensively traveling botanist and geologist Junghuhn. Initially, from 1820 to 1850, the Natuurkundige Commissie van het Bataviaasch Genootschap van Kunsten en Wetenschappen (Physics Commission of the Batavian Society of Arts and Sciences) coordinated this type of research. In 1850 the Koninklijke Natuurkundige Vereeniging (Royal Physics Society), hereafter KNV, was founded by physicist Bleeker, with the *Natuurkundig Tijdschrift voor Nederlandsch-Indië* (*Physics Journal for the Dutch East-Indies*) as its publishing channel. Previously, publications in the natural sciences appeared in the *Verhandelingen* (*Proceedings*) of the above-mentioned Society.

In 1860 Bleeker was succeeded as President of the KNV by the Utrecht astronomer Professor Oudemans,[1] who had already been in Java from 1834 to 1840, and who returned to the East Indies in 1857 with the assignment from the Department of the Navy to astronomically determine geographic positions throughout the Indies. To this end, he constructed the so-called primary triangulation network in the East Indies. During this period he also published a number of purely astronomical treatises, more on which later. In 1875, he returned to Utrecht to succeed his successor Hoek, who had died at a young age, as Director of Utrecht Observatory. There he completed his book *Ibmu Alam* (*Knowledge of Nature*) for schools in the East Indies.

Meanwhile, in 1866, partly through the initiative of Governor-General Pahud, the Koninklijk Magnetisch en Meteorologisch Instituut (Royal Magnetical and Meteorological Institute) was founded in Weltevreden. This institute also recorded and studied seismologic and volcanic activity. It was partly supported in its work by private individuals. For example, the tea planter Karel Frederik Holle had been making meteorological observations at his Cikajang estate on the slopes of Mount Papandayan since 1858, which he continued in 1862 at his Waspada estate on the slopes of Mount Cikuray. It was also done at the Ciumbuleuit estate on the slopes of Mount Tangkuban Prahu by Meyboom from 1864 to 1869.

To meet the further need for the exchange of knowledge in the natural sciences, the Vereeniging Nederlandsch-Indisch Natuurwetenschappelijk Congres (Association Dutch-Indies Scientific Congress) was founded in 1918. It organized its congresses every two or three years from 1919 onwards and published a *Bulletin*.

The establishment of the TH Bandung in 1920, as mentioned at the beginning of this paper, brought a further blooming of scientific research in the East Indies (see Figure 2).

How did astronomy develop in the East Indies in those days?[2] The oldest report of astronomical research in the archipelago was by the 'subcommies' [a middle ranked civil servant] of the V.O.C. [the United East-Indies Company, a Dutch trading company] and later Governor of Amboina, Frederick de Houtman.[3] In 1603 he published a southern star catalogue, which had been compiled during his two sea voyages to the East Indies (1595–1599), as an appendix to a dictionary titled: *Spraeck ende WoordBoeck Inde Maleysche ende Madagaskarsche Talen met vele Arabische ende Turcsche Woorden ... Noch zijn hier byghevoecht de Declinatien van vele vaste Sterren Staende omtrent den Zuydpool: Voor desen Tijd Noyt Ghesien. Sonderling nut voor de ghene die de Landen van Oost-Indien besoecken: ende niet min vermakelick voor alle Curieuse Liefhebbers van Vreemdicheydt ...* (*Dictionary of Language and Words of the Malay and Madagascar Languages with many Arabic and Turkish Words ... also are here included the Declinations of many Fixed Stars Positioned around the South Pole: Before this Time Never Recorded. Particularly useful for those who visit the Countries of the East-Indies: and not less useful for all Curious fans of Foreign Countries* ...). de Houtman's star catalog included 303 southern stars, plus names for new constellations, such as The Bird Phoenix, The Water Snake, The Dorado (goldfish), The Fly, The Flying Fish, The Chameleon, The Bird of Paradise, The Peacock, The Indian, The Heron, The Indian Magpie named Lang in the East Indies, The Dove with Olive Branch, The Southern Triangle and The Cruzero (i.e. Southern Cross). These names were soon accepted, for they also appeared that same year, albeit Latinized, on Blaeu's celestial globe and in Bayer's Uranometria.

It was then more than 160 years before the first observatory was built in Java. It was a wealthy preacher in the Portuguese congregation in Jakarta, Johan Mauritz Mohr,[4] who, in

Figure 2: Excursion of staff and students of TH Bandung to the Malabar tea plantation in July 1921. Standing from right to left: Mrs Boomstra (1st), Mrs Klopper (2nd), R.A. Kerkhoven (6th), Mrs J.C. Kerkhoven-Mulock Houwer (7th), Mrs T.C. Clay-Jolles (8th), Professor W. Boomstra (9th), Professor J. Clay (12th), Professor H.C. de Vos (14th), Mrs E. de Vos-Bertch (23rd) and Professor J. Klopper (24th). On one knee on the left is K.F. Kerkhoven (courtesy: Stichting Indisch Thee- and Familie-Archief van der Hucht c.s.).

addition to his pastoral work, could afford the luxury of observing the Sun and the stars from his own tower observatory near the Chinese temple at Glodok in Jakarta (Figure 3). According to reports from visiting astronomers, Mohr had very good instruments for that time. These visitors included the British navigator James Cook and the French astronomer de Bougainville, who had travelled via Southeast Asia in 1769 to observe a transit of Venus. At this time, such observations were important for determining the orbital elements of Venus and the distance scale of the Solar System. Mohr himself had already observed the 1761 transit of Venus, and he also recorded the one in 1769. He published these and other observations that were important at that time in the *Philosophical Transactions of the Royal Society*, and in the *Verhandelingen der Hollandsche Maatschappij der Wetenschappen* (*Treatises of the Holland Society of Sciences*) in Haarlem, of which he was a member. Mohr's astronomical work was not continued in the East Indies by others, and his observing tower and instruments have been lost. Only a few etchings and a street in Jakarta, called Gang Torong, remind us of the place where the observing tower, which was still there in 1812, must have stood. Once again astronomy had failed to gain a foothold in the East Indies.

Less than a century later, during his aforementioned stay in the East Indies, Utrecht astronomer Oudemans published four astronomical treatises: about a comet in 1858, about two possible planets within the orbit of Mercury, and about the total solar eclipses of 1868 and 1871.[5] Several solar eclipses prompted astronomers to visit the East Indies, such as the eclipse in Padang in 1901,[6] which was viewed by Wilterdink from Leiden, among others, and those of 21 September 1922 and 14 January 1926, during which an attempt was made to observe the deflection of starlight by the Sun predicted by Einstein.

It would only be in 1920 that the first steps were taken to establish a permanent observatory in the East Indies. The initiative for this was taken by two members of a tea-growing family in Preanger, a region of West Java around Bandung. This family was remarkable for the ethical and scientific attitude of its members.

2 RU BOSSCHA AND RU KERKHOVEN

The origins of the Bosscha Observatory near Bandung are inextricably linked to growing tea in the Preanger. From 1843, members of the van der Hucht, Holle and Kerkhoven families, and later the Bosscha family, established tea plantations from the area of Bogor and Sukabumi to that of Bandung and Garut. In those days, the Government used to lease land to planters under the so-called Culture System policy, and

Figure 3: Mohr's observatory at Glodok in Jakarta (after van Gent, 2005: 69).

buy the products at a fixed price. However, the then-used Chinese tea seed did not thrive in Java. In 1860, the number of tea plantations was still only 15, limited to the residences of Batavia, Preanger Regencies, Cheribon and Bengal. Only when in 1863, under Governor-General Sloet van den Beele, the Culture System was abolished and the plantations were left to the free entrepreneurs, did tea culture start to develop.

The big breakthrough came in 1878 when Assam tea seed from India came into use in Java, notably on the Parakan Salak and Sinagar estates by Adriaan Walraven Holle, Albert Holle and Eduard Julius Kerkhoven, and on the Ardja Sari and Gambung estates by Rudolf Eduard Kerkhoven. These were all cousins. The Assam tea seed did very well in Java and made perfect tea. This was the beginning of a big boom in the tea culture, and it led to the establishment of many plantations, such as one called Malabar. By 1930, there were 329 tea companies in the East Indies, 286 of them in Java, and of these, 249 were in the Preanger, the mountainous region also called Parahyangan in West Java including the area around Bandung.

Remarkably, the planters of the Holle, Kerkhoven and Bosscha families were not only successful pioneers in bringing the Preanger under cultivation, but they also had a profound ethical and scientific attitude towards the people and land of the Sundanese, the natives of the area. For instance, they were among the first planters to establish schools on the plantations for the children of the employees. The aforementioned Karel Frederik Holle himself translated Dutch textbooks into Sundanese and incorporated Sundanese stories in them. In 1866, he founded a school in Bandung to educate East Indians to become teachers. Five years later, he was appointed Honorary Advisor for Internal Affairs by the Government, in which capacity he aided education, agriculture and fishery with advice on their development. Among other things, he wrote treatises on the dangers of deforestation, and useful advice for the construction of terraces.

From this planter family descended Ru Bosscha and Ru Kerkhoven (both grandsons of Mrs. Anna Jacoba Kerkhoven, born van der Hucht), the initiators of the first professional observatory in the East Indies (Figure 4).

Karel Albert Rudolf (Ru) Bosscha was born on 15 May 1865 in The Hague, the son of physicist J. Bosscha Junior (Professor at the Royal Military Academy in Breda and Director of the Polytechnic School in Delft) and Paulina Emilia Kerkhoven. As a result of a hip defect contracted as a child, he was inseparable from his

cane. He had a bright mind and nerves of steel. After four years of study in Delft, a disagreement with an examiner which was not Ru's fault, caused him to interrupt his engineering studies, and he left for the East Indies in 1887.

Ru Bosscha started his career there with his uncle Eduard Julius Kerkhoven at the company Sinagar, near Cibadak, where he was introduced to tea growing. However, when in 1888 his brother, the geologist Dr. Jan Bosscha, went to Borneo as director of a gold-mining exploration at the Little Sambas at Bin Pan San, Ru followed him there. In 1892, Sinagar and the Preanger saw him return to the growing of tea, which he then would never leave. Meanwhile, his cousin Ir. Rudolf Eduard Kerkhoven (Ir. stands for the academic degree of engineer) of the tea company Gambung, had founded a number of new tea companies on the Pengalengan Plateau in 1890: first Malabar, and later Talun and Negla. Their high altitude, 1500 m above sea level, was considered a risk. In 1896, Kerkhoven found his nephew Ru Bosscha willing to act as Malabar's administrator. He soon saw his trust rewarded, as the business flourished. Not that everything went easily; many trials were carried out with the soil and plants as well as the processing, before Malabar grew into the most prosperous tea company in the East Indies. In 1902, Jan Bosscha also came from Borneo to Java, where he first served as administrator of Malabar for a year during a leave of absence by Ru, and was administrator of neighboring Talun from 1903 to 1919.

The Bosscha brothers came from a lineage of researchers and scholars. Their scientific disposition therefore contributed greatly to their playing an active part in many improvements in tea growing. In 1910, we see Ru Bosscha as a member of the Executive Committee of the Association's Thee-Experts Bureau, from 1917 as Chairman of the Association Algemeen Proefstation voor Thee (General Experimental Station for Tea), and from 1917 to 1920 and again from 1922 to 1923 as Chairman of the Soekaboemische Landbouw Vereeniging (Soekaboemian Agricultural Society), which had been founded in 1881 by his uncles Eduard Julius Kerkhoven and Albert Holle. Following in the footsteps of his father, who had been involved in introducing the metric system in Europe, Ru too promoted its introduction wherever he could. Contrary to the custom of expressing areas in bahoe units (1 bahoe = 500 × 500 Rhineland rods = 7096 square meters), he used the hectare at his enterprise. Along the road from Pangalengan to Bandung, which was marked in poles (1 pole = about 1.5 kilometer), he placed his own markings in kilometers. With his tea company, Bosscha was always keen to apply the latest inventions of technology. This helped him make Malabar the largest and most profitable tea company in the East Indies, producing the very best tea. No less importantly, he provided schools and good healthcare for the staff and their families at his company.

Ru Bosscha was also very active outside tea-growing: among other things, he was a board member of numerous agricultural, industrial and social organizations. In 1895, for instance, he initiated the establishment of the Preanger Telefoon Maatschappij (Telephone Company) at Bandung of which he was Director until it was taken over by the Government in 1908. He also participated in the establishment in Bandung of the Nederlandsch-Indische Jaarbeurs (Dutch-East-Indies Trade Fair), of the Kanker Instituut (Cancer Institute) there, to which he donated 250 grams of radium-bromide, among other things, and to whose premises he paid great attention, and of the TH Bandung. He was President-Curator of the latter until his death in 1928. Its Physics Laboratory was named after him. He was a member of the Volksraad (People's Council, an advisory board to the Governor-General with representation of various ethnic backgrounds), and he was involved in the Doofstommen Instituut (Institute for the Deaf-Mute), and supported the Salvation Army, the leper colony of Pelantungan, and all those in need of help.

Figure 4a (left): K.A.R. Bosscha (1865–1928) in about 1890 (photograph: Woodbury and Page, Batavia); 4b (right): R.A. Kerkhoven (1879–1940) (courtesy: Stichting Indisch Thee- and Familie-Archief van der Hucht c.s.).

He was an exceptionally noble man; the fate of his fellow man was close to his heart, and he was always ready to help and support. For all these qualities, he was awarded honorary citizenship of Bandung on his 25th anniversary as a tea planter. Ru Bosscha made the East Indies his second homeland and did an enormous amount of work for the promotion of prosperity in the East Indies. Blessing others widely with his fortune, he returned in another form to the country what the country had given him.

Ru Bosscha's love for pure science stayed with him all his life. He shared it with his assistant and later successor at Malabar, his cousin Rudolf Albert (Ru) Kerkhoven. He was born on 27 August 1879 at the Ardja Sari tea plantation, as son of the aforementioned founder of Malabar Rudolf Eduard Kerkhoven. After studying in Zurich, Ru Kerkhoven returned to the East Indies in 1904, and in 1907 he became an employee at Malabar under his uncle Ru Bosscha. Ru Kerkhoven was an extremely skilled technician, with many scientific interests. He was an active amateur astronomer and owned a 13-cm Zeiss refractor. He also brought a 100-kg horizontal Wiegert seismograph to Malabar, of which there were only a few in the East Indies. He sent the seismograms to the Royal

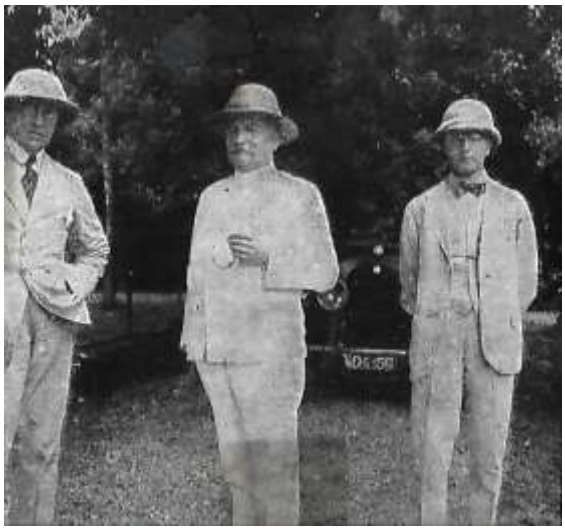

Figure 5: Visit of Louis Couperus to Ru Bosscha on Malabar. From the left: L. Couperus, K.A.R. Bosscha and C.W. Wormser (courtesy: Stichting Indisch Thee- and Familie-Archief van der Hucht c.s.).

Magnetical and Meteorological Observatory in Weltevreden. Bosscha and Kerkhoven's office at Malabar was also their study: they were tea planters, administrators, scientists and patrons at the same time.

Malabar attracted many visitors, including princes and presidents. The well-known Dutch writer Louis Couperus once visited Malabar and Ru Bosscha (Figure 5). Afterwards, looking around the Pangalengan plateau and the surrounding mountains, Couperus said:

> Yes, it is in this beautiful natural and magnificent environment that man belongs. It is big and strong like the great volcano, it is tender and delicate like the green tea leaf. His sharp mind encompasses everything, as this high blue sky spans all land ...

In his book *Eastward*, Bosscha is called 'the King of Tea' by Couperus. Another visitor, Sir Roderick Jones, Director of the Reuter News Agency, said after a meeting with Ru Bosscha "Yes, that man can generate more copy than a world war." Bosscha was a tea planter whose company Malabar was known as well in the East Indies and in the Netherlands as the radio station of the same name was around the world.

3 JAVA GETS ITS OWN OBSERVATORY

Ru Bosscha did not develop an interest in astronomy independent of others. His grandfather, Professor J. Bosscha, had earlier advocated in the Tweede Kamer der Staten Generaal (the lower house of Dutch Parliament), on 1 December 1853, the construction of a new, well-equipped observatory for Leiden University. When the Government did not respond to this, following a call from the Leiden astronomer Professor Dr. F. Kaiser, committees were formed throughout the country to raise the necessary funds from private parties. These were so successful that the Government gave in and contributed in the form of a new building. Also, the later Professor Dr. J. Bosscha Jr., at that time a young student, managed to raise money among his fellow students, resulting in a 19-cm Merz refractor that they donated to Leiden Observatory.

J. Bosscha Jr. had always been interested in astronomy. For example, in 1902, in the dining room of Spaarne 17 (still the address of the Holland Society of Sciences and Humanities in Haarlem, of which he was Secretary and where he officially lived) he expressed the idea of enriching Java with an observatory. According to family lore, he spoke at the dinner table to his son Ru Bosscha, during his first leave in the Netherlands:

> If you ever become very wealthy, Ru, do something for astronomical research in the East-Indies. There are still far too few observatories in the southern hemisphere!"

The son remembered well these words.

In 1919 Ru Bosscha learned via the Royal Magnetical and Meteorological Observatory in Weltevreden that an astronomer named Voûte would be appointed as a scientific employee there, and that he had been given the assurance by Leiden Professor W. de Sitter that the old Leiden 19-cm Merz refractor would be sent to the East Indies. (This was the same telescope that had been purchased in 1855 thanks to the above-mentioned fundraising campaign by Ru's father and had been in service for thirty years.) Around Easter 1920, Ru Bosscha and Ru Kerkhoven invited Voûte to a meeting in Malabar to discuss the possible establishment of an observatory on Java. In that first conver-

sation, Bosscha offered to finance a large telescope, which should be equivalent to those of the most modern observatories at that time. Bosscha and Kerkhoven made sure that enthusiasm for their ideas was not limited to just a few people.

Less than six months later, on 12 September 1920 (the same year in which the TH Bandung was opened), at a meeting of interested parties in the Hotel Homann in Bandung it was decided to establish the already mentioned Dutch East-Indies Astronomical Association, with the objective set out in Article 3 of the by-laws: the establishment and maintenance of an observatory in the Dutch East Indies and the promotion of astronomical science. At this first meeting Bosscha repeated his offer to finance a large telescope, and Kerkhoven offered an astronomical Richter pendulum, as well as his 13-cm Zeiss refractor on loan and the financing of a large meridian instrument.

By Government decree of 17 November 1920, the statutes of the Dutch East-Indies Astronomical Association were approved. Bosscha was appointed Chairman and Kerkhoven Secretary-Treasurer. The Vice-President of the Council of the East-Indies (a body advising the Governor-General), Lieutenant General H.N.A. Swart, was appointed Honorary Chairman, and the Fleet Commander, Vice Admiral W.J.G. Umbgrove, honorary member. There were also six co-founders and a number of financial supporters. It would take another eight years, however, before the Government would provide financial support. The resources of the Association were provided in the first years by private individuals such as Bosscha and Kerkhoven and by a number of companies: the Bataafse Petroleum Mij. (Batavian Petroleum Company), the Javasche Bank (Bank of Java), the Nederlandse Handel Mij. (Dutch Trade Company), the Nederlandse Stoomvaart Mij.(Dutch Steamship Company), Rotterdamsche Lloyd (another shipping company) and the Koninklijke Pakketvaart Mij. (Royal Packet Navigation Company, the major inter-island shipping agency in the Dutch East Indies). These joined, partly thanks to Bosscha's influence, as founders of the young Association.

Following the proposal of the Board, at the general meeting of 3 December 1920 the name Bosscha Observatory was given to the still to be established observatory, after Ru Bosscha's father, the aforementioned Professor Dr. J. Bosscha Jr. Voûte received from the Board the authority to build and organize the Observatory according to his own insights. The Association had three instruments at its disposal at that time: the aforementioned Leiden 19-cm Merz refractor (f = 3 m) with associated Bamberg micrometer; a 16-cm Secrétan refractor (f = 2.15 m, Paris 1884), which had originally belonged to the amateur astronomer Lie Saay, Major-China of Padang (Justus van Maurik described him in his 'Impressions of a tòtòk'; tòtòk used here in the sense of a novice), and which was donated by his grandson Sim Hong Lie, and the 13-cm Zeiss refractor (f = 2.3 m) from Ru Kerkhoven. In 1921 Bosscha and Voûte left for Europe to order an astrophotographic refractor and a meridian instrument financed by Kerkhoven from Askania Werke Carl Bamberg in Berlin, and they ordered the large double refractor, offered by Bosscha, from Carl Zeiss Werke in Jena.

During all these activities, a suitable site for the observatory was also searched for. As Bandung itself was located 670 meters above sea level and surrounded by mountains, a higher location was sought. This was found 14 km north of Bandung, in Lembang, which is located on the southern slope of Mount Tangkuban Prahu. This was a site of 4.7 hectares, 1300 meters above sea level, located on the southern border of Lembang and approximately 100 meters higher than Lembang itself. It was donated to the Association by the Ursone brothers of the Baru Ajak Livestock Company. The construction of the first buildings, started in October 1922, went so well that Bosscha Observatory was officially opened on 1 January 1923, in the presence of Governor-General Mr. (Master of Law) D. Fock.

Ir. J.G.E.G. Voûte was then officially appointed Director of the Observatory, on such modest terms that the Board of the Association was actually embarrassed. The then 44-year-old Voûte, a descendant of an old tea broker family, was originally a civil engineer, but had some experience as an astronomer. He was appointed as an Assistant at Leiden Observatory in 1908, and became an observer at the Cape Observatory in 1913. He would remain Director of Bosscha Observatory until his retirement. On behalf of the Government and with financial support from Bosscha, he accompanied the Dutch-German eclipse expeditions to Christmas Island (21 September 1922) and Benkoelen (14 January 1926). Ru Kerkhoven, the Amsterdam astronomer Professor A. Pannekoek and the Utrecht astronomer Dr. M.G.J. Minnaert participated in the latter. Unfortunately, during both expeditions the Sun was covered by clouds at the times of the eclipses. In 1924, the University of Berlin awarded Voûte an honorary doctorate (Figure 6).

In 1923 the young Observatory had the privilege of receiving the private library of Prof-

Figure 6: Visit by dignitaries at the Bosscha Observatory, 17 October 1924. Left to right: Ina Voûte (6th), General Secretary G.R. Erdbrink (9th), Dr. J. Voûte (11th), Professor J. Clay (13th), Governor-General Mr (Master of Law) D. Fock (14th), K.A.R. Bosscha (18th) and Professor J. Klopper (20th) (courtesy: Stichting Indisch Thee- and Fam ilie-Archief van der Hucht c.s.).

essor Dr. H.G. van de Sande Bakhuyzen, Emeritus Professor and Director of Leiden Observatory, inherited upon his death on 8 January 1923. To house this collection, Ru Kerkhoven donated a fireproof library building in 1931.

From 1923 to 1926, with financial support from Bosscha, some personnel from the Triangulation Brigade of the Topografische Dienst (Topographc Service), led by, among others, P.H. Poldervaart, was seconded to the Observatory, with Lembang as a starting point and using, among other things, the Bamberg meridian instrument, donated by Kerkhoven, to determine geographical longitude differences for places in Borneo and Sumatra, as part of the international World Longitude Observations. They determined the position of the tertiary triangle point T20 on the Observatory site at 7h 10m 27.8s E and 6° 49' 32.9" S. The altitude of this point was determined at 1303 meters. Together with the Topographic Service, time signals sent from Bosscha Observatory to Professor Dr. Ir. F. A. Vening Meinesz, during his journey in the submarine K-XIII on the Curaçao–Panama–Pacific–India route, for his famous standard gravity determinations. For his further gravity measurements in the East Indies archipelago using the submarines K-II in 1923, the K-XIII in 1926 and 1929, and the K-XVIII in 1934, when Vening Meinesz was hosted at the Bosscha Laboratory of the TH Bandung. On these occasions he was also a frequent guest at Bosscha Observatory.

The Observatory's instruments had in the meantime been expanded with a universal instrument (theodolite) by Hildebrand, which was owned by the Triangulation Brigade, for latitude determinations; a Dallmeyer photoheliograph, owned by the Teyler's Foundation in Haarlem, loaned to the Association through mediation by Lorentz (this produced a solar image with a diameter of 16 cm); a Zeiss comet finder (d = 11 cm, f = 95 cm); a number of cameras, including a Zeiss UV triplet (d = 15 cm, f = 1.50 m) and a Zeiss tessar (a lens for photography, d = 12 cm, f = 60 cm) (Figure 7), and a clock cellar, containing three precision timing instruments: a Richter, a Riefler, and a Casseres. The latter was owned by the Topographical Service. These clocks were oriented differently to prevent them from all stopping in the event of an earthquake. This plan was not always successful: after the earthquake of 22 June 1924 all three came to a standstill.

4 ASTRONOMY IN THE EAST INDIES

During the first years, partly due to the lack of personnel, not much more could be done than collecting observation material. For several months in 1925, the well-known amateur astronomer P.G. Meesters from Halfweg worked at the Observatory with the comet finder. Among other things, he obtained photographic images of the Comet C/1925 F2 (Reid). Measurement of the plates had to wait until the arrival of a Zeiss stereo-comparator, which was also an excellent measuring instrument for determining

Building for the Bamberg-Astrophotographic Refractor with sliding roof.

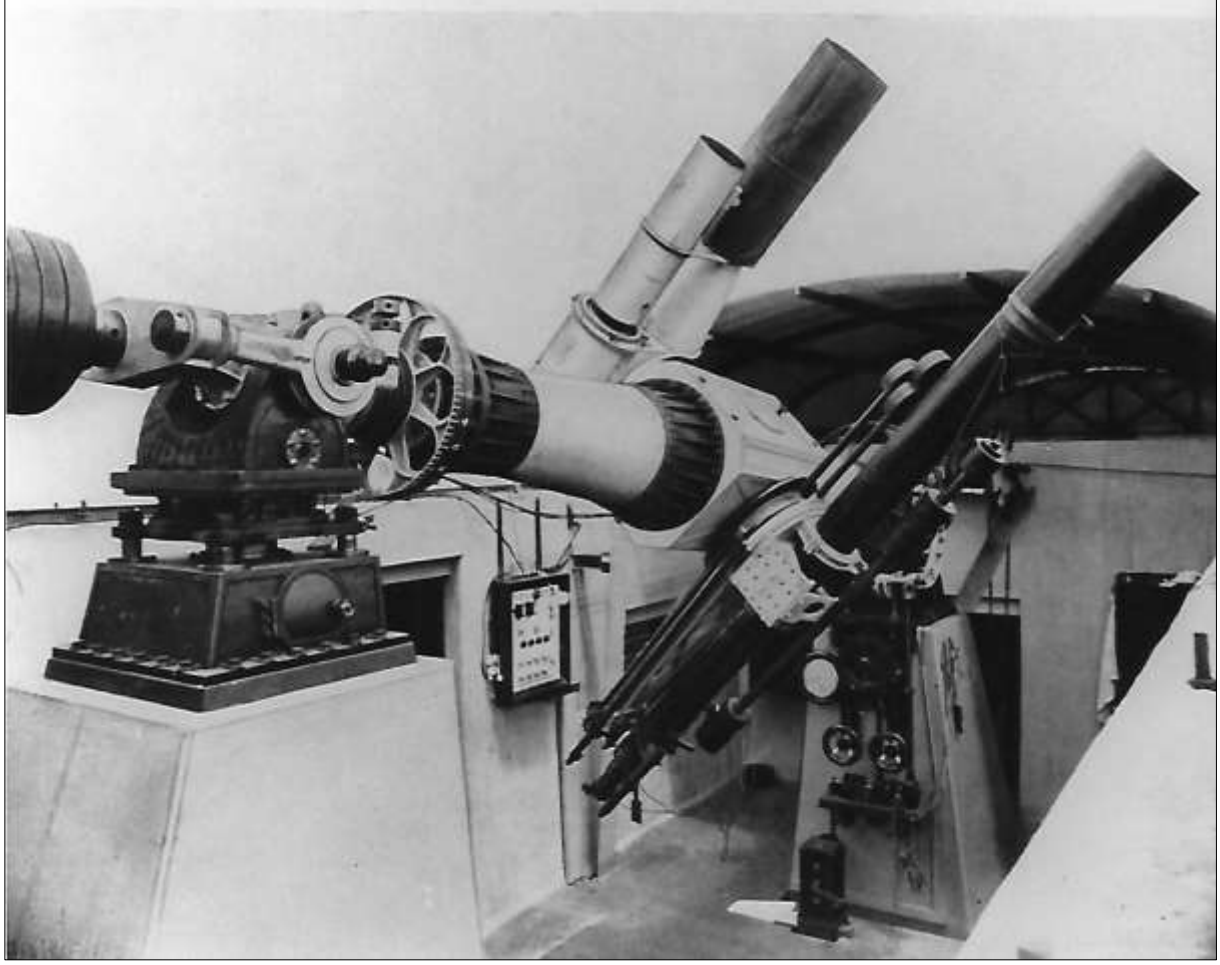

Figure 7 (top): A view of the roll-off roof observatory housing the Bamberg Astrophotographic Refractor. (Bottom): A close-up of the Bamberg Astrophotographic Refractor, comprising a 19-cm Merz refractor and two astrocameras, one with a 15-cm Zeiss UV triplet objective for spectroscopy, and the other with a 12-cm Zeiss Astro-tessar objective for direct imaging (after Voûte 1933: Plate IX).

stellar parallaxes.

The lack of personnel could be partly alleviated in 1926 by a bequest to the Society of about fl. 170,000, the assets of F.H. Klein in Garut, who died on 2 September 1926. According to the International Institute of Social History in Amsterdam (IISG, 2024) this nowadays corresponds to a purchasing power of €1,450,000. It was decided to use this to attract young astronomers from Europe (Figure 8). The first to be appointed in this way was the German astronomer Dr. P. ten Bruggencate from Göttingen, for the period October 1926 to October 1928, who, apart from binary star measurements, applied himself to photometric and spectroscopic observations of variable stars.

Figure 8: At the Bosscha Observatory, 1926. Seated left to right are Professor W. Boomstra, Professor F.A. Vening Meinesz and R.A. Kerkhoven; standing left to right are Dr. J. Voûte, Dr. P. ten Bruggencate, Professor J. Clay and three unidentified persons (courtesy: Stichting Indisch Thee- and Familie-Archief van der Hucht c.s.).

From September 1926, the Observatory employed A.J. Witlox, previously a sergeant in the Koninklijke Genie (the Army's Royal Engineers), as a Technical Assistant who also participated in night observations. In July 1928, the Swedish astronomer Dr. Å.A.E. Wallenquist from Uppsala joined the Observatory; he stayed for more than six years. Besides much observational work, he also did important theoretical work.

The work at Bosscha Observatory in those early years can be characterized as follows. Fundamental observational work on visual double stars entailed >2400 observations of more than 600 binaries, up to and including 1928. Combining these with later observations would lead to the determination of the orbital elements and thus the masses of these stars. Photometric and spectroscopic observations of open and globular clusters led to the establishment of color-luminosity diagrams for these clusters, allowing their composition and evolutionary histories to be determined. Furthermore, in those early years, photographic photometry light curves were obtained for 25 variable stars, including eclipsing binaries and Cepheids, to determine stellar masses or pulsation properties. Already in 1920, Voûte published the first catalogue of stellar radial velocities, which included about 2000 objects, while his second one, of 1928, brought this number to 4000.

Another particularly successful study was that of Amsterdam Professor and founder of the Amsterdam Astronomical Institute Professor Dr. A. Pannekoek. He remained a guest at Bosscha Observatory for five months after the eclipse expedition to Benkulen in 1926. (The guest pavilion built on the Observatory grounds for his stay has since been called 'Rumah Pannekoek'). Pannekoek had in 1920 determined the brightness distribution of the northern part of the Milky Way using extrafocal images. In Lembang, he complemented this work by photographing the southern part of the Milky Way in the same way, and determining the isophotes (lines of equal brightness) from the photographic plates. He thus obtained a complete picture of the visible structure of the Milky Way, a pioneering study, which he recorded in a voluminous paper in the *Annals of the Bosscha Observatory* (Pannekoek, 1927b).[7]

While the work, which began in 1925, on the housing of the double refractor was still in full swing, Ru Bosscha offered another new instru-

Figure 9 (left): The 'Bamberg Refractor', with a 37-cm Schmidt objective (after Voûte, 1933: Plate X).
Figure 10 (right): The dome of the 60-cm Zeiss double-refractor (courtesy: Stichting Indisch Thee- and Familie-Archief van der Hucht c.s.).

ment in 1927: the mounting and tube assembly for a 37-cm Schmidt objective, which the Society had already purchased in 1922, and which at the time had been made by B. Schmidt in Mittweide (Sachsen) as a test-lens ordered by Professor K. Schwarzschild in Potsdam. The mount was outsourced to the firm Carl Bamberg. This Bamberg–Schmidt telescope (f = 7 m) was commissioned in February 1929 (Figure 9).

By 1928, it was time to assemble the double refractor. On 10 January 1928, the Rotterdamsche Lloyd's *Kertosono* disembarked the components of this large telescope in 27 crates. The crates with their 30 metric tons contents had been transported by Lloyd free of charge. The National Railways did the same between Tanjung Priok (Jakarta's port) and Bandung; the automobile company of the Engineering Department of the Army in Bandung provided transport to Lembang, and the Bureau of Construction and Bridge Building of the National Railways undertook the task of erecting the telescope in the already completed dome (Figure 10).

The dimensions and spectral sensitivity of the optics of the double refractor (each d = 60 cm, f = 10.5 m) had been chosen in consultation with Groningen astronomer Professor J.C. Kapteyn, with the intention of using one of the two telescopes for photographic parallax determination of southern stars, and the other for (simultaneous) visual measurements of various kinds. The former was of great importance for the new branch of statistical astronomy founded by Kapteyn, because Kapteyn's observational material had a gap: the southern sky had not been studied to the same extent as the northern one, mainly due to the lack of southern observatories. Both telescopes were confined in a single tube of 1.66 m diameter, which was supported by a massive yoke English equatorial mounting (see Figure 11; note that this image was not included in the original 1982 paper). The circular dome floor could move up and down over a height of 3.5 meters. The dome had a diameter of 15 meters, and was clearly visible from Bandung, 14 km to the south and 630 m below. Local people called the dome 'The egg of the bird Rok'. At the time of commissioning, the Bosscha 60-cm double refractor was the fourth largest telescope in the Southern Hemisphere, after Melbourne's antiquated 122-cm speculum mirror reflector, the 70-cm reflector at La Plata Observatory, and the 66-cm refractor at the Union Observatory in Johannesburg.

It was on the occasion of the official handover by Ru Bosscha of the double refractor and the Bamberg–Schmidt refractor to the Dutch-East-Indies Astronomical Society, that the Governor-General Jhr. (Esquire) Mr. (Master of Law)

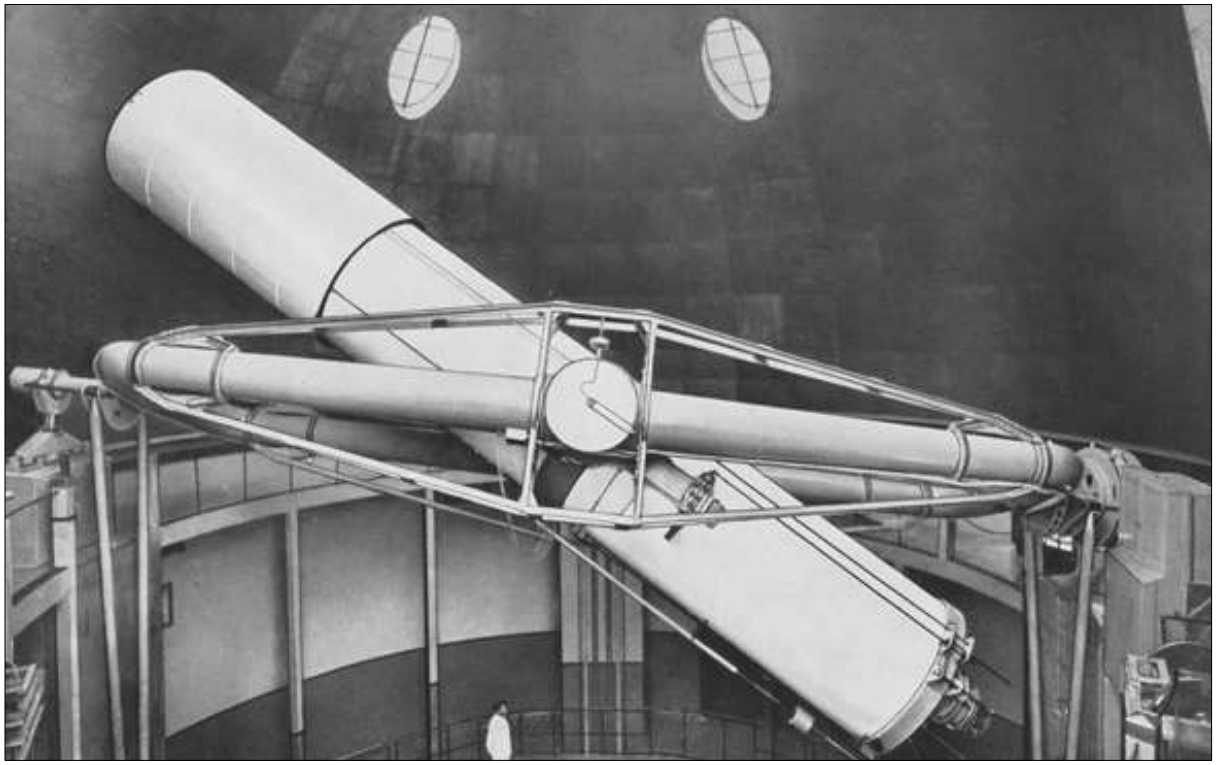

Figure 11: The 60-cm Zeiss double refractor. For scale, note the person standing below the telescope (after Voûte, 1933: Plate V).

Figure 12 (left): K.A.R. Bosscha during his handover speech on 7 June 1928 in the dome of the Zeiss double-refractor (photograph courtesy: Mrs D.W.J. Bosscha-Hahn).

Figure 13 (below, left): Governor-General Jhr A.C.D. de Graeff during his speech at the unveiling of the bronze bust of K.A.R. Bosscha on the grounds in front of the dome. Bosscha stands to the left of the Governor-General; fourth from right, with moustache and holding a book, is Dr J. Voûte. On the far left and partly off the photograph is Bosscha's niece, Mrs. C.C. Erdbrink-Bosscha, who would later pin his decoration (Commander in the Order of Orange-Nassau) on him (photograph courtesy: Mrs D.W.J. Bosscha-Hahn).

A.C.D. de Graeff visited Bosscha Observatory on 7 June 1928 (Figure 12). After the handover, a bust of Bosscha was unveiled by the Governor, based on a design by Professor C.R. Wolff Shoemaker (Figure 13). This was presented to Bosscha as a token of appreciation from friends and admirers for all he had done for the East Indies, science in general, and astronomy in particular. During the ceremony, the Governor-General announced that Ru Bosscha had been decorated by the Queen as Commander in the Order of Orange-Nassau. It was also gratifying that two months later, the first annual Government grant of fl. 18,000 (nowadays about €150,000) was paid through the Department of the Navy. For the appearance of

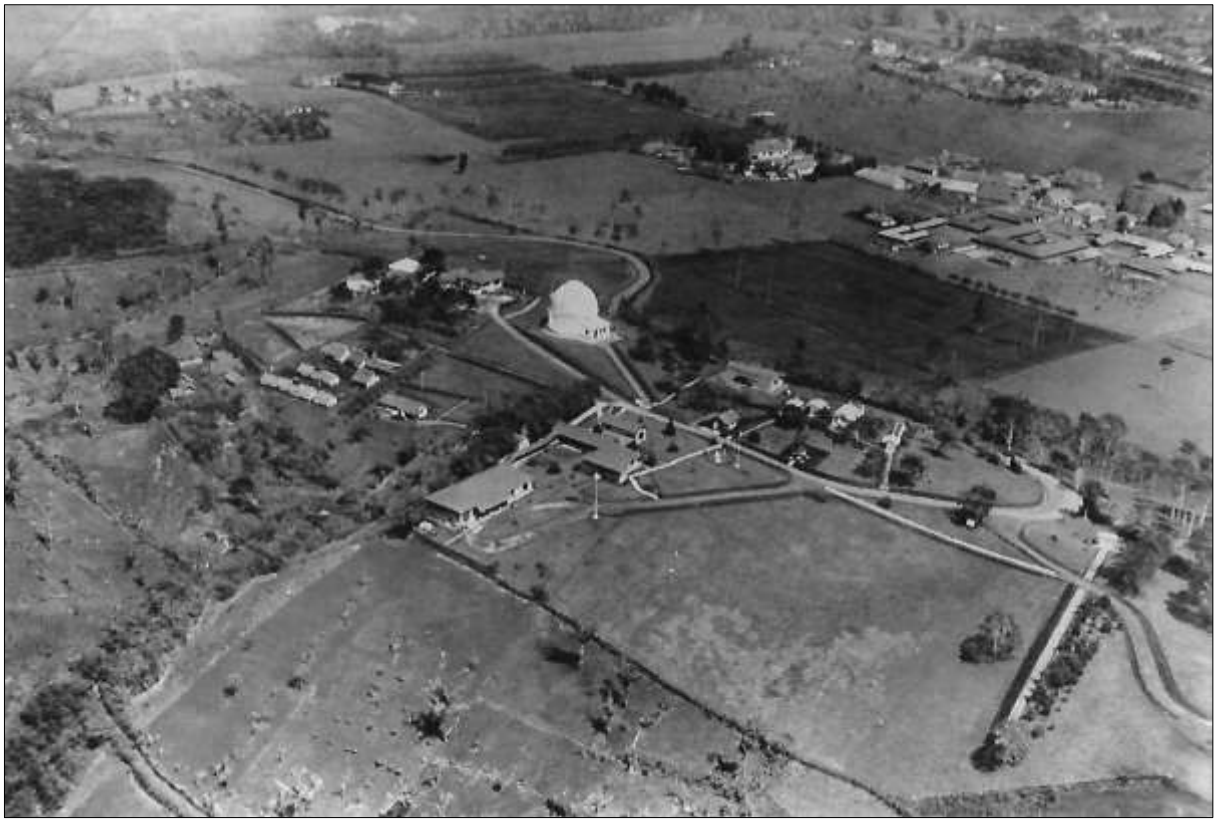

Figure 14: Bosscha Observatory in 1927 (photograph courtesy: luchtvaartafdeling N.-I. Leger).

the Observatory at this time see Figure 14.

In that same year, on Monday 26 November 1928, Ru Bosscha, the patron and benefactor of astronomy in the East Indies, died at Malabar. Ru Kerkhoven succeeded him as President of the Dutch-East-Indies Astronomical Society, and as Chief Administrator of Malabar. In a last will and testament, Bosscha bequeathed fl. 300,000 (now €2.5 million) to the Society for the operation of Bosscha Observatory. That this facility still bears his name today, and that even his grave at Malabar has survived the turmoil of time, are proof of Bosscha's lasting legacy.

5 CONCLUSION

Indonesia has a great astronomical privilege due to its equatorial location. This location enables it to choose the entire celestial sphere as its field of operation. The location of observatories on the Earth has had to adapt to the distribution of land and water. Only Bosscha Observatory is located at or near the Equator. This location has proved of great benefit for the necessary north–south connection of astronomical observations. This is why Bosscha Observatory has been able to attract the interest of the international astronomical community.

6 NOTES

1. For an overview of Oudemans' time in the Dutch East Indies see Orchiston et al., 2021.
2. For recent overviews or summary comments of the history of Indonesian astronomy see Hidayat, 2000; 2004; Hidayat et al., 2017; Orchiston, 2017; Orchiston and Vahia, 2021a. For the history of Bosscha Observatory see van den Heuvel, 2025. For the future of Bosscha Observatory see Epifania and Mumpuni, 2011. Excluded here are recent papers on Indonesian archaeoastronomy, ethnoastronomy and traditional calendars, along with astrophysical research carried out at ITB and Bosscha Observatory and reports on site surveys and searches for radio-quiet zones.
3. For Frederick de Houtman and his star maps see de Grijs, 2023; Dekker, 1987; and Verbunt and van Gent, 2011.
4. For an excellent overview of Mohr see Zuidervaart and van Gent, 2004. For his observations of the 1761 and 1769 transits of Venus see van Gent, 2005.
5. For observations of the 1868 and 1871 solar eclipses by Oudemans and others see Mumpuni et al., 2017.
6. For Lick Observatory observations of the 1901 solar eclipse from Padang see Pearson and Orchiston, 2011; 2017.
7. For much more on this see van der Kruit, 2024.

7 REFERENCES (relating mainly to the 1982 paper)

Annalen van de Bosscha-Sterrenwacht, I, II (up to 1928).
Anonymous, 1924. *Gedenkboek van de Nederlandsch-Indische Theecultuur, 1824-1924*. Bandung, Proefstation voor Thee.
Anonymous, 1950. *Een Eeuw Natuurwetenschap in Indonesië, 1850-1950*; *Gedenkboek Koninklijke Natuurkundige Vereeniging*. [Bandung], Koninklijke Natuurkundige Vereeniging.
Hoogland, W.H., 1965. Bij de 100ste geboortedag van Dr. K.A.R. Bosscha. *Oost en West*, 58, 10ff.
IISG, 2024. Value of the Guilder versus Euro, Internationaal Instituut voor Sociale Geschiedenis. Amsterdam.
Knol, J.,1925. Een en ander over de Bosscha-sterrewacht te Bandoeng. *Hemel en Dampkring*, 23, 221–235.
Pannekoek, A.,1927a. Het werk in Lembang. *Hemel en Dampkring*, 25, 109–113.
Pannekoek, A., 1927b. Die Südliche Milchstrasse. *Annals of the Bosscha Observatory*, II, A1–73.
Stein, J.,1922. De oorsprong der Zuidelijke Sterrebeelden. *Hemel en Dampkring*, 20, 2–10.
van der Bilt, J., 1931. Het eerste decennium der Bosscha-sterrewacht. *Hemel en Dampkring*, 29, 313–321.
van der Hucht, K.A., and Kerkhoven, C.L.M., 1982. De Bosscha Sterrenwacht: van thee tot sterrenkunde. *Zenit*, 9, 293–300.
Voûte, J., 1933. Description of the Observatory (with a Dutch Introduction). *Annalen v.d. Bosscha-Sterrenwacht Lembang (Java)*, 1, A1–A27.
Wormier, C.W.,1938. *Ontginners van Java*. Deventer, van Hoeve.

8 SUPPLEMENTARY REFERENCES

de Grijs, R., 2023. Early star charts of the Dutch East India Company. In Gullberg, S., and Robertson, P. (eds.), *Essays on Astronomical History and Heritage: A Tribute to Wayne Orchiston on His 80th Birthday*. Cham (Switzerland), Springer. Pp. 39–55.
Dekker, E., 1987. Early explorations of the Southern celestial sky. *Annals of Science*, 44, 439–470.
Epifania, P., and Mumpuni, E.S., 2011. Bosscha Observatory: challenges as a scientific heritage in Indonesia. In Valls-Gabaud, and Boksenberg, A. (ed.), *The Role of Astronomy in Society and Culture*. Cambridge, Cambridge University Press. Pp. 235–240.
Hidayat, B., 2000. Under a tropical sky: a history of astronomy in Indonesia. *Journal of Astronomical History and Heritage*, 3, 45–58.
Hidayat, B., 2004. A short history of astronomy in Indonesia. In Wamsteker, W., Albrecht, R., and Haubold, H.J. (eds.), *Developing Basic Space-Science Worldwide. A Decade of UN/ESA Workshops*. Dordrecht, Kluwer. Pp. 61–76.
Hidayat, B., Malasan, H., and Mumpuni, E.S., 2017. The development of astronomy and emergence of astrophysics in Indonesia. In Nakamura and Orchiston, 329–356.
Mumpuni, E.S., Orchiston, W., and Steinicke, W., 2017. J.A.C. Oudemans' observation of the 18 August 1868 and 12 December 1871 total solar eclipses from the Dutch East Indies. In Nakamura and Orchiston, 357–373.
Nakamura, T., and Orchiston, W. (eds.), 2017. *The Emergence of Astrophysics in Asia: Opening a New Window on the Universe*. Cham (Switzerland), Springer.
Orchiston, W., 2017. Studying the history of Indonesian astronomy: future prospects and possibilities. *Journal of Astronomical History and Heritage*, 20, 145–154.
Orchiston, W., Mumpuni, E.S., and Steinicke, W., 2021. J.A.C. Oudemans and nineteenth century astronomy in the Dutch East Indies. In Orchiston and Vahia, 2021b, 285–315.
Orchiston, W., and Vahia, M.N., 2021a. Exploring the history of Southeast Asian astronomy: a checklist of recent research projects and future prospects and possibilities. In Orchiston and Vahia, 2021b, 3–36 [For Indonesia see 20–23.]
Orchiston, W., and Vahia, M.N. (eds.), 2021b. *Exploring the History of Southeast Asian Astronomy: A Review of Current Projects and Future Prospects and Possibilities*. Cham (Switzerland), Springer.
Pearson, J., and Orchiston, W., 2011. The Lick Observatory solar eclipse expedition to Padang (Indonesia) in 1901. In Nakamura, T., Orchiston, W., Sôma, M., and Strom, R. (eds.), *Mapping the Oriental Sky: Proceedings of the Seventh International Conference on Oriental Astronomy (ICOA-7)*. Tokyo, National Astronomical Observatory of Japan. Pp. 207–216.
Pearson, J., and Orchiston, W., 2017. American observations of the 16 May 1901 total solar eclipse from Padang, Dutch East Indies. In Nakamura and Orchiston, 375–392.
van den Heuvel, E.P.J., 2025. One hundred years of Bosscha Observatory, Indonesia: developments since 1939. *Journal of Astronomical History and Heritage*, 28(1), 65–70.
van der Kruit, P.C., 2024. Pannekoek's Galaxy. *Journal of Astronomical History and Heritage*, 27, 135–199.
van Gent, R.H., 2005. Observations of the 1761 and 1769 transits of Venus from Batavia (Dutch East Indies). In Kurtz, D.W. (ed.), *Transits of Venus: New Views of the Solar System and the Galaxy*. Cambridge, Cambridge University Press. Pp. 67–73.
Verbunt, F., and van Gent, R.H., 2011. Early star catalogues of the Southern sky. De Houtman, Kepler (second and third classes), and Halley. *Astronomy & Astrophysics*, 530, A93 (26pp).
Zuidervaart, H.J., and van Gent, R.H., 2004. "A bare outpost of learned European culture at the edge of the jungles of Java." Johan Maurits Mohr (1716–1775) and the emergence of instrumental and institutional science in Dutch colonial Indonesia. *Isis*, 95, 1–33.

Dr. Karel A. van der Hucht is an Emeritus Senior Scientist at SRON, the National Institute for Space Research in Leiden, the Netherlands. He was born in Nuth (Limburg), The Netherlands, in 1946, and obtained his doctoral degree in physics, mathematics and astronomy in 1972 and his PhD in astrophysics in 1978, both from the University of Utrecht. From 1972 to 2011 Karel was employed as a Senior Scientist at the Laboratory for Space Research of the University of Utrecht, which was later renamed the SRON National Institute for Space Research.

His scientific interests focussed on multi-wavelength astrophysics of Wolf-Rayet stars, notably in cooperation with Peredur M. Williams of Edinburgh Observatory. During the period 1978–1979 he served as ZWO-Fellow at the Joint Institute for Laboratory Astrophysics in Boulder (CO, USA). From 1980 to 2005 he was an Annual Guest-Lecturer at the ITB Observatorium Bosscha in Lembang, Indonesia.

During 2003–2006 Karel served as Assistant General Secretary and from 2006 to 2009 as General Secretary of the International Astronomical Union.