



# BOTANICAL RESEARCHES IN THE ESTONIAN S.S.R.



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BOTANICAL RESEARCH  
IN THE ESTONIAN S.S.R.

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## INTRODUCTION

Botanical research work has assumed an extremely wide range under Soviet conditions in the Estonian S.S.R. during the post-war period. The decisions adopted by the Twenty-first Congress of the C.P.S.U. open up even broader vistas for such work in the republic. In collaboration with specialists in other fields our botanists are tackling a variety of problems that have a theoretical as well as a practical importance.

Botanical studies are carried out in the Estonian S.S.R. mainly by two institutions: the Academy of Sciences of the Estonian S.S.R. and Tartu State University. The latter is the oldest scientific institution in Estonia. A professorship of botany was established at the university in 1802, and is represented today by the Chair of Systematic Botany and Geobotany (headed by H. Trass) in the Faculty of Mathematics and Natural Science. The following year the botanical garden was founded and is at present subordinated to the abovementioned chair. Scientific research at the chair is being pursued mainly in the fields of plant ecology, coenology, systematic botany and plant geography. Botanical research work is also being carried out at the same faculty by the Chair of Plant Physiology (established in 1920, headed by A. Perk) and the Chair of Genetics and Darwinism which was established in the post-war period (headed by O. Mikhaylov).

The Academy of Sciences of the Estonian S. S. R. was founded in 1946. The Institute of Zoology and Botany (Director: H. Haberman) at Tartu and the Institute of Experimental Biology (Director: O. Priilinn), as well as the botanical garden recently founded in Tallinn, are engaged in botanical research. The Botany Section of the Institute of Zoology and Botany (headed by L. Laasimer) and the Chair of Systematic Botany and Geobotany of Tartu State University are working on a common research problem — "The Flora and Vegetation of the Estonian S. S. R., Their Composition, Origin, Development, Use and Reconstruction". The principal lines of research pursued by the botany section are floristics, systematic botany and plant ecology and coenology. The section of hydrobiology of the same institute is engaged in algological research work. The principal lines of research at the Institute of Experimental Biology are the problems connected with the regularities of plant ontogenesis and adaptation, the nature of viruses, the influence of nuclear radiations and landscape architecture.

The Estonian Agricultural Academy at Tartu and the Estonian Scientific Research Institute of Agriculture and Land Improvement in Tallinn (subordinated to the Ministry of Agriculture of the Estonian S. S. R.) are concentrating on research into the problems of applied botany.

Scientific and educational institutions are also helping individual naturalists who work on their own. All nature lovers are gathered in the Naturalists' Society, founded in 1853 and attached to the Academy of Sciences. The Estonian Branch of the All-Union Botanical Society also works hand in hand with the Botany Section (headed by A. Vaga) of the Naturalists' Society. The Botany Section is working on the same research problems as the corresponding section of the Institute of Zoology and

## Botany and the Chair of Systematic Botany and Geobotany.

Botanists are being trained chiefly at Tartu State University. From 1949 to 1959 126 highly-qualified botanists, including 48 plant physiologists, graduated from this institution. Of this number 25 botanists are working at higher educational and scientific institutions, the rest mainly as teachers. Some highly-skilled specialists have studied also at other educational establishments of the Soviet Union. In recent years the Chair of Systematic Botany and Geobotany has paid special attention to the training of specialists in algology, lichenology and mycology because of a shortage of experts in these fields.

The Board of Nature Conservation attached to the Council of Ministers of the Estonian S. S. R., the Nature Conservation Commission subordinated to the Academy of Sciences of the Estonian S. S. R. and the Nature Conservation Section of the Naturalists' Society are engaged in the conservation of botanical objects and the organisation of work in nature conservation areas.

Works on botany are published mainly in the following serial publications:

*Eesti NSV Teaduste Akadeemia Toimetised*, bioloogiline seeria (The Transactions of the Academy of Sciences of the Estonian S. S. R., biological series; abbreviated TA Toim.) — issued 4 times a year; articles in Estonian or Russian with abstracts in Russian or Estonian and a foreign language (English, German or French);

*Tartu Riikliku Ülikooli Toimetised* (The Transactions of Tartu State University, abbreviated TRÜ Toim.) — issued irregularly; articles in Estonian or Russian with abstracts in Russian or Estonian and a foreign language;

*Eesti Loodus* (Estonian Nature), a popular-scientific magazine of the Academy of Sciences of the Estonian S. S. R. — issued 6 times a year, articles in Estonian with summaries in Russian and English;

*Loodusuurijate Seltsi Aastaraamat* (Year-Book of the Naturalists' Society, abbreviated LUS Ar.) — issued once a year, articles in Estonian or Russian with summaries in Russian or Estonian, summaries in a foreign language are also provided beginning with Vol. 50;

*Abiks loodusevaatlejale* (A Guide for Amateur Naturalists, abbreviated Abiks lood.) — a non-periodical publication of the Naturalists' Society in Estonian provided with summaries in Russian and (beginning with No. 28) also in a foreign language;

*Floristilised märkmed* (Floristic Notes) — a non-periodical publication of the Naturalists' Society in Estonian provided with Russian and English translations of headings.

An Estonian-language booklet *Botanical Literature 1945—1955* (Tartu, 1958) has been issued containing a summary of botanical literature in the post-war period.

The present survey has been published in connection with the IX International Botanical Congress in Montreal (1959) and describes the work done in each speciality during the post-war period and lists the more important publications in individual fields.

The Editors

## I. THE STUDY OF THE HISTORY OF BOTANY

The biographies and activities of the more outstanding botanists who have worked at Tartu are being studied mainly by Professor A. Vaga. The life and work have been studied of Professor C. F. Ledebour (1785—1851), who established the floristic plant geographic line of research at Tartu University and who is well-known as an investigator of the flora of the Altai and the compiler of the first complete flora of Russia (*Flora Rossica*). Of the other botanists the following are being dealt with: A. Bunge (1803—1890), who produced monographic studies of several genera that are chiefly found in Central Asia; F. Schmidt (1852—1908), the founder of the botanical regional study of Estonia; E. Russow (1841—1897), a sphagnologist and plant anatomist; N. Kuznetsow (1864—1932), an investigator of Caucasian flora and the creator of the first Russian phylogenetic system of plants; M. Tswett (1872—1919), the inventor of the method of chromatographic adsorption; T. Lippmaa (1892—1943), an investigator of plant pigments and the founder of Estonian plant ecological and synecological research.

The lives and activities of amateur botanists have been studied by J. Eilart.

An extensive review of Professor T. Lippmaa's activities is being published in the form of a volume of recollections written by a group of authors.

- Sokolov, V. S.**, 1957. The Work of Estonian Botanists and Sylviculturists during the Period from 1947 to 1956 and, Partially, during the Preceding Years. Ботанический журнал, XLII, 1. (Russian.)
- Trass, H.**, 1958. Botanische Forschungsarbeit des Lehrstuhls für Pflanzensystematik und Geobotanik an der Universität Tartu. TRÜ Toim., 64. (Estonian with Russian and German summaries.)
- Vaga, A.**, 1946. T. Lippmaa. Советская ботаника, XIV, 6. (Russian.)
- Vaga, A.**, 1955. [Botanical Investigations and Expeditions of Tartu University.] TRÜ Toim., 37. (Russian with Estonian summary.)
- Vaga, A.**, 1958. Zur Biographie von Professor M. Tswett. TRÜ Toim., 64. (Russian with Estonian and German summaries.)
- Vaga, A.**, 1959. [History of the Foundation of a Central Institution of Botanical Research in Pre-revolutionary Russia.] Tallinn. (Russian with Estonian summary.)
- Veski, V.**, 1953. [150th Anniversary of the Botanical Gardens of Tartu State University.] LUS juubelikoguteos. Tallinn. (Estonian with Russian summary.)

## II. TAXONOMY, FLORISTICS AND PLANT GEOGRAPHY

### 1. The Study of the Phylogeny of the Vegetable Kingdom

Professor A. Vaga has dealt with the general questions of the phylogeny of the vegetable kingdom. In 1946 he published a survey of the development of the phylogenetical system of cryptogams and suggested the lines to be followed in further research. Later on, in 1952, he presented a development scheme of organic nature in the form of a genealogical tree. This scheme presumes that most of the heterotrophic plants (Fungi, Bacteria) have not become heterotrophic in a secondary manner, but they have been heterotrophic from the very beginning: consequently, they should be regarded as an independent kingdom of organic nature alongside the vegetable and animal kingdoms. A. Vaga has also dealt with the problems of the phylogeny of vascular plants.

K. Eichwald has studied the phylogeny of the genus *Rubus*. A monograph will soon be published on this problem in which the author will show that the subgenera which now occur in different parts of the world have developed from the early dendriform ancestors of this genus. This development has led from dendriform hook ramblers to new lifeforms with semilignified stems and thence to boreal and arctic herbaceous forms. The boreal subgenus *Cylactis* has been dealt with especially thoroughly.

- Eichwald, K., 1952. [On the Evolution of Blackberries (*Rubus*) of the Boreal Type.] Teaduslikud tööd pühendatud TRU 150. aasta-päevale. Tallinn. (Russian with Estonian summary.)
- Vaga, A., 1946. Développement du système des Cryptogames et les problèmes actuels de leur classification. Acta et Commentationes Universitatis Tartuensis, biol. tead. 1. (Estonian with Russian and French summaries.)
- [Vaga, A., 1952. The Phyla of the Organic World.] Ботанический журнал, XXXVII, 5. (Russian.)

## 2. Algology

Although the first known botanical work that also mentions Algae occurring on the Estonian territory was published already 150 years ago, we cannot regard Estonia as a country that has been thoroughly investigated from the algological point of view. Up to the present time more than a hundred shorter or longer articles discussing algal flora have been published, but only some of them may be said to be comprehensive. K. Mölder was the first investigator to summarize and publish surveys of the composition and distribution of several phyla of Algae (*Diatomeae*, *Flagellatae*, *Dinoflagellatae*, *Chlorophyceae*, *Heterocontae*, *Cyanophyceae*.)

Among recent floristical and taxonomical works the instructions for the investigation of *Charophyta* (M. Pork) and fresh-water *Chroococceae* (K. Pork), published by the Naturalists' Society are noteworthy. They sum up all the places of occurrence of the species known in Estonia and contain descriptions of them. E. Kukk has studied the problems of the distribution and systematics of Blue-green Algae. 367 different species, varieties and forms of Blue-green Algae occur in Estonia. In their works on some Estonian lakes N. Voronikhin and H. Riikojä have presented new data on the algal flora of the Estonian S. S. R.

K. and M. Pork have discussed ecological problems when analyzing seasonal changes in the composition of phytoplankton and epiphyton in four southern Estonian lakes of different types. Observations have also been carried out concerning the biomass of epiphyton. K. Pork has presented a comprehensive review of the phytoplankton of 36 lakes in southeastern Estonia.

The algal flora of Estonia is being studied by E. Kukk (*Cyanophyta*, *Chlorophyta* incl. *Conjugatae*), V. Kõvask (*Conjugatae*), K. Pork (*Euglenophyta*, *Dinoflagellatae*) and M. Pork (*Bacillariophyta*).

- Kukk, E., 1958. Über die Entwicklungsstadien der Arten *Gloeotrichia* J. Ag. im Zusammenhang mit der systematischen Lage der *Oscillatoria lacustris* (Kleb.) Geitl. TA Toim., biol. s., VII, 2. (Estonian with Russian and German summaries.)
- Kukk, E., 1958. Neufunde von Arten und Formen einiger Blaualgen in der Sowjetunion. TRU Toim., 64. (Estonian with Russian and German summaries.)
- Kukk, E., 1958. The Occurrence of *Hyalobryon Leickii* Gessner in the Estonian S. S. R. Fl. Notes I, 2. (Estonian.)
- Kõvask, V., 1959. Über das Phytoplankton von vier Seen in Mittel- und Südestland. Tartu (Estonian with Russian and German summaries.)
- Mölder, K., 1945. Die Cyanophyceenflora Estlands. Ann. Bot. Soc. Zool.-Bot. Fenn. «Vanamo», 20, 4. (German with Finnish summary.)
- Mölder, K., 1946. Die geographische Verbreitung der Algen in Estland nebst einem Verzeichnis der Konjugaten. Ann. Bot. Soc. Zool.-Bot. Fenn. «Vanamo», 21, 6. (German with Finnish summary.)
- Pork, K., 1955. [The Fresh-water *Chroococceae* of the Estonian S. S. R.] Abiks lood., 21. (Estonian with Russian summary.)
- Pork, K., 1958. Remarks Concerning the Algae Occuring on the Sphorophores of *Polyporaceae*. Fl. Notes I, 2. (Estonian.)
- Pork, K., 1958. Über das Sommer-Phytoplankton der Seen im südöstlichen Teil der Estnischen SSR. Hüdrobioloogilised uurimused I. Tartu. (Russian with Estonian and German summaries.)
- Pork, M., 1954. [The *Charophyta* of the Estonian S. S. R.] Abiks lood., 16. (Estonian with Russian summary.)

- Pork, M., 1958. *Tabellaria binalis* (Ehr.) Grun. in the Lakes of Kurtna (north-eastern Estonia, Jõhvi District). Fl. Notes I, 2. (Estonian.)
- Pork, M., 1959. Zur Algenflora der Endla-Hochmoore. LUS Ar., 51. (Estonian with Russian und German summaries.)
- Pork, M. und Pork, K., 1958. Angaben über das Epiphyton und Phytoplankton einiger Seen der Estnischen SSR. Hüdrobioloogilised uurimused I. Tartu. (Russian with Estonian and German summaries.)
- Riikoja, H., 1953. [On the Algal Flora in the Lake Jussi Suurjärv.] LUS juubelikoguteos. Tallinn. (Estonian with Russian summary.)
- [Voronikhin, H., 1950. The Phytoplankton of Lake Pskov.] Acta Inst. Bot. Ac. Scient. URSS, ser. II, 5. (Russian.)

### 3. Mycology

The beginning of mycological research in Estonia may be said to go back to 1856, when H. A. Dietrich published the first comprehensive work on fungal flora. More intensive research work began with the present century. Chr. Gobi, T. Vestergren, F. B. Bucholtz, E. Lepik, N. Witkowski, etc. worked in this field for some time. Thanks to their researches the species composition of several groups of Fungi (*Peronosporales*, *Erysiphaceae*, *Ustilaginales*, *Uredinales*, *Fungi hypogaei*, partly also *Hypocreales* and *Agaricales*) has been ascertained. Exsiccata (H. A. Dietrich, E. Lepik, etc.) have been edited containing materials gathered from the territory of Estonia.

Mycological research work has been revived during recent years. At present research work is being pursued in three directions.

**Floristical and Taxonomical Research Work.** The family *Polyporaceae* (E. Parmasto) and the genera *Septoria*, *Phoma* (A. Marland) and *Phyllosticta* (M. Aksel) of the group *Deuteromycetes* have been studied monographically. Intensive research work is being done in the following groups of Fungi: *Corticaceae*, *Clavariaceae* and *Meruli-*

*aceae* (E. Parmasto), genus *Lactarius* (K. Kalamees). The investigation of the groups *Pyrenomycetes*, *Pezizales* and *Tremellales* has begun.

**Ecological Research Work.** A study of microfungi of soil is in progress (V. Lasting); works on the sporulation of *Polyporaceae* and the ecology of *Fomitopsis annosa* and *Inonotus obliquus* (E. Parmasto) have been published.

**Research into Phytopathological Fungi.** In addition to the different studies in phytopathology the genus *Helminthosporium* (I. Randalu) and *Phytophthora infestans* (Chair of Botany, Plant Physiology and Phytopathology of the Estonian Agricultural Academy) have been studied from the phytopathological-mycological point of view. Research into mycological diseases of grasses, clover and alfalfa has begun (K. Kask, K. Kivi and A. Laats).

The publication of the exsiccata «*Mycotheca estonica*» was begun in 1958 and its second fascicle (Nos. 26—50) will come out this year.

In addition to field-works in the Estonian S.S.R. during the last few years, expeditions have been organized to the Trans-Carpathian region, the Komi A.S.S.R. and Krasnoyarsk area (E. Parmasto). These expeditions have made a contribution to systematic botany and mycology.

The most important mycological herbariums in Estonia are that of the Institute of Zoology and Botany (15,000 specimens, mainly fungi belonging to the orders *Aphyllophorales* and *Uredinales*) and that of the Chair of Botany, Plant Physiology and Phytopathology of the Estonian Agricultural Academy (21,000 specimens).

Aksel, M. J., 1956. Genus *Phyllosticta* in Estonian. Acta Inst. Bot. Ac. Scient. URSS, ser. II, 11. (Russian.)

Kalamees, K., 1958. Some Interesting Species of Fungi from Estonia I. Fl. Notes I, 1. (Estonian.)

Lasting, V., 1957. Die mikrobiologischen Prozesse im Boden bei der Kultivierung des weissen Honigklee. TA Toim., biol. s., VI, 3. (Estonian with Russian and German summaries.)

- [Lasting, V., 1958. The Microbiologic Processes in the Propagation of Melilot as a Green Fertilizer.]
- Lasting, V. A., Gurfel, D. B., 1956. A Contribution to a Quantitative Assay of Fungi in the Soil. *Микробиология*, XXV, 5. (Russian with English summary.)
- [Marland, A., 1948. A Critical Review of the Genus *Septoria* with Special Reference to Estonian Flora.] *Acta et Commentationes Universitatis Tartuensis*, biol. tead. 4. (Russian.)
- Muiste, L., 1957. On Larch Canker in the Estonian S.S.R. *TA Toim. biol. s.*, VI, 3. (Estonian with Russian and English summaries.)
- Parmasto, E., 1956. [A Handbook for the Identification of the Most Important *Polyporaceae* of the Estonian S.S.R.] *Abiks lood.*, 26. (Estonian with Russian summary.)
- Parmasto, E., 1957. *Mycotheca Estonica*, I, Nr. 1—25. Tartu.
- Parmasto, E., 1958. Development and Spore Discharge of the Fruit-Bodies of *Polyporaceae*. *TA Toim.*, biol. s., VII, 2. (Russian with Estonian and English summaries.)
- Parmasto, E. 1959. Fam. Polyporaceae in R.P.S.S. *Estonicae. Acta Inst. Bot. Ac. Scien. URPS*, ser. II, 12. (Russian.)
- Randalu, I. 1953. [On the Distribution of *Helminthosporium sativum* P. K. et B. and the Damage It Causes to Barley in the Estonian S.S.R.] *TA Toim.*, II, 4. (Estonian with Russian summary.)

#### 4. Lichenology

Due first and foremost to the research of A. Bruttan, K. Mereschkowsky and V. Räsänen, but also to the works and collections of other scientists and amateur lichenologists (H. A. Dietrich, V. P. Savicz, P. Wasmuth, E. Häyren, H. and T. Lippmaa, G. Åberg, G. Vilbaste, N. A. Minyayev, etc.), Estonia is a comparatively well-investigated area. Although there is as yet no complete summary of Estonian lichenoflora based on modern taxonomy, the works of the scientists just mentioned provide a general survey of its composition.

The Estonian lichenoflora consists of nearly 600 species, the number being quite remarkable if one takes into account the small area of the Estonian S.S.R.

(45,149 sq. km.). Recent researches into the elements of lichenoflora show us that the group of northern species is a relatively important component (c. 10 per cent) of the flora, but on the other hand several species of western and southern distribution and origin also extend to Estonia. The importance of lichens in the Estonian vegetation is great in places (heaths, pine heaths, alvars, sandy heaths).

In the postwar period lichenological research work in Estonia has been comparatively slack. Lichenological material has been gathered (H. Aasamaa, E. Parmasto, H. Trass), but only about ten works have been published.

The largest lichenological collections in Estonia belong to the Chair of Systematic Botany and Geobotany of Tartu State University. These include the oldest collections (those of A. Bruttan, P. Wasmuth, K. Mereschowsky), several exsiccata (Nylander-Norrin's Herbarium Lichenum Fenniae; V. Räsänen's Lichenes Fenniae Exsiccati; V. P. Savicz' Lichenotheca Rossica, etc.), H. Lippmaa's and V. Räsänen's herbariums and H. Trass' collections from Estonia, the Caucasus and the Kola peninsula. Smaller lichenological collections may be found at the Institute of Zoology and Botany at Tartu and in the State Museum of Natural Sciences in Tallinn. H. Aasamaa's herbarium is the largest private collection. One may also find Estonian lichenological material in Leningrad, Helsinki and Turku.

Monographs on Estonian Cladoniae (H. Trass, H. Aasamaa) and a lichenocoenological research work on the synusia of lichens (H. Trass) are being completed.

A large herbarium of lichens from the Kola peninsula (the Khibini mountains) and material on other genera are being studied simultaneously with Cladoniae.

Aasamaa, H., 1956. [On the Characteristic Features of the Genera *Cetraria* Ach. and *Cornicularia* Ach. Occurring in the Species *Cornicularia odontella* Ach.] LUS Ar., 49. Tallinn. (Estonian with Russian summary.)

- Trass, H., 1956. Ad Floram Cladoniacearum Rei-publicae S.S. Estoniae. Not. Syst. e Sect. Crypt. Inst. Bot. Ac. Scient. U R S S, XI. (Russian.)
- Trass, H., 1957 and 1959. Distribution of the Rare and Interesting Species of Estonian S.S.R. LUS Ar., 50. and 51. Tallinn. (Estonian with Russian and English summaries.)
- Trass, H., 1958. Four New Species of Lichens in the Estonian S.S.R. Fl. Notes I, 1. (Estonian.)
- Trass, H., 1958. The Discovery of Some Species of the Genus *Parmelia* in Estonia. Fl. Notes I, 1. (Estonian.)
- Trass, H., 1958. *Cladonia acuminata* (Ach.) Norrl. and *Cl. foliata* (Arn.) Vain. in the Estonian S.S.R. Fl. Notes I, 2. (Estonian.)
- Trass, H., 1958. Über antibiotische Wirkstoffe der Flechten und über Aufgaben der lichenofloristischen Forschung in der Estnischen SSR. TRU Toim., 64. (Estonian with Russian and German summaries.)
- Trass, H., 1958. Bestimmungstabellen der Cladonien Estnischer SSR. Abiks lood. 39. (Estonian with Russian and German summaries.)

## 5. Bryology

The Bryophyta are quite important in the vegetation of Estonia, especially on raised bogs, eutrophic mires and peat-land forests.

The major works published up to the present in the field of Estonian bryoflora are the survey of the flora of Eastern Baltic Hepaticae by N. Malta and J. Strautmanis (1926) and a book on the flora of Eastern Baltic Musci by N. Malta (1930). In the above-mentioned works all the early material from the Estonian territory as well as the materials collected in Estonia by the authors and their contemporaries (G. Vilberg-Vilbaste, A. Üksip, etc.) have been taken into account and investigated critically. 83 species of *Hepaticae* and nearly 300 species of *Musci* were found to occur in Estonia. These works have been the basis for further bryological work on this territory.

In the following years (1930—1944) Professor T. Lippmaa was one of the most enthusiastic investiga-

tors in the field of bryology and he succeeded in interesting his students as well. No generalizing and extensive reviews of Estonian Bryophytes were published in this period, however, although they had been planned by T. Lippmaa.

In the post-war period a number of limited bryological investigations have been undertaken mainly in forests (H. Tuvikene, A. Kalda) and in peat lands (S. Talts, V. Masing). Several handbooks have been compiled and additional material for collections has been gathered. The most efficient work has been done in the field of *Hepaticae* (L. Laasimer). As a result a monograph has been completed in which 105 species of *Hepaticae* found in Estonia are discussed thoroughly and critically.

A task set for the immediate future is the compilation of a critical bryoflora of the Estonian S.S.R.

The most important herbariums of Bryophytes may be found at the Chair of Systematic Botany and Geobotany of Tartu State University and the botany section of the Institute of Zoology and Botany of the Academy of Sciences of the Estonian S.S.R.

- Laasimer, L., 1948. [A Handbook for the Identification of the Most Important Forest Mosses of the Estonian S.S.R.] Tartu. (Estonian.)
- Laasimer, L., 1953. [On the Specific Composition and Indicatory Properties of the Hepatical Flora of the Estonian S.S.R.] LUS juubelikoguteos. Tallinn. (Estonian with Russian summary.)
- Laasimer, L., 1955. [A Handbook for the Identification of the Most Important *Hepaticae* of the Estonian S.S.R.] Abiks lood., 20. (Estonian with Russian summary.)
- Laasimer, L., Talts, S., Varep, E., 1945. [The Peat Mosses of the Estonian S.S.R.] Tallinn. (Estonian with Russian summary.)
- Masing, V., 1957. Die Moose, Farne und Blütenpflanzen der Hochmoore des Endla-Moorgebietes. LUS Ar., 50. Tallinn. (Estonian with Russian and German summaries.)

## 6. Vascular Plants

The more detailed taxonomical investigation of the Estonian flora began in the middle of last century when A. Bunge was professor of botany at Tartu University. His students F. Schmidt, E. Russow, P. Glehn and L. Gruner compiled the best local floras of their time. It was during Bunge's period, too, that the best Baltic flora of the time was published by F. J. Wiedemann and E. Weber (1852). Research work in systematic botany and floristics had attained preeminence already in the middle of the 19th century under C. F. Ledebour. A taxonomical and plant geographical line of research was developed under Professor N. Kuznetsov at the turn of the century.

During Professor T. Lippmaa's period intensive studies of the flora of Estonia were carried out by himself as well as his students (E. Pastak-Varep, H. Salasoo, V. Sirgo, etc.).

At present the compilation of "The Flora of the Estonian S.S.R.", a profusely illustrated work in nine volumes, supplied with distribution and areal maps, is the most important undertaking in the study of the Estonian flora. The authors of this work are botanists of the Academy of Sciences of the Estonian S.S.R. and the Tartu State University. The first three volumes of "The Flora of the Estonian S.S.R." were published in 1953—1959. Volume 1 deals with the phyla *Pteridophyta* (A. Vaga) and *Gymnospermae* (K. Eichwald). Volume 2 surveys the following families of the phylum *Angiospermae*: *Ranunculaceae* (E. Varep); *Berberidaceae*, *Nymphaeaceae* and *Crassulaceae* (A. Vaga); *Ceratophyllaceae* and *Saxifragaceae* (S. Talts) and *Rosaceae* (K. Eichwald). The following families are dealt with in Volume 3: *Leguminosae*, *Geraniaceae*, *Onagraceae*, etc. (S. Talts); *Tiliaceae*, *Euphorbiaceae*, *Aceraceae*, etc. (M. Kask and E. Varep); *Malvaceae* (K. Eichwald) and *Oxalidaceae* (A. Vaga).

In collaboration with Latvian and Lithuanian botanists and dendrologists a Baltic dendroflora is being compiled (editor A. Vaga). The stock-taking of the Estonian dendroflora has been nearly completed (A. Paivel). The summaries show us that in addition to the 87 local species of trees and shrubs, only a little over half of the 900 species introduced to Estonia in the course of time still occur here.

Some genera have been especially carefully studied, as for instance the critical genus *Hieracium* by A. Üksip. A. Üksip has written the corresponding part of "The Flora of the Estonian S.S.R." in which he deals monographically with 154 taxa of *Hieracium* found in Estonia. The same author has also compiled the volume devoted to the genus *Hieracium* for "The Flora of the U.S.S.R." and has written original diagnoses of 150 *Hieracium* species new to the science.

Floristic notes on the distribution of characteristic or rare species of plants constitute a special group among the floristic works written in the Estonian S.S.R. (A. Üksip, K. Eichwald, G. Vilbaste, J. Eilart, K. Kask, etc.).

Of the separate elements of flora the pontical and pontosarmatical elements have been studied by J. Eilart, who has also supplemented T. Lippmaa's phytogeographical division of Estonia.

A comprehensive work on the present state and future tasks of floristic and plant geographic research in Estonia has been published by K. Eichwald. It is under the latter's supervision, too, that the mapping of the distribution of different species is being carried out in the republic.

Of the plant species that are of increasing importance in the national economy particular interest has been taken (especially by foresters) in various trees and shrubs. Special attention has been paid in recent years

to *Evonymus europaeus* which contains guttapercha and is found in southern Estonia (K. Eichwald, J. Laasimer, V. Ritslaid.). Some fodder plants and medicinal herbs have also been the object of more detailed research.

The problem of adventive plants has been treated mainly by A. Remmel. She as well as other authors (G. Vilbaste, etc.) has published data on adventive plants. The naturalization of cultivated plants has been dealt with by K. Eichwald. Different ways of plant dispersal are being studied by V. Masing.

The following aids in floristic research work have been published: a plant guide for schools, two identification tables of trees and shrubs, an identification key of hay-plants and several instruction on how to collect plants. A more complete manual of the flowering plants of Estonia is being printed.

Herbariums collected during almost a century and a half play an important part in the investigation of the Estonian flora. The largest herbal collections belong to the Chair of Systematic Botany and Geobotany of the Tartu State University, and include A. Uksip's and K. Eichwald's herbariums (a total of approximately 25,000 herbal sheets of vascular plants), Institute of Zoology and Botany (nearly 33,000 sheets), the State Museum of Natural Sciences (30,000 herbal sheets). The valuable Herbarium Generale of the Chair of Systematic Botany and Geobotany of the Tartu State University, consists of more than 150,000 sheets. The most extensive private herbarium belongs to the botanist G. Vilbaste. Plants collected in Estonia are preserved also in herbariums in Riga and Leningrad.

In addition to herbal collections one should also mention exsiccata collections. The oldest of these, embracing all the Baltic States, dates from Professor A. Bunge's period. The second, the exsiccata collection "Estonian Plants" was issued in Professor T. Lippmaa's day with

the assistance of numerous botanists and amateurs (four folders were issued, each containing 50 numbers; publication was suspended at the beginning of the war).

- Aasamaa, H., 1953. [On *Medicago falcata* sp. coll. as a Promising Fodder Plant, Its Systematics and Distribution in the Estonian S.S.R.] LUS juubelikoguteos. Tallinn. (Estonian with Russian summary.)
- Adojaan, A. ja Kotkas, H., 1948. [The Most Important Hay Plants.] Tartu. (Estonian.)
- Eesti NSV floora I [The Flora of the Estonian S.S.R. I], 1953. Tallinn. (Estonian with Russian summary.)
- Eesti NSV floora II [The Flora of the Estonian S.S.R. II], 1956. Tallinn. (Estonian with Russian summary.)
- Eesti NSV floora III [The Flora of the Estonian S.S.R. III], 1959. Tallinn. (Estonian with Russian summary.)
- Eichwald, K., 1953. [The Problem of the Species of *Evonymus* in the Estonian S.S.R.] LUS juubelikoguteos. Tallinn. (Estonian with Russian summary.)
- Eichwald, K., 1953. [On the Distribution of the Species *Galinsoga* Ruiz et Pav. in the Estonian S.S.R.] LUS juubelikoguteos. Tallinn. (Estonian with Russian summary.)
- Eichwald, K. 1953. [The Transchel Blackberry, Analysed in the Light of Michurinist Biology.] LUS juubelikoguteos. Tallinn. (Estonian with Russian summary.)
- Eichwald, K., 1955. [The Plant Species of the Estonian S.S.R. to Be Mapped]. Tartu (Latin and Estonian.)
- Eichwald, K., 1957. Über eine Naturalisation der Gelben Narzisse im Osten Estlands. LUS Ar., 50. Tallinn. (Estonian with Russian and German summaries.)
- Eichwald, K., Laasimer, L., Talts, S., Vaga, A., Varep, E., Üksip, A., 1948 [A Handbook for the Identification of Vascular Plants.] Tallinn. (Estonian.)
- Eichwald, K., Parmasto, E., Pork, K., 1954. [Plant Collections.] Abiks lood., 15. (Estonian.)
- Eilart, J., 1956. [New Floristic Finds in the South-East Estonian Phytogeographical Region and Their Utilization as Indicators of Environmental Conditions.] LUS Ar., 49. Tallinn. (Estonian with Russian summary.)
- Eilart, J., 1958. On the Distribution of Steppe Plants and on Phytogeographical Boundaries in Estonia. Estonian Nature, 2. (Estonian with Russian and English summaries.)

- Gröntved, J., 1953. Botanische Untersuchungen auf der Insel Dagö (Hiiumaa). Dansk Bot. Arkiv, 15, 3. (German.)
- Kask, K., 1958. Verbreitungsbereich der *Helichrysum arenarium* (L.) DC. in der Estnischen SSR. TA Toim., VII, 4. (Estonian with Russian and German summaries.)
- Kusk, V., 1958. [The Species of Weeds and their Distribution in Eutrophic Fen Fields in the Western Part of the Estonian S.S.R.] TRÜ Toim., 55. (Estonian with Russian summary.)
- Laasimer, J., 1953. [The Possibilities of Breeding *Evonymus* in the Estonian S.S.R.] LUS juubelikoguteos. Tallinn. (Estonian.)
- Lellep, E., 1958. Die Verbreitung der Meer-Wermut (*Artemisia maritima* L. s. 1.) an der Nordgrenze seines Areals. TRÜ Toim., 64. (Estonian with Russian and German summaries.)
- Masing, V., 1956. [The Part Played by Birds in the Dispersal of Plants] LUS Ar., 49. Tallinn. (Estonian with Russian summary.)
- [Paivel, A., 1954. On the Introduction of Species of Trees and Shrubs to the Island of Saaremaa.] TA Toim., III, 3. (Russian.)
- Paivel, A., 1957. Im Westteile von Estland bekannte eingeführte Nadelholzarten und die Möglichkeiten ihrer Verwendung. TA Toim., biol. s., VII, 3. (Estonian with Russian and German summaries.)
- Rebassoo, H., 1957. Bemerkungen zur Verbreitung einiger seltenen Pflanzen in Westestland. LUS Ar., 50. Tallinn. (Estonian with Russian and German summaries.)
- Rommel, A., 1958. On the Adventitious Flora of the Area of the Tartu Railway Station. TRÜ Toim., 64. (Estonian with Russian and English summaries.)
- Vilbaste, G., 1953. [On the Distribution of *Potentilla fruticosa* in the Estonian S.S.R.] LUS juubelikoguteos. Tallinn. (Estonian with Russian summary.)
- Uksip, A., 1953. [Floristic Notes.] LUS juubelikoguteos. Tallinn. (Russian.)
- Uksip, A., 1953. [On the Systematics of *Hieracium umbellatum* L. sp. coll.] LUS juubelikoguteos. Tallinn. (Estonian with Russian summary.)

### III. PLANT ECOLOGY AND SYNECOLOGY

#### 1. Theory and Methods

Synecological investigations of the Estonian area began in the '20s of the present century. At first research work (K. Regel, G. Vilbaste, E. Spohr, etc.) was based on the methods and theoretical views of generally acknowledged schools (Uppsala, Zürich-Montpellier). An original school, whose theoretical basis was provided by its head Professor T. Lippmaa, came into being in Estonia in the 1930s. A characteristic feature of this school is that in studying plant communities it proceeds from their structural parts — unistratal societies (synusiae). Applying the method of synusiae T. Lippmaa extensively analyzed several interesting plant communities in deciduous forests, alvars etc. In 1933 he published the first classification of Estonian vegetation based on unistratal societies. Besides the works of T. Lippmaa, one must also mention the investigations of V. Sirgo, E. Pastak-Varep, etc., and especially A. Vaga's work on the theory of phytocoenology written in 1940.

Those who apply the method of synusiae maintain that the differentiation of synusiae, the study of their development, composition, ecology and connections, their classification — is the method that enables one to study multistratal communities more thoroughly and to differentiate their types — associations — more correctly.

In the postwar period, beginning with 1945, our phytosociologists set out among other things to evaluate the method of synusiae from the standpoint of Soviet ecology. In a paper published posthumously in 1946, T. Lippmaa wrote that the method of synusiae (previously called the method of unistratal associations by the author) does not contradict the view that an association is the fundamental unit of phytocoenology. When the association consists of two or many synusiae, detailed study helps us to a better understanding of the given association. The same view has been elaborated by L. Laasimer, A. Vaga and H. Trass who have applied the method of synusiae concretely and interpreted the results of their research in their works.

Works on the general theoretical problems of synecology (the notion of plant societies, the problem of cultural plant communities, of historical development and human influence, etc.) have been published by A. Vaga, H. Trass and V. Masing. A differentiated approach to synecological categories is characteristic of the Estonian plant sociologists. The following synecological categories have been differentiated by H. Trass: 1) developmental stages of plant communities, 2) plant communities, 3) secondary plant communities, 4) cultural plant groups. The mosaic character of vegetation and the consequent problems of classification have been dealt with in several works (V. Masing).

The problems of the classification of plant communities and the fundamental unit have been discussed by A. Vaga, L. Laasimer, H. Trass and V. Masing. The Estonian synecologists are of the opinion that the relations of plant communities to their ecological conditions (water conditions, soils etc.) must be more carefully considered when classifying vegetation, especially in the differentiation of higher synecological units. Floristic composition, characteristic species and environmental conditions have

been taken into account in the differentiation of associations.

In the field of **the methods of synecology** works have been published by A. Vaga, V. Masing and H. Trass. Several methods and scales for evaluation (the determination of frequency, abundance, dominance, vitality and other characteristics) have been defined more exactly. The methods for the determination of the indicatory properties of vegetation have been worked out, etc.

Joint expeditions of botanists from the Baltic republics and Leningrad have been systematically organized in order to coordinate methods, test new methods and exchange experience: e. g. such expeditions were arranged in the Latvian S.S.R. and the Lithuanian S.S.R. in 1954, in the Estonian S.S.R. in 1955, in the west of Latvia in 1956, in the west of Lithuania in 1957 and to the island of Saaremaa (Estonia) in 1959.

A monograph on the vegetation of Estonia (L. Laasimer), a handbook of synecology (H. Trass) and a collection of articles on T. Lippmaa's scientific heritage are being prepared.

- Laasimer, L., 1946. The Ecology of the Alvar-forest. Acta et Commentationes Universitatis Tartuensis, biol. tead. 2. (Estonian with Russian and English summaries.)
- [Laasimer, L., 1958. Tentative Classification of the Vegetation of the Estonian S.S.R.] Тезисы докладов делегатского съезда ВБО, IV. Ленинград. (Russian.)
- Laasimer, L., 1959. The Position of Estonia in Phytogeographical and Geobotanical Partitions of North-Europe. TA Toim., biol. s., VIII, 2. (Russian with Estonian and English summaries.)
- [Lippmaa, T., 1946. On the Synusiae.] Советская ботаника, XIV, 3. (Russian.)
- Masing, V., 1953. [On the Methods of the Study of Vegetation, Its Use as an Indicator of Changes in Drainage and Other Environmental Conditions.] LUS juubelikoguteos. Tallinn. (Estonian with Russian summary.)
- Masing, V., 1955. [On the Use of Plant Indicators in Forestry.] LUS Ar., 48. Tallinn. (Estonian with Russian summary.)

- Masing, V., 1958. Über Prinzipien und Einheiten der Klassifikation der Hochmoorvegetation. TRÜ Toim., 64. (Estonian with Russian and German summaries.)
- Masing, V. ja Trass, H., 1955. [Instructions for the Plant Ecological and Coenological Study of Peat Bogs.] Abiks lood., 23. (Estonian with Russian summary.)
- [Sabardina, G., 1956. Botanical Expedition in the Estonian S.S.R.] Ботанический журнал, XLI, 4. (Russian.)
- Trass, H., 1955. [On the Synusial Method in Plant Ecology and Coenology] LUS Ar., 48. Tallinn. (Estonian with Russian summary.)
- Trass, H., 1958. Probleme der geobotanischen Theorie im Zusammenhang mit der Klassifizierung der Niedermoorvegetation. TRÜ Toim., 64. (Estonian with Russian and German summaries.)
- [Vaga, A., 1951. On cultivated Phytocoenoses.] Ботанический журнал, XXXVI, 1. (Russian.)
- Vaga, A. 1953. [On the Phytocoenoses of the Peat Bogs of the Estonian S.S.R.] Coll.: Eesti NSV fauna ja floora uurimise küsimusi. Tallinn. (Estonian with Russian summary.)
- [Vaga, A., 1954. Stationary Plant Ecological and Coenological Investigations researches in the Estonian S.S.R.] Coll.: Доклады на совещании по стационарным геоботаническим исследованиям. Москва-Ленинград. (Russian.)
- [Vaga, A., 1955. Vegetation of the Estonian S.S.R.] Природа, 5. (Russian.)

## 2. The Mapping of Vegetation

In 1934 the mapping of Estonian vegetation was begun on Professor T. Lippmaa's initiative and under his supervision. The decision for the mapping of the vegetation of Europe adopted by the Fifth International Botanical Congress (Cambridge, 1930) served as the incentive for this great work. Professor T. Lippmaa was one of the few enthusiastic and active supporters of this undertaking. He drew up the instructions and the legend necessary for the mapping. Vegetation units, of which there were originally 42, were entered on large-scale base maps (1:42,000). The units have been established taking into account floristic composition as well as ecological factors, mainly the properties of soils. A large body of colla-

borators took part in the mapping. As a result 35—40 per cent of the territory of Estonia was mapped in 6 years.

This work was suspended during World War II and resumed in 1948 under the guidance of the Botany Section of the I.Z.B. (L. Laasimer). A number of students and other naturalists took part in the work in addition to the personnel of the Botany Section of the Institute of Zoology and Botany. Mapping field work on an area larger than one half of the Estonian territory that had remained unmapped was completed in 1955. Altogether 67 persons have taken part in the mapping and drawing up of descriptions. They have produced a total of over 400 map sheets. Vegetation maps of Estonia on scales of 1 : 200,000 and 1 : 600,000 have been constructed on the basis of the large-scale material available. Only a few countries have vegetation maps on such a scale. The 1 : 600,000 map also forms a component part of the vegetation map of the Baltic states which will be published in Leningrad at the end of 1959.

The obtained data have made it possible to begin drawing general conclusions concerning Estonian vegetation. Thus a geobotanical division of the Estonian territory has been carried out and a detailed monograph "The Vegetation of the Estonian S.S.R." has been compiled (L. Laasimer). These works serve as a valuable basis for further detailed investigations of Estonian vegetation and they are also being used in the economically important work of planning and division into districts.

Peat-land communities (c. 80,000 ha) and (to a lesser extent) grassland communities have been mapped in collaboration with the Estonian Scientific Research Institute of Agriculture and Land Improvement.

Laasimer, L., 1958. Geobotanische Gliederung der Estnischen S.S.R. Tartu. (Estonian with Russian and German summaries.)

Laasimer, L. R., 1958. Geobotanical Regions of the Estonian SSR. Botanical Journal, XLIII, 3. (Russian with English summary.)

### 3. Forests

Estonian forests form the western component part of a mixed forest subzone belonging to the Eurasian conifer forest zone. They take up almost 30 per cent of the territory of Estonia. The dominating species in the forests are *Pinus silvestris* (46 per cent of the total area of forests), *Picea excelsa* (20 per cent), *Betula verrucosa* and *B. pubescens* (28 per cent), *Populus tremula* (3 per cent), *Alnus glutinosa* (2 per cent) and *Alnus incana* (1 per cent). Other trees (oak, ash, elm, etc.) are less common.

Estonian forests are divided according to considerable differences in site conditions into: 1) dry forests on mineral soils and 2) swamp forests on peat soils. A peculiar site type within the first group consists of the alvar forests growing on the humus-calcareous soils on limestone bedrock which are characteristic of northern and north-western Estonia.

Forestry research with a synecological slant began in Estonia in the '20s and '30s of the present century. A. Rühl, T. Lippmaa and K. Linkola were among the best-known investigators in the field of forest botany and forest typology; A. Mathiesen, E. Viirok, P. Reim, B. Haller, E. Kohh, etc. were outstanding in the field of dendrology and silviculture.

Investigations of an ecological character predominate in the silvicultural research of the postwar years.

The influence of man's activities (drainage, timber cutting, cultivation of land) upon the changes of site conditions has been the object of the **forest ecological studies** completed up to the present. Comparatively more attention has been paid to the characterization of edaphic, microclimatic and hydrological factors. Studies have been carried out according to individual forest site types, particular attention being given to those types which have

presented difficulties from the point of view of forest economy. The following such sites have been dealt with: wooded transition bogs and their clearings (P. Kollist, V. Hainla, U. Riispere), heath areas and heathy forests (U. Valk, M. Margus, P. Rõigas, O. Henno), alvar forests and alvars (L. Laasimer, E. Kaar, E. Pihelgas, R. Sepp). The botanist A. Kalda has made a detailed study of broad-leaved forests.

Among **dendrological works** with a silvicultural bias one must point out the more significant investigations of *Quercus borealis*, *Pseudotsuga* and *Pinus murrayana* (M. Margus), of *Larix* (E. Laas), *Pseudotsuga taxifolia* (H. Taimre). and *Juglans regia* (O. Henno). Research into the silvicultural properties of economically important foreign species of trees is becoming more extensive and thorough.

The recent **works on forest typology** (A. Ilves, A. Karu, L. Muiste, L. Laasimer) reflect to a greater or lesser extent the influence of Academician V. N. Sukachov's works in this field. The classification of forest site types and forest types by A. Karu and L. Muiste has best met practical needs and has been adopted in forest management in Estonia. This classification pays comparatively more attention to the characterization of woods and forest site conditions than is done in other similar works undertaken in our country.

Hainla, W., 1956. Über die Produktivität der Wälder in den entwässerten Übergangsmooren mit tiefer Torfschicht. TA Toim., biol. s., V, 1. (Estonian with Russian and German summaries.)

Hainla, V., 1957. Über die Entwässerungsergebnisse der Kiefernwälder in den Übergangsmooren Estlands. Coll.: Metsanduslikud uurimused I. Tartu. (Estonian with Russian and German summaries.)

Henno, O., 1955 [On the Growing of *Juglans cinerea* L. in the Estonian S. S. R.] LUS Ar., 48. Tallinn. (Estonian with Russian summary.)

- Henno, O., 1955. [Afforestation of Ortstein Areas That Are Bogging Up.] TA Toim., IV, 1. (Estonian with Russian summary.)
- Iives, A., 1953. [Types of Estonian Firm Land Forests.] LUS juubelikoguteos. Tallinn. (Estonian with Russian summary.)
- Kaar, E. 1957. Die Alvaren der Insel Saaremaa und ihre Aufforstungsmöglichkeiten. TA Toim., biol. s., VI, 3. (Estonian with Russian and German summaries.)
- Kalda, A., 1958. Die gegenwärtige Verbreitung von Edellaubwäldern in der Estnischen SSR. TRÜ Toim., 64. (Estonian with Russian and German summaries.)
- Karu, A., 1955. [On the Importance of the Reconstruction of Forests in the Estonian S.S.R.] LUS Ar., 48. Tallinn. (Estonian with Russian summary.)
- Karu, A., Muiste, L. 1958. [Site Types of Estonian Forests.] Tallinn. (Estonian.)
- [Kollist, P., 1954. Renewal of Forests in the Transition Bogs of the Estonian S.S.R.] Природа, 11. (Russian.)
- [Kollist, P., 1955. Some Results of the Study of Forest Renewal Conditions in Drained Transition Bogs of the Estonian S. S. R.] Тр. Ин-та леса АН СССР, XXXI. (Russian.)
- Kollist, P., 1956. Die Standortsverhältnisse in entwässerten Übergangsmoorwäldern. TA Toim., biol. s., V, 4. (Estonian with Russian and German summaries.)
- Kollist, P., 1957. Der Einfluss der Entwässerung der Übergangsmoorwälder mit tiefer Torfschicht auf die Verjüngungsbedingungen. Coll.: Metsanduslikud uurimused I. Tartu. (Estonian with Russian and German summaries.)
- Laas, E., 1955. [The Results of Larch Growing in the Estonian S. S. R.] LUS Ar., 48. Tallinn. (Estonian with Russian summary.)
- [Laas, E., 1956. The Larch in Estonia.] Coll.: Внедрение лиственницы в лесных насаждениях. Москва-Ленинград. (Russian.)
- Laasimer, L., 1946. The Ecology of the Alvar-forest. Acta et Commentationes Universitatis Tartuensis, biol. tead. 2. (Estonian with Russian and English summaries.)
- Margus, M., 1957. Die Aufforstung der für die Landwirtschaft unbrauchbar Böden im süd-östlichen Teil Estlands. Coll.: Metsanduslikud uurimused I. Tartu. (Estonian with Russian and German summaries.)
- Margus, M., 1958. Vom Anbau des *Quercus borealis* in Estland. TA Toim., biol. s., VII, 3. (Estonian with Russian and German summaries.)
- Margus, M., 1959. Murray-Kiefer in Estland. LUS Ar., 51. Tallinn. (Estonian with Russian and German summaries.)

- Masing, V., 1955. [On the Use of Plant Indicators in Forestry.] LUS Ar., 48., Tallinn. (Estonian with Russian summary.)
- Pihelgas, E., 1957. [Forest Cultivation on Clearings in Alvar Forests.] Coll.: Eesti Põllumajanduse Akadeemia Teaduslike Tööde Kogumik 3. Tallinn. (Estonian with Russian summary.)
- [Proceedings of the Scientific Conference on Forest Drainage], 1957. Tartu. (Estonian.)
- Rõigas, P., 1957. [Investigations and Observations in the Pine Forest Fine Areas of the Sagadi Forestry District.] Coll.: Eesti Põllumajanduse Akadeemia Teaduslike Tööde Kogumik 3. Tallinn. (Estonian with Russian summary.)
- Sepp, R., 1959. Die Menge und Zusammensetzung des Waldabfalles im Alvarenwald. TA Toim., biol. s., VIII, 1. (Estonian with Russian and German summaries.)
- Taimre, H., 1954. [Possibilities of Growing Douglas Fir in the Forests of the Estonian S.S.R.] TA Toim., III, 4. (Estonian with Russian summary.)
- The Reafforestation of Heathlands and the Maintenance of Wooded Heaths, 1958. Tartu. (Estonian with Russian and English summaries.)
- [Valk, U., 1953. Afforestation of Dry Pine Forest Fire Areas in the Estonian S.S.R.] Coll.: Научная сессия по вопросам биологии и сельского хозяйства. Москва. (Russian.)
- Valk, U., 1957. Investigation of the Afforestation of Dry Heather Wastes. Coll.: Metsanduslikud uurimused I. Tartu. (Estonian with Russian and English summaries.)

#### 4. Grasslands

Grasslands (meadows and pastures) cover almost one quarter of the territory of the republic and account for a little more than one half of its agricultural land. The natural grasslands are divided typologically into dry meadows (alvar, heathy and dry meadows proper), marsh-ridden grassland, alluvial meadows and halophilous meadows. The first two groups predominate.

In the '20s of the present century the plant sociological investigation of Estonian grasslands was launched by K. Regel in the grasslands near Sangaste. G. Vilbaste has studied alvar vegetation. The works of A. Blumberg-

Lillema, A. Miljan and T. Lippmaa give us some information regarding dry meadows and marshridden grasslands.

A preliminary inventory and classification of grasslands all over the Estonian S.S.R. was carried out in connection with the mapping of vegetation (see p. 27). The collaboration of the scientists of the Estonian Scientific Research Institute of Agriculture and Land Improvement and Institute of Zoology and Botany resulted in the publication in 1957 of a booklet on grassland types.

Research on the vegetation of the grasslands and pastures of the Estonian S.S.R. was carried out by the Institute of Zoology and Botany in 1954—1956. This work began with the dry meadows of western Estonia and was later extended (from 1957 onwards) to include the whole of Estonia (H. Karu). The alluvial meadows of the central Estonian rivers have also been scientifically investigated (1955 and later; K. Pork). These studies deal with the types of dry and alluvial meadows, the regularity in the distribution of plant communities and their dependence on site conditions, their floristic composition, phenology and yield. Studies aiming at the determination of seasonal changes in the natural grassland plant communities, yield dynamics and the environmental conditions in the vegetation period are being carried out at temporary observation stations.

During the past few years the problems of the reproduction of vegetation on meadows have been dealt with at the Chair of Systematic Botany and Geobotany (under the supervision of H. Trass), the problems of site conditions on river-meadows are being studied at the Estonian Agricultural Academy (L. Reintam). In 1958 a series of experiments (K. Pork, H. Trass, L. Reintam) were started for the purpose of tracing the influence of deposits as an ecological factor.

The problems of the vegetation, soils and cultivation of the western Estonian alluvial meadows and marshy meadows are being solved by scientists of the Estonian Scientific Research Institute of Agriculture and Land Improvement (A. Lillema and H. Michelson).

Improved meadows form only 5 per cent of the total grassland area at present, but their area is steadily increasing. The largest centre of scientific research into improved meadows is the Estonian Scientific Research Institute of Agriculture and Land Improvement with its experimental stations (head of the improved meadows department: R. Toomre). Research work of a plant ecological and coenological character is being carried out on the development, composition, types and grazing qualities of the turf of improved grasslands by A. Adojaan at the Jõgeva Experimental Station (where there are improved paddocks up to 35 years old) and elsewhere in the republic. A. Adojaan's extensive observations of the biology of grasses have attracted special attention. The Estonian Institute of Stock-Breeding and Veterinary Science is another large centre of research into pastures (from the standpoint of meat and milk production, etc.).

A scientific session devoted to the problems of the plant ecological and synecological study of grasslands was held on the initiative of the Institute of Zoology and Botany in 1957 and summed up the results of research in this field.

Adojaan, A., 1955. [The More Important Hay Plants in the Cultivated Pastures and the Formation the High-Yield Turfs.] Coll.: Kultuurkarjamaade rajamine ja kasutamine. Tallinn. (Estonian.)

[Cultivated Pastures of Long Duration in the Estonian S.S.R.], 1958. Tallinn. (Estonian; Russian 1959.)

Karu, H., 1957. Zu den Saisonveränderungen der Trockenwiesenvegetation in Westestland. LUS Ar., 50. Tallinn. (Estonian with Russian and German summaries.)

- Karu, H., 1957. Über die Pflanzendecke der Trockenwiesen Westestlands und deren wirtschaftliche Nutzung. TA Toim., biol. s., VI, 1. (Estonian with Russian and German summaries.)
- Karu, H., 1958. Spring, Summer and Autumn on the Meadow. Est. Nat., 4. (Estonian with Russian and English summaries.)
- Lillema, A., 1958. [Soils of the Estonian S.S.R.] Tallinn. (Estonian.)
- Lillema, A., Michelson, H., 1958. Bodenbeschaffenheit und Grünlandtypen der Überschwemmungsgebiete der Flüsse und der Strandwiesen Westestlands. TA Toim., biol. s., VII, 2. (Estonian with Russian and German summaries.)
- Matveyeva, E. P. and Karu, H. A., 1958. Notes on the Vegetation of Alvares and Upland Forest-meadows of Western Estonia. Botanical Journal, XLIII, 7. (Russian.)
- Pork, K., 1958. Floristic Notes from the Meadows Lining the Põltsamaa and Pedja Rivers. Fl. Notes I, 2. (Estonian.)
- [Scientific Session on the Plant Ecological and Coenological Investigation of Meadows and Pastures. Theses of Reports, 1957. Tartu.] (Russian.)
- Toomre, R., Lillema, A., Talts, S., Laasimer, L., 1957. [Types of the Natural Grass Lands of the Estonian S.S.R.] Tallinn. (Estonian.)

## 5. Peat Lands

In the prewar period peat bogs were studied to a comparatively limited extent, mainly by specialists at the Tooma Bog Experimental Station (L. Rinne, etc.) and by several individual scientists (P. W. Thomson, E. Markus, I. Paasio, etc.). In the postwar years, since 1949, in particular, the economic as well as phytosociological investigation of peat bogs has been revived considerably and is being carried out by several collectives of scientists — the Botany and Forestry Sections of the Institute of Zoology and Botany, the Tooma Experimental Station of the Estonian Scientific Research Institute of Agriculture and Land Improvement and the Chair of Systematic Botany and Geobotany.

Extensive land improvement work has been carried out in peat bogs. In this connection planning and research institutions have engaged in investigations which include a general analysis of vegetation and of the structure of the peat layer. As a result of these activities which have mainly had a practical purpose, it has been possible to determine more precisely the actual distribution of peat bogs in the republic (A. Raudsepp, A. Truu, K. Veber, H. Kurm, L. Laasimer, etc.). It has been ascertained that there are nearly 1,000 peat bogs with a total area of nearly 7,000 sq. km. or 16 per cent of the area of the Estonian S.S.R.

Almost two thirds of the peat bogs of Estonia have been studied more thoroughly and surveys of northern Estonia and Saaremaa have been published (L. Rätsep, A. Truu and K. Veber). Similar works dealing with other districts are being prepared.

Two botanical descriptions (E. Varep, H. Karu and L. Viljasoo) of the west Estonian peat bogs have been published.

Instructions for the specification and generalization of the methods of phytosociological field research work have been compiled by V. Masing and H. Trass.

The more extensive study of the peat bogs made it possible to specify the bog typology and characterize several peat bog vegetation types in detail. The triple classification of C. Weber (fens, intermediate types and bogs), which has been elaborated in the direction of the differentiation of subdivisions, has proved to be the most applicable basis for typology. The detailing of phyto-coenological (vegetation) classification has taken place both as regards fens (H. Trass) and bogs (V. Masing). Of the different bog types special attention has been devoted to the *Schoenus*-fens (H. Trass) and the intermediate type with *Myrica* (M. Kask), characteristic of western Estonia.

The typology of peat bog forests has been dealt with by A. Ilves, A. Karu, etc. (see p. 29).

The first detailed stationary investigations of peat bogs with the aim of determining site conditions began in the post-war period. Regular studies of eutrophic mires were carried out in Avaste mire (Pärnu District) in 1951—1953 by the Botany Section of the Institute of Zoology and Botany (M. Kask). The Forestry Section of the same institute has investigated the ecologic conditions of raised bogs with the principal purpose of determining the possibilities of afforestation at Rae (near Tallinn) in 1952—1958, at Rääma (near Pärnu) beginning with 1957, and at Tähtvere (near Tartu). Observations have been made in these bogs of microclimatic conditions, the freezing and melting of soils, the ground water table and the chemical properties of peat (U. Valk).

The possibilities of the afforestation of bogs have also been studied on mesotrophic bogs (see p. 29).

Methods of determining the efficiency of drainage in the forest swamps by means of the character of undergrowth have been elaborated by V. Masing.

The pollen-analytical investigation of peat bogs has also been intensified in recent years. The study of the stratigraphy of peat layers together with pollen analysis has been pursued at the Tooma Experimental Station (K. Veber), in the Institute of Geology of the Academy of Sciences of the Estonian S.S.R. (L. Orviku) and in the Forestry Section of the Institute of Zoology and Botany of the Academy of Sciences (H. Valk, U. Valk). At Tooma have also investigated the botanical composition and other qualities of peat (H. Kurm).

The many-sided investigation of peat bogs by different specialists has made it possible to begin the **complex description** of peat bogs. The first step in this direction will be the publication of a monograph on one of the lar-

gest peat bog areas — the Endla peat bog complex (Jõgeva District). This monograph will appear in the yearbooks of the Naturalists' Society (Vols. 50—51 ff.) which have hitherto included general surveys of the geology, stratigraphy, hydrology, microclimate, vegetation, flora and fauna of the Endla bogs.

The present state of the phytosociological investigation of peat bogs has made it possible to undertake the compilation of more comprehensive works in the coming years.

Karu, H. ja Viljasoo, L., 1956. [Vegetation of the Eutrophic Mires in Haapsalu District.] LUS Ar., 49. Tallinn. (Estonian with Russian summary.)

Kask, M., 1957. Übersicht der Vegetation des Endla-Moorgebietes. LUS Ar., 50. Tallinn. (Estonian with Russian and German summaries.)

Masing, V., 1955. Method of Determining the Degree of Drainage in Peat Land Forests according to the character of Vegetation.] Тр. Ин-та леса АН СССР, XXXI. (Russian.)

Masing, V., 1957. The Part Played by Birds in the Dispersal of the Seeds of Forest and Peat-Bog Plants.] Coll.: Тр. II Прибалтийской орнитологической конференции. Москва-Ленинград. (Russian.)

Masing, V., 1958. Über Prinzipien und Einheiten der Klassifikation der Hochmoorvegetation. TRÜ Toim., 64. (Estonian with Russian and German summaries.)

Masing, V., 1959. Die Vegetation der Endla-Hochmoore. I Pflanzengesellschaften. LUS Ar., 51. Tallinn. (Estonian with Russian and German summaries.)

Masing, V. ja Trass, H., 1955. [Instructions for the Plant Ecological and Coenological Investigation of Peat Bogs.] Abiks lood., 23. (Estonian with Russian summary.)

Rätsep, L., Truu, A. ja Weber, K. 1954. [The Peat Bogs near Tallinn and in the Oil-Shale Basin and the Prospects of Their Utilization. TA Toim., III, 4. (Estonian with Russian summary.)

Rätsep, L., Truu, A. und Weber, K. 1956. Über die Torfmoore der Insel Saaremaa und die Aussichten ihren Verwertung. TA Toim., biol. s., V, 3. (Estonian with Russian and German summaries.)

Trass, H., 1955. [Changes in the Vegetation of Eutrophic Mires Due to Drainage.] LUS Ar., 48. Tallinn. (Estonian with Russian summary.)

- Trass, H., 1957. The *Schoenus*-Swamps in the Estonian S.S.R. TA Toim., biol. s., VI, 2. (Estonian with Russian and English summaries.)
- Trass, H., 1958. Probleme der geobotanischen Theorie im Zusammenhang mit der Klassifizierung der Niedermoorvegetation. TRÜ Toim., 64. (Estonian with Russian and German summaries.)
- Valk, U., 1956. On the Problem of Afforesting Treeless Bogs. TA Toim., biol. s., V, 3. (Estonian with Russian and English summaries.)
- [Valk, U., 1959. Sylvicultural and Agricultural Problems of Utilizing Unwooded Raised Bogs in Estonia.] Тр. Ин-та леса АН СССР, XLIX. (Russian.)
- Valk, U., Valk, H., 1959. On the Genesis of Kerreti Peat Bog. TA Toim., biol. s., VIII, 1. (Estonian with Russian and English summaries.)
- Varep, E., 1953. [Plant Ecological and Coenological Description of the Peat Bogs in the Western Part of the Estonian S.S.R.] Coll.: Eesti NSV fauna ja flora uurimise küsimusi. Tallinn. (Estonian with Russian summary.)
- Viljasoo, L. 1959. Einfluss der Senkung der Wasseroberfläche auf die Pflanzendecke des Endla-Sees und dessen Umgebung. LUS Ar., 51. Tallinn. (Estonian with Russian and German summaries.)
- Weber, K., 1957. Geologische und hydrographische Übersicht und Entwicklungsgeschichte des Endla-Moorgebietes. LUS Ar., 50. Tallinn. (Estonian with Russian and German summaries.)
- [Weber, K., Kurm, H., Laasimer, L., Raudsepp, A., Truu, A., 1957. Peat Resources of the Estonian S.S.R.] Coll.: Сборник статей по изучению торфяного фонда, 2. Москва. (Russian.)

## 6. Fresh-Water Vegetation

The Estonian S.S.R. is comparatively rich in lakes. More than 1,500 lakes with a total area of c. 2,200 sq. km. have been counted here, the largest being Peipsi and Võrtsjärv.

The works of J. Klinge and M. zur Mühlen mark the beginning of the study of fresh-water vegetation. Of the investigations in the '20s and '30s of the present century those by E. Spohr, A. Miljan and P. Kaaret are the most outstanding.

In the postwar period the study of fresh-water vegetation was resumed in 1951. The evaluation of the vegetation in lakes of 20 hectares or more from the standpoint of fishery was carried out by the Institute of Zoology and Botany (H. Tuvikene) in connection with the investigation of other lakes of the republic. In the course of five years the maps of the vegetation of 120 lakes were compiled and a general estimate of the vegetation in these lakes was given. The maps and descriptions of the vegetation of the lakes investigated will be published in a collection of hydrobiological articles.

As a result of additional investigations during the following years (of 140 lakes in all), a floristic ecological description of the Macrophytae in the lakes of Estonia has been prepared. This work deals with the macroflora of the lakes studied, the relations of Macrophytae with environmental conditions and the macro-vegetation in lakes of different types (H. Tuvikene).

- Kask, M., 1958 [Growing Indian Corn in Estonia.] Materjale jahispordlastele talviseks jahisesooniks. Tartu. (Estonian.)
- Miljan, A., 1958. Vegetationsuntersuchungen an nährstoffarmen Seen Estlands. TRÜ Toim., 64. (Estonian with Russian and German summaries.)
- Tuvikene, H., 1956. Die Makroflora der Seen Südost-Estlands. TA Toim., biol. s., V, 4. (Estonian with Russian and German summaries.)
- [Tuvikene, H., 1957. Floristical-Ecological Description of the Macrophyta in the Lakes of the Estonian S.S.R.] Пятая научная конференция по изучению внутренних водоемов Прибалтики. Тезисы докладов. Минск. (Russian.)
- Tuvikene H., 1958. Some rare Macrophytes from the Lakes of the Estonian S.S.R. Fl. Notes. I, 2. (Estonian.)

#### IV. PLANT PHYSIOLOGY

Research in plant physiology is being conducted mainly by the Chair of Plant Physiology of Tartu State University and the Institute of Experimental Biology of the Academy of Sciences of the Estonian S.S.R. (organized in 1957).

In the post-war years the study of the influence of heavy metal salts upon the stability at high temperatures of the cell protoplasm of plants (J. Talts) was continued at the Chair of Plant Physiology of Tartu State University.

At present the main line of scientific research at the chair is the study of the rest period of species of trees, including fruit-trees, in connection with their winter hardiness. The reasons are being studied why the buds of trees enter a dormant state. Special attention is being paid to the mutual correlative connections that arise within the "bud — leaf" system during the vegetation period. The strong influence of leaves upon the water conditions of the buds and the character of their growth (A. Perk) has been established.

The chair is also engaged in work aimed at finding ways and means of increasing the productivity of agricultural crops and ascertaining the physiological effect of external influences on plant organisms. L. Viileberg is studying the influence of an exchange of seed potatoes between mineral and peat soils upon the seed qualities of

the tubers. It is in order to encourage useful changes and weaken or eliminate harmful ones that field experiments are being conducted to determine the differences in soil conditions under which the exchange of seeds yields the greatest economic benefit and to ascertain the accompanying differences in the physiological-biochemical processes of the plant. L. Sarapuu is examining the influence of the presowing steeping of the seeds of spring wheat in water, in solutions of trace elements and some chemicals.

H. Miidla is studying the changes in the biology of grape-vines growing in northern conditions in order to help to ascertain the theoretical foundations of the acclimatization of new cultivated plants. He has completed an inventory of the species and sorts of grapes that grow on the territory of the Estonian S.S.R.; the peculiarities of growing the most promising sorts in greenhouses, trained to walls or in the open ground have been studied; the best time for the cultivation of the plants has been determined in order to make the shoots develop in time and improve their winter hardiness.

A study of the ontogenetical regularities of perennial hay plants was begun at the Institute of Experimental Biology (V. Dushechkin), special attention being paid to the determination of the relations between the intensity of growth processes, the use of assimilation products and the processes of development. The radioactive isotope of carbon —  $C^{14}$  was employed in studying photosynthesis (E. Värk, O. Keerberg).

Duschetschkin, W., 1958. Akkumulation der Trockensubstanz und Verwendung der plastischen Stoffe bei den verschiedenen Rotkleesorten im Saatjahr. TA Toim., biol. s., VII, 3. (Russian with Estonian and German summaries.)

Miidla, H., 1957. [Theoretical Foundations of the Winter Hardiness of Grapevines and Relevant Practical Consequences.] Praktilisi küsimusi aianduses ja mesinduses, 1. (Estonian).

- [Miidla, H., 1958. Wall-Trained Grapevines.] Виноделие и виноградарство, 1. (Russian.)
- Miidla, H., 1959. Die biologische Charakteristik der in der Estnischen SSR angebauten Weinreben. TA Toim., biol. s., VIII, 1. (Estonian with Russian and German summaries.)
- Talts, J., 1947. [Influence of Some Heavy Metal Salts and Acids upon the Heat Coagulation of Protoplasm.] Acta Botanica Universitatis Tartuensis 2. (Estonian with Russian summary.)

## V. GENETICS

Practical plant breeding began in Estonia already in the last century. F. Berg, the owner of Sangaste manor, who experimented mainly with cereals, was a well-known plant breeder of the beginning of the present century. Under the bourgeois republic two selectionists of the Jõgeva Plant Breeding Station, J. Aamisepp (potatoes, legumes, etc.) and M. Pill (cereals) became prominent. Their research work was greatly expanded upon the reestablishment of Soviet power in Estonia. Their work is being continued by the Estonian Scientific Research Institute of Agriculture and Land Improvement.

The theoretical direction in the study of plant genetics developed in Estonia in the postwar period.

In 1950 the Chair of Genetics and Darwinism of Tartu State University was organized to carry out genetic investigations based on the Michurinist doctrine. The developmental biology and morphogenesis *in vivo* and *in vitro* of new forms of plants are being studied at the chair, in order to compare the normal natural and the experimental pathological morphogenetic processes. The principal research methods used are the cultivation of tissues and organs as well as their biophysical and biochemical influencing and analysis. With the development of a new method, it became possible to study the differentiation of the homogenous callus and the origin of new tissues and the whole adventitious germ from the callus. As the new for-

mations originating from the adventitious germ are unstable, "shaky" in their heredity, they can serve as a suitable initial material for the selectionist. The staff of the chair have succeeded in determining the morphological processes, the importance and mechanism of the regeneration of plants. Field experiments have led to the development of new hybrids of sunflower bred for its selection in Estonia. The results of this research have been published in several works by O. Mikhaylov and others.

The Institute of Experimental Biology of the Academy of Sciences of the Estonian S. S. R. (organized in 1957) is continuing the work on the methods of directed changes in plants which was begun under the supervision of Academician J. Eichfeld at the former Institute of Plant Culture in 1951. The following problems are being studied: the influence of the stock upon the variability of the morphological and biochemical characteristics of the scion and its seed propagation (L. Issako), the regularities of the changes in the heredity of spring corn under conditions of autumn sowing (O. Priilinn), the ways and means of acclimatizing maize and some other southern plants in the conditions of the Estonian S.S.R. (A. Nõmmsalu, K. Kask), the influence of ionic radiations upon the morphogenesis and the nuclear structure of the *Gramineae* (T. Orav).

Kurvits, A., 1957. Über Mutationserscheinungen bei Obstbäumen und deren Verwertung bei der Züchtung neuer Sorten. LUS Ar., 50. (Estonian with Russian and German summaries.)

[Mikhaylov, O., 1952. Biological Specificity of Seed-Lobes in Plants in Whose Seeds Endosperm Does Not Persist. Coll.:] Teaduslikud tööd pühendatud TRÜ 150. aastapäevale. Tallinn. (Russian with Estonian summary.)

[Mikhaylov, O., 1957. Phylogenetic Importance of the Regeneration of Plants.] TRÜ Toim., 46. (Russian with Estonian summary.)

[Mikhaylov, O., 1957. Method of Cultivation of Tissues and the Formation of New Plants.] TRÜ Toim., 46. (Russian with Estonian summary.)

- Mikhaylov, O. F., 1958. The problem of determination and pathological morphogenesis in plants. TRÜ Toim., 64. (Russian with Estonian and English summaries.)
- Piiper, E., 1957. [How to Obtain New Plant Formations from the Calluses of Isolated Seed-Lobes.] TRÜ Toim., 46. (Russian with Estonian summary.)
- Priilinn, O. 1954. [The Dependence of the Character of Yield upon the Biological Specific Properties of the Sorts of Spring Wheat and Their Conditions of Growth.] TA Toim., III, 2. (Estonian with Russian summary.)
- Toomsalu, A., 1958. Regenerations- und Reproduktionsfähigkeit des Hypokotyls einiger Pflanzen. TRÜ Toim., 64. (Estonian with Russian and German summaries.)

## VI. NATURE CONSERVATION

It was in the 1930's that more attention began to be paid in Estonia to nature conservation (G. Vilberg-Vilbaste, T. Lippmaa and others).

The principal laws and regulations on which nature conservation in the Estonian S.S.R. is based, were passed in 1957. Of the four nature conservation areas and 28 protected areas established in accordance with these laws, several are of great botanical value. *Hedera helix*, *Gymnadenia odoratissima*, etc. grow in the Viidumäe nature conservation area situated on the cliff of the former Ancylus-lake. The Nigula nature conservation area is a typical raised bog with characteristic hummock ridges. Additional protected bog and peat land areas have been set aside at Muraka, Nätsi and Nehatu. Four protected areas are situated in characteristically Estonian park-meadows. Particular attention has been paid to the conservation of plant communities that possess a general relict character (the deciduous forest groves of Atlantic origin on Puhtulaid, on Abruka island and at the foot of the steep north Estonian limestone cliffs, the so-called "glint"; a flood-land forest on the Jäniõgi, an oak grove at Mihkli, etc.). Forest conservation districts are being established.

49 relics, rare or other plant species interesting from the standpoint of general plant geography have been placed under protection.

Of these species the *Rhinanthus osiliensis* is an endemic plant in Estonia and three species: *Juncus subnodulosus*, *Sorbus aria* and *Cochlearia danica* do not occur in a natural state elsewhere in the Soviet Union.

340 old trees, nearly 40 parks and arboretums and several selectionist orchards are also being protected as natural landmarks.

- Eichwald, K., Kumari, E., Orviku, K., 1953. [About the Nature Conservation in the Estonian S.S.R.] Abiks lood., 11. (Estonian with Russian summary.)
- Eilart, J., 1957. Über die Verbreitung einiger naturschutzbedürftiger Pflanzenarten in Estland. LUS Ar., 50. Tallinn. Estonian with Russian and German summaries.)
- Eilart, J., 1958. A New Stage in the Development of Nature Conservation in the Estonian S.S.R. Estonian Nature, 1. (Estonian with Russian and English summaries.)
- Kask, M., 1959. A Late Autumn Visit to Virussaar. Estonian Nature, 2. (Estonian with Russian and English summaries.)

## SOME ADDRESSES

The Institute of Experimental Biology (EBI) of the Academy of Sciences of the Estonian S. S. R. — Tallinn, Keemia t. 41.

The Institute of Zoology and Botany (ZBI) of the Academy of Sciences of the Estonian S. S. R. — Tartu, Vanemuise t. 21.

The Chairs of Genetics and Darwinism; Plant Physiology; Systematic Botany and Geobotany of Tartu State University (TRÜ) — Tartu, Mitšurini t. 40.

The Estonian Scientific Research Institute of Agriculture and Land Improvement (EMMTUI) — Tallinn, Estonia pst. 7.

Estonian Agricultural Academy (EPA) — Tartu, Riia t. 60.

The Naturalists' Society (LUS) Attached to the Academy of Sciences — Tartu, Hariduse t. 3.

In the list below Estonian abbreviations of the various institutions mentioned above (see abbreviations in brackets) have been given instead of the full addresses of the scientists concerned.

Aasamaa, Heinrich — Lichenology. Tartu, Ujula t. 3.

Adojaan, Aleksander — Cultivation of Meadows. Jõgeva, EMMTUI Jõgeva katsebaas.

Aksel, Maria — Mycology (*Fungi imperfecti*). Tallinn, Ped. Instituut, Narva mnt. 57.

Dushechkin, Vladimir — Plant Physiology. EBI.

- Eichwald, Karl — Floristics, Systematic Botany of Vascular Plants, Plant Geography. TRÜ taimesüst. ja geobot. kat.
- Eilart, Jaan — Floristics, Plant Geography, Nature Conservation. ZBI.
- Hainla, Vaike — Forestry. ZBI.
- Henno, Olev — Forestry. EPA.
- Ilves, Alfred — Forest Typology, Jõgeva raj., Kuremaa Metsakool.
- Kaar, Elmar — Forestry. ZBI.
- Kalamees, Kuulo — Mycology (*Agaricales*, especially *Lactarius*). TRÜ taimesüst. ja geobot. kat.
- Kalda, Aino — Plant Ecology and Coenology (Forests), Bryology. TRÜ taimesüst. ja geobot. kat.
- Karu, Heljo — Plant Ecology and Coenology (Meadows). ZBI.
- Kask, Kalju — Landscape Architecture, Floristics. EBI.
- Kask, Maret — Taxonomy of Vascular Plants, Plant Ecology and Coenology (Peat Bogs). ZBI.
- Kollist, Peeter — Forestry. ZBI.
- Kukk, Erich — Algology (especially *Cyanophyta*). TRÜ taimesüst. ja geobot. kat.
- Kurm, Hilja — Peat Science. Jõgeva raj., EMMTUI Tooma katsebaas.
- Kuusk, Vilma — Taxonomy of Vascular Plants. ZBI.
- Kõvask, Viive — Algology (*Conjugatae*). ZBI.
- Laas, Endel — Forestry, Dendrology. EPA.
- Laasimer, Liivia — Plant Ecology and Coenology, Bryology (especially *Hepaticae*). ZBI.
- Lasting, Väino — Mycology (Microfungi of Soils). EMMTUI.
- Leisner, Tõnu — Mycology (*Agaricales*, esp. *Russula*). Tallinn. Kingissepa t. 83 — 3.
- Lellep, Elli — Floristics, Taxonomy of Vascular Plants. TRÜ taimesüst. ja geobot. kat.
- Lillema, Alfred — Soil Science, Cultivation of Meadows. EMMTUI.
- Margus, Malev — Forestry. ZBI.
- Marland, August — Mycology (*Fungi imperfecti*), Phytopatology. EPA.
- Masing, Viktor — Plant Ecology and Coenology (Bogs Forests), Plant Geography. TRÜ taimesüst. ja geobot. kat.
- Mikhaylov, Oleg — Genetics. TRÜ geneetika ja darvinismi kat.
- Miidla, Heigo — Plant Physiology. TRÜ taimefüsioloogia kat.
- Miljan, August — Applied Botany, Plant Ecology and Coenology (Meadows). TRÜ Botaanikaaed, Mitšurini t. 38 — 1.
- Orav, Toivo — Cytology. EBI.
- Paivel, Aleksei — Dendrology. EBI.

- Parmasto, Erast — Mycology (esp. *Aphylllophorales*). ZBI.
- Perk, Aleksander — Plant Physiology. TRU taimefüsioloogia kat.
- Pihelgas, Endel — Forestry. EPA.
- Pork, Kaljo — Plant Ecology and Coenology (Meadows), Algology. ZBI.
- Pork, Maia — Algology (*Diatomeae*). ZBI.
- Priilinn, Oskar — Genetics, Breeding, EBI.
- Põldmaa, Peeter — Mycology (esp. *Uredinales*). ZBI.
- Pärtelpoeg, Valter — Mycology (*Agaricales*). Tartu, Jakobsoni t. 18—9.
- Randalu, Ilme — Phytopatology (esp. *Helminthosporium*). EMMTUI.
- Rebassoo, Haide — Floristics, Plant Geography. Kingissepa raj. Lümandu k/n., Viidu küla, Viidumäe looduskaitseala.
- Rommel, Alide — Floristics (esp. Adventitious Flora). TRU taimesüst. ja geobot. kat.
- Rõigas, Peeter — Forestry. Rakvere metsamajand.
- Rätsep, Lembit — Peat Science. Jõgeva raj., EMMTUI Tooma katsebaas.
- Sarapuu, Lembit — Plant Physiology. TRU taimefüsioloogia kat.
- Sepp, Ragnar — Forest Soil Science. ZBI.
- Talts, Silvia — Taxonomy of Vascular Plants, Bryology, Plant Ecology and Coenology (Peat Bogs). ZBI.
- Toomsalu, Aino — Genetics, Histology. TRU gen. ja darv. kat.
- Trass, Hans — Plant Ecology and Coenology (General Problems, Peat Bogs and Meadows), Lichenology. TRU taimesüst. ja geobot. kat.
- Tuvikene, Heljo — Bryology, Hydrobotany. ZBI.
- Vaga, August — Phylogeny, Systematic Botany, Phytocoenology, History of Botany. TRU taimesüst. ja geobot. kat.
- Valk, Uno — Forestry, Peat Science. ZBI.
- Veski, Vello — Landscape Architecture (*Rosa*). EBI.
- Viileberg, Laine — Plant Physiology. TRU taimefüs. kat.
- Vilbaste, Gustav — Floristics. Tallinn, Vase t. 18—8.
- Viljasoo, Linda — Taxonomy of Vascular Plants. ZBI.
- Üksip, Albert — Taxonomy of Vascular Plants (*Hieracium*). Tallinn — Nõmme, Õie t. 48—2.
- Weber, Karl — Peat Science, Palinology. Jõgeva raj., EMMTUI Tooma katsebaas.
- All the above-mentioned scientists live in the Estonian S. S. R.

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