BLUMEA 25 (1979) 93 – 99

BRYOLOGY AND BRYOPHYTES AT THE RIJKSHERBARIUM

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Research and management

The main task of the first directors of the Rijksherbarium consisted of the preparation of a catalogue of its Dutch East Indian and Japanese collections (cf. van Steenis-Kruseman's paper in this volume). Among those who contributed to this catalogue was J. H. Molkenboer, a young physician who had graduated on a botanical thesis in 1840. From that year until 1846 he worked on vascular plant collections of the Rijksherbarium and got permission from its director (C. L. Blume) to devote part of his time to bryophytes. He sorted and arranged the Asian collections and started their identification together with his friend and colleague F. Dozy. In 1844 their first precursory paper appeared ('Muscorum frondosorum novae species ex archipelago indico et Japonia'). They then trained a draughtsman and made a first attempt to prepare an illustrated survey of the moss flora of the Dutch East Indies and Japan. During the daytime they looked after their patients and during the evening and part of the night they worked on mosses. After the first instalment had appeared of their 'Musci frondosi inediti archipelagici indici, etc.' (1845 – 1854) the university of Leiden awarded Molkenboer a honorary doctorate. They started a much more elaborate survey of the Dutch East Indian moss flora of which the results were to be published in their 'Bryologia Javanica, etc.' (1854 – 1870). They intended to distribute specimens of species described in this work together with it. Unfortunately, Molkenboer died in 1854 after the prospectus and the first instalment had been distributed. Dozy continued the work but when he died in 1856 only ten instalments had been printed.

Though Molkenboer and Dozy are best known by these publications they also published several smaller papers on Malesian mosses and liverworts, on Dutch bryophytes (culminating in their treatment of the Musci in the first edition of 'Prodromus florae Batavae'), and they published a 'Prodromus florae bryologicae Surinamensis' (1854). The latter was largely based on F. L. Splitgerber's collection in the herbarium of the university of Leiden. This serves as an example that they did not restrict themselves to the collections of the Rijksherbarium. Nowadays all collections concerned are found in that institute.

The remainder of 'Bryologia Javanica' was edited by R. B. van den Bosch and C. M. van der Sande Lacoste. They too were physicians by profession and friends of Molkenboer and Dozy. Van den Bosch (who was related to Dozy by marriage) also published important papers on phanerogams, ferns, lichens, and algae. When he died in 1862 the completion of 'Bryologia Javanica' was left to van der Sande Lacoste who also published papers on malesian liverworts (of which his 'Synopsis Hepaticarum Javanicarum', 1856, must be mentioned here) and the chapter on

bryophytes in Miquel's 'Prolusio florae Japoniae' (1866 – 1867). He spent much of his time in the field and published many papers on Dutch bryophytes. He treated the Hepaticae in the first edition of 'Prodromus florae Batavae' (1851); the treatment of the bryophytes in its second edition (1893) was based on his revision of the herbarium of the 'Botanische Vereeniging' (Dutch Botanical Society). Little is known for certain about contacts of Molkenboer, Dozy and van den Bosch with bryologists in other countries. Van der Sande Lacoste exchanged letters and specimens with many of them and accumulated a very large herbarium. In the collections and files of the Rijksherbarium is evidence of contacts with J. G. Bamberger, E. Bescherelle, J. C. Breutel, V. F. Brotherus, A. Geheeb, C. M. Gottsche, E. Hampe, P. T. Husnot, F. C. Kiaer, J. F. Laurer, E. Levier, A. F. Le Jolis, S. O. Lindberg, P. G. Lorentz, C. B. Massalongo, J. P. F. C. Montagne, A. Rehmann, A. E. Sauter, W. P. Schimper and F. Stephani, and no doubt more names will turn up when his herbarium is thoroughly scanned. It is interesting to note that no evidence has been found with regard to contacts with C. Müller (Halle) and W. Mitten, both very prominent bryologists and working in the same field as van der Sande Lacoste.

When van der Sande Lacoste died in 1887 there was no one to follow in his tracks, and until c. 1925 interest in bryology in the Netherlands was almost nil. During this period V. F. Brotherus (Helsinki) identified extra-European bryophytes from the Rijksherbarium collections.

The revival of bryology in the Netherlands was no doubt influenced by a rapidly growing popularity of phytosociological and floristic research. W. H. Wachter (a high school teacher) strongly stimulated and facilitated bryological work. He provided numerous identifications to others and between 1928 and 1943 he published a series of papers on Dutch bryophytes and on the history of bryology in the Netherlands, mostly mentioning his friend P. Jansen as co-author but in fact written by him alone. He re-arranged the Dutch bryophyte collections of the Rijksherbarium and the Dutch Botanical Society and identified large numbers of (mainly Dutch) bryophytes for the Rijksherbarium. At his death in 1946 he left behind an incomplete manuscript of a liverwort flora of the Netherlands.

From 1943 to 1957 J. J. Barkman was appointed to the staff of the Rijksherbarium. He devoted part of his time to its bryophyte collections but he was primarily interested in phytosociological research and had to spend much time on teaching duties. He composed his magnum opus 'Phytosociology and ecology of cryptogamic epiphytes' (1958) and many smaller floristic, taxonomic, and ecological papers on bryophytes from the Netherlands and other parts of Western Europe.

In 1950 the 'Flora Malesiana' project was started and plans were made for a bryophyte series to be edited by R. van der Wijk (professor of general botany at the university of Groningen). The director of the Rijksherbarium (H. J. Lam) tried to create a position for a full-time bryotaxonomist and curator of the bryophyte collections at the Rijksherbarium and he succeeded in the end. In 1963 his and Barkman's pupil A. Touw was appointed, six years after Barkman had left and one year after Lam had retired. He was to prepare revisions of moss groups for 'Flora Malesiana', in collaboration with R. van der Wijk and B. O. van Zanten at Groningen. However, it soon became obvious that a restriction to the area covered by 'Flora Malesiana' would be a too narrow and inefficient approach. A large proportion of the species concerned extend far beyond that area and for a better

understanding of relationships many taxa from adjacent areas had to be incorporated. Therefore, the plan for a bryophyte series of 'Flora Malesiana' was abandoned in 1966 and it was decided that revisions would be made for a bryogeographically better delimited area, including Malesia and, depending on the group concerned, parts of continental Asia, the island groups in the Pacific Ocean, and Australasia. Thusfar, Touw has published a monographic revision of the *Hypnodendraceae* and partial revisions of *Neckeropsis* (*Neckeraceae*) and several genera of *Thuidiaceae* (*Thuidium*, *Pelekium*, *Rauiella*). At present, the Australasian species of *Thuidium* are being revised. A world-wide revision of the *Rhizogoniaceae* will follow.

Between November, 1965, and February, 1966, Touw collected c. 4150 bryophytes in Thailand as a member of the 'Thai-Dutch Botanical Expedition 1965/66'. From March to May, 1975, he participated in a joint expedition of the Papua New Guinea Division of Botany and the Rijksherbarium to the Papua New Guinean part of the Star Mountains. From April to June, 1978, he executed bryological field work in Sarawak as a member of the (British) Royal Geographical Society's Mulu Expedition.

From c. 1945 onwards bryology has become popular in the Netherlands, and the collections of Dutch bryophytes in the Rijksherbarium and other herbaria are growing very fast. Unfortunately, the most recent critical survey of the composition of the Dutch bryoflora and the distribution of bryophytes in the Netherlands was published in 1893 (in the second edition of the 'Prodromus florae Batavae'), and has become completely outdated. Taxonomic concepts have changed, many species have become very rare or extinct, and others have been added to our flora since.

In 1976 W. V. Rubers was appointed as a temporary research associate to the Rijksherbarium in order to fill this gap. He is preparing a revision of the collections of Dutch Musci (excluding *Sphagnum*) from the larger institutional and private herbaria. He receives the collaboration of a small group of colleagues throughout the country who work up groups of their own speciality. The results will be summarized in a moss flora of the Netherlands containing keys, descriptions, and concise details on distribution, ecology and variability. Besides, distribution maps will be prepared of all species, The acrocarpous mosses (excluding the Bryales) will be worked up between 1976 and 1979. If the necessary funds can be found the remaining groups will follow between 1979 and 1982. From the results already available it appears that our herbaria contain many misidentified specimens (which comes as no surprise) and that our impressions of the frequency, distribution, and sometimes ecology of our species clearly need to be changed. Of some species all records have shown to be false. On the other hand several species not previously reported from the Netherlands have turned up. A few species have become more widespread since the early 19th century and many are on the decline or appear to have become extinct in the Netherlands.

Bryophyte taxonomy at the species level and below strongly depends on the use of vegetative characters. These, however, may show great phenotypic plasticity and deviate in juvenile and depauperate stages, thus obscuring genotypic differences. In order to obtain information on these phenomena cultivation experiments have been started in 1978, using a phytotron constructed in the Botanic Garden of the university of Leiden. Attention will be focused on plants responding well to the artificial climate offered and belonging to groups of closely related taxa.

Collections

In the bryophyte herbarium Hepaticae and Musci are kept separate, and the same holds for the collections from the Netherlands vs. those from elsewhere. All specimens are kept in packets and stored upright in strong cardboard boxes, except c. 67,000 Musci which are mounted on sheets (cf. p. 98). Within these-subdivisions the bryophytes are alphabetically arranged.

Detailed information on the origin of the component parts of the bryophyte collections is often scanty or absent. Much can be found in the surveys of the collections of the Rijksherbarium given by M. J. van Steenis-Kruseman in this volume and by W. A. Goddijn in Mededeelingen van 's Rijks Herbarium, Leiden, No's 62a and 62b, 1931.

Among the oldest bryophyte collections are those in the herbaria of C. H. Persoon and G. F. Kaulfuss. The former was presented to the institute by King Willem I but how the latter has come to Leiden is not clear. Already in 1862 material from it had been examined by van der Sande Lacoste. Both collections contain numerous duplicates (often isotypes) from the herbaria of early 19th century bryologists such as J. Hedwig, C. F. Schwaegrichen, C. G. D. Nees von Esenbeck, C. F. Hornschuch, J. F. Ehrhart, J. C. Schleicher, etc. Unfortunately, most specimens are poorly labeled.

During the first fifty years the core of the bryophyte collections consisted of the (separate) herbaria of Japanese plants (coll. H. Bürger, Pompe van Meerdervoort, Ph. F. von Siebold, and C. J. Textor) and plants from the Dutch East Indies (coll. C. L. Blume, J. C. van Hasselt, F. W. Junghuhn, P. W. Korthals, H. Kuhl, C. G. C. Reinwardt, A. Zippelius, H. Zollinger, and many others). The flow of incoming Asian bryophytes diminished to a trickle after c. 1865.

Important collections from other areas acquired during that period are the coll. Persoon mentioned before, F. L. Splitgerber and H. C. Focke's bryophytes from Surinam, and the herb. Schultes. The latter contains numerous German cryptogams, but also specimens from other parts of the world such as South African bryophytes from the collections of J. F. Drège, C. F. Ecklon and K. L. P. Zeyer.

The herbaria of van den Bosch, Dozy, Molkenboer, and van der Sande Lacoste constitute the most important 19th century acquisitions of the bryophyte collections of the Rijksherbarium (cf. p. 93). Their Dutch collections were deposited in the herbarium of the Dutch Botanical Society. That herbarium contains nearly all important 19th century Dutch bryophyte collections. From 1871 onwards it has been housed in the Rijksherbarium, and on that occasion the non-Dutch specimens in it were presented to the Rijksherbarium.

From 1871 to 1898 W. F. R. Suringar was director of the Rijksherbarium. He was a friend of van der Sande Lacoste, and the latter probably advised him when he started filling the gaps in the cryptogamic collections. Many important collections from all over the world (mainly series of exsiccatae) were acquired, often bought by the director at his own expense. Among those acquisitions are a large number of specimens sent by W. P. Schimper, and South American plants collected by P. W. Korthals and by Suringar himself. In 1888 the heirs of L. H. Buse ceded his collections to the Rijksherbarium, on condition that the Dutch specimens were to be presented to the Royal Botanical Society. Buse had been an eminent amateur bryologist who issued a series of exsiccatae and built up a very large herbarium of mainly European bryophytes which a.o. contains many specimens from J. Juratzka and C. A. J. Milde.

During the first decades of the twentieth century the acquisition of bryophytes continued in a much less successful way than before. No funds were obtained to buy the herbarium of A. Geheeb; it went to Berlin where it was destroyed in 1945. Likewise, no funds were found to buy the bryophyte herbaria of M. Fleischer (c. 30,000 specimens) and V. F. Schiffner (c. 50,000 specimens). Fortunately, these collections of utmost importance to students of Southeast Asian bryophytes are accessible now in the Farlow Herbarium (Cambridge, U.S.A.). In 1949, the Rijksherbarium obtained a set of c. 1300 duplicates of Schiffner's malesian Musci, and of course the institute has a set of the exsiccatae issued by Fleischer. During this period the most important acquisitions from the tropics were duplicates of collections made by Th. Herzog (Bolivia, Ceylon), J. Elbert (Lesser Sunda Is.), A. D. E. Elmer (Borneo, Philippines) and Philippine material distributed by E. D. Merrill. From Europe, the Rijksherbarium obtained c. 3000 Belgian bryophytes from the herbarium of P. J. F. Gravet (the largest set outside Belgium), and the Dutch bryophyte herbarium of D. Lako.

Between c. 1930 and 1950 the acquisitions mainly consisted of exsiccatae and Dutch material. Several private herbaria were obtained (coll. T. R. Broeksmit and W. H. Wachter), and Barkman added much to the herbarium.

As a direct result of the start of the 'Flora Malesiana' project collecting was started in Indonesia and from 1952 onwards large numbers of specimens were sent from Bogor to the Botanical Laboratory at Groningen and the Rijksherbarium. One year later an extensive exchange of bryophytes was started between the Rijksherbarium and the Hattori Botanical Laboratory at Nichinan (Japan), the centre of bryological research in Asia. In 1959 van Zanten collected bryophytes during the Dutch expedition to the now Indonesian part of the Star Mountains, New Guinea, on behalf of the Rijksherbarium.

In 1963 the institute possessed a large bryophyte herbarium rich in type specimens but of a rather ill-balanced composition. Most collections from Indonesia dated from the first six decades of the 19th century when large parts of the area had been hardly touched by explorers. Thanks to Merrill's extensive distribution of duplicates the Philippine collections were reasonable, but of collections made in other parts of Malesia only few were represented in the Rijksherbarium. Continental Asia, the Pacific island groups, Australasia, Africa, and tropical and South America (excluding Bolivia and Surinam) were represented by valuable but small and old collections. There were large collections rich in 19th century specimens from Europe and rather large ones from North America. The collections of Dutch bryophytes in the Rijksherbarium and the herbarium of the Dutch Botanical Society were by far the richest in the Netherlands.

From c. 130,000 specimens in 1963 the bryophyte collections have increased to c. 210,000 specimens in 1978. Large collections were obtained by donation or in exchange for identifications. However, the exchange of duplicates is the main source of important acquisitions and takes much time. The sorting is a time consuming job and duplicates for exchange must be at least provisionally identified, unidentified bryophyte material being very unpopular among curators because of the difficulty of getting it named.

The acquisition of material from Malesia and adjacent areas has top priority, followed by material from other parts of Asia, Australasia, the Pacific island groups, and Africa. No particular efforts are made to obtain material from tropical

and South America, that being the area studied by colleagues at the Utrecht herbarium.

Large malesian acquisitions are coll. W. Meijer (c. 12,000 specimens from Sumatra, Java, and Borneo), west malesian duplicates from the Bogor herbarium and coll. R. van der Wijk, and many, often small collections from Papua New Guinea (a.o. duplicates of coll. R. G. Robbins including type material of numerous species described by E. B. Bartram). Material has been received from nearly all parts of Malesia, but Celebes, the Moluccas, the Lesser Sunda Islands, and the Indonesian part of New Guinea remain lamentably underrepresented areas. The acquisitions from East and South Asia include a.o. the exsiccatae of Japanese bryophytes issued by the Hattori Botanical Laboratory, duplicates of Himalayan bryophytes collected by the University of Tokyo expeditions, and coll. C. Ruinard from Ceylon.

Large numbers of Australian bryophytes were sent by the Canberra Botanic Gardens (coll. H. Streimann). Several rather large collections were received from New Zealand and Pacific island groups (e.g. duplicates of coll. W. Schultze-Motel from Samoa).

The African collections were improved by large collections from South Africa (duplicates of coll. M. R. & C. Crosby and P. Vorster) and smaller ones from Malawi (coll. H. R. & C. Feijen), Tanzania (duplicates of coll. T. Pócs), various other parts of continental Africa, Madagascar and the Mascarenes.

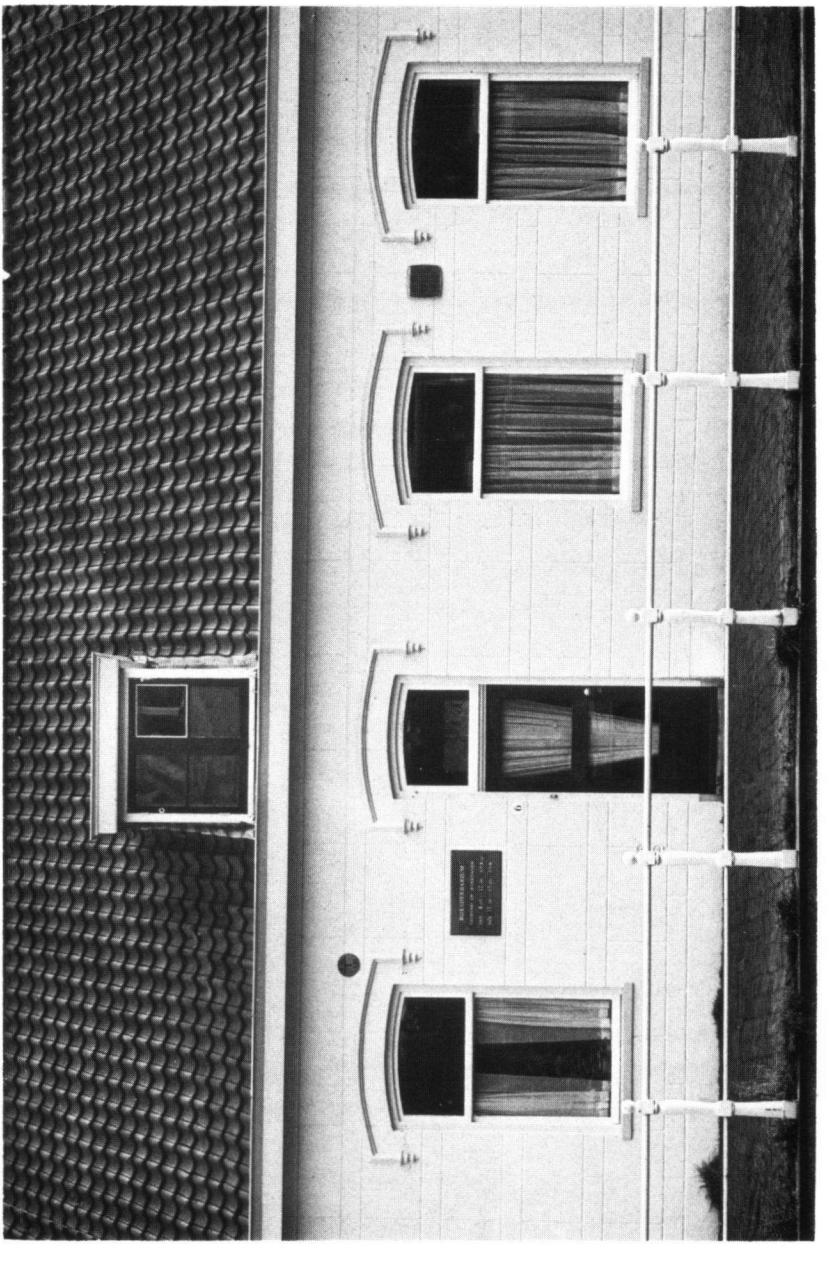
The collections of Dutch bryophytes have grown strongly too. Most amateur and professional bryologists deposit duplicates of notable discoveries in the Rijksherbarium and several private herbaria have been bequeathed or donated to it: coll. E. Agsteribbe, S. Groenhuijzen and A. N. Koopmans (each counting c. 4000 – 5000 specimens), and coll. C. J. Booy, E. C. H. Kolvoort and B. J. Reichgelt (c. 1100 – 2300 specimens).

Though Hepaticae are not intentionally neglected most acquisitons are Musci since bryological research at the Rijksherbarium is presently restricted to that group. Nevertheless, large numbers of unworked malesian Hepaticae are accumulating and it is strongly hoped that someday a hepaticologist can be appointed to work up this material.

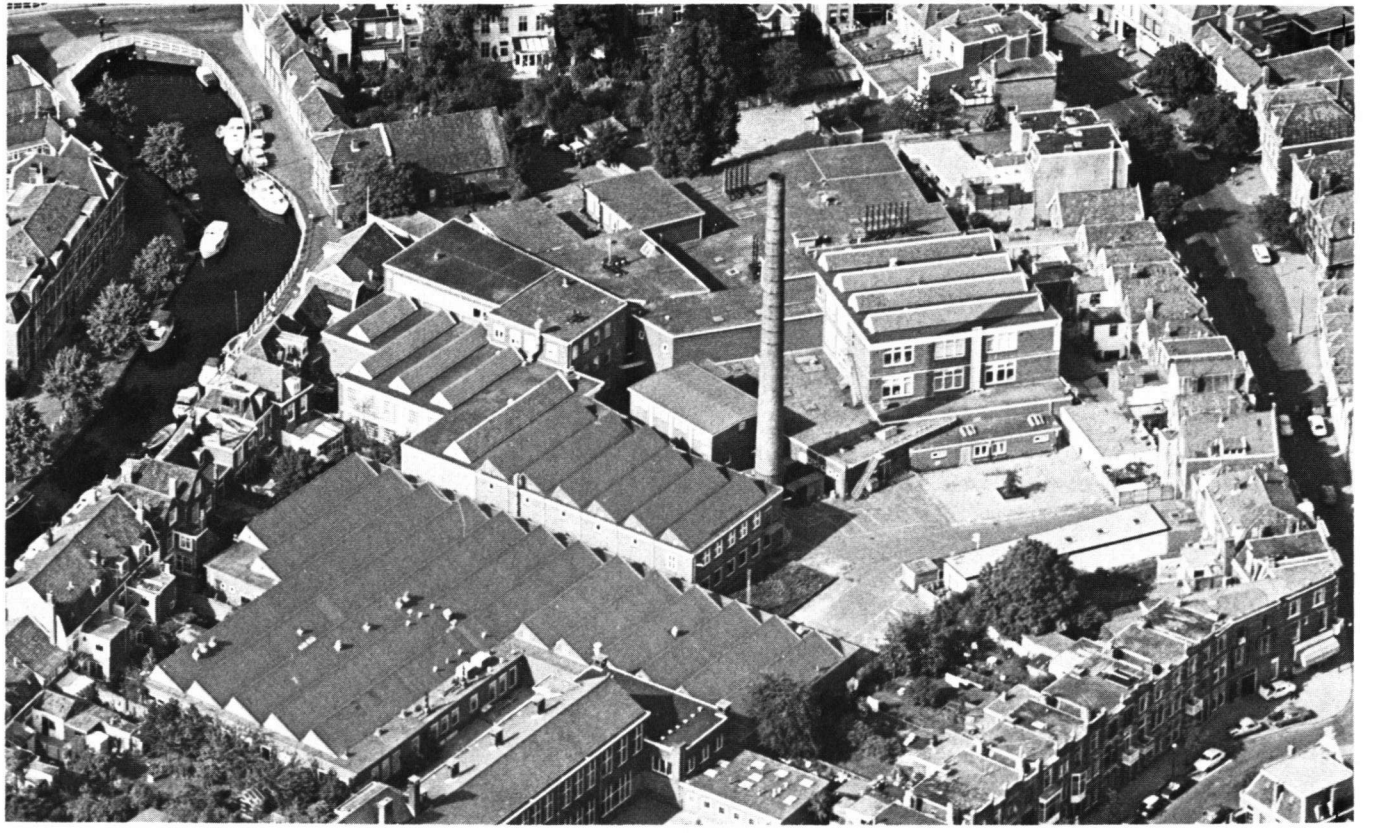
Around the turn of the century it had become very hard to get access to the material because the old collections from the Dutch East Indies, the Japanese herbarium, the 'general herbarium', the herbarium of the university of Leiden, and a number of other collections had been kept separate. Between 1907 and 1912 all collections of the Rijksherbarium were united and rearranged, and the bryophytes were (re)mounted on sheets measuring 22.5 by 30 cm (half the size of the sheets used for vascular plants). In 1950 this procedure was abandoned and bryophytes were put in packets. A remounting of the specimens on sheets was started but at present c. 67,000 Musci remain to be done.

During the remounting in 1907 – 1912 the names of the Musci were brought up to date using Paris' Index Bryologicus. Unfortunately, this work had to be done by people without any bryological training. Nasty mistakes have been made, particularly where homonyms were involved. Thus, most collections of *Dicranum bonjeanii* De Not. were stored under *Ceratodon purpureus* (Hedw.) Brid. by confusing *Dicranum palustre* B & S (= *D. bonjeanii*) with *D. palustre* Brid. ex Schum. (= *Ceratodon purpureus*). A start has been made with a revision of the nomenclature of the moss collections, but c. 80% of the labels remain to be checked.

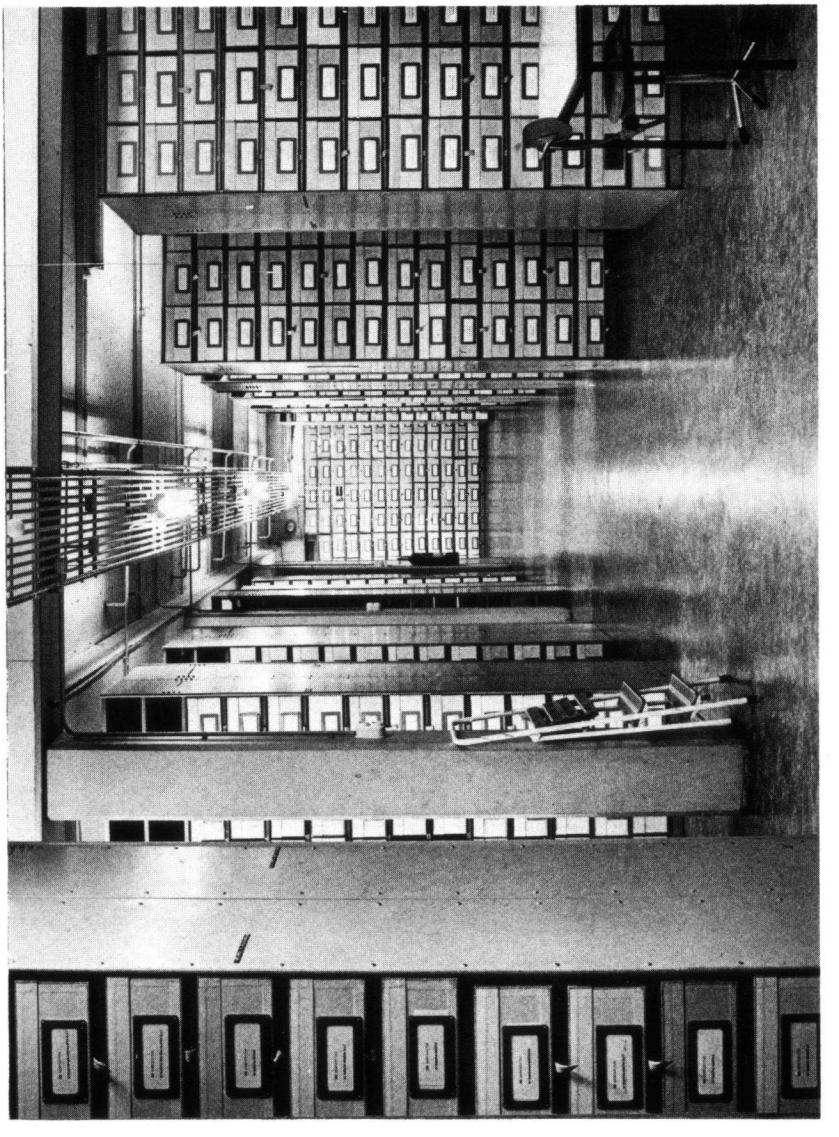
The curation of the fast growing and for a long time somewhat neglected collections is a source of worry, considering the lack of sufficient assistance by technicians. In 1973, some relief was found in the appointment of W. J. Holverda as botanical assistant. He spends 50% of his time on bryophytes, making routine identifications of European material, sorting new exotic collections, and revising the nomenclature of the old collections of Musci.



The front door of the Rijksherbarium. This small house is part of the so-called Provisorium, a former textile-factory. The complex is hardly visible from the street. Photo Ruth van Crevel, Rijksherbarium.



Aerial photograph of the Provisorium, which houses the Rijksherbarium and some other departments. It is situated in a residential neighbourhood and closely surrounded by houses. Photo Frans Rombout, Leiden.



The herbarium is stored in stout cardboard boxes shelved in open racks, not in pigeon-holes in closed cupboards as in most herbaria. The 13th and 14th row, out of reach for most people, were intended as a reserve. In some places they are already in use. Photo Ruth van Crevel, Rijksherbarium.