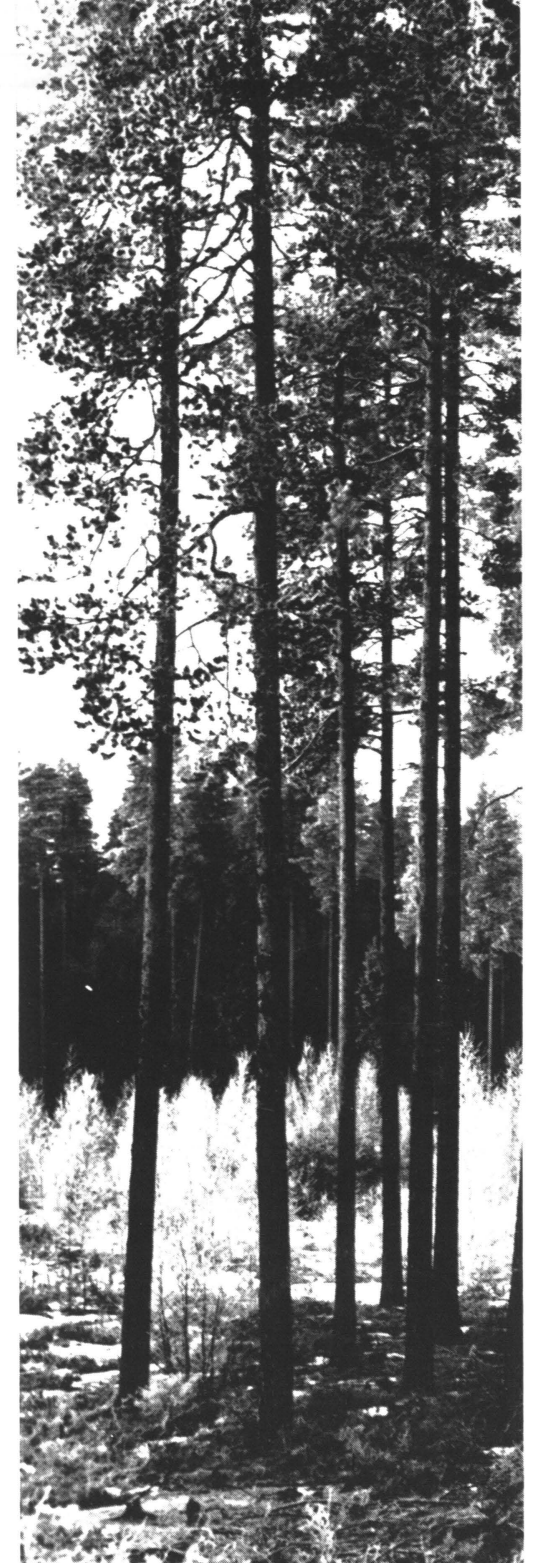


**RESEARCH IN  
FORESTRY AND  
WOOD SCIENCE IN  
FINLAND**



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# RESEARCH IN FORESTRY AND WOOD SCIENCE IN FINLAND

## Preface

Forestry education and research in Finland came into being in the middle of the nineteenth century. Their inception at this point of history is not surprising, for there were already, particularly in Western Europe, powerful forces at work that obviously stimulated interest and emphasized the importance of the forest resources even in Finland. We need here to call attention to only a few of them. For example, there was the industrial revolution generating intense economic development, including an especially great increase in building activity (i.e. construction); there was the emergence of a more liberal economic policy which eliminated many high protective tariffs; there was the rapid technical evolution in transport facilities; and there were immense improvements and expansion in saw-milling, followed later by similar developments in other wood-using industries. In Finland, these developments first meant the rapid rise of saw-milling and, later, of other industries depending on wood as the primary raw material. These industries became the dominant export industries, a position that they have retained to this day.

The growth of the wood-using industries and the importance of forest products as export commodities began to awaken public and government authorities to the fact that the forest resource was vital to the economic life of Finland. Coupled with this awareness was the growing concern about the adequacy of the forest resource to sustain the expanding wood-using industries, and the obvious need for steps to protect, improve and maintain the productivity of the woodlands. Thus it came about that the State Forest Administration was established in Finland in 1851, at first on a temporary basis, but permanently in 1859. Among the provisions of this establishment was the education of foresters and the initiation of forestry research.

This brochure has two major objectives: (a) To trace the history and development of higher forestry education in Finland from its humble beginnings shortly after the middle of the nineteenth century to its present strength;



and (b) to describe briefly the nature and scope of forestry research as it is reflected in the organization and activity spheres of various institutions, all contributing to the solution of problems in forest production, wood utilization, or both.

Because of the close and continuing interdependence of research and higher education in forestry as in any field, it seems appropriate at the start to outline some highlights in the growth of higher forestry education and its relation to research as it has developed in Finland over the past one hundred years.

It is to be hoped that this booklet can serve our visitors from abroad as a first hand orientation to the Finnish forestry research.

August 1966

The Society of Forestry in Finland

## STATE INSTITUTIONS

### THE FACULTY OF AGRICULTURE AND FORESTRY OF THE UNIVERSITY OF HELSINKI

#### Initial Phases and Progress of the Higher Education in Forestry in Finland

Higher education in forestry in Finland began in 1862 at a school separate from the university; this school was at Evo situated about 120 kms north of Helsinki in the midst of a large forest.

The principal task of the school was to educate forest officers in the service of the Finnish forestry, but members of the teaching faculty were also able to initiate forest research. In particular, *A. G. Blomqvist*, the most outstanding teacher of the school, strove purposefully to develop forest research. He published a number of papers on results of his studies and wrote a handbook of forest policy. In recognition of his scientific work he received in 1897 the honorary degree of Doctor of Philosophy at the University of Helsinki.

*A. G. Blomqvist* served as teacher at Evo during 1862—1903, and for the greatest part of this time (1870—1903) was the principal of the school. However, it became increasingly clear as the years went by that the remote location of Evo caused higher education in forestry to suffer numerous disadvantages and to hinder its scientific development. As a consequence it was decided in 1907 to move the staff and facilities of the school at Evo to the University of Helsinki where higher education in agriculture had been transferred from Mustiala already in 1896. The transfer of higher education in agriculture had resulted in the establishment of a special Department of Agriculture in the Faculty of Philosophy in 1902. Forest education was amalgamated with this in 1908. In 1924 the department became an independent Faculty of Agriculture and Forestry.

At the outset two professorships were founded in this new faculty: one for silviculture, the other for forest mensuration. The first professor of silviculture was *A. K. Cajander* who served with great vigour and distinction from

1911 to 1934. Since, however, he had already been in 1918 appointed as Director-General of the State Forest Service, the teaching duties of the professorship on the undergraduate level had to be mainly handled by deputies and assistants. In addition, A. K. Cajander had to take care of the professorship of forest mensuration until 1928.

Subsequently the following chairs have been founded: Forest Policy (1923), Logging and Wood Technology (1930), Peatland Forestry (1937, a permanent extraordinary professorship which was converted to a full chair in 1950), Business Economics of Forestry (1947), Logging and Wood Technology (1948 — to be held by a professor using the Swedish language), and Forest Products Marketing (1959). Holders of the chairs of Agricultural and Forest Zoology, and of Plant Biology and Plant Pathology also serve as associates in forest education. They devote part of their time to teaching forestry students in their particular subjects and to advising graduate students. The first of these two chairs was founded in 1921 as a permanent extraordinary professorship, but was changed in 1949 to an ordinary Chair of Agricultural and Forest Zoology. The second of the two chairs was also founded in 1921 as a permanent extraordinary chair but changed in 1948 to a full professorship of Plant Biology and Plant Pathology.

To facilitate the practical field training of foresters the position of the Forest Officer of the University was founded in 1907. Until 1930 he also taught Logging and wood technology. Since then the Forest Officer has only been responsible for giving the basic course in silviculture and conducting practical training at the Forest Training Centre of the University.

Immediately after the transition of the higher forest education from Evo to the University of Helsinki, a part of the Korkeakoski Forest District was assigned as the regular outdoor laboratory and training grounds for students in silviculture and forest management. The winter training of logging has also been undertaken at Hyytiälä (Korkeakoski) since 1954. Subsequently, the whole Forest District has been dedicated for use as the Forest Training Centre of the University, though it has remained under the control of the State Board of Forestry. The first Forest Officer of the University was Dr. A. Benj. Helander.

The buildings of the Forest Training Centre were not ready for occupation until 1912, but training already began in 1910 in a temporary manner. For the purpose of teaching forest mensuration and supervising practical field training an associate chair of Forest Mensuration was founded in 1962. In addition to the offices mentioned already, there are a number of associate professors and other teachers who lecture in different basic and auxiliary subjects.

## Studies and Degrees

The most recent stipulation concerning the examination requirements for forest studies was made in 1965. According to it, successful execution of the required examinations before the Faculty of Agriculture and Forestry entitles the students to the following degrees:

1. Bachelor of Forestry
2. Master of Agriculture and Forestry
3. Licentiate of Agriculture and Forestry
4. Doctor of Agriculture and Forestry

The last degree is not obtained through a separate examination, but is awarded when the doctor's dissertation of a licentiate has been published and officially examined and approved.

The forest examination (Bachelor of Forestry) provides the qualification required by a person whose purpose is to enter practical forestry. But the examination is usually also taken by persons who intend to enter a research career. According to the requirements now in force the forest examination takes two forms — the General Forest Examination and the Commercial Forest Examination. The former is a qualification for those who undertake the traditional tasks of forestry (forest management, logging, etc.); the latter prepares experts for the marketing of forest products.

There is, however, a certain specialization within the limits of the General Forest Examination. A student is required to include in his forest examination at least four of the following main subjects: business economics of forestry, forest mensuration, forest pathology, logging technology, forest zoology, marketing of forest products, peatland forestry, silviculture, social economics of forestry, and wood technology.

In each of these subjects he may take a course at three different levels. The most intensive is the *laudatur* course, the next the *cum laude* course, and the least intensive is the *approbatur* course. A student is required to pass the *laudatur* course in at least one main subject and in at least one other main subject at the *cum laude* level. The fulfilment of a *laudatur* course requires not only a wider knowledge of literature compared with the *cum laude* and *approbatur* courses, but also more practical training and the production of a *laudatur*-thesis.

The combination of subjects is chosen by the student himself (in collaboration with the adviser of the chosen main subject) but the final program must be approved by the Faculty. Some main subjects can only be studied in combination with certain others. Thus a student who chooses silviculture as his main subject must also include in his combination of subjects forest mensuration



Outdoor lecture for forestry students at Hyytiälä.

and peatland forestry; the fourth main subject is optional. As a result of this arrangement specialists can be educated for every branch of forestry, and combinations of subjects corresponding to the requirements in every field of activity can be taken. The only main subject of the Commercial Forest Examination is the marketing of forest products.

With Faculty permission a student may select a fourth major subject outside the Faculty of Agriculture and Forestry. For example, he may choose a suitable complementary subject e.g. botany or genetics in the Faculty of Philosophy or statistics, economics in the Faculty of Political Science.

In order to secure a sufficiently broad background in general forestry a student has also to pass general courses usually of one semester's duration (i.e. courses shorter than the approbatur courses) in the following forest subjects: forest mensuration, silviculture, business economics of forestry, social economics of forestry, and logging technology (also peatland forestry for the General Forest Examination). The students have also to pass examinations in so called basic subjects: botany — including plant physiology — and chemistry, and in a number of auxiliary subjects which are mainly determined according to the schedule of subjects.

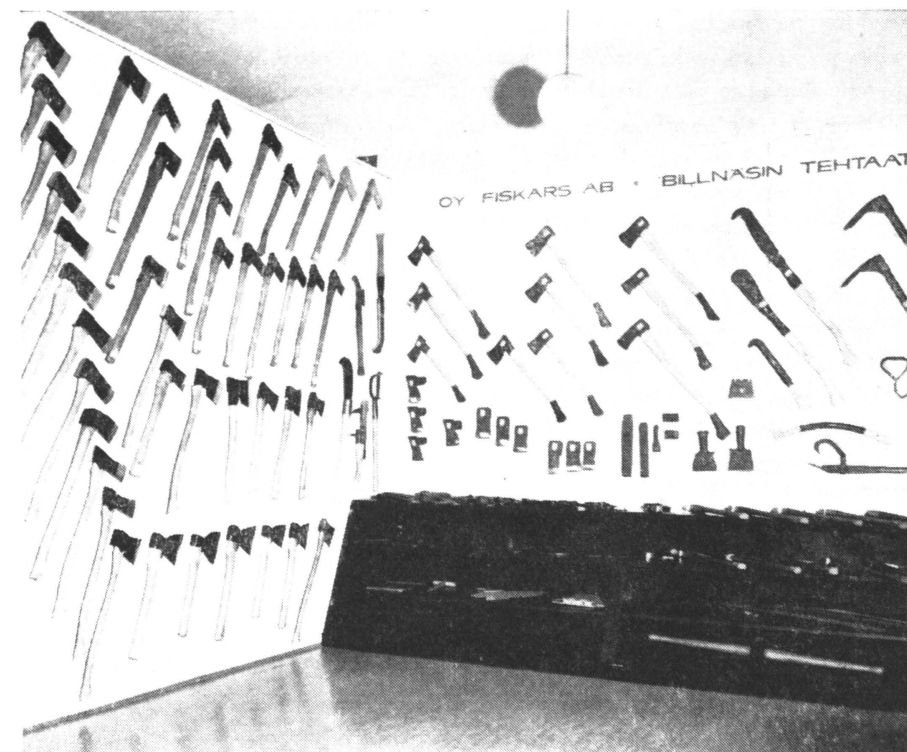
The undergraduate course takes about four years and it comprises lectures and practical training. The first year comprises an essentially common curriculum for every forest student. The program consists of basic and auxiliary subjects such as botany, chemistry, etc. and of general courses in forestry subjects. After the first year a student chooses his combination of main subjects. These largely determine the specialized curriculum that he will follow, i.e. forest management, technology, economics, etc.

In the second year the study of the basic and auxiliary subjects is continued but the main stress is paid on the lectures in the main subjects.

The third year is devoted to continued lectures and seminar training in the main subjects, to a now limited study of the auxiliary subjects, and to the preparation of a report based on practical work undertaken during the second summer.

During the fourth year the student concentrates on the laudatur - thesis and on the final examinations. These examinations — both written and oral — are held

Collection of axes at the Department of Logging and Forest Utilization Products of the University of Helsinki.



once a month. Under this system a student is allowed to take one subject at the time, for example, one examination in a main subject every month.

The *practical training* is of great importance. It takes place mainly in the summer, partly as joint training arranged by the University and partly as special training which is arranged in companies, organizations, and state forest administration.

Joint training is undertaken with a few exceptions (eg. training of forest mensuration during the second summer) at the Forest Training Centre of the University at Hyytiälä where the Korkeakoski Forest District is reserved for this purpose. Training is mainly concentrated in the first and second summer according to the following program:

	1st summer	2nd summer
silviculture	4 weeks	5 weeks
peatland forestry	2 „	2 „
forest mensuration	5 „	5 „
logging	2 „	6 „

Every student participates in joint studies during the first summer; but in the second summer only those students participate whose combination of subjects requires additional field education. In practice, however, almost every student aiming to pass the General Forest Examination is required to take part in the joint training of the second summer.

In addition, joint training of logging is undertaken at Hyytiälä during the third academic year (in January — February). Every student taking logging technology to at least the cum laude mark must fulfil this requirement. Students use the third summer for special training in their main subject. This may be taken in industrial companies, State Forest Service, forest associations, and in corresponding organizations abroad. The length of this training varies and depends on the subject and the requirements of the joint training included in the combination of subjects. The length of the special training in the main subjects of the General Forest Examination varies from one to five months but generally takes about two months.

Training for the Commercial Forest Examination is executed mostly in a specialised manner. A part of this special training, which lasts six months, takes place in domestic enterprises, such as round wood purchasing and logging operations, wood processing industries (saw mills, board and plywood factories, pulp and paper mills), sales and shipping offices of companies, etc. Every effort is made to see that the students studying the Commercial Forest Examination have an opportunity to secure a third summer's training abroad in a country important for Finland as a buyer.

The number of students accepted to undertake study in preparation for the Forest Examination is limited. Today a total of 55 new students are admitted yearly, about one third of the candidates to study for the Commercial Forest Examination. Usually five to six times as many applications are received as the number of students that can be admitted. The selection of students is based on a number of specific qualifications. The most important qualifications considered in judging the merits of each applicant are academic performance in the secondary school, the quality of performance in the student's entrance examination, and the duration and quality of pre-entrance practical training.

## Graduate Studies

Graduate studies serve principally for the development of research workers, although, to an increasing degree, they are also considered as additional qualifications for advancement to more senior posts. These studies lead to the examinations of the Master of Agriculture and Forestry and Licentiate of Agriculture and Forestry. A licentiate whose doctor's dissertation has been officially examined will be granted the title of Doctor of Agriculture and Forestry.

The examination of the *Master of Agriculture and Forestry* is comparable to the Forest Examination in general character but differs from it mainly in scope and intensity. The first difference is that there are both fewer main and basic and auxiliary subjects than in the Bachelor's examination. The combination of subjects comprises at least three main subjects. The second difference is that the studies go more deeply into the main subjects (the cum laude course of the Master's examination corresponds approximately to the laudatur course of the Bachelor's examination). Also the thesis (pro gradu work) of the Master's examination is somewhat more thorough than the laudatur work of the Forest Examination. The Master's examination can be passed either after the Bachelor's examination or without a preceeding Forest Examination. Only a few students have recently studied for this degree.

Those who intend to enter more thoroughly into Forest Science, and especially those who intend to qualify in research work usually proceed directly to the degree of the *Licentiate of Agriculture and Forestry* after the Forest Examination. The licentiate prescribes a thorough knowledge of a main subject in the Faculty. In addition, the examination includes at least one supplementary subject in which a student has to obtain the highest mark of the Master's examination or possess knowledge corresponding to it.

A student must also present a licentiate thesis in his main subject by which he shows his ability to use scientific research methods. The thesis is often the result of research work lasting from two to three years. The licentiate thesis is examined in a special licentiate seminar by a committee consisting of three members appointed by the Faculty. In addition to the members of the committee others are also allowed to comment on the thesis. Cum laude and laudatur marks in the main subject of the licentiate examination presuppose not only a first class licentiate thesis but also other research, publication in the field and a thorough knowledge of the literature. A student intending to take the licentiate examination must also have had at least one year's service as a Forest Officer.

In order to achieve the degree of *Doctor of Agriculture and Forestry* a candidate has to prepare a dissertation which will be officially examined, and on the recommendation of the opponent or opponents be accepted by the Faculty. More recently, it has become increasingly common for the thesis undertaken in partial fulfilment of the degree of a licentiate to be expanded to a doctor's dissertation.

Graduate study involving formal course work has hitherto been relatively limited, and has consisted mainly of seminars. Currently, it is also becoming customary for persons studying for the licentiate's and doctor's degrees to take examinations in other faculties, for example in botany, chemistry, mathematics, commercial science, statistics, etc.

## Research

The University's annual budget does not provide funds for research. Research at the University is therefore financed from other sources, mainly the *National Research Council for Agriculture and Forestry*. Forestry research is also sponsored by certain foundations, especially the *Foundation for Research of Natural Resources in Finland* and the *Finnish Cultural Foundation*.

One result of the lack of sufficient continuity in financing research programs is that the professors, lecturers and assistants of the University give preference to theoretical and methodological research. Programs requiring long-term experiments are performed mainly by the Forest Research Institute.



Forestry House, home of the Forestry Department of the University of Helsinki, and of the Finnish Forest Research Institute



## THE FINNISH FOREST RESEARCH INSTITUTE

### History and Organization

Towards the end of the 19th century representations were made by practising foresters for the establishment of a special forest research institute. The interest in such an institute stemmed from conviction that progress in forestry required and must be based on systematic research work. An additional factor that spurred interest at the end of the 19th century was that corresponding research institutes had been established in a number of European countries.

In 1906 the Finnish Government (Senate) commissioned A. K. Cajander to study forest research institutes and their activity in European countries, and to work out a proposal for Finland. Cajander visited institutes in Germany, Austria, Switzerland, France, Denmark and Sweden and in 1909 put forward an independent and detailed proposal for the establishment of a Finnish forestry experimental institute. Cajander's proposal was instrumental in the formation of a state committee whose report recommended establishment of a Forest Research Institute. This was founded by a Senate decree of the 24th of October, 1917 but a few weeks prior to the date (December 6th, 1917) of Finland's declaration of independence. The Institute started its activity on the 1st of July, 1918.

The Forest Research Institute is subordinated to the Ministry of Agriculture. Originally it comprised three departments, namely, silviculture, forest mensuration and soil science. At a later date the following additional departments were established:

Department of Forest Economics and Department of Peatland Forestry in 1928.  
Department of Forest Technology in 1931

Department of Forest Biology in 1953 (the professorship of Forest Biology was, however, founded already in 1938 in the Department of Silviculture).

The Forest Research Institute now consists of seven research departments and four offices: Secretarial-Financial Office, Experimental Forest Office,

Statistical Office and Nature Conservation Office (under supervision of the Government Counsellor for the nature conservation). General coordination of the work of the Institute rests with its Director, a post founded in 1962 and carrying the academic title of Professor. The decree issued in 1962 prescribes the tasks of the different departments as follows:

*The Department of Soil Science* studies the silvicultural utilization of soil, its physical and chemical properties, its development and its improvement by various methods.

*The Department of Peatland Forestry* studies the silvicultural utilization of swamps, e.g. suitability for draining and afforestation, ecology of swamp forests, the hydrology of swamps, the effect of various measures on the development of swamp forests, and drainage and other swamp cultivation techniques.

*The Department of Silviculture* studies forest regeneration and forests thinning methods, forest tree breeding and its genetic bases, damage to forests and measures to prevent it.

*The Department of Forest Biology* studies the morphology, physiology and ecology of forest trees and the mycology, microbiology and plant communities of the forests.

*The Department of Mensuration and Inventory* studies the methods of forest mensuration; the structure, growth, yield and development of tree stands; the principles of forest management; carries out national forest inventories; and assists the Department of Forest Economics in forest balance studies.

*The Department of Forest Technology* studies forest work and technical equipment, the measurement of timber, and the properties of wood.

*The Department of Forest Economics* studies social economics, business and market questions in forestry and forest industries, conducts surveys of drain and its utilization, and, assisted by the Mensuration and Inventory Department, performs forest balance studies.

Every department is headed by a professor who participates in active research work. He is assisted by a permanent body of technicians and graduate foresters and by auxiliary help as needed.

Since the 1930's the Institute has also been authorized to engage senior research specialists to study specific problems, and since 1963 several posts of senior research specialists have been established. Currently there are six such posts, two in the Department of Silviculture, two in the Department of Forest Technology and one each in the Department of Forest Mensuration and Forest Economics.

In 1965 the total research staff at the Forest Research Institute comprised seven professors, six senior research specialists and 39 research assistants.



Seed harvesting from plus-stands

In order to promote collaboration between forest research and practical forestry a Negotiating Board of the Forest Research Institute was established in 1953. According to the present decree it consists of the Director of the Institute, one of the professors, and eight members representing various fields of forestry. They are nominated by the Ministry of Agriculture. Primary responsibility of this Board is to serve in an advisory capacity suggesting problem areas which in their judgement need investigation, and receiving first hand reports on the progress of the Institute's research program, thus an opportunity is provided for the representatives of practical forestry to alert the research staff about critical needs and to stay informed about latest development.

## Experimental forests

Experimental forests form an important part of the Forest Research Institute. Reservation of experimental areas for the use of the Institute was already included in the proposal presented by A. K. Cajander, and the first experimental forests were established in 1923—24, i.e., only a few years after the founding of the Institute. The number of experimental areas has subsequently been increased. At present they cover about 70 000 hectares, fairly evenly distributed throughout the country.

The experimental forests, which are permanently under the control of the Forest Research Institute, offer the opportunity of permanent experiments with a minimum of red-tape and generally ensure the possibility of carrying through long-term investigations.

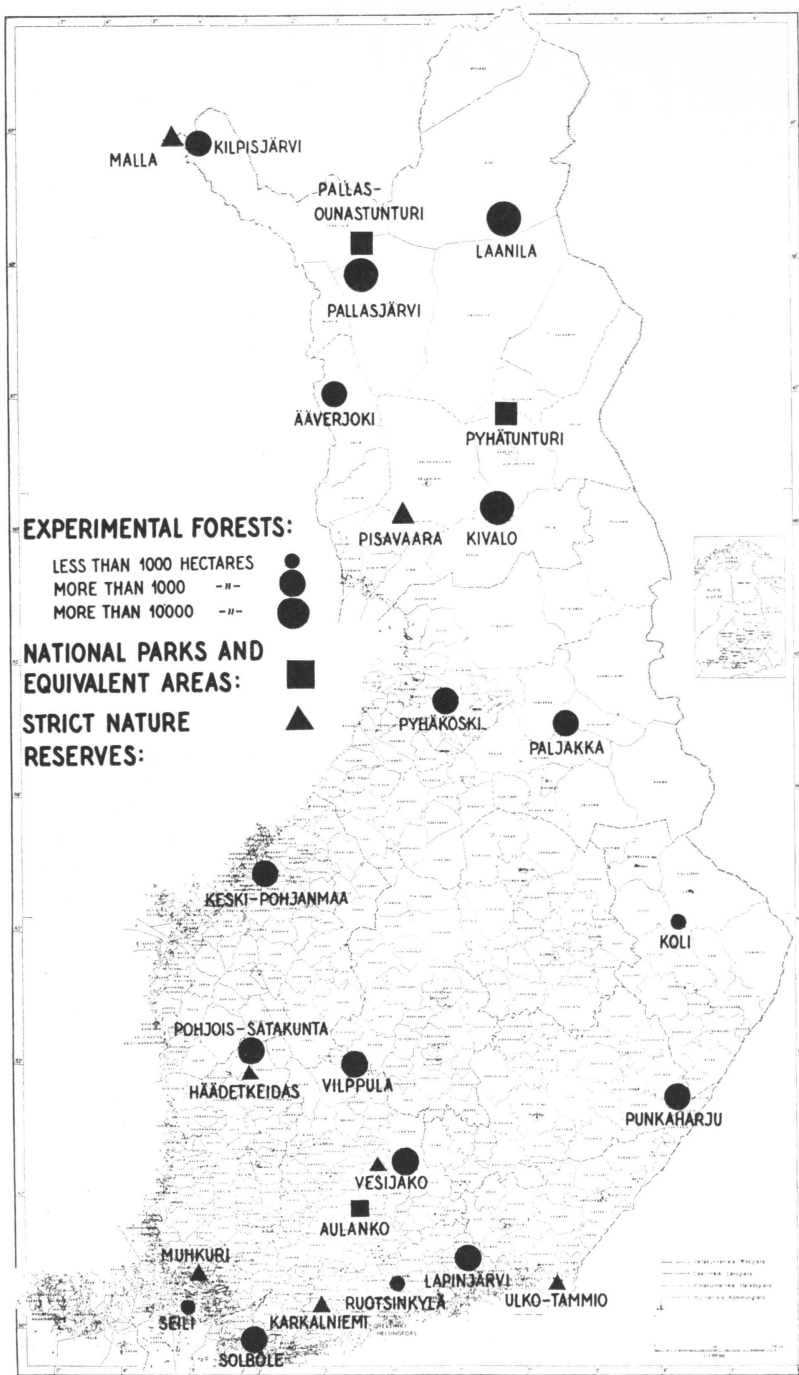
The Experimental Forest Office (headed by a Chief Forest Officer) is responsible for the administration of the experimental forests. Regionally, they are divided into three forest districts, each headed by a district forest officer. The districts are further divided into 15 smaller units which are headed by a forestry technician or a foreman. Every research worker of the Institute has the right to establish experiments in the experimental areas.

Until recently, actual research has been undertaken solely by the various research departments. Since 1963 special local forest experimental stations have been established. Each of these stations are headed by a university graduate competent to undertake independent research work. For the time being the Forest Research Institute operates three forest experimental stations. They contribute to research work by concentrating on certain regional problems, for example the drainage of forest land (in Pohjois-Satakunta and Keski-Pohjanmaa), the regional genetic programs (in Länsi-Lappi), etc.

Since 1939 national parks and nature conservation areas have been established on state owned land. Some of them are administered by the Forest Research Institute. The Government Councillor for nature conservation, acting as chief of the Institute's Nature Conservation Office, is also the ultimate executive authority for all national parks and conservation areas in Finland.

At present the Forest Research Institute controls three national parks and three conservation areas, totalling approximately 60 000 hectares. Strict nature reserves, completely reserved and protected except for research purposes, are important subjects for forest studies. The remaining national parks and nature conservation areas are administered by the State Forest Service.

Long-term experiments of the Forest Research Institute also are carried out to some extent in forests other than those of the Institute. In particular there has been long-standing research collaboration with the State Forest



Service. Bilateral agreements have also been made with some wood-using companies regarding the use of certain areas for experimental purposes. By these arrangements it has become possible to fill certain gaps in the network of the Institute's experimental forests.

## Publication Activity

The results of the research work of the Forest Research Institute have been published from the beginning in a special series entitled now *Metsäntutkimuslaitoksen julkaisuja* (*Communicationes Instituti Forestalis Fenniae*). By the end of 1965, fifty-nine volumes had been published, covering a total of 338 separate studies and comprising 25 761 pages.

In order to facilitate rapid publication of the more important findings and topical results the Institute introduced in 1963 *Folia Forestalia*. By the end of 1965 fifteen volumes had been published in this series.

Registering sample trees





## THE INSTITUTE OF TECHNOLOGY

Education in technology in Finland commenced in 1849, in the beginning in a rather modest scale, but the decree concerning the foundation of the Institute of Technology was not issued until 1908. Higher education in wood science and wood processing is nowadays mainly given at the Wood Processing Department of the Institute, established in 1942, which has professorships in the following subjects:

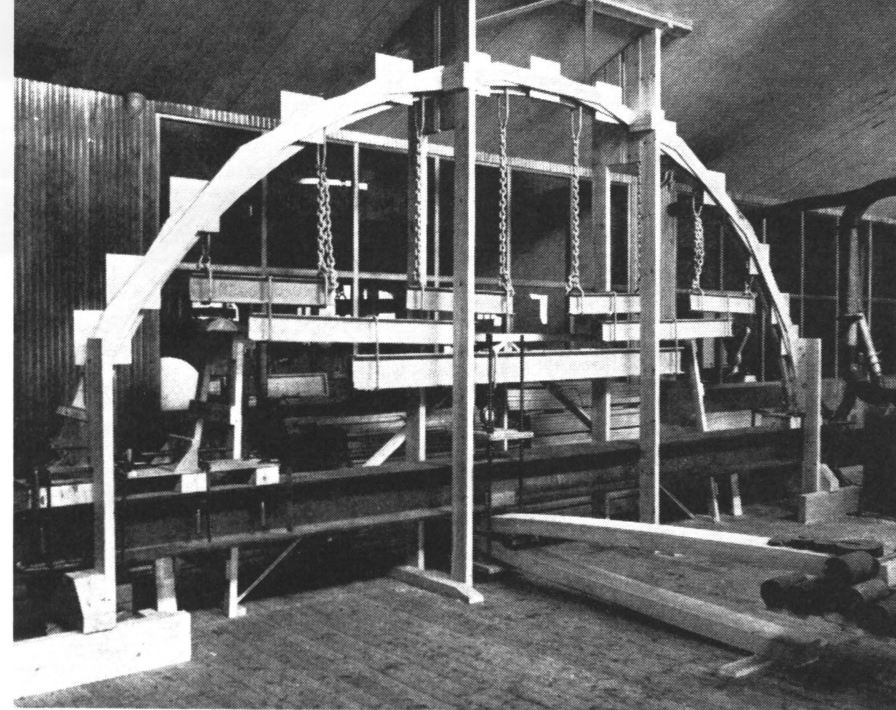
- mechanical technology of wood
- chemical technology of wood
- paper technology
- wood chemistry

In addition, a professorship in paper conversion is in program.

General courses in forestry and wood material science are also included in the curriculum of the Wood Processing Department.

Besides teaching, the staff of the Department carries out research work in wood science and wood processing. The necessary equipment for research is available at the Department but since no funds are provided for research work in the State Budget it must be financed from various outside sources. Especially the *National Research Council for Technology* and the *Foundation for the Advancement of Technology* sponsor technical research in Finland. In addition, some of the members of the teaching staff are working in the State Institute for Technical Research.

The Institute of Technology occupies a special campus at Otaniemi ten kilometers westward from the centre of Helsinki.



Strength test for glued wood arch at the State Institute for Technical Research

## THE STATE INSTITUTE FOR TECHNICAL RESEARCH

The State Institute for Technical Research was founded in 1942 to carry out both basic research in, among other, wood science and material testings required by various Authorities and private organizations and firms. Besides, the Institute has to assist the Institute of Technology in teaching and research work.

The Institute comprises 26 laboratories or main research fields which are organized into five groups. Each laboratory has an Advisory Committee composed of experts in that particular area of research and activity. Overall direction of the work of the Institute rests with the Director and the Board of the Institute. The State Institute for Technical Research as well as the Institute of Technology are subordinated to the Ministry of Commerce and Industry. One of the groups (Wood Group) is responsible for research in wood science and mechanical wood processing. This group consists of the following laboratories and research sections:

### Woodtechnical Laboratory:

- wood material, wood products and production investigations
- timber drying section
- wood glueing and finishing section
- industrial waste wood section

### Woodworking Laboratory:

- woodworking and tool investigations

### Timber Preservation Laboratory:

- pure culture of fungi
- decay and discolouration of wood and wood products
- wood preservation technique
- inspection of wood preservatives

At the end of 1965 the research staff of the Wood Group numbered:

- 3 professors
- 1 doctor of science (engineering)
- 4 college-trained engineers

Research in the chemical processing of wood is carried out, to some extent, in the Chemico-Technical Laboratory.

The results of the research work are published mainly in the Institute's own two series (*Publications and Reports of the State Institute for Technical Research*) and partly in various periodicals.

The Institute is situated in the centre of Helsinki but some of the laboratories have moved lately to Otaniemi, some are just moving and all the Institute will be there after a few years.

### THE NATIONAL RESEARCH COUNCIL FOR AGRICULTURE AND FORESTRY

In 1961 six National Research Councils were established in Finland, based on a special law, to promote scientific research and to act as expert committees to the Government in problems connected with science. They are subordinated to the Ministry of Education.

The members of the councils must be active in research work, and they are nominated by the universities, university faculties, other state research institutions, and national scientific societies. The chairman of each Council is appointed by the President of the Republic.

The National Research Council for Agriculture and Forestry consists of a chairman and nine members. Three of the members are currently forest scientists and they are nominated by the following institutions: the Faculty of Agriculture and Forestry of the University of Helsinki, the Finnish Forest Research Institute, and the Academy of Science in Finland.

The National Research Councils promote research particularly in two ways:

1. they employ research workers: senior fellows, junior fellows and research assistants. The posts are filled for the period of three years each time and the same person is allowed to hold a position for a maximum of nine years;

2. the councils grant fellowships to research workers for equipment and travel expenses, for employing assisting personnel, and personal allowances. Each council is granted annually a certain amount of money in the State Budget, 216 524 Fmk were used for forestry research in 1965.

Also the state financial support to the scientific societies is distributed on the basis of recommendations made by the Research Councils.

The Councils have no laboratories or institutes. Consequently, for instance the forest researchers employed by the Council carry out their work either in the Finnish Forest Research Institute or in the Department of Forestry at the University. In 1965 seventeen research workers were employed by the National Research Council for Agriculture and Forestry and seven of them were forest scientists.

The National Research Council for Agriculture and Forestry plays an important role in sponsoring forestry research especially in the Department of Forestry at the University of Helsinki. The posts of research assistants are mainly intended to serve as starting points to those who have passed an academic examination and want to proceed in their scientific career to doctor's degree.

*The National Research Council for Technology* is responsible for promoting technical research, including research in wood science, in Finland.

## PRIVATE INSTITUTIONS

### THE SOCIETY OF FORESTRY IN FINLAND

The Society of Forestry in Finland (SFF) was established in 1909 on the initiative of A. K. Cajander to promote forestry research in Finland and to serve as a link among those who devote themselves to the study of forestry. The Society endeavours to attain its objects principally by:

1. issuing and exchanging publications
2. holding meetings
3. granting financial support for research from its yearly income and funds
4. taking part in international activities in forestry research

SFF started to publish *Acta Forestalia Fennica* in 1909 and *Silva Fennica* in 1926. By the end of 1965 a total of 77 volumes of *Acta Forestalia Fennica* had been published containing 456 separate studies and comprising 35 079 pages. For *Silva Fennica* the figures are 116, 164, and 9 589 respectively. Publication activities are probably the most important function of the Society. The main part of the investigations conducted outside the Forest Research Institute are published in *Acta Forestalia Fennica* and *Silva Fennica*.

The ordinary meetings of the Society are held every month from September to May inclusively. The meetings are devoted chiefly to scientific lectures containing reports from the recently completed investigations. It is a commonly established practice that the results of the major investigations in forestry are reported to the Society before publication.

The Society's possibilities to grant financial support for research are rather limited. The grants available are mainly used to encourage young, promising graduates to take up a career in forestry research. Society takes part in international activities in forestry research, e.g. by exchanging publications (currently with 360 foreign institutions) and by inviting foreign forest scientists to address its meetings. It is one of the five Finnish members of the IUFRO.

The membership of the Society consists mainly of ordinary members

who are Finnish citizens working in forestry and related research. In 1965 ordinary members numbered 310.

Distinguished foreign scientists in the sphere of forestry and related sciences may be elected as corresponding members.

The administration of the Society is carried out by a Council consisting of the president, vice-president, retiring president, secretary, and three other members elected by the annual meeting. The president is elected for a term of one year. He is not eligible for immediate re-election. The secretary and other officers are elected for a period of three years and they may be frequently re-elected.

The Society receives regular financial support from the Ministry of Education.



Time studies in a winter setting.

#### **METSÄTEHO, THE FOREST WORK SECTION OF THE CENTRAL ASSOCIATION OF FINNISH WOODWORKING INDUSTRIES**

Metsäteho was founded in 1945 to conduct forest work studies with the object of determining fair standards for relations to forest work wages and rationalizing the logging operations. It is supported by approximately 75 forest industry companies, all members of the Central Association of Finnish Woodworking Industries. In addition, VAPO (the State Fuel Bureau) is a member of Metsäteho. The research staff of Metsäteho consists of a director and five researchers with an academic degree in forestry, one of them being also master of science in engineering. Moreover, there is a forester for information and consultation. The annual research program is made up of subjects proposed by the member companies and approved by a council, Metsäteho Committee, consisting of the chief foresters of the biggest forest industries in the country.

In the beginning, main emphasis in the research work was laid on investigations creating uniform wage basis for timber felling and transport work. Technical development, e.g., new assortments and new mechanized felling and



Stream and rapid cleaned out for timber floating in North Finland.

transport methods, has resulted in the necessity of continued retention of these studies in the program. Ever since 1945 studies aiming at the rationalization of the forest work have also been in the program of the Institute and the number of these studies has increased considerably in recent years. They are carried out in felling and preparation, barking and transportation with the purpose, among other things, of establishing the suitability of different methods of work, machines and devices as well as of improving them. Metsäteho has also conducted studies on various measuring methods, the quality keeping of timber, and the buoyancy of different kinds of timber. The materials are collected at the work sites of the member companies.

Co-operation with both domestic and foreign research institutes in the forest branch is lively, especially with those in the Nordic countries.

The results of Metsäteho investigations are published in various publication series. Comprehensive investigations of basic nature are published in *Metsäteho Publications*. A total of 43 volumes have appeared to date. Concise summaries of the results of studies and experiments are published in *Metsäteho Reports* (247 in number). The Publications and the Reports are furnished with a summary in English. In addition, six handbooks serving for guidance in forest work have been published and 60 films have been made on the methods of work and machinery experimented.

## THE WORK EFFICIENCY ASSOCIATION

Työtehoseura, the Work Efficiency Association, is a registered private association founded in 1924 enjoying state support. The Association aims at promoting the rationalization of agriculture, forestry, and home economics. The Association endeavours to carry into effect its object by performing rationalization investigations, experiments, and educational work, and by informing of their results.

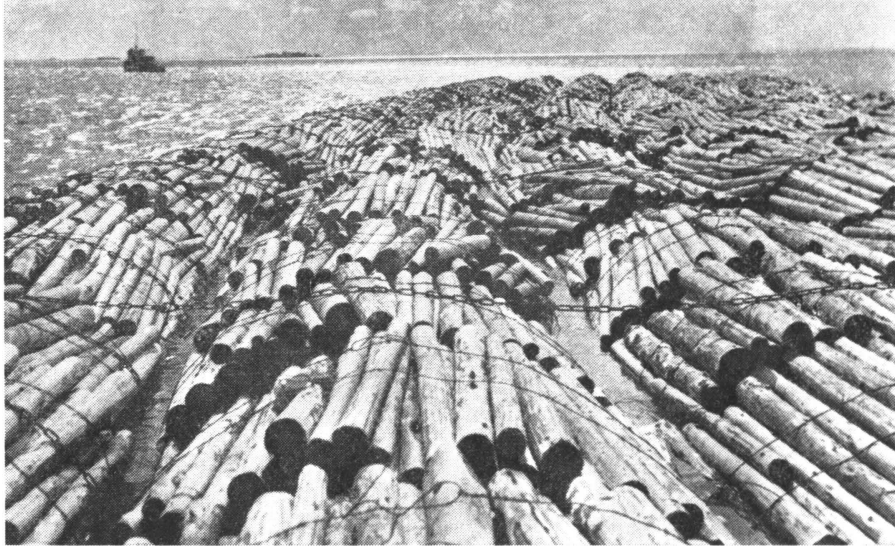
The Forestry Department of the Work Efficiency Association, founded in 1942, aims at promoting the rationalization of forest work, especially the manual and mechanical work in connection with the felling and transportation of timber. In addition, it has performed research work to investigate and to develop working methods and equipment.

The personnel of the Forestry Department is composed of the department head, various forest officers, machine experts, and of a necessary office staff. Research work is performed both in the office of the Work Efficiency Association in Helsinki and in the Research and Training Centre at Rajamäki about fifty kilometers northwards from Helsinki.

During the first period of activity research work was directed primarily to felling methods and equipment. Lately attention has been paid also to development of other logging machinery and to its maintenance. Among means of transportation horse and tractor driven sledges, various skidding equipment and tractor trailers have belonged to the field of the Forest Department. In the past few years an essential part of investigation work has been directed to the harvesting of small wood and to the development of timber extraction in farm forests.

Investigation results have been published in the publication *Series of Work Efficiency Association*, in the *Teho*-periodical, and in other professional reviews.





Bundle floating at sea.

## UITTOTEHO, THE FLOATING RESEARCH ORGANIZATION IN NORTH FINLAND

Uittoteho was founded in 1951 to carry out studies concerning rationalization of floating in North Finland.

Seven floating associations have been members of Uittoteho since its beginning. Its research staff consists of a director and two research foresters. The head office is situated in Rovaniemi, one research forester works at Oulu. Annual research program is confirmed by a board composed of the forest chiefs of the leading member companies and the representatives of the Forest Service and floating associations.

From the very beginning the emphasis in the research program has been to study the influence the power plant construction has had on the floating and how it changes the methods used in floating. The plans and comparing cost calculations of the bundle floating have also been continuously in the research program.

Other important study projects deal with the development of mechanical sorting of timber, floating boats, towing of logs on the lakes and the sea, sinking and buoyancy problems and measuring of wood.

Uittoteho is in keen contact with the floating organizations in South Finland, Sweden and Norway.

The research results are published in three different series. Two of them serve mainly the members of Uittoteho but the third is also exchanged with other forest research organizations in Finland and abroad.

## THE FOUNDATION FOR FOREST TREE BREEDING

The Foundation for Forest Tree Breeding was founded in 1947 by all the important forestry organizations in Finland. Today it has one tree breeding center, Haapastensyrjä, in southwestern Finland, a nursery in eastern Finland (Pieksämäki) and a tree breeding office in southern Finland (Hyvinkää). The main office is in Helsinki.

The main purposes of the Foundation are:

1. to select and maintain exceptionally valuable trees, plus-trees and -stands, for breeding purposes.
2. to supply enough genetically good or superior seeds and plants for forest cultivation
3. to promote scientific research of forest tree breeding (forest genetics)
4. to keep contact with persons and institutions working in the same field in Finland and in other countries
5. to supply information and publications relating to forest tree breeding

Spruce seedlings in a plastic greenhouse at Haapastensyrjä.



Sofar the Foundation has selected and marked over 4 000 plus-trees, 256 plus-stands with 130 000 marked trees recommended for seed collection, collected about 3 000 kilograms good seed from standing trees, sold over 40 million seedlings originating from plus trees and stands. It has made several hundred thousands of grafts. Nowadays it produces annually about 200 000—300 000 grafts made from plus trees. There is a total national aim of 3 550 hectares seed orchards which means 1 420 000 living grafts. About 1/3 of the grafts are already done and it is calculated that in some 5—7 years the aimed area of seed orchards will be established. These seed orchards will produce all seed of forest trees required in the country after some ten years. The Foundation has now about ten hectares plastic greenhouses for seedling production, grafting cuttings and for experimentation.

There are about 10 000 grafts permanently growing in Haapastensyrjä. The crossing or hybridization activities are starting now and will become larger and more systematic year by year.

The Foundation publishes an annual report "*Metsänparannussäätiö*" in Finnish, Swedish, English, German, and Russian.



Finnish Pulp and Paper Research Institute, Tapiola.

## THE FINNISH PULP AND PAPER RESEARCH INSTITUTE

The Finnish Pulp and Paper Research Institute has developed from a Central Laboratory, founded in 1916, to serve the chemical industry of Finland. Today, the aim of the Institute is the carrying out of technical and scientific research concerned with chemical and mechanical pulp, and the manufacture of paper and board with a view to promoting progress in these fields of activity.

This work is done in the premises of the Institute, situated in the vicinity of the large technical research centre built for the Finnish Institute of Technology and the State Institute for Technical Research, some nine kilometers to the west of the centre of Helsinki. The total volume of the buildings is 52 000 cubic metres; the site has an area of 2,5 hectares, which will allow expansion to double the size at a future date.

It is estimated that Institute expenditure will amount to 6,5 million marks in 1966. The total number of employees at the beginning of 1965 was 221, including 70 graduates. The staff is engaged in work in 15 different departments, including those for Chemical Pulping, Mechanical Pulping, Paper and Board, and others concerned with the fields of inorganic and organic chemistry, biochemistry and physics. The Library and Documentation Service, comprising 22 000 volumes and 330 periodicals, provides extensive assistance to the Institute and to the industry.

Contact with the industries and research workers of other countries is a very important part of the Institute's activity. In 1964, 2 885 visitors were received, 613 of whom were from abroad. Members of the staff of the Institute made 314 visits to domestic mills, and 68 trips abroad. In the same year, 18 different lectures were given abroad by representatives of the Institute. In general, valuable active contacts are maintained with research workers throughout the world.

## INDEX OF PERSONNEL<sup>1)</sup>

### The Faculty of Agriculture and Forestry of the University of Helsinki

Address: Unioninkatu 40 B, Helsinki 17

#### Department of Silviculture

Head: Yli-Vakkuri, Paavo, DF, Professor  
Mikola, Peitsa, DF, Professor  
Sirén Gustaf, DF, Professor  
Assistant: Räsänen, Pentti, BF

#### Department of Forest Mensuration and Inventory

Head: Nyysönen, Aarne, DF, Professor  
Vuokila, Yrjö, DF, Assoc. Professor  
Assistant: Jaakkola, Sipi, MF

#### Department of Social Economics of Forestry

Head: Riihinen, Päiviö, DF, Professor  
Assistants: Keltikangas, Matti, BF  
Rinkinen, Ilmo, MF

#### Department of Logging and Utilization of Forest Products

Head: Wegelius, Theodor, DF, Professor  
Putkisto, Kalle, DF, Professor  
Assistants: Salmi, Juhani, BF  
Haarlas, Rihko, BF

#### Department of Peatland Forestry

Head: Heikurainen, Leo, DF, Professor  
Assistant: Seppälä, Kustaa, MF

#### Department of Business Economics of Forestry

Head: Keltikangas, Valter, DF, Professor  
Assistant: Ahonen, Leo, LF

<sup>1</sup> Abbreviations of titles on the last page.



#### Department of Forest Products Marketing

Head: Ervasti, Seppo, DF, Professor  
Assistant: Sainio, Jorma, BF

#### Department of Farm Forestry

Head: Heiskanen, Veijo, DF, Assoc. Professor

#### Department of Agricultural and Forest Zoology

Head: Kangas, Esko, DF, Professor  
Assistant: Löyttyniemi, Kari, BF

#### Department of Plant Biology and Plant Pathology

Head: vacant  
Assistant: Mäkelä, Kaiho, DF

#### Forest Officer of the University

Sarasto, Juhani, DF

#### Retired professors:

Jalava, Matti, DF, Professor in Forest Logging and  
Utilization of Forest Products  
Laitakari, Erkki, DF, Professor in Silviculture  
Lönneroth, Erik, DF, Professor in Forest Mensura-  
tion and Inventory  
Multamäki, Sulo, Ph.D, Professor in Peatland  
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Saari, Eino, Ph.D, Professor in Social Economics  
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### The Finnish Forest Research Institute

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#### Department of Peatland Forestry

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Kaunisto, Seppo, BF

#### Department of Silviculture

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Hagman, Max, MF  
Helenius, Olavi, BF  
Huuri, Olavi, MF

#### Department of Forest Biology

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Hintikka, Veikko, Ph.D

#### Department of Forest Mensuration and Inventory

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Poso, Simo, LF  
Salovaara, Alli, M Ph.  
Salminen, Sakari, BF

#### Department of Forest Technology

Head: Vacant  
Senior Research Specialist: Makkonen, Olli, DF  
Assistants: Hakkila, Pentti, DF  
Nisula, Pentti, LF  
Rikkonen, Pentti, BF

#### Department of Forest Economics

Head: Heikinheimo, Lauri, DF, Professor  
Senior Research  
Specialist: Runeberg, Lorenzo, DF  
Assistants: Salo, Esko, LF  
Palo, Matti, BF

#### Experimental Forest Office

Chief Forest Officer: Miettinen, Leevi, MF

#### Nature Conservation Office

Government Councillor for the conservation of nature:  
Kalliola, Reino, Ph.D, Professor  
Assistant: Haapanen, Antti, Ph.D

#### Statistical Office

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Assistant: Väänänen, Sulo, MF  
Mathematician: vacant  
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Heikinheimo, Olli, Ph.D, Professor in Silviculture and Director of the Institute  
Ilvessalo, Yrjö, Ph.D, Professor in Forest Mensuration and Inventory, Member of the Academy of Finland  
Kujala, Viljo, Ph. D, Professor in Forest Biology  
Pöntynen, Viljo, DF, Professor in Forest Economics

#### The Society of Forestry in Finland

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Vice Chairman: Kuusela, Kullervo, DF, Professor  
Secretary: Heiskanen, Veijo, DF, Assoc. Professor

#### The Foundation for Forest Tree Breeding

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Leskinen, Usko, BF  
Tyystjärvi, Pentti, BF  
Hahl, Juhani, BF  
Niiranen, Juhani, BF  
Oskarsson, Ole, MF

#### Metsäteho, Forest Work Section of the Finnish Woodworking Industries

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Savolainen, Raimo, BF  
Tuovinen, Arno, BF

#### Information and

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#### The Work Efficiency Association

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Levanto, Seppo, BF  
Hahtola, Kauko, MF  
Haataja, Paavo, BF  
Makkonen, Arvi, BF  
Virtanen, Arvo, BF

#### The State Institute for Technical Research, Woodtechnical Laboratory

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Kivimaa, Eero, Sc.D (Eng.), Professor  
Liiri, Osmo, Sc.D (Eng.)  
Aho, Veli, Ph.L  
Sorsa, Bror, M Sc. (Eng.)  
Paajanen, Tero, M Sc. (Eng.)  
Juvonen, Kauko, M Sc. (Eng.)  
Perttunen, Olavi, M Ph.

#### The Institute of Technology, Wood Processing Department

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Laboratory of Mechanical Technology of Wood:  
Head: Kivimaa, Eero, Sc.D (Eng.), Professor  
Assistant: Juvonen, Risto, M Sc. (Eng.)  
Laboratory of Chemical Technology:  
Head: vacant  
Assistant: Sipilä, Heikki, M Sc. (Eng.)

Laboratory of Paper Technology:

Head: Ryti, Niilo, L Sc. (Eng.), Professor  
Assistants: Mauronen, Pekka, M Sc. (Eng.)  
Aaltonen, Erkki, M Ph.

Laboratory of Wood Chemistry:

Head: vacant  
Assistants: Seppälä, Eino, L Sc. (Eng.)  
Pankamaa, Heikki, M Sc. (Eng.)

**The National Research Council for Agriculture and Forestry**

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Chairman: Vartiovaara, Unto, DF, Professor  
Vice Chairman: Sarvas, Risto, DF, Professor  
Secretary: Gyllenberg, Helge, DF, Assoc. Professor  
Senior Fellows: Oinonen, Eino, DF  
Nuorteva, Matti, DF  
Junior Fellow: Schalin, Ilmari, DF  
Assistants: Laiho, Olavi, LF  
Hämäläinen, Jouko, BF  
Väisänen, Unto, MF

**Uittoteho, the Floating Research Organization in North Finland**

Address: Rovaniemi  
Chief: Hemmi, Lauri, MF

**The Finnish Pulp and Paper Research Institute**

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Board of Directors:  
Man. Director: Jensen, Waldemar, Sc.D (Eng.), Professor  
Director: Sihtola, Hannes, Ph.D  
Director: Nordman, Lars, M Sc. (Eng.)  
Library and  
Literature Service: Holm, B., M Ph.

Inorganic Chemistry

Department: Tötterman, H., Ph.D

Organic Chemistry

Department: Kahila, S. K., Ph.L

Biochemistry

Department: Gadd, G. O., B Ph.

Cooking and

Bleaching Department: Virkola, N-E., Ph.D

Cellulose Chemistry

Department: Sihtola, H., Ph.D

Cellulose Analysis

Department: Palenius, I., M Ph.

Mechanical Pulp

Department: von Alfthan, G., M. Sc. (Eng.)

Paper Department: Nordman, L., M Sc. (Eng.)

Board Department and

Packing Laboratory: Juselius, A., M Sc. (Eng.)

Grinding and Tenacity

Department: Ekstam, T., M Ph.

Fiber Analysis

Department: Ilvessalo-Pfäffli, M-S., M Sc. (Eng.)

Abbreviations:

DF	Doctor of Agriculture and Forestry
LF	Licentiate of Agriculture and Forestry
MF	Master of Agriculture and Forestry
BF	Bachelor of Forestry
Ph.D	Doctor of Philosophy
Ph.L	Licentiate of Philosophy
M Ph.	Master of Philosophy
B Ph.	Bachelor of Philosophy
Sc.D (Eng.)	Doctor of Science (Engineering)
L Sc. (Eng.)	Licentiate of Science (Engineering)
M Sc. (Eng.)	Master of Science (Engineering)