POLISH ACADEMY OF SCIENCES

W. SZAFER INSTITUTE OF BOTANY

1953–1994

GUIDEBOOK

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Leon Stuchlik

POLISH ACADEMY OF SCIENCES

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GUIDEBOOK

Kraków 1995

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1. INTRODUCTION

In the spring of 1992 the Institute of Botany decided that a scientific symposium "Botany for Society", would be organized in autumn 1993 to honor its 40th anniversary and that a guidebook about the Institute would be prepared. The guidebook presents information about the current structural organization of the Institute, and a brief history of the Institute's origin and development, with some suggestions regarding the future of the Institute. This book is intended mostly for visitors and individuals interested in the Institute's activities. The English language version of this guidebook has been prepared for our foreign visitors. This publication should serve as a guide to the departments and laboratories of the Institute.

I would like to express my gratitude to the heads of the individual departments: Prof. Krystyna Grodzińska, Doc. Dr. Zbigniew Mirek, Ms. Magdalena Nowak, Prof. Ryszard Ochyra, Ms. Janina Oleszakowa, Prof. Jadwiga Siemińska, Prof. Jerzy Staszkiewicz, Prof. Władysław Wojewoda, Dr. Konrad Wołowski, and Prof. Kazimierz Zarzycki, for their contribution in preparation of the book and for allowing me to use various documents related to activities of their departments.

I also thank Mr. Marian Wysocki of the Editorial Services Department for his skillful computer typesetting and Mr. Jacek Wieser of the same Department for graphic design of the book. And I thank Mr. Antoni Pachoński for his photographs presented in this book. I am grateful to Prof. Ryszard Ochyra and Ms. Lidia Nowak for their assistance with the word processing of the final draft. I wish to expresse my special thanks to Dr. Andrzej Bytnerowicz and Ms Laurie Dunn, from the Pacific Southwest Research Station USDA Forest Service, for their excellent translation the Polish version of this guide. The publications by Szafer (1961), Pawłowski (1967), Środoń (1979), Zarzycki (1992) and annual reports on the Institute's activities in 1953–1992 were used during preparation of this book.

2. BRIEF HISTORY OF THE INSTITUTE

Thanks to the initiative of Władysław Szafer, an outstanding scholar and Professor of the Jagiellonian University, on October 5, 1953, the Scientific Secretariat of the Polish Academy of Sciences (PAS) established the Department of Botany as an independent, national scientific institution located in Kraków. The Department of Botany was upgraded to the Institute of Botany on April 5, 1956. On June 10, 1986, according to the decision of the Scientific Secretariat of the Polish Academy of Sciences, the Institute's name was changed to the "Władysław Szafer Institute of Botany."

The Institute was established in Kraków, the city with a long tradition of physiographic botanic experiments, that had been performed at the Physiographic Committee of the Polish Academy of Arts

Prof. Władysław Szafer, the initiator and first director of the Institute of Botany (1953–1960) (oil painting by J. Świecimski)

and Sciences for more than 100 years. The Institute's intellectual and scientific foundations were established on the basis of more than 40 years of activity at the Department of Systematics and Geography of Plants of the Jagiellonian University. During the initial years of activities at this new botanical institute, the scientific program incorporated many recommendations and ideas of Prof. Marian Raciborski (the first head of the Department in 1912–1917).

The first employees of the Department of Botany, Polish Academy of Sciences, exclusively consisted of the personel of the Department of Systematics and Geography of Plants, Jagiellonian University, who were full-time employees of the University and part-time (50% time) employees of the Institute. Only the Director of the Institute (Prof. W. Szafer) and the Deputy Director (Prof. B. Pawłowski) were full-time employees of both the Institute and the University. In 1953 the Polish Academy of Arts and Sciences assigned the large Herbarium of Polish Flora to the Polish Academy of Sciences, and the curator of the Herbarium also became a full-time employee of the Institute.

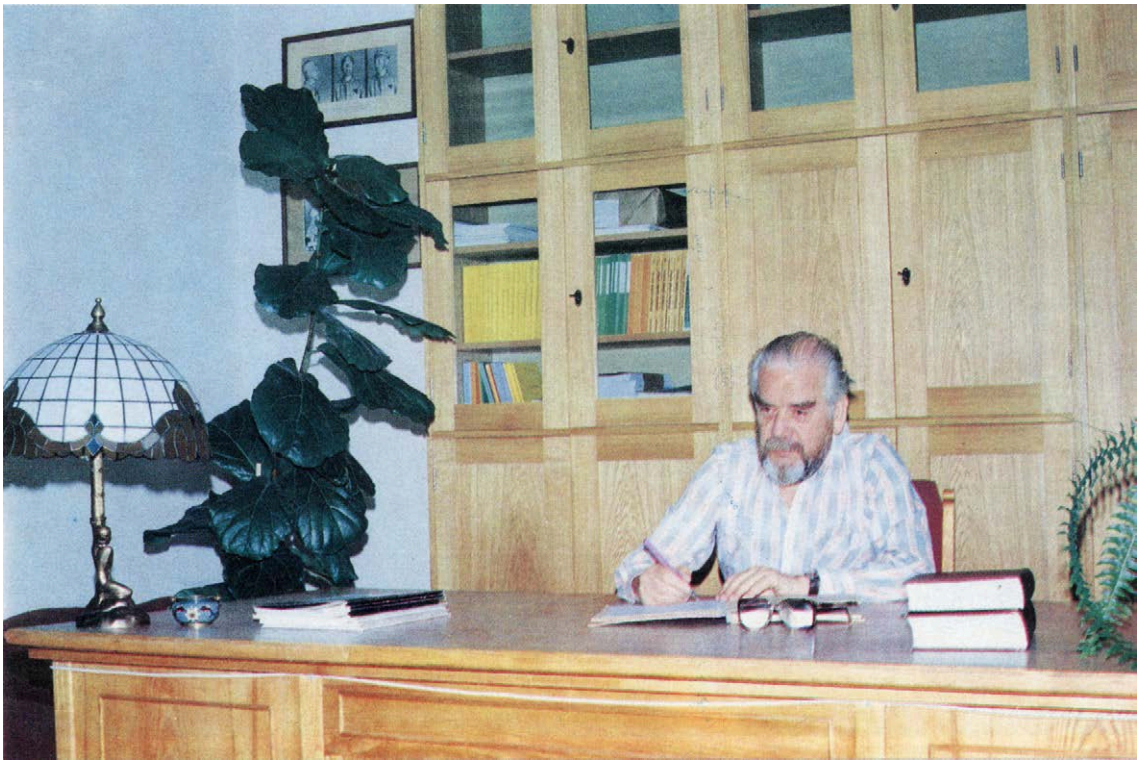
Prof. Szafer wished to establish in Krakow a prominent research center specializing in systematics and geography of plants as well as paleobotany. These three disciplines have been the major research areas of the Institute since its establishment. The directions of the Institute's scientific activities outlined in 1953 by Prof. Szafer have been carefully followed and developed, and new disciplines have also been studied, such as the variability of plants, ecology, algology, and in recent years, environmental ecology, ecological monitoring, bioindication and paleoethnobotany. Some of the traditional scientific disciplines initiated by Prof. Szafer changed their names to more modern terms such as biosystematic, palynotaxonomy, and paleoecology.

In 1954, the Department of Botany of the Polish

Prof. B. Pawłowski, second director of the Institute (1961–1968) (oil painting by J. Padzanowski)

Academy of Sciences had only three laboratories: Polish Flora (vascular plants), Bryology, and Paleobotany, which totalled 30 employees (including administration and support services). After receiving a higher employment quota from the Polish Academy of Sciences in May 1954, the Institute began to develop dynamically. New laboratories were established such as the Atlas of Polish Flora (located in Wrocław), Algology, Variability and Historical Evolution of Plants, and later the Laboratories of Mycology and Lichenology. The number of employees increased every year and reached relative stability in the beginning of 1960's (72–74 employees). In 1961 the Institute was critically affected: the Ministry of Science and Higher Education issued new regulations that did not allow the academic faculty to have a joint appointment in the Polish Academy of Sciences. By the end of 1962, when most of the members of the Jagiellonian University faculty had already left the Institute, 58 persons remained in the Institute's staff. However, the number of employees continued to grow rapidly

Director’s room



The Director Prof. dr hab. Leon Stuchlik

and reached 107 people in 1970. During the next 20 years the number of employees varied, reaching the lowest number of 107 persons in 1970 and 1990, and the highest-numbers of 131 and 130 employees in 1974 and 1980, respectively. Because of the reduced financial support for science in Poland in 1988–1991, the number of employees consistently decreased. In 1992 the employment quota for the Institute was reduced by 18 positions to the current level of 86 employees (80 and one-fourth positions). At present (end of December 1994), 14 professors and docents, 9 adjuncts, 11 assistants, 35 technicians, 4 librarians, and 15 persons in the administration and support services (together 88 employees – 81 and half positions) work at the Institute.

In addition to these personnel changes, the character of the research activities simultaneously changed as well, such as continuously broadened research scope. Later, during a period of higher stability (1970's and 1980's) the Institute coordinated the multi-departmental basic programs and participated in the research coordinated by other institutions. Currently, 52 research projects within 11 topic groups are in progress.

Although the Institute has focused on basic research, applied research has also been an integral part of the Institute's mission. During the entire 40 years of its existence, the Institute's role to serve society's needs has been strongly emphasized. In 1961, W. Szafer wrote "the Institute of Botany has not only solved problems related to the development of botany for the country, but it has also participated in solving problems from other disciplines of science. This example proves that the Institute of Botany fulfills the current needs presented by the society. By achieving these tasks, often in the form

Portion of the yard: blooming azaleas (top) and araucaria (left), *Ginkgo biloba* and *Metasequoia glyptostroboides* (middle) and trunk of the "black oak" excavated from the Vistula River bed (bottom)

Portion of a garden in front of the building (top) and corridor of the old building with the new one (bottom)

A group of araucarias displayed at a stairway hall by the entrance

of expert reports, the Institute of Botany actively participates in the life of the entire nation."

During the first year of its existence, the Department of Botany of the Polish Academy of Sciences implemented the program "Plant Communities as a Basis for Economical Planning." Effects of fertilization on development of the meadows of the Tatra Mountains, characterization of plant communities of the planned Goczałkowice retention reservoir, and research on alga polluting drinking water were among the research topics of that program.

Another program, "Botany Serving Society", included activities such as: re-cultivation of the cinder tips in Upper Silesia, the Lubin Copper Basin, the Tarnobrzeg Sulphur Basin; paleobotanical studies for the geological service needed for planning spatial development of the country; and organization of lectures encouraging people to participate in activities in natural settings. The Institute also organized exhibitions of edible and poisonous mushrooms, prepared open-houses for schools, etc.

In addition, the Institute also established various culture-support activities in the areas of archeobotany, prehistory, and history (paleobotanic studies of the excavations in the Kraków Market Square and the Wawel Castle). Recently the Institute has started a wide range of studies on environmental pollution, including biological monitoring in Kraków, evaluation of effects of heavy metals from vegetables grown in allotment plots on human health, and cooperation of palinologists with the medical personnel of the allergy clinics.

Initially, the newly developed Institute of Botany of the Polish Academy of Sciences and the Department of Systematics and Geography of Plants of the Jagiellonian University were located in the old, two-

story building at 46 Lubicz Street. Because more space was needed, in 1954 the new three-story building adjacent to the old building was finished, which housed the Institute's laboratories. The herbarium belonging to the University and the Academy of Sciences was located on the first floor and the library on the second floor of this new building.

During 1961–62 the old building of the Department was remodelled and the third floor added, which housed the Department of Paleobotany. In 1961, in the large hall of that floor an exhibition of the sixth INQUA Congress was displayed; currently the Museum of Paleobotany is located there. Construction in 1966 of a modern, five story building in the backyard of 46 Lubicz Street was the last phase of the Institute's development.

Currently, on the first floor of the joint front buildings at 46 Lubicz Street, the herbarium and laboratories of the Institute of Botany of the Jagiellonian University are located. On the second floor a common library, Editorial Services, Laboratory of Mycology and administration of the Institute of Botany are located. The director's room, which has preserved its original appearance designed by Prof. Władysław Szafer, is also located on that floor. Other laboratories of the University and the Department of Paleobotany (including the Museum of Paleobotany) are located on the third floor. The Storehouse of the Museum of Paleobotany, the Scientific Photography Laboratory, and the Mycological Herbarium are located on the fourth floor. The herbarium stockroom is located in the attic.

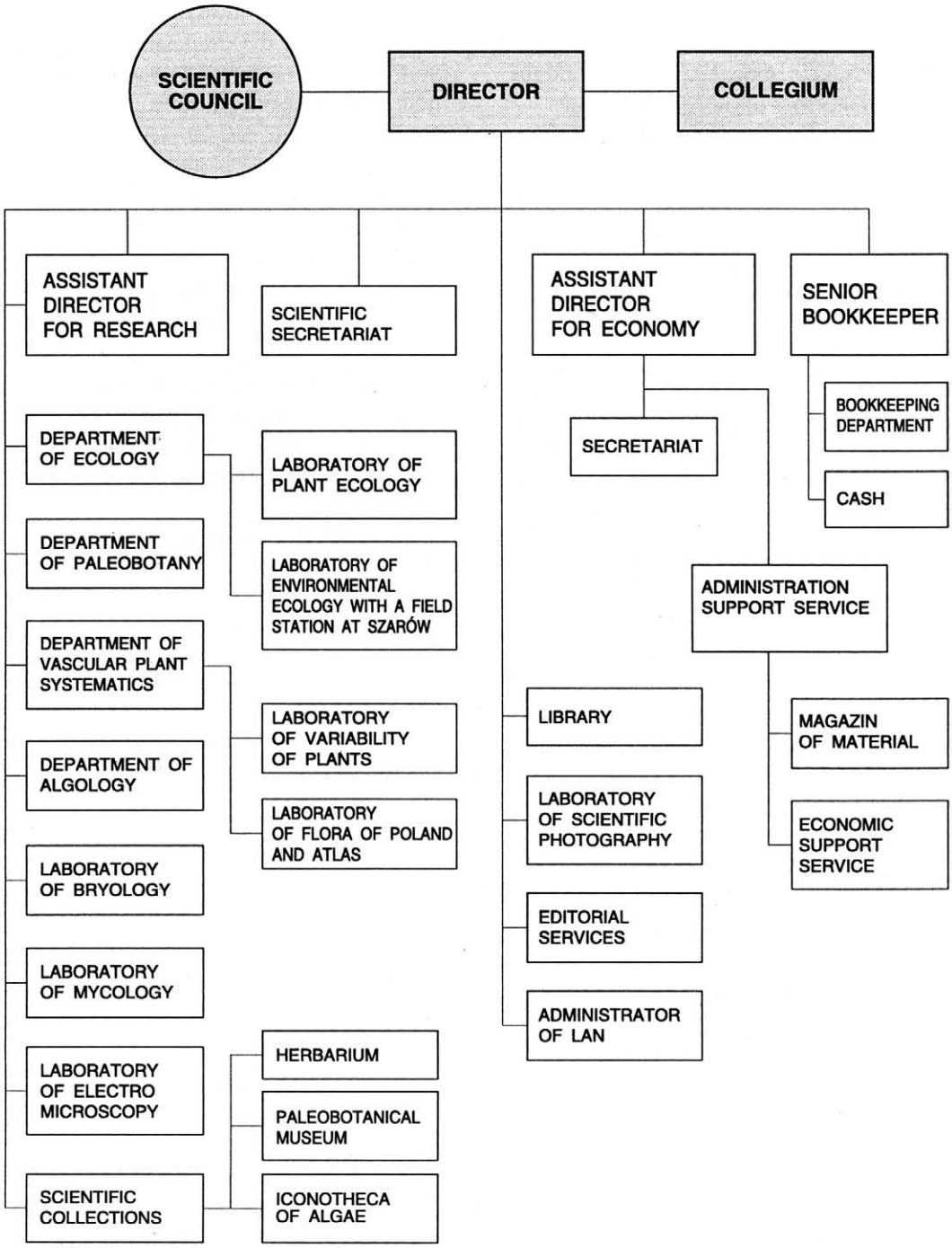
The Department of Systematics of Vascular Plants and a portion of the Laboratory of Mycology are located on the ground floor of the new building. The Institute's Herbarium and the preparatory rooms are located on the newly adapted basement and on first floor, while the library stockroom and Laboratory of Bryology are located on the second floor. The Department of Ecology and the Department of Algology are located on the fhird floor. The two highest levels of the building belong to the Institute of Nature Protection of the Polish Academy of Sciences.

Prof. Władysław Szafer was a director of the Institute in 1953–1960, Prof. Bogumił Pawłowski in 1961–1968, Prof. Adam Jasiewicz in 1969–1983, and Prof. Kazimierz Zarzycki in 1984–1990.

3. ORGANIZATIONAL STRUCTURE OF THE INSTITUTE

Director:	Prof. Dr. Leon Stuchlik (since April 1, 1990).
Assistant Director for Research:	Doc. Dr. Marta Mizianty (since April 1, 1993).
Assistant Director for Economy:	Ms. Elżbieta Fortuńska-Jankiewicz, M. Sc. (since May 1, 1986).
Chairman of the Scientific Council:	Prof. Dr. Kazimierz Zarzycki (since March 23, 1993).

THE ORGANISATION SCHEME OF THE W. SZAFER INSTITUTE
OF BOTANY POLISH ACADEMY OF SCIENCES IN KRAKÓW



4. SCIENTIFIC DEPARTMENTS

4.1. Department of Ecology

Head: Prof. Dr. KAZIMIERZ ZARZYCKI

The Department of Ecology is one of the oldest department established in 1954 as a laboratory, was later changed to the Department of Geography, Ecology and Sociology of Plants. The scope of research in the initial years was quite different from the current focus on geobotanical and phytosociological (plant community) research. In the early years research provided comprehensive monographic descriptions of plant communities of the western Bieszczady Mountains (K. Zarzycki, 1964); the Bukowica Range (K. Grodzińska, E. Pancer-Kotejowa, 1965); the Gubałówka Elevation (E. Pancer-Kotejowa, 1965); the Tatra Mountains meadows (S. Pawłowski, 1965; B. Pawłowski, S. Pawłowska and K. Zarzycki, 1966); the geobotanical description of the Gubałówka Elevation (K. Grodzińska and E. Pancer-Kotejowa, 1960), Nowotarskie and Spiskie Klippen Belt (K. Grodzińska, 1975).

In 1956–1964, the Laboratory of Geography of Plants was established within the Department of Ecology. Under the guidance of Prof. J. Kornaś, a work on the Atlas of the Distribution of Vascular Plants in the Polish Carpathian Mountains was initiated. That work was gradually acquired by the researchers of the Institute of Botany of the Jagiellonian University.

Gradually, less time was devoted to the geobotanical and plant community research, and studies on relationships between phytocoenotic components, and vegetation and ecological sites were emphasized. Research on relationships between the meadow and forest communities and determinations of depth and changes of the ground water level were performed. Studies on the inner dynamics of phytocoenosis, species competition, etc. were also developed.

Since 1963, many specialists, both from the Institute and outside, have begun complex studies of various ecosystems in then Pieniny Mts. Thanks to intensive ecological studies, the flora of these mountains was well-described and a color map of the plant communities of the Pieniny National Park was published. Later studies focused on the primary environmental factors (such as phosphorus and various forms of mineral nitrogen) affecting composition and structural development of plant communities. One of the results of those studies was the development of management guidelines for the meadows of the Pieniny National Park prepared according to the requirements of nature preservation. In addition, directions were outlined of vegetation changes in the National Park due to the rapid development of tourism and construction of the water retention reservoir near Czorsztyn (the vicinity of the Pieniny Mountains).

Since the early 1970's ecological studies have been divided into two directions. Although the autoecological studies continued, new studies on the effects of industrialization and urbanization on vegetation in southern Poland emerged, such as studies on the effects of increasing air pollution on disturbances of water relationships of the shallow ground waters in the Silesian-Kraków Industrial Region and the Lubin-Głogów Copper Basin. Studies on the effects of air pollution on vascular plants e.g. air pollution bioindication studies in the industrial regions (analysis of bark acidity, sulphur and heavy metal concentrations in foliage of trees and herbaceous plants) were also developed. Such studies significantly differed from the classical ecological studies. As a result of all these changes, two laboratories were established within the Department of Ecology in 1991: the Laboratory of Plant Ecology and the Laboratory of Environmental Ecology with a Field Station in Szarów.

4.1.1. Laboratory of Plant Ecology

Employees: Prof. Dr. KAZIMIERZ ZARZYCKI (head), Prof. Dr. KRYSTYNA FALIŃSKA, Dr. JERZY WOŁEK (adjunct), ZBIGNIEW SZELĄG, M. Sc. (senior assistant), URSZULA KORZENIAK, M. Sc., and ALINA SIDOR, M. Sc. (technical support staff).

Research topics:

1. Changes in vegetation and evaluation of factors affecting species composition of phytocoenoses

On the basis of field studies that have been conducted for many years in the Pieniny Mountains, a plan for managing meadow ecosystems of the Pieniny National Park has been developed. That project, managed by the Pieniny National Park staff, is supervised by Prof. Zarzycki and his coworkers. Vascular plants of the area have been observed for the project, as well as those in the vicinity of the complex of water retention reservoirs in the Czorsztyn-Niedzica-Sromowce Wyżne area. The stochastic models and the zero hypothesis method have been used for the analysis of factors affecting species composition of the phytocoenoses (J. Wołek).

2. Horizontal and vertical distribution of vascular plants in selected areas

Studies in the Śnieżnik Range and in the Bialskie Mountains (Eastern Sudety Mountains) are in progress. The mapping of vascular plants has also started on the edges of the complex of the water retention reservoirs in the Czorsztyn region (Z. Szeląg).

3. Threatened and endangered vascular species

As a result of many years of field studies, the red lists of the endangered vascular plants in the territory of Poland have been published. The Laboratory also participates in preparation of the Red Data Book of the Baltic Region (International cooperation of 10 countries). The Polish Red Book of Ferns and Flowering Plants which contains monographs of more than 200 of the extinct and threatened plant species in Poland has just been published.

4. Biology and ecology of vascular plants

As a continuation of the earlier studies, the spatial structure of selected dioecious plants (U. Korzeniak) has been examined, as well as observations on a number of threatened and endangered species in Poland (*Erysimum pieninicum*, *Carduus lobulatus*, *Ophrys insectifera*).

5. Demographic studies

Demographic studies of the vascular plants populations related to the secondary forest succession on the meadows in the Białowieża Primeval Forest have been conducted by Prof. K. Falińska.

6. Methodical and mathodoligical basis of ecology

Preparation of a handbook "Multidimensional analysis for biologists"

Scientific cooperation: Many scientific institutions in Poland and abroad cooperated on these studies, such as the Pieniny National Park, Department of Physiography and Arboretum in Bolestraszyce near Przemyśl, the Regional Office of Water Resources in Kraków, Geobotanisches Institut ETH in Zürich, and the Agricultural University in Uppsala.

4.1.2. Laboratory of Environmental Ecology with the Field Station in Szarów

Employees: Prof. Dr. KRYSTYNA GRODZIŃSKA (head), Dr. BARBARA GODZIK, Dr. MAREK KRYWULT (adjuncts); Ms. GRAŻYNA SZAREK, M. Sc., (senior assistant), Dr. Eng. STANISŁAW BRANIEWSKI, Ms. ELŻBIETA CHRZANOWSKA, M. Sc., Ms. BARBARA PAWŁOWSKA, M. Sc., Ms. EWA BUDZIAKOWSKA, Mr. JANUSZ GUZIK, (technical support staff).

Research topics: The research can be divided into four categories: (1) biogeochemical studies in forest watersheds; (2) environmental monitoring using plants as bioindicators; (3) monitoring of tropospheric ozone concentrations and ozone effects

Field Station of the Department of Ecology in Szarów

on forest ecosystems in southern Poland; and (4) studies on distribution of synanthropic plants in Poland. The first two topics have been conducted for several years, while the third topic started in 1991. These are the main research projects of the Laboratory. The fourth topic has been studied by one employee (J. Guzik).

1. Biogeochemical studies

In a small catchment of the forest stream Ratanica (located in the vicinity of the drinking water reservoir for the city of Kraków in Dobczyce), the input, accumulation and output of elements from natural origins and environmental pollution have been investigated.

These studies include: measurements of SO_2, NO_2, and particles in air; determinations of amounts and chemical composition of bulk precipitation, throughfall and stemflow; determination of amounts and chemical composition of the catchment output water; determination of biomass and chemical composition of litter; meteorological monitoring; and inventory of plants.

Outflow of water from the catchment are measured in two weirs meteorological monitoring in two meteorological stations, and continuous determinations of air chemistry at one site in the Ratanica Valley. Samples have been collected every 2 weeks since October 1990. Concentrations of cations: K^+, Na^+, Ca^{2+}, Mg^{2+}, Mn^{2+}, Zn^{2+}, Cu^{2+}, Pb^{2+}, Cd^{2+}, NH_4^+, and anions: NO_3^-, NO_2^-, PO_4^{3-}, SO_4^{2-}, and pH, and electrical conductivity are monitored.

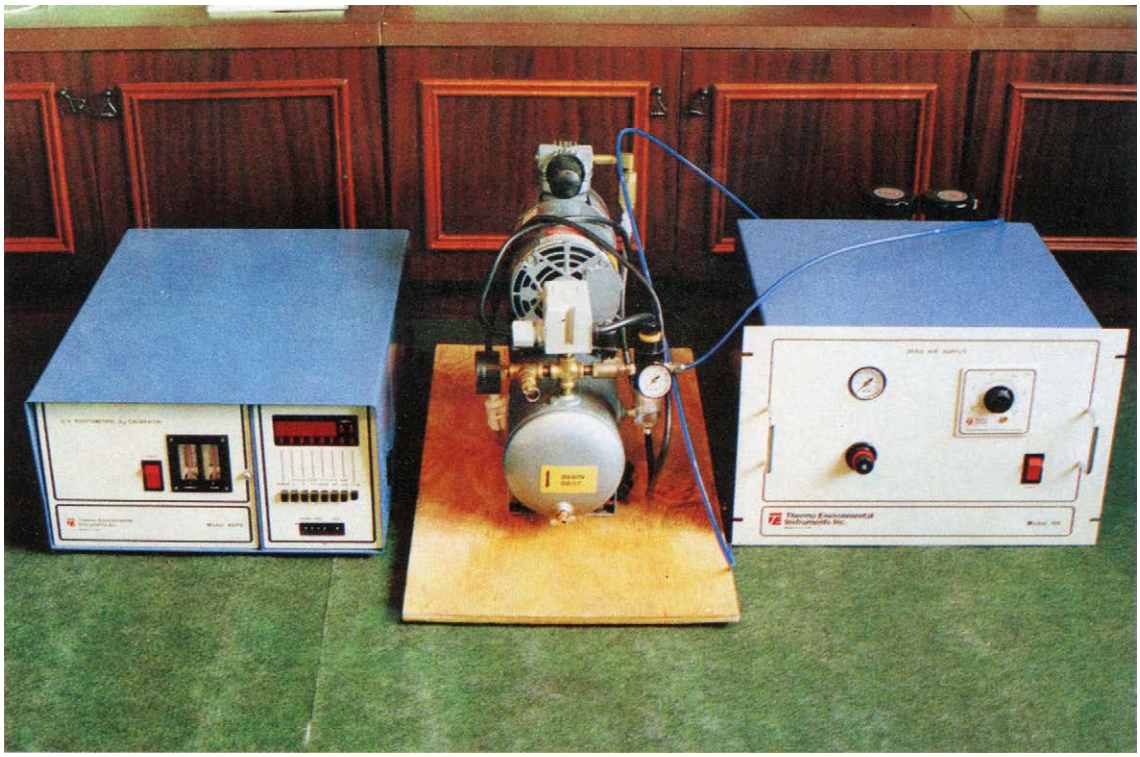
The biogeochemical studies in the Ratanica valley are carried out in cooperation with a group of ecologists from the Jagiellonian University (Dr. R.

Laboratory on the Field Station in Szarów

Laskowski with coworkers). This group is responsable for determination the quantity and chemical composition if the ground water. The results obtained by the two groups will give the possibility to determine the chemical balance in the catchment of the forest stream Ratanica.

The results of the studies suggest that the Ratanica catchment is under long-term influence of industrial emissions of gases and particles (SO_2 – 20 $\mu g\ m^{-3}$; NO_2 – 8 $\mu g\ m^{-3}$; dust particles 18 $\mu g\ m^{-3}$), rain of pH about 4.5 and substantial deposition of sulphur (about 26 kg/ha/yr) and nitrogen (about 24 kg/ha/yr) into the ecosystem.

Research is performed in a framework of Polish-Swedish cooperation (agreement between the Polish Academy of Sciences and the Swedish Royal Academy of Agricultural and Forestry Sciences signed in Pułtusk in 1989). Determination of critical loads for



Laboratory on the Field Station in Szarów

environmental pollutants in various forest ecosystems and predictions of ecosystem changes under pollution stress are the main objectives of these studies.

2. Ecological monitoring with plant bioindicators

Environmental pollution by heavy metals and sulphur compounds on the entire territory of Poland, national parks, and selected areas of southern Poland have been evaluated. Samples have been collected several times during recent years. This procedure investigates the dynamics of pollution changes in selected areas of Poland.

Studies on the contamination of the environment with heavy metals were part of the European Environmental Monitoring Program (EMEP).

Mosses and lichens have also been used as ecological bioindicators in the Arctic (southern Spitsbergen, mainly the Hornsund area), in the Antarctic (King George Island) and in Korea. The specimens were collected during various scientific expeditions by the members of the Laboratory of Environmental Ecology.

3. Studies on the effects of ozone on forests

Pilot studies on concentrations of tropospheric ozone in the Niepołomice Forest and its vicinity have been performed. Concentrations of ozone have been determined by active methods (ozone monitor on loan from the USDA Forest Service), passive samplers, and bioindicators (sensitive and resistant cultivars of tobacco, *Nicotiana tabacum*). The determined levels of ozone can be phytotoxic to the forests of the area. Long-term and more detailed studies on the effects of ozone on the Niepołomice Forest are planned. The "ozone" studies are conducted in cooperation with the United States scien-

Laboratory on the Field Station in Szarów

tists (agreement between the Institute of Botany and the Pacific Southwest Research Station of the USDA Forest Service).

4. Studies on distribution of synanthropic plants in Poland

These studies consist of cataloging the synanthropic plants in Kraków, studies on plants growing in the vicinity of grain mills in Poland, and maps of distribution of selected synanthropic plants in Poland.

In addition to the basic studies, applied studies are performed that have been contracted from the Department of Environmental Protection, the Kraków Voievodship Office, and the Ministry of Environmental Protection.

Within a framework of the Kraków Ecological

Study room in the Field Station in Szarów

Experimental plot in the Ratanica Valley (Carpathian Foothills, near Myślenice)

Monitoring, studies on heavy metal contamination of soils and vegetables in the allotment plots in the city of Kraków have been conducted for several years. Studies on acidification and chemical composition of precipitation in the Kraków agglomerations have been conducted for 1 year.

Within a framework of national monitoring, the scientists of the Laboratory have been involved in an assessment of environmental quality in the selected areas of southern, central, and northern Poland. Contamination of the environment of those areas with heavy metals and sulphur compounds has been evaluated with bioindicator plants (mosses, pine needles, tree bark).

Participation in the international programs

1. Polish-Swedish program: *Deposition and biogeochemical run-off investigations in Poland and Sweden* and *Air pollution monitoring of forest health in Poland and Sweden*. These two projects are performed according to the environmental protection agreement between the Polish Academy of Sciences and the Swedish Royal Academy of Sciences and the Swedish Royal Academy of Agricultural and Forestry Sciences.

2. EMEP program (European Environmental Monitoring Programme): *Atmospheric heavy metal deposition in Europe*.

3. Polish – United States – east European program: *Effects of atmospheric deposition and climate change on forest ecosystems in central and eastern Europe and the United States*.

Field Station in Szarów

The Station is located in a two story building surrounded by a 1 ha garden in Szarów (30 km east of

Kraków), close the Niepołomice Forest. The building contains laboratories, work rooms, rooms for collections and reagents, etc., rooms for glass cleaning, and a guest room.

Greenhouses for fumigation of plants with ozone have been built in 1994.

Equipment of the Laboratory of Environmental Ecology

The Laboratory of Environmental Ecology has well-equipped laboratories both in the Institute in Kraków and the Field Station in Szarów.

The most important pieces of equipment are: ion chromatograph (Dionex 1000), atomic absorption spectrophotometer with graphite cuvette (Varian BQ), monitors of SO_2, NO_2 and suspended particles, ozone monitor (Thermo Environmental Model 49), water deionizer (Labconco), muffle furnace (Strohlein), microwave oven for combustion of biological materials, agate grinder, analytical balance (Sartorius), pH meters, conductivity meters, dryers, freezer, and IBM personal computers.

4.2. Department of Paleobotany

Employees: Prof. Dr. LEON STUCHLIK (head), Prof. Dr. MAGDALENA RALSKA-JASIEWICZOWA, Prof. Dr. KRYSTYNA WASYLIKOWA, Prof. Dr. MARIA ŁAŃCUCKA-ŚRODONIOWA (emeritus, † 1995), Prof. Dr. ANDRZEJ ŚRODOŃ (emeritus), Doc. Dr. KAZIMIERA MAMAKOWA, Doc. Dr. EWA ZASTAWNIAK, Doc. Dr. MARIA REYMANÓWNA (emeritus), Dr. ANDRZEJ OBIDOWICZ and Dr. DOROTA NALEPKA (adjuncts), Mr. WOJCIECH GRANOSZEWSKI, M. Sc., Ms. ELŻBIETA WCISŁO-LURANIEC, M. Sc. (disability pensioner), Mr. DIETER DEMSKE, M. Sc. (50% time), and Mr. GRZEGORZ WOROBIEC, M. Sc. and Ms. JADWIGA ZIAJA (maternity leave) (senior assistants); Ms. MARIA LESIAK, M. Sc. (75% time), Ms. EWA MADEYSKA, M. Sc. (50% time), Ms. DANUTA MOSZYŃSKA-MOSKWA (75% time), Dr KRYSTYNA SKAWIŃSKA-WIESER, Ms. ZOFIA TOMCZYŃSKA, A.E., Ms. MAŁGORZATA ZURZYCKA (technical support staff).

The department of Paleobotany is the largest center of paleobotanical studies in Poland. Prof. Władysław Szafer, who established the Department and was its first head in the years 1953–1960, initiated most of the research projects that have been continued and developed until today. During 1961–1978, the research started by Prof. Szafer, was continued and further developed by his successor, Prof. Andrzej Środoń. After Prof. Srodoń's retirement in 1978, the research of the Department was coordinated by Prof. Krystyna Wasylikowa (1979–1982), and since 1982 by Prof. Leon Stuchlik. The scientists of the Department have been studying the history of the development and changes of flora from the Paleozoic era to the present. In the past 25 years, the studies have been conducted in three research areas: Paleozoic and Mesozoic flora (directed by Doc. M. Reymanówna, presently retired); Tertiary flora (directed by Prof. Stuchlik; and Quaternary flora (directed by Prof. K. Wasylikowa and Prof. M. Ralska-Jasiewiczowa).

In addition to the basic research, the studies fossils floras in Poland also have practical importance in geologic explorations and spatial development of the country. Some of the research tasks are conducted in close cooperation with the state enterprises.

Most of the results of the paleobotanical studies are published in *Acta Palaeobotanica*, a specialized journal established and edited for many years by Prof. W. Szafer. This journal is unique in central and eastern Europe and is available for all paleobotanists.

1. Paleozoic and Mesozoic flora

Studies have been conducted on the evolution of macroscopic and microscopic flora from the Polish Mesozoic era and woods of the Paleozoic and Mesozoic eras. The studies were mostly focused on the

Jurassic flora of the incombustible clay of Grójec near Kraków, described for the first time by Prof. M. Raciborski in 1894 and studied later by Doc. Dr. M. Reymanówna. An undisputable accomplishment was the discovery in Poland of the female reproductive organs of *Caytoniales* from the Jurassic period, known from only a few sites in the world. Thanks to modern scientific methods researchers determined several new, previously unknown, anatomical details of that interesting group of plants; these will be significant in determining evolutionary chains of succession. In addition, from other studies of small Jurassic flora of southern Poland, among others the fruits of *Ginkgoales* were found. The main emphasis in recent years was focused on a detailed description of the remnants of the extinct Mesozoic family, *Cheirolepidiaceae*, as well as on the continuation of studies on macroscopic remnants of the Liassic flora from Odrowąż.

2. Tertiary flora

Studies on the Tertiary flora, initiated by Prof. Szafer with a study on the Pliocene flora from Krościenko (1947) and areas near Czorsztyn (1954) are continued and further developed. The main goal of those studies is to understand the history of flora in the Tertiary period.

The multi-year studies in the western Carpathian Mountains and the southern Poland have led to a summation of studies on the history of vegetation in the Neogene in that region (J. Oszast, L. Stuchlik, 1977; L. Stuchlik, 1980; M. Łańcucka-Środoniowa, 1979; E. Zastawniak, 1972, 1980; N. Oszczypko, L. Stuchlik, A. Wojcik, 1992). That work was linked to the international studies on chronostratygraphy of the Neogene of the Central Paratethys. The area of southern Poland is an important link between the eastern Paratethys and the western Paratethys. In addition, the earlier studies described the Miocene flora from Rypin in the Dobrzyń Lake District, Stare Gliwice, Gdów area, Mirostowice in the Lower Silesia, Kłodzko and Gozdnica and areas of Tarnobrzeg and Chmielnik.

Current studies focus on flora of western and central Poland. For many years the classical broad-leaf flora from Sośnica near Wrocław have been re-evaluated. Because of the importance in the international scientific literature, that flora, described by Goeppert in 1855, needs a modern revision. The studies are conducted on the original specimens described by Goeppert and on the specimens collected during the last 30 years by the scientists of the Institute of Botany and other Polish research institutions. E. Zastawniak conducts that work in cooperation with Dr. H. Walther, the Museum of Mineralogy and Geology in Dresden, who performs cuticular analysis of leaves. The fruits and seeds washed out of the loam and preserved as imprints in Sośnica are studied by M. Łańcucka-Środoniowa.

Current palynological studies in central Poland, conducted by L. Stuchlik and his team, concentrated on the origin and genesis of lignite deposits in the Bełchatów Coal Basin.

These studies, which are important in correlating the lignite deposits with the adjacent geological layers, are conducted in cooperation with the Bełchatów Lignite Mine and the Institute of Geology of the Wrocław University One of the goals of these studies is to develop a methodology that would allow for fast and precise characterization of coal deposits (normally identified by prospecting drillings).

Independently from the studies on the Tertiary period, the scientists have conducted investigations on Cretaceous and Tertiary deposits in the Arctic regions (Antarctica and Spitsbergen), palynology (L. Stuchlik, 1981), and broad-leaf flora (E. Zastawniak, 1981). Pioneering investigations have been done on the broad-leaf flora from numerous sites of the upper Cretaceous and the Tertiary deposits in the King George Island of the western Antarctica. In those studies, the Antarctic angiosperm plants of the upper Cretaceous have been presented and described for the first time. These studies also examine the characterization of plant development in that region between the upper Cretaceous and Oligocene epochs and proved existence of the interglacial flora in western Antarctica during the Tertiary period.

Some of the projects have been conducted in col-

Laboratory (top) and the hallway with comparative collections and museum exhibits (bottom) in the Department of Paleobotany

laborations with foreign scientists. The flora from Sośnica have been re-evaluated within a framework of the agreement on scientific cooperation with the Museum of Mineralogy and Geology in Dresden. The expedition organized in 1976 to India (H. Walther, L. Stuchlik) is another example of that cooperation – the herbarium specimens from that expedition have been deposited in the foliage herbarium of the Department of Paleobotany and the Museum of Mineralogy and Geology in Dresden.

The paleobotanical studies in the Cheb Basin in the western Bohemia and Moravia have been conducted according to a cooperative agreement with the Institute of Geology and Geotechnology of the Czech Academy of Sciences in Prague. The main goal of these studies is to correlate the Neogene profiles in Poland and the Czech Republic and to develop a standard profile. Similar studies have been performed in cooperation with the Institute of Paleobiology of the Georgian Academy of Sciences in Tbilisi; the goal of these studies has been to compare the Neogene floras from the Eastern and Central Paratethys (L. Stuchlik and I. Shatilova, 1987). In addition, in cooperation with the Georgian scientists, palynological studies of the surface spectra have been performed in the refugia of the Tertiary forests in the Caucasus and the Transcaucasia.

3. Quaternary Flora

Studies on Quaternary flora focus on some of the problems of the Pleistocene and on comprehensive characterizations of vegetation and climate changes in the Late Glacial and Holecene epochs, including anthropogenic effects on vegetation.

Previous studies on the Pleistocene mostly dealt with the history of interglacial vegetation in Poland and changes in vegetation and climate during the last glaciation in the Carpathian Mountains and near Kraków (A. Środoń and K. Mamakowa). A comprehensive monograph of the Eemian Interglacial and early Vistulian periods have been published (K. Mamakowa, 1989), on the basis of very interesting materials from Ibramowice and revisions and re-evaluations of more than 100 profiles of that interglacial from Poland. Currently, the interglacial materials from Golasowice and Horoszki have been studied. In cooperative studies with the Belarussian paleobotanists from Mińsk, the interglacial flora from Korczew and exotic elements in the Masovian interglacial flora (Alexandrian) from Poland and Belarus have been investigated. In addition, the younger and middle Pleistocene (K. Mamakowa), early Pleistocene bordering with the Tertiary and Quaternary periods (L. Stuchlik), and younger Pleistocene of central Sweden (W. Granoszewski) have been studied.

For many years Prof. Środoń studied paleobotanical data related to distribution of individual genera of trees during the Tertiary and Quaternary periods which were used in the monograph "*Our Forest Trees*".

Many people have been involved in studies on the flora of the Holocene and Late Glacial of the last glaciation. Many comprehensive studies have been published: Witow (K. Wasylikowa), Mikołajki Lake (M. Ralska-Jasiewiczowa), Sandomierz Basin (K. Mamakowa), and Podhale (W. Koperowa and A. Obidowicz). An extensive monograph on the history of vegetation in the Bieszczady Mountains has also been published (M. Ralska-Jasiewiczowa, 1980). This monograph, analyzes pollen, macroscopic and carbon dating, various problems related to the development of vegetation belts in the Carpathian Mountains, anthropogenic influence on vegetation and migration of individual tree species. The latter problem has been extended over the entire territory of Poland and presented as isopoll maps for the most important trees species (M. Ralska-Jasiewiczowa, 1983). And finally, the genesis of peat deposits and accumulation of peat in relation to the general changes of flora and development of present vegetation belts in the Carpathian Mountains have been studied (A. Obidowicz).

In all the studies on the Holocene, anthropogenic influence on natural vegetation has been included, especially for studies by M. Ralska-Jasiewiczowa (in northern Poland) and studies on the old river bed of the Vistula in the vicinity of the Neolithic settlements of Kraków (K. Wasylikowa, D. Nalepka, and Z. Tomczyńska).

Paleoethnobotanical studies that focus on the history of agricultural and synanthropic plants and the development of farming and husbandry are conducted in close cooperation with archeologists (K. Wasylikowa). Among others, the medieval flora of Kraków has been described (K. Wasylikowa, 1978; A. Wieserowa, 1979). Extensive biological studies (geomorphology, pollen analysis, paleopedology) on the ancient Vistula meander in Pleszew near Kraków helped to reconstruct the natural environment of Neolithic man in that area. Disturbances in the natural environment caused by the inhabitants of the early (4,000 to 6,000 year old) agricultural settlements have been described.

In 1977 the Polish paleobotanists specializing in the Quaternary period participated in international research program IGCP-158 "Paleohydrological Changes in the Temperate Zone in the Last 15,000 Years," and sub-program B "Lake and Peat Bog Environment." The aim of those studies was to reconstruct changes in the environment based on comprehensive paleoecological and paleoclimatological studies of lake deposits and peat bogs in chosen standard sites. Within that program the scientists of the Department described sites: Woryty in the Olsztyn Lake District (M. Ralska-Jasiewiczowa), Puścizna Rękowiańska in the Orawa-Nowy Targ Basin (A. Obidowicz) and Wolbrom in the Kraków-Częstochowa Upland (D. Nalepka – macroscopic remnants; M. Latałowa of the Gdańsk University – pollen analysis). Twenty three scientists from 17 Polish scientific institutions participated in those studies. M. Ralska-Jasiewiczowa was the national coordinator of the studies and the international secretary of the sub-program IGCP-158B.

Currently, in the framework of international programs, scientists have begun a project of the regional paleobotanical data bank for the late glacial period and Holocene. Multi-directional investigations of the annually laminated Lake Gościąż have been performed (M. Ralska-Jasiewiczowa). The results are unique and will elongate the carbon radioisotope calibration scale for pine developed by B. Becker. In the methodology of those studies a new technique of utilization of annual, oe even seasonal deposits of palinological deposits was introduced. In the area of paleoethnobotany, a project "Plants in the Economy of the Prehistoric Nations of the Sahara" has been conducted (K. Wasylikowa). On the basis of about a dozen taxons, the floristic composition of various archeological objects have been determined.

4.3. Department of Variability of Plants (1954–1992)

Head: Prof. JERZY STASZKIEWICZ

Because of the initiative of Prof. J. Jentys-Szaferowa, the Department of Variability of Plants was established in 1954 as one of the laboratories of the newly developing Department of Botany. The Laboratory was upgraded to the level of a Department in 1956. The research activities of the Department are plant systematics and paleobotany. The research has focused on the variability of contemporary and fossil plants and their morphogenesis.

In the first 20 years of its activity, tree populations variability was emphasized. At that time the morphological variability of leaves and fruits of the Polish species of birch was determined (J. Jentys-Szaferowa, M. Białobrzeska and J. Truchanowicz), the history of the genus *Carpinus* was studied (J. Truchanowicz), and an explanation of the genesis of *Betula x oycoviensis* was emphasized (J. Jentys-Szaferowa, M. Białobrzeska, I. Więckowska, A. Korczyk, A. Szwabowicz, S. Pawłowska, J. Truchanowicz, and J. Staszkiewicz). As a result of those studies, a new birch species for Poland, *Betula szaferi* (J. Staszkiewicz) was described. Variability of leaves and fruits of trees and shrubs of the Białowieża Primeval Forest were also studied by the entire Department. Numerous studies dealt with intraspecific variability of *Pinus sylvestris* in Europe

and Asia and variability of *Picea abies* in Poland and many European countries (J. Staszkiewicz). Also, the natural hybrids of *Pinus mugo x P. sylvestris* from Poland and Czechoslovakia were investigated (J. Staszkiewicz and M. Tyszkiewicz). The most recent monographs have included: *Prunus fruticosa* (J. Wójcicki), *Camelina* (Z. Mirek), *Trapa* (J. Staszkiewicz and J. Wójcicki), species of the genus *Avenae* (L. Frey), genus *Dactylis* (M. Mizianty), and genus *Podocarpus* (J. Staszkiewicz). These monographs have been characterized by a new approach towards systematics, distribution, variability and kariology. Often they have examined trees such as genus *Podocarpus* found in the Grater and Lesser Antilles (J. Staszkiewicz), or other species found in Europe or other continents.

The Department specializes in analysis of species or taxons of the hybridogenic origin (*Betula x oycoviensis*, *Pinus rhaetica*) and hybrid forms, e.g. of the genera *Cornus* or *Lonicera*. The generally accepted biometric methods, as well as the original graphical method developed by Jentys-Szaferowa have been used. Specific to the Department is the parallel variability analysis of the contemporary and fossil plants that have been very useful in determinations of the fossil materials.

In February 1993, as a result of the Institute's restructuring, the Department of Variability of Plants merged with the Department of Systematics.

4.4. Department of Systematics of Vascular Plants (1953–1992)

Head: Prof. ADAM JASIEWICZ

The Department of Systematics of Plants was established in 1953, initially as the Laboratory of Polish Flora (vascular plants), and since 1956 as a Department. Its initiator, Prof. W. Szafer, and later its founder, Prof. B. Pawłowski wanted to establish a prominent, leading center for Poland in the area of systematics and floristic studies. In 1967 Prof. Pawłowski wrote: "plant systematics was, is, and will remain the irreplaceable basis for all branches of botany." He also thought that the most important task of the Department of Systematics was to publish the descriptive "Flora of Poland." Publication of that work, initiated in 1919 by the Polish Academy of Arts and Sciences, was continued by the Institute and ended with the 14th volume published in 1980. Because the volumes published before World War II (volumes 1 to 6) were outdated from the point of view of taxonomy and nomenclature, the Department prepared their revised edition – in 1981–1992 volumes 3, 4, and 5 were published. Because a general view on editing the "Flora of Poland" changed, editing of the remaining volumes of that series was abandoned. Regional flora, such as *Flora of the Tatra Mountains*, Vol. 1 (B. Pawłowski, 1956), *Vascular Plants of the Western Bieszczady Mountains* (A. Jasiewicz, 1965), and *Vascular Plants of the Pieniny Mountains* (K. Zarzycki, 1981) were described by the scientists of the Department of Systematics.

The preparation of monographs of individual genera in Poland, southern Europe, and the entire continent was an important research project of the Department. Among the described genera were *Melampyrum*, *Scabiosa*, *Hieracium*, (A. Jasiewicz), *Crataegus*, (M. Gostyńska-Jakuszewska), *Alchemilla*, (M. Pawlus) and others. Also important were detailed descriptions of critical species, e.g. *Rhinanthus serotinus* M. Mizianty and monographic descriptions of genera *Molinia* and *Deschampsia* (L. Frey). The Department was also involved in research and coordination of the national studies on threatened and endangered species of Polish flora. In 1988 the first part of the work, edited by A. Jasiewicz, containing short monographs of 38 endangered species was published. The second part is in preparation.

The Department has cooperated with many foreign scientific centers. Fruitful partnerships have

been formed with the Institute of Botany of the Lithuanian Academy of Sciences in studies on the boreal species of the Baltic Coast; scientists from Tallin, Estonia, on systematics and geographic distribution of orchids; and the Institute of Botany of the Bulgarian Academy of Sciences, on flora of the Pirin Mountains.

As a result of restructuring of the Institute, in February 1993, the Department of Systematics merged with the Departmemt of Variability of Plants into the Department of Systematics of Vascular Plants.

4.5. Department of Systematics of Vascular Plants (since 1993)

Head: Prof. JERZY STASZKIEWICZ

4.5.1. Laboratory of Variability of Plants

Employees: Prof. Dr. JERZY STASZKIEWICZ (head), Doc. Dr. MARTA MIZIANTY, Doc. Dr. LUDWIK FREY, Dr. JANUSZ WÓJCICKI (adjunct), Ms. MAGDALENA KUŻDŻAŁ M.Sc (assistant), Ms. ANNA TRELA, M.Sc. (50% time technical support staff).

Research topics: Studies are analogous to the recent studies in the Department of Variability of Plants. These taxonomic studies use modern numerical methods in which population analysis, chorology, and metric, karyologic and chemical properties are included such as:

1. Variability and taxonomy of critical vascular plants.

Genera *Avenula*, *Trisetum*, *Koelaria*, *Avena Agrostis* (L. Frey), *Dactylis* (M. Mizianty), *Agropyron* (M. Kużdżał), *Camelina, Neslia*, *Veronica*, *Glyceria*, *Milium*, *Phleum* (Z. Mirek), *Veronica* gr. *hederifolia* (E. Cieślak, Z. Mirek), *Sanguisorba* (M. Mandecka, Z. Mirek), *Euphrasia*, *Centaurea*, *Pinus* (J. Staszkiewicz), *Saxifraga*, *Trapa* (J. Wójcicki).

2. Karyology

Number of chromosomes of the selected species of vascular plants are determined. In addition, for many years, cytological files of various genera and species both from Poland and abroad have been prepared (M. Mizianty, L. Frey), as well as the bibliography of chromosome banding patterns of flowering plants from the beginning of application of this method in the world (M. Mizianty).

4.5.2. Laboratory of Flora of Poland

Employees: Doc. Dr. ZBIGNIEW MIREK (head), Ms. ELŻBIETA CIEŚLAK, M. Sc. (assistant), Ms. MARIA MANDECKA M.Sc. (senior assistant), Ms. LUCYNA MUSIAŁ, M. Sc., Ms. DANUTA CYGANEK (75% time), Ms. BEATA NĘCKA (75% time) (technical support staff).

Research topics: Studies of the newly established Laboratory include:

1. Flora of Poland – vascular plants

Coordinated by Z. Mirek, project's goal is to publish a new, source monograph of Polish flora containing descriptions of about 2,600 species. This is an entirely new monograph of Flora of Poland that is not based on previously published Polish Flora. It will contain, among others, rich synomics and source information from the territory of Poland regarding detailed distribution, sites, phytocoenoses, information on the number of chromosomes, confirmed hybrids, characteristics of vertical distribution, etc.

2. Vascular plants of Poland – a key for critical identification of the flowering plants and ferns

This will be a field key for identification of plants developed by a team led by Z. Mirek, which consists of about a dozen persons from several Polish institutions.

3. Regional Polish flora and chorology of the selected species

There are under study the flora of the Tatra Mountains and Podtatrze (Z. Mirek), chorology of *Dactylis glomerata* (M. Mizianty), *Agrostis rupestris* and *A. alpina, Holcus lanatus* and *H. mollis* (L. Frey).

4. Documentation and data management

The bibliography of Polish flora (vascular plants) is developed in the Laboratory of Flora of Poland. The main goal is to publish a complete bibliography of vascular plants as a basis for a new edition of the *Flora of Poland*.

In addition, the collections of the herbarium will also be inventoried. A goal of this inventory is to create a central computer database for information on the content of 54 Polish herbaria, with a special emphasis on the existing type of nomenclature.

4.5.3. Laboratory of the Atlas of Flora of Poland (Wrocław, 1954–1994)

Employees: Dr. ANDRZEJ CHLEBICKI (head 50 % time), Prof. Dr. JÓZEF MĄDALSKI (emeritus), BARBARA WIŚNIEWSKA, M. Sc. (technical support staff).

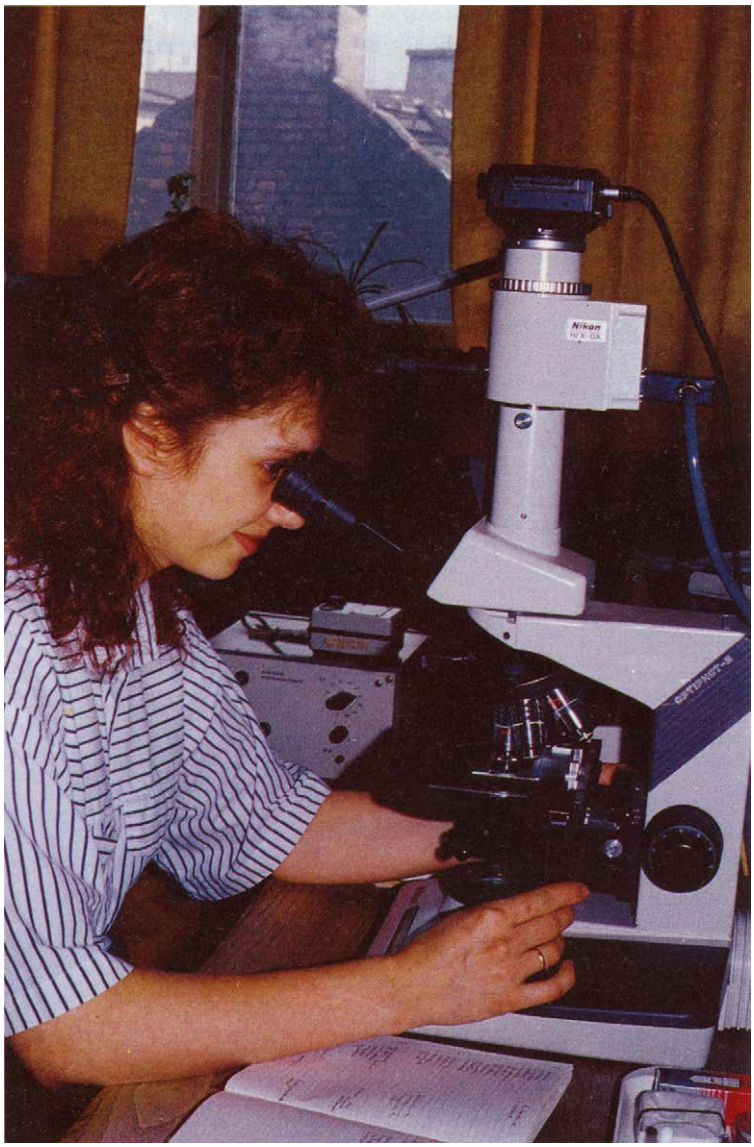
The activity of this Laboratory is limited to editing the *Atlas of Flora of Poland and Neighboring Countries*. This work was initiated by Prof. Stanisław Kulczyński in 1930, and until World War II, six volumes with 198 tables were published. S. Kulczyński then transferred the authorship of the *Atlas* to Prof. Józef Mądalski who, on behalf of the Institute of Botany, PAS, coordinated this work in 1954–1984. During that time 33 volumes containing 1 181 tables were published. This is a highly respected scientific publication that has attracted much interest abroad and has been a significant to the publication exchanges between the library of the Institute and foreign libraries. The scientific descriptions in the Atlas were published both in Polish and Latin languages.

In 1984, due to his advanced age, Prof. J. Mądalski transferred the leadership for the *Atlas* editing to Dr. Tadeusz Tacik, who was a head of the Laboratory until 1989. Currently, A. Chlebicki is managing the Laboratory. On February 14, 1991, the Laboratory decided that because of the slow progress of work, the format of the *Atlas* would be changed and the new publication will be published in a modified format, both in Polish and English, and will be closely linked to the new edition of the *Flora*. The current work will encompass the Polish flora in the present political boundaries. At the beginning of 1995 the Laboratory of the Atlas of Flora of Poland is transfered from Wrocław to Kraków and joint with the Laboratory of Flora of Poland.

4.6 Department of Algology

Employees: Dr. KONRAD WOŁOWSKI (head), Ms. AGATA WOJTAL, M. Sc. (assistant), Ms. JADWIGA GRZBIELA, M. Sc. (50% time), Ms. JOLANTA PAJĄK, M. Sc., Mr. MAREK VEREY, M. Sc., Ms. LUCYNA ŻAK-EL-SHAHED (technical support staff). Cooperators: Prof. Dr. JADWIGA SIEMIŃSKA, (emeritus), Prof. Dr. TERESA MROZIŃSKA (emeritus), and Dr. WIESŁAWA PRZYBYŁOWSKA-LANGE (emeritus).

The Department was established in May 1954 as national center for algal research in Poland. The idea was initiated in Kraków by Prof. Józef Rostafiński, the founder of the Polish Phytological school in the 19th century. His work was continued, among others, by Jadwiga Wołoszyńska and Kazimierz Rouppert. Prof. Karol Starmach, a student of Rouppert, established and organized first the Laboratory, and later the Department of Algology. The goals of the Department were to train new specialists from the entire country and to describe critical taxonomic



Department of Algology – Nikon Microscope, the newest purchase of the Department

groups of alga. To improve the quality of work and to train new researchers, K. Starmach proposed to edit a new series, *Fresh-water Flora of Poland*, which includes field keys for identification of individual species of various systematic groups.

While preparing plans for the Department research program, Prof. K. Starmach emphasized a need to develop and publish a bibliography of the algal flora of Poland, and to prepare an inventory of algae taxons from Poland on the basis of the algal bibliography, collection of wet materials, herbaria, and dry specimens. The main goal for the newly established Department was to edit the book *Flora of Poland*, which would contain critical monographs on individual groups of algae. Prof. Starmach also proposed that the Department would describe algal

flora from different, previously non-described or interesting physiographical units of Poland. The research program was subsequently fulfilled and developed by Prof. J. Siemińska, Prof. K. Starmach's pupil, who led the Department until her retirement in 1992. The main publication *Fresh-water Flora* has been almost completed (16 volumes have been published and 4 are currently prepared). Despite the fact that the series has been published in Polish, it has received much international interest because of the comprehensive descriptions of species from all the continents and the updated, well-illustrated keys.

The research record of the Department in the area of systematics and physiography is substantial and diversified. The physiographic studies of algae concentrate mainly in the Kraków-Częstochowa

Department of Algology – work in the iconotheca

Upland, the Tatra Mountains, the Pieniny Mountains, Nowy Targ peat bogs, area near Mszana Dolna, and Krynica, carp ponds, springs, streams, rivers and water reservoirs in southern Poland and the Białowieża National Forest. Changes in algal communities caused by anthropogenic factors have received special attention. Studies have also been done on algal communities in waters polluted mainly from sugar-factory sewage waters (K. Hojda). K. Wołowski was the first scientist worldwide to provide detailed description of algal communities of the open sewage treatment processing plants, and the first to describe two new species of diatoms usually mixed with the common species. He also indicated the practical importance of the "color aspects" of algal, fungal, and bacteria communities.

A major accomplishment of the Department was the publication of the *Polish Phycological Bibliography* (J. Siemińska, J. Pająk), which contains not only examples of the current and fossil alga of Poland but also the Polish contribution to knowledge of the worldwide algal flora. This work acknowledges also various publications dealing with utilization, cytology, genetics, ecology and physiology of algae. It contains current data to 1990 including the oldest positions, e.g. first annotation on alga in the Polish language literature of the Polish Renaissance naturalist Jan Stanka (1472).

The index of the Polish taxons, which has been compiled for many years, will be the basis of a publication *Index of Latin Names of the Polish Algae*. As a result of the taxonomic studies, many new taxons of the order *Oedogoniales* (T. Mrozińska) and two euglena species (K. Wołowski) have been described. Gradually, also the fossil algae were included in the studies of the Department of Algology. W. Przybyłowska-Lange has studied the Quaternary diatoms from the sediments found in lakes and in the Vistula Bay. In recent years she conducted interesting studies on succession of the diatoms in the profile of the sediments from Ferdynandów, and in addition she documented the palynological description of a new Ferdynandów Interglacial. An interesting discovery of the unknown diatoms in the granitic layers of the marbles of the Devonian period in Przeworno was made by Prof. Barbara Kwiecińska of the Academy of Mining and Metallurgy. Prof. J. Siemińska scientifically documented the discovered diatoms.

The Department has been involved in training specialists in phycology. Eleven persons from various institutions (Institute of Botany of the Polish Academy of Sciences, Institute of Botany of the Jagiellonian University, the Silesian University, the Pedagogical College in Kraków, the Institute of Environmental Planning in Katowice) have earned degrees of Doctor of Philosophy, and one person has earned a degree of Habilitated Doctor. The employees of the Department maintain close ties with all the Polish scientific institutions and many foreign institutions. Research training of the foreign specialists have also been organized in the Department – for instance, Dr. An Gi Sun submitted for publication two of his manuscripts completed in the Department.

The Department of Algology has enough area for its activities; however, it is lacking a room in which modern "live" collections could be bred. The Department is well-equipped (microscopes and computers), and has access to the electron microscope in the Environmental Laboratory. The Department has a unique collection of algal drawings that is used both by Polish and foreign specialists.

Research topics:

1. Taxonomy

Taxonomic studies on the selected systematic groups of algae-*Euglenophyceae*, *Vaucheria* (*Xanthophyceae*) and *Bacillariophyceae* of the Kraków-Częstochowa Plateau.

2. Physiography

Description and collection of the basic physiographic documentation of Polish flora: bibliography, index of Latin names of species, collection of drawings of algae.

3. Fossil algae

Studies on the remnants of diatom marbles from Przeworno.

4. Taxonomy and stratigraphy of diatoms from the Ferdynandów Interglacial.

5. Studies of euglena from the French Jurassic and the Bratislava area.

6. Freshwater flora of Poland and Flora of Poland.

Description of *Mesotaeniales* (*Chlorophyta*) for the *Freshwater Flora of Poland* (under the leadership of Dr. G. Tomaszewicz) and of Charophyta for the *Flora of Poland* (under the leadership of Prof. K. Karczmarz) have been prepared with the assistance of scientists from other institutions.

4.7. Laboratory of Bryology

Employees: Prof. Dr. RYSZARD OCHYRA (head), Ms. HALINA BEDNAREK-OCHYRA, M. Sc., (senior assistant); Ms. KATARZYNA NOGA (technical support staff).

The Laboratory of Bryology was established in 1953 and was upgraded to the level of a department in 1956. The Laboratory was established by Prof. Bronisław Szafran, who was its first head until he died in 1968. In 1969 the Department of Bryology merged with the Laboratory of Lichenology into the Department of Bryology and Lichenology under the leadership of Doc. Dr. Janusz Nowak. In 1988 the Department was divided into two separate units, the Laboratory of Bryology and the Laboratory of Lichenology. Prof. R. Ochyra has been the head of the Laboratory of Bryology since that time.

The activities of the Laboratory may be distinguished by two separate periods: the first, in 1953–1970, and the second, since 1976, when Prof. Ochyra was employed. In the first period, both Prof. B. Szafran and his students, Dr. Marian Kuc, Dr. Maria Wacławska, and Ms. Alicja Pałkowa, M. Sc. were employed in the Laboratory. At that time the research activities focused mostly on the taxonomic and geographical studies of the flora of mosses of Poland. The first and unique work, *Flora of the Mosses of Poland*, was published which is considered the most important accomplishment of the Laboratory. A monograph of mosses for the *Freshwater Flora of Poland* by B. Szafran (1963) was also published. The majority of work during that period focused on the flora of bryophytes in southern Poland, and the most noteworthy work in that area, *Bryoflora of the Southern Uplands of Poland* (M. Kuc), was published. That book summarized many individual publications dealing with individual geobotanical regions of that area. Descriptions were also provided of mosses of the Beskid Śląski and Beskid Mały, the Pieniny Mountains, the Miechów Upland, southern parts of the Kraków-Częstochowa Upland, and the reserve areas on the lower Nida River (B. Szafran), the Beskid Niski Mountains, Miechów Upland, and the Nida Valley (Z. Wacławska), and of the liverworts of the Ojców National Park (A. Pałkowa). In addition, Prof. B. Szafran often cooperated with the Department of Paleobotany, determining fossil mosses for various monographs, e.g. flora of Krościenko, Stare Gliwice, and Gdów Bay.

In the late 1950's the broad-scale studies of the flora of Spitsbergen began (M. Kuc). As a result of those studies a manuscript describing flora of mosses of Horsund was published in 1964; this work is one of the most important descriptions of the Arctic mosses in Europe.

From 1970 to the end of 1976, the activities of the Laboratory were temporarily delayed because of the deaths or separations from work of all the employees.

The new period of the Laboratory's activities

Laboratory of Bryology

started in 1976. Initially, R. Ochyra was the only bryologist employed; however, he was later joined by H. Bednarek-Ochyra (1986) and K. Noga (1988) as the technical support person. Ms. Lidia Gos, M. Sc., of the Gdańsk University, cooperated with the Laboratory while working on her Ph. D. dissertation.

Research topics: The research is focused mostly on the taxonomy and bryogeography of the mosses of Poland and also exotic mosses, mainly from the Antarctica and tropical Africa.

1. Taxonomy

Taxonomies of many genera, among others *Sciaromium*, *Limbella*, *Handeliobryum*, *Sciaromiopsis*, *Vittia*, *Platylomella*, *Scieriomiella*, *Cratoneuron*, and *Holodontium* (R. Ochyra) has been revised. In addition, revisions of the order *Seligeria* in Europe (L. Gos), and *Racomitrium* in Poland (H. Bednarek-Ochyra) have almost been finished.

R. Ochyra has described a total of 19 new genera, 11 species, 4 families and 2 sub-families of bryophytes. In addition, a taxonomic revision has been prepared of the family *Amblystegiaceae* outside of the Holoarctis, as well as regional descriptions of the same family for the *Flora Neotropica*, *Flora and Fauna of Australia*, *Flora Criptogamica de Tierra del Fuego*, and *Flora of Southern Africa* (R. Ochyra). H. Bednarek-Ochyra is currently describing the genus *Racomitrium* for *Flora Neotropica*.

The most important taxonomic project is a descriptive publication *Moss Flora of the Antarctica* (R. Ochyra) which will contain keys, descriptions, and full iconography of all known species from that continent.

2. Floristics

The domestic floristic studies focus on the areas in which biogeographical knowledge is not well developed. The main goal of such studies is to provide data for the *Atlas of the Geographical Distribution of Mosses in Poland*. Among others, the moss flora of the Hel Peninsula (1988), Skalice Nowotarskie, Skalice Spiskie, and the Little Pieniny Mountains (R. Ochyra, 1984) have already been described. Studies on the moss flora of the Pojezierze Sejneńskie (R. Ochyra, H. Tomaszewicz), the Suwałki Landscape Park (R. Ochyra, L. Gos, H. Tomaszewicz), and the Polica Range in the Western Carpathians (R. Ochyra, H. Bednarek-Ochyra, L. Stuchlik) are in progress.

The critical index of the mosses of Poland has also been prepared (R. Ochyra, P. Szmajda, 1978), and its new updated version is currently prepared for printing.

The floristic and taxonomic studies conducted by R. Ochyra outside of Poland led to discoveries of several mosses new for Europe, e.g. *Racomitruium lamprocarpum* (C. Muell.), Jaeg. or *Schistidium andreaeopsis* (C. Muell.) Lazar., and about 30 new species for the Antarctica and also for other continents.

Many floristic studies for the tropical eastern Africa have been conducted in cooperation with Prof. T. Pocs from the Institute of Botany of the Hungarian Academy of Sciences, and the results are published in the series *East African Bryophytes*. The cooperators also published the first summary of the bryoflora of Zambia (R. Ochyra, P. Phiri, 1988) and Mozambique (R. Ochyra, T. Pocs, 1986).

Studies conducted in the Laboratory resulted in the first description of the liverworts of the Antarctica (R. Ochyra, J. Vana, 1989), broadly presenting local distribution, ecology, and geography of these plants, and also containing an index of all presented liverworts of this continent.

3. Terminology

Suggestions to preserve the well known names of moss genera such as *Schistidium* Bruch & Schimp., *Drepanocladus* (C. Muell.) G. Roth, and *Haplocladium* (C. Muell.) C. Muell. have been proposed as a result of the terminological studies conducted by R. Ochyra.

4. Chorology

A unique *Atlas of the Geographical Distribution of Mosses in Poland* is being prepared presenting bryogeographic monographs of the individual moss species, original maps of their distribution in Poland, Europe, the Northern and Southern Hemispheres, and worldwide. Currently 8 volumes with 80 species have already been published.

5. Karyology

The karyologic studies are performed by R. Ochyra in cooperation with Doc. Dr. Elżbieta Kuta and Prof. Dr. Lesław Przywara of the Jagiellonian University. Several years ago a new program focusing on determination of the number of chromosomes of all species of mosses and liverworts in Poland was initiated. Currently more than 150 species have been karyologically described. In addition, the karyology of mosses of the Antarctica has been described, as well as systematic studies on mosses of New Zealand.

6. Bibliographies

R. Ochyra and H. Bednarek-Ochyra in cooperation with P. Szmajda are preparing a bibliography of the moss flora of Poland. R. Ochyra is preparing *Index Iconum Muscorum Africanorum* that will contain an index of iconography and bibliography all the moss species for tropical Africa.

7. Protection of mosses

R. Ochyra has prepared a "red list" of the threatened moss species in Poland (two editions: 1986, 1992). Studies on the selected species of the rare moss species with verification of their field sites have also been conducted. These studies have confirmed disappearance of the only stands of *Pseudocalliergon turgenscens* (Th. Jens.) (R. Ochyra, J. Baryła, 1990).

8. Herbarium publications

The main goal of these publications is to provide material for exchanges, and to present the newest taxonomic ideas, especially for the exotic mosses. Detailed information regarding these publications is presented in the section "Scientific Collections."

4.8. Laboratory of Lichenology (1957–1992)

The Laboratory of Lichenology was established in 1957 and until 1969 was led by Prof. Józef Motyka. Initially, the Laboratory was mostly involved in descriptive studies on lichen flora that were published in the series *Flora of Poland Lichens*. Currently, five volumes from that series have been published. In 1969 the Laboratory of Lichenology merged with the Laboratory of Bryology into the Department of Bryology and Lichenology that until 1988 was led by Doc. Dr. Janusz Nowak. The research programs of the Department included:

1. Taxonomy

Various groups of lichens, among others *Verrucariaceae*, *and Thelocarpaceae*, have been described. Some of these studies were conducted with the assistance of lichenologists from other institutions. In 1973, a key that determined 1,656 species of lichens, *Lichens of Poland*, was completed in cooperation with Dr. Zygmunt Tobolewski, the Adam Mickiewicz University in Poznań. More volumes for the series *Flora of Poland. Lichens* were also prepared.

2. Geography

Studies on horizontal distribution of lichens and geographic elements among the Carpathian lichens were conducted in the Beskidy Mountains. Materials have also been collected for the atlas of lichen distribution in the Polish Carpathian Mountains.

3. Phytosociology

Studies focused on the rock communities of the calciphilous lichens of the Kraków-Częstochowa Upland (J. Nowak), soil communities of the gypsum hills on the Nida River (J. Nowak), and communities of the epiphitic lichens in the Beskid Żywiecki Mountains (U. Bielczyk). In 1992, after J. Nowak's retirement, the Laboratory was incorporated into the laboratory of Mycology.

4.9. Laboratory of Mycology

The Laboratory of Mycology was established in 1956 from the suggestion of Prof. Szafer. Until 1959 only one permanent person was employed in the Laboratory. Prof. Alina Skirgiełło cooperated with the Laboratory since its creation, providing the necessary scientific supervision. Until recently she has also edited the series *Flora of Poland. Fungi*. Currently, 20 volumes from that series have been published. In 1962–1965 the Laboratory did not have any permanent employees and contracted research. Since 1965 the Laboratory has employed two to three permanent employees in Kraków, and one person in Warszawa (Dr. Tomasz Majewski, specializing in parasite fungi). A team for studies of the higher fungi was formed in 1969. The herbarium of fungi, formerly belonging to the Polish Academy of Arts and Sciences, has been arranged and incorporated into the main herbarium of the Institute.

Research activities have included flora, ecology, and distribution of fungi. Among others, the Macromycetes of the city of Kraków have been described (W. Wojewoda), as well as the effects of industry on macromycetes of the Copper Basin near Lubin (W. Wojewoda), and the distribution of macromycetes in the Polish Carpathian Mountains (W. Wojewoda, Z. Heinrich). Also foreign materials have been de-

scribed, from Japan (T. Majewski), the Polar regions (Z. Heinrich), and popular keys for the practical determinations of fungi (W. Wojewoda, B. Gumińska).

Activities since 1992

Employees: Prof. Dr. WŁADYSŁAW WOJEWODA (head), Dr. ANDRZEJ CHLEBICKI (50% time), Dr. HALINA KOMOROWSKA (50% time) adjuncts, Dr. ZOFIA HEINRICH, Ms. BARBARA PLEBAN, M. Sc. (technical support staff, team of mycologists); Dr. URSZULA BIELCZYK, Ms. BOŻENA JĘDRYCHOWSKA (technical support staff, team of lichenologists).

4.9.1. Team of Mycologists

General area of research. Taxonomy, floristic studies, ecology (threat to fungi, fungi as indicators of environmental changes, edible fungi, poisonous fungi), chorology. The studies focus on the following research problems:

1. Taxonomy

Taxonomic studies are conducted on various groups of fungi, including *Heterobasidiomycetes*, *Aphyllophorales*, and *Agaricales*. W. Wojewoda has published monographs of the orders *Septobasidiales*, *Auriculariales* and *Tremellales* (two books and several other smaller publications) occurring in the territory of Poland, Europe and worldwide. Currently, W. Wojewoda is describing the orders *Dacryomycetales* and *Tulasnellales* from Poland, and *Aphyllopharales* (mainly *Corticiaceae*) with a special emphasis on southern Poland. Z. Heinrich studies fungi of the family *Strophariaceae* (*Agaricales*) and is preparing for publication a monograph of the Polish species of genus *Hypholoma*.

2. Floristic studies

W. Wojewoda, Z. Heinrich and H. Komorowska are preparing for publication rich materials related to the macromycetes of North Korea that were collected during the scientific expeditions of the Institute's researchers during 1982–1986. Z. Heinrich is describing specimens of fungi from the Polar regions collected by the members of the joint scientific expedition of the Institute and the Institute of Botany of the Jagiellonian University. In addition, publications on regional fungal flora (i.e. southeastern Poland, Polish Carpathian Mountains) have been released.

A complete, critical index of the macroscopic *Basidiomycetes* in Poland does not exist. Since 1990 W. Wojewoda has been preparing such an index, *Checklist of the Polish Macroscopic Basidiomycetes*. This publication covers more than 2,000 species. For every species its current scientific name, most important synonyms, site, soil, threat, and importance for man and nature is described. In addition, chorographic information and citations of the most important taxonomic source with iconography are provided. The book should be published by 1996.

A project on Pyrenomycetes in the National Parks has also been performed (A. Chlebicki).

3. Ecology

The Laboratory participates in description of the endangered fungi in Poland. W. Wojewoda, Z. Heinrich and M. Ławrynowicz of the Łodź University, have published the "Red Lists" of such fungi. The first book (1986) described 800 species, and the second (1992), 1,013 species. Since 1955 W. Wojewoda has been conducting studies on changes in the fungal flora of the Kraków agglomeration. Preliminary results entitled *Changes in macrofungal flora of Cracow (S. Poland)* have been published in Switzerland. These studies will be continued and research on contamination of the edible mushrooms with heavy metals and radioactive elements will be particularly emphasized. The Laboratory has participated in investigations on the effects of a copper mine on mushrooms and the environment in the Copper Basin in southwestern Poland (Lubin and Legnica region). Similar studies have been conducted in the Niepołomice Forest near Kraków (H. Komorowska).

4. Chorology

Zofia Heinrich is studying distribution of species from the genus *Hypholoma* in the territory of Poland. Other distribution maps of various groups of fungi (including microscopic), which are presently investigated by the scientists of the Institute and mycologists from other institutions in Poland, will also be published.

5. Teaching and Popularization

Various teaching and popular-science publications have been prepared in the Laboratory. W. Wojewoda has been an author or co-author of textbooks, color atlases of edible and poisonous mushrooms, as well as popular science articles. He has also participated in various radio and TV programs devoted to popularization of knowledge about mushrooms. In addition, the Laboratory has also been organizing exhibitions of edible and poisonous mushrooms for the citizens of Kraków and the Kraków region.

4.9.2. **Team of Lichenologists**

General area of research: Taxonomy, floristic studies, chorology, and ecology of lichens (i.e. threat, protection in reservation areas, lichens as indicators of environmental changes). Studies are conducted in the following research problems:

1. Taxonomy

Monographic descriptions of the selected taxonomic groups are continued by J. Nowak. Recently he has submitted for publication the successive volume of the lichen flora on the *Physiaceae* family. He is presently preparing a new, second edition of a key for species determinations entitled *Polish Lichens*, including all the known species of Poland and the neighboring countries.

2. Chorology

In cooperation with Prof. S. Cieśliński of the Pedagogical College in Kielce, U. Bielczyk is preparing maps of distribution of the selected species of lichens that will be included in the *Atlas of the Geographical Distribution of Lichens in Poland*.

3. Ecology

U. Bielczyk is planning participation in studies on lichens as indicators of changes in environment of the Kraków agglomeration and the vicinity of Kraków, e.g. the Ojców National Park.

4. Popularization

Exhibition of lichens as bioindicators has been organized in Kraków, Warszawa-Powsin and Bolestraszyce near Przemyśl

5. SUPPORT SERVICES

5.1. Scientific Collections

5.1.1. **Herbarium**

Curator: Prof. Dr. LEON STUCHLIK

The Herbarium of the Institute is divided into four parts:

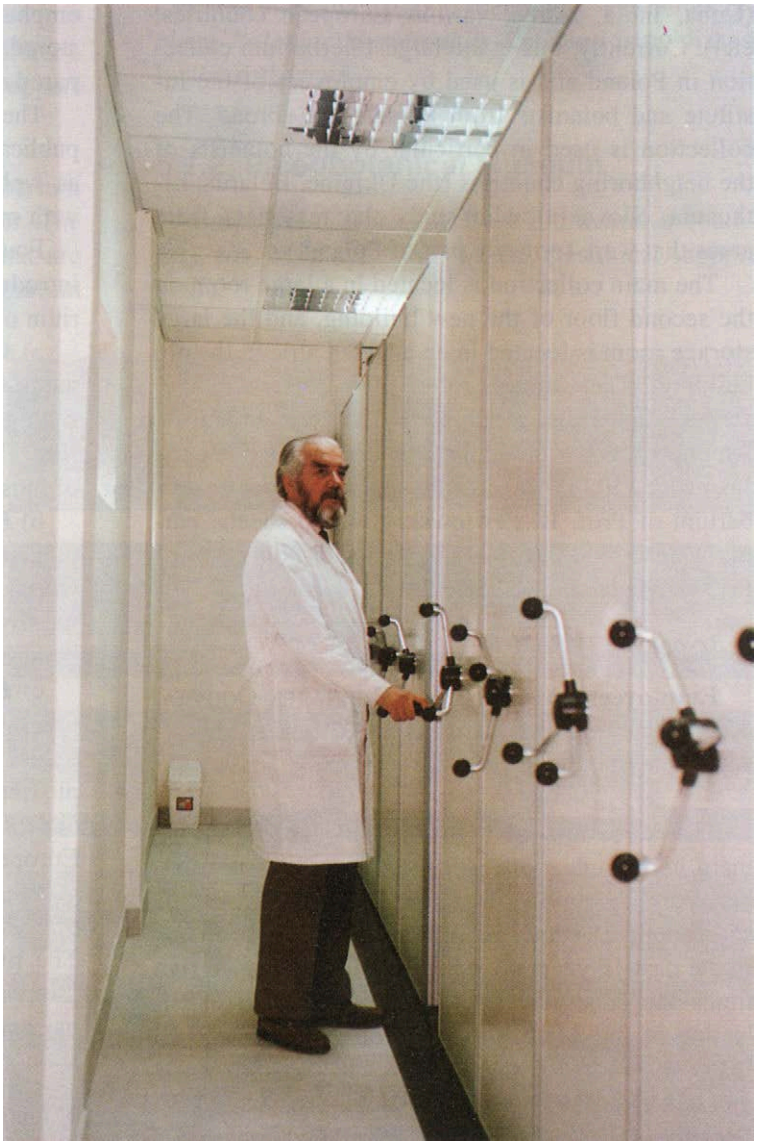
1. Vascular plants (KRAM)

Employees: Dr. ZBIGNIEW MIREK (curator), Ms. DANUTA CYGANEK and Ms. BEATA NĘCKA (technical support staff).

On the work in the Herbarium

The herbarium is located in the building on the first floor and newly adapted basement. Plants in the herbarium are glued to sheets of paper bound together and stored in metal cabinets. The herbarium is organized according to the Durand system. The collections in the main herbarium and Prof. Pawłowski's collection have been cataloged. All of the undescribed specimens are stored in the herbarium storage room located in the old building on the fourth floor.

In 1962, when the Herbarium was acquired from the Physiographic Committee of the Polish Academy of Arts and Sciences, it consisted of 120.000 sheets. In 1990 the collection consisted of 380.000 sheets. All the herbarium sheets have been numbered and plants attached to them. This rapid in-



A Fragment of the Herbarium in the new adapted basement

crease in the number of specimens has occurred mainly because of the collection expeditions organized by Prof. A. Jasiewicz, head of the Department of Systematics. During such expeditions new specimens for the Herbarium were acquired and series "centuria" for the specimen exchanges were also completed. For that purpose a special herbarium edition *Flora Polonica Exsiccata* has been prepared. Seven of such "centurias" have been prepared and mailed. Plants that were acquired through such exchanges greatly complemented the development of the herbarium collections. Plant specimens have been exchanged with 70 foreign institutions. Collections of the herbarium have also increased by acquiring collections prepared by the Institute's scientists after local floral descriptions were completed (Gubałówka, Polica, Działy Orawskie, Pieniny, etc.), or after long-term foreign expeditions

(Cuba, India, Korea, various European countries, etc.). Currently, this is the largest herbarium collection in Poland and is used by employees of the Institute and botanists from Poland and abroad. The collection is used in particular by the botanists of the neighboring countries (the Ukraine, Belarus, Lithuania, Slovakia) who study the materials from areas that were formerly part of Poland.

The main collection is located in a large room on the second floor of the new building, and the large storage room is located in an adapted attic in the old building. The storage room also contains undescribed materials collected by various botanists. Among others, it contains a collection of Prof. A. Jasiewicz (50,000 sheets), as well as a separate herbarium of Prof. B. Pawłowski (30,000 sheets, partially described). In 1991, a valuable collection of Prof. J. Mądalski was added to the herbarium.

2. Bryophytes (KRAM-B)

Employees: Ms. HALINA BEDNAREK-OCHYRA, M. Sc. (curator), Ms. KATARZYNA NOGA (technical support staff).

The herbarium of bryophytes is located in the main herbarium room. All the specimens are numbered and the numbering. Until 1976 the collections of bryophytes consisted only of 25.000 specimens. In the past 15 years the collection has increased five times and contains 120,000 specimens. A rich collection of the African mosses collected by Prof. S. Lisowski (12,000 specimens) and herbarium of mosses of northern Poland collected by Doc. Dr. L. Olesiński (5,000 specimens) are still awaiting incorporation into the bryophytes herbarium.

The herbarium is organized systematically – liverworts are arranged according to the Schuster system, and mosses according to the Fleischer-Brotherus system. The specimens are stored in paper bags that are loosely stored in cardboard folders. A geographic key is used for the most numerous species. Although the herbarium consists of collections from the entire world, the African, Antarctic and Australian collections of mosses are primarily emphasized. About 600 nomenclature types are stored in the herbarium, and a catalog is being prepared of these.

The herbarium contains many important exsiccate publications, both historical (L. Rabenhorst, E. Bauer) as well as contemporary. Specimens are exchanged with more than 70 institutions and private parties.

Four editorial series, both of the domestic and introduced bryophytes, are published by the Herbarium of Bryophytes:

a) *Musci Poloniae Exsiccati* (R. Ochyra, H. Bednarek-Ochyra) – published in series "centuria" consisting of 100 issues; in 1978–1993 twelve "centurias" (No. 1–1200) containing species and varieties of mosses from various regions of Poland.

b) *Bryophyta Antarctica Exsiccata* (R. Ochyra) – published in 1984, containing 200 mosses and liverworts from the Southern Shetland Islands. This is the first and so far the only herbarium edition of the Antarctic bryophytes.

c) *Bryophyta Svalbardensia Exsiccata* (H. Bednarek-Ochyra, B. Godzik, K. Grodzińska) – published in 1988 contains four fascicles (No. 1–80) of mosses and liverworts of the Hornsund region. This is the first herbarium edition on the Arctic mosses in Europe.

d) *Bryophyta Africana Selecta* (R. Ochyra, T. Pocs) – has been published in a series of 25 issues. The first 8 series were published in 1992–93, and more series are in preparation. This is the first herbarium edition about the entire African continent south of the Sahara Desert.

3. Fungi (KRAM-F)

Employees: Prof. Dr. WŁADYSŁAW WOJEWODA (curator), Ms. Barbara Pleban, M. Sc. (technical support staff).

The herbarium of fungi is located in the adapted part of an attic, fourth floor of the old building. The fungal specimens are stored in paper bags that are placed on sheets of paper, tied in fascicles and stored in specially designed wooden boxes. The herbarium contains about 35,000 specimens.

4. Lichens (KRAM-L)

Employees: Dr. URSZULA BIELCZYK (curator), Ms. BOŻENA JĘDRYCHOWSKA (technical support staff).

The herbarium is located in the main herbarium room in the new building on the second floor. The lichen specimens are stored in paper bags that are vertically stored in cardboard boxes. The herbarium contains more than 40,000 specimens. The series *Lichens Poloniae Meridionalis Exsiccati* is published by the herbarium.

5.1.2. **Paleobotanical Museum**

Employees: Doc. Dr. EWA ZASTAWNIAK (curator), Ms. MARIA LESIAK, M. Sc. (technical support staff).

Portion of an exhibition in the Museum

The Paleobotanical Museum was developed and supervised since its creation until 1983 by M. Łańcucka-Środoniowa, and since 1984 by E. Zastawniak. The Museum is located on the third and fourth floors of the old building. The Museum contains contemporary scientific collectionsfor comparison and a small exhibition used for educational purposes.

Modern comparative collections

1. Collection of fruits and seeds (about 28,000 vials in the custody of Ms. Maria Lesiak, M. Sc.).
2. Palinological collection (16,000 specimens in the custody of Dr. Krystyna Skawińska-Wieser).
3. Dendrological collection (about 100 specimens in the custody of Ms. Zofia Tomczyńska, B. Sc.)
4. Collection of moss specimen and tissues of other plants composed of peat bogs (180 specimens in custody of Dr. Andrzej Obidowicz).
5. Collection of 158 cuticular specimens in custody of Grzegorz Worobiec, M. Sc.

Although European species comprise the majority of the collection, species from other regions of the world are also collected as indispensable for determinations of fossil flora. Species from Africa and Cuba are very well represented in the palynological collection.

Fossil Materials

Macroscopic remains of the floras described by the scientists of the Institute and of the Jagiellonian University are stored in the Museum and are available to interested parties. The collection also contains materials from some other fossil floras in Poland and abroad. The collections consist of: Mesophytic, Tertiary, and Quaternary floras. The Tertiary and Quaternary collections contain specimens that have already been described and cataloged, as well as those that have been either evaluated on a preliminary basis or have not been studied.

The Mesophytic floras contain materials from several sites in Poland. These are the petrified plant fragments and microscopic specimens of leaves, stems and other organs of the gymnosperms. Seven nomenclature types are contained in the collection of the Mesozoic floras.

Tertiary floras contain materials from 292 sites, including 156 outside of Poland, mainly from Europe, Antarctica and Spitsbergen. These materials consist of various fragments of fossil fungi, mosses, water fern sporas, various fragments of gymnosperms and angiosperms, insect cocoons, caprolites, zoocecidia, samples of sediments, and other specimens that are helpful to palinological and carpological analyses. These specimens belong to 1,139 taxons, mainly species, more rarely genus or family, and very rarely as variety. The Tertiary collection contains 60 nomenclature types.

The Quaternary floras contain materials from 319 sites, including 60 outside of Poland, mainly from Europe but also from China, India, Japan, and Mongolia. The majority of the collection consists of the flowering plants, and oosporas of *Charophyta*, fungal sclerotes, fragments of mosses and liverworts, horsetails (rhizomes), massulae spores and fern leaves, insect cocoons and *Bryozoa*. A catalog of taxons, described mostly for species, contains 1,221 cards. Six nomenclature types are in the collection of the Quaternary floras.

Documentation

Several card indices containing information on Tertiary floras of Poland and abroad, Quaternary floras of Poland, and bibliography on morphology of sporomorphs and diaspores have been developed in the Department.

Archives that contain unpublished tables of the described sporomorphs in pollen spectra of the studied profiles, protocols of pollen spectra, paleobotanic expert opinions, as well as materials inherited from the former employees of the Department are in the custody of Ms. Zofia Tomczyńska, A.E.

5.1.3. **Iconotheca of Algae**

Curator: Prof. Dr. JADWIGA SIEMIŃSKA

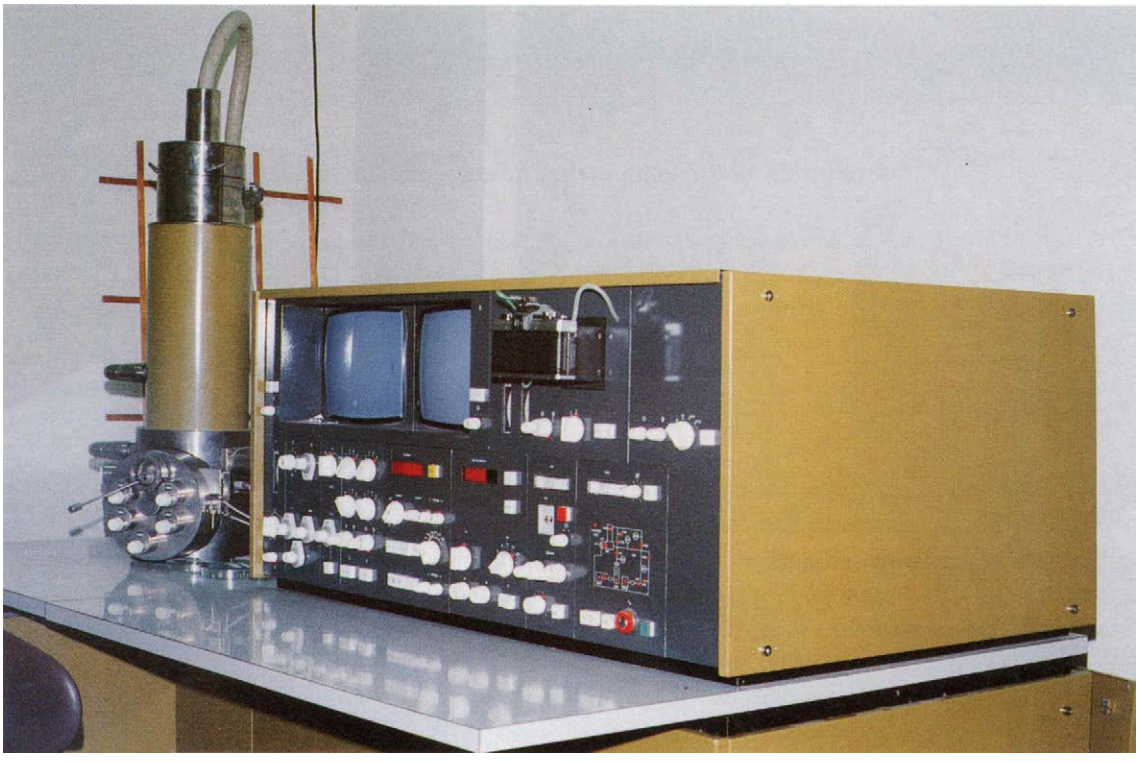
The collection is located in the Department of

Algology, in the new building. Created by Ms. Anna Siemińska, it contains more than 350,000 taxons, including synonyms, and bibliography of the cited publications. The collection was initiated in 1959 and is similar to the unique "Fritsch collection of algal drawings" of the Windermere Laboratory in England.

Drawings and photographs (and recently also Latin diagnoses) have been copied from Polish and international literature and placed on separate cards for each taxon within individual systematic groups. These materials are indispensable especially when the microscopic specimens cannot be preserved and stored in herbaria. Illustrations and diagnoses from the current literature supplement monographs that are used for identification of species for various regional descriptions of floras, ecological diversity, etc. This collection is used for the continuous updating of taxonomy of various species.

5.2. Laboratory of Electron Microscopy

The Laboratory has been in operation since 1990 when a scanning electron microscope Tesla 301 was installed. Ms. Zofia Petri, M. Sc., is head of the Laboratory. Since its creation, the Laboratory has co-operated closely with the Laboratory of the Electron Microscopy and X-ray Microprobe of the Laboratory of Physicochemical Analysis and Structural Studies at the Jagiellonian University. On the basis



Laboratory of Electron Miscroscopy-scanning electron microscope Tesla 301

Laboratory of Electron Microscopy – Joel sputter

of a long-term agreement signed in 1993, the scientists of the Institute of Botany have had access to modern, state-of-the-art electron microscopes made by the Phillips Company: scanning-transmission EM 301 (100kV) equipped with a system of microanalysis EDS Kevex (USA); scanning microscope XL30 equipped with a microanalysis system type EDS (Link Company); and a high resolution transmission microscope CM20 (200kV), as well as scanning microscope Jeol 50FX. The Laboratory of Electron Microscopy has mostly prepared scanning micrographs for the Departments of Paleobotany and Algology. An average of about 850 sessions (micrographs of 110 samples) have been done annually.

5.3. Laboratory of Scientific Photography

The Laboratory was developed in 1956 to produce photographic documentation of scientific work of all the Departments of the Institute, primarily for the Department of Paleobotany and the Department of Algology. All of the paleobotanic monographs of W. Szafer and other scientists contain complete photographic documentation made in the Laboratory. The quality of the documentation is very high, although photographing some of the specimens (small seeds, leaf imprints, etc.) may be externally difficult. Mr. Stanisław Łuczko, M. Sc. was the first head of the Laboratory, and for the past 25 years the

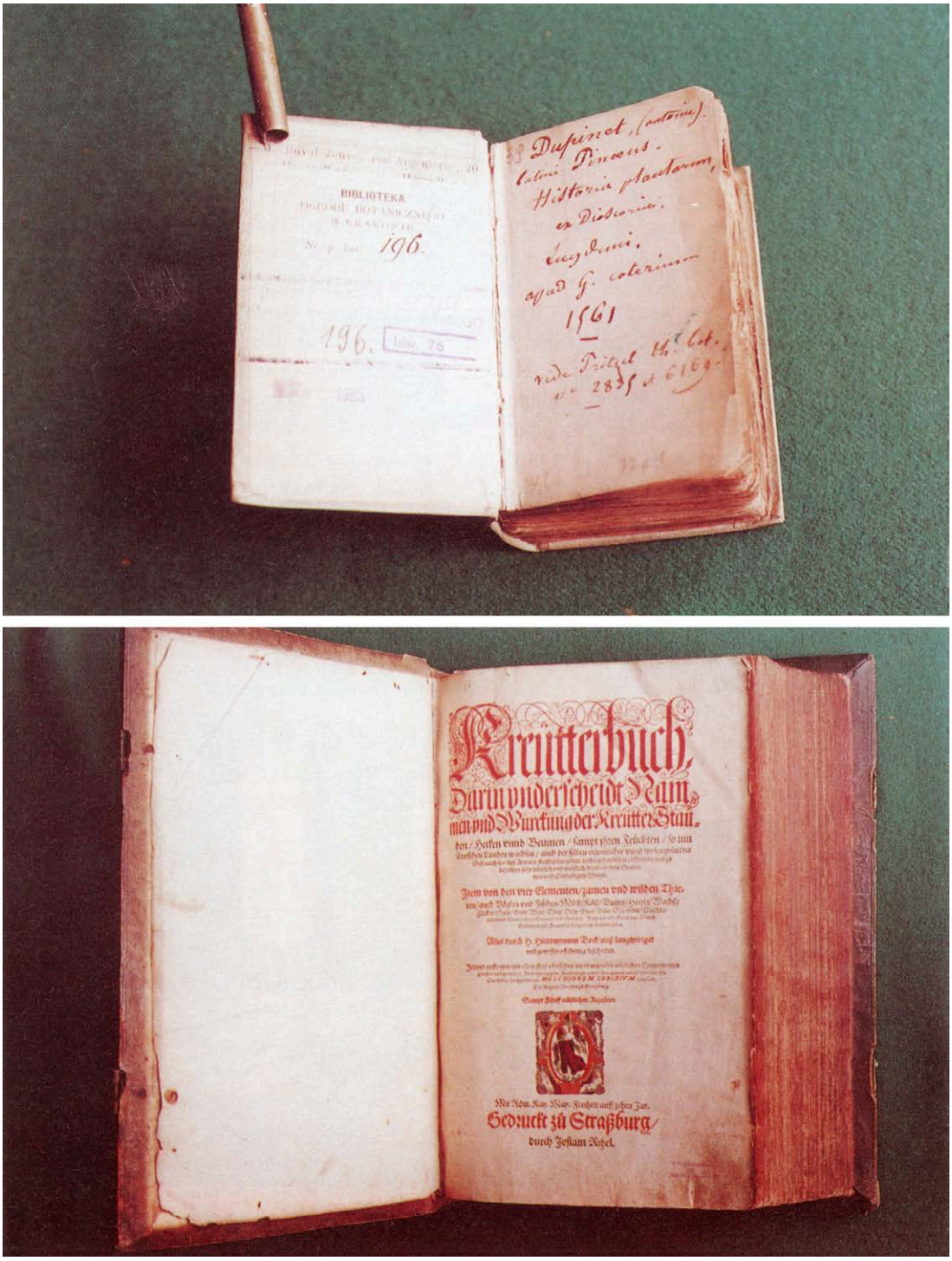
Laboratory has been managed by Mr. Antoni Pachoński. Full photographic documentation of paleobotanical research and all the photographs for the Algal Iconotheca have been made in the Laboratory. Because the Laboratory is adequately equipped, the work is very effective. About 1,300 negatives, 700 slides, 4,500 enlargements from negatives, and 220 films are developed annually in the Laboratory.

5.4. Library

Employees: Dr hab. ANDRZEJ JANKUN (head), Ms. BOŻENA PIETRAS, M. Sc., Ms. MAGDALENA NOWAK, M. Sc. (senior curator), Ms. IZABELA MARCZYŃSKA, M. Sc. (curator), Ms. HANNA MIŁOWSKA, Ms. LIDIA NOWAK M.Sc., Ms. BARBARA ZNAMIEROWSKA, (senior librarians), Ms. BERNADETA PAWLIK (storage specialist)

The common library of the Institute of Botany of the Jagiellonian University and Institute of Botany of the Polish Academy of Sciences is the largest botanical library in Poland. Its creation and development are closely related to the history and changes of two institutions: the Department of Chemistry and Natural History and the Botanical Garden of the Jagiellonian University. The first purchase of botanical books in 1794 is considered the beginning of the Library. The Library still owns four volumes by N. J. Jacquin, *Icones Plantarum* (published in 1781–1793), which were included with the first purchase.

Library – Portion of the exhibition of new book arrivals



The smallest and one of the oldest books in the Library (top) and the Kreutterbuch of H. Bock from 1580 (bottom)

Beautiful leather cover of Kreutterbuch by H. Bock from 1580

In the mid-19th century, according to the ruling of the Chancellor of the University, the collections were managed by the Jagiellonian Library. At the end of the 19th century an independent library belonging to the Botanical Garden was developed. In 1896 that library contained more than 500 volumes. The next inventory from 1923 showed 3,500 volumes. This collection consisted mainly of purchases and subscriptions from all over Europe, and also substantial gifts from University professors (e.g. Marian Raciborski, Józef Rostafiński, Aleksander Ślędziński, and others).

After World War I, in 1923, Jadwiga Dyakowska started working in the Library of the Department of Systematics and Geography of Plants and the Botanical Garden of the Jagiellonian University. During that time she was an Assistant Professor of the Department, becoming later a full Professor of the

Jagiellonian University. She was head of the Library until her retirement in 1976. In the 1920's the exchanges of publications started to develop, and currently exchange remains the primary means of acquiring publications by the Library. Thanks to Prof. Jadwiga Dyakowska, the Library survived the period of the Nazi occupation, and the number of books even increased by about 500 volumes.

After World War II, increase of the Library collection was minimal. In 1953, establishment of the Department of Botany of the Polish Academy of Sciences and the combining of the two libraries into one central library resulted in its development. At that time the Library had 6,334 volumes of books and journals and a large collection of copies of reprints (about 20,000). Prof. W. Szafer, the organizer and director of the two institutes, understood the value of the library for science. His goal was to establish in Kraków a central library for botanical sciences with the financial help of the Polish Academy of Sciences. Much more funds were available for book purchases in the Institute than in the Institute than in the Department of the University and therefore an increase was also unproportionally higher in the Institute: for instance, 154 books were acquired by the Department and 210 by the Institute in 1954; and in 1960 the Department acquired 99 books while the Institute acquired 882. In addition, exchanges with other libraries were very dynamic: in 1960's and 1970's the Institute of Botany PAS established 450 exchange partners and the Institute of Botany UJ established 150. Although recently the number of the partners was reduced by one-third, the exchanges still remain an important source of new acquisitions (as well as purchases of books, new publications and acquisitions of collections, such as

The largest book in the collection, the Banksias

those of Jadwiga Wołoszyńska, Władysław Szafer, Tadeusz Wilczyński, and Bogumił Pawłowski).

The Library collects specialistic collections from the areas of botany, paleobotany and related disciplines such as forestry, nature preservation, environmental protection, agriculture, soil sciences, geology, archeology, etc.

At the end of 1992, the Library had 146,658 volumes, including 111,540 books and booklets, 31.350 volumes of journals, 3,768 maps, and 630 microforms.

In addition to the basic collections of books, journals, and booklets, the Library also has 736 old prints. The old prints have been collected by botanists and bibliophiles from the Kraków Region, mainly Józef Rostafiński, Władysław Szafer and Jadwiga Dyakowska. Among the oldest printed natural history books, or herbaria, the Library's collection includes:

Dorstenius Theodoricus – *Botanicon continens herbarum aliorumque simplicium*. Frankfurt, 1540 (the oldest book of the collection).

Lonicer Adam – *Vollständiges Kräuter-Buch oder das Buch über Reiche der Natur*. Augsburg, 1793.

Du Pinet – *Historia Plantarum ex Dioscorici*. Lughduni, 1561 (the smallest book in the collection – 8.2 x 12 cm).

Siennik Marcin – *Herbarz, to jest ziół tu-tecznych, postronnych i zamorskich opisanie*. Kraków, 1568.

Syreniusz Szymon – *Zielnik*. Cracoviae, 1613 (the thickest book of the Library – 11.2 cm).

Unique to Poland is the collection of old flora, containing many rare works, such as the first flora of the Tatra Mountains by G. Wahlenberg, *Flora Carpatorum Principalium exhibens plantas in Montibus Carpaticus inter flumina Waagum et Dunajetz* (Göttingen, 1814). The illustrated atlases of flora are notable because they are masterpieces of the printing art, e.g. Schmidel D. Casimirus Christophorus' *Icones plantarum et analyses partium aeri incisae atque vivis coloribus* (Erlangae, 1793).

Botanical Polish editions (Polonica 259 items) contain classical works of Polish botany of the 18th century, such as those by Krzysztof Kluk, Stanisław Bonifacy Jundziłł, Gabriel Raczyński and many others. Among the rarities are also old botanical textbooks, dating from the period of Carolus Linnaeus to the authors of the 19th century (Edward Strassburger, Józef Rostafiński), to the textbooks published in the first half of the 20th century (e.g. by Richard Wettstein, Dezydery Szymkiewicz, Emil Godlewski, and others).

The largest book in the collection is a beautifully edited description atlas by E. Rosser Celia and S. George Alexander, *The Banksias*, Vol. 1, London, 1981 (dimensions 77.5 x 55.5 cm).

5.5. Editorial Services

Employees: Mr. JACEK WIESER, M. Sc. (head), Mr. MARIAN WYSOCKI, M. Sc., Ms. ANNA WYROSTEK, M. Sc., and Ms. DANUTA JANIK (technical support staff).

Since 1953 when the Institute was established, until the 1980's most of the publications of the Institute were done by the Polish Scientific Publisher. The publishing cycle was relatively long, between 18 and 50 months. Because of the drastic reduction of budget for science in 1990, the Institute resigned from the services of the Polish Scientific Publisher. With the help of the Polish Academy of Sciences providing the adequate computer equipment, the Institute started its own editorial services unit in 1989/1990.

The Editorial Services were organized by Doc. Zbigniew Mirek with the assistance of Dr. Janusz Wójcicki. In the initial phase Prof. Ryszard Ochyra also helped to develop the Services. Until January 31, 1993 Dr. Zbigniew Mirek was in charge of the Services.

Publication of the Institute

Since February 1993, Mr. J. Wieser has been the head of Editorial Services. About 20 publications are published annually (about 250 publishing sheets, which is about two to three times more than in the 1980's). In the past 3 years major changes in the editorial policy of the Institute have occurred: the covers, general appearance of the publications, and quality of the paper were changed according to the international standards. A new journal was also established and is published only in English, French or Spanish and in 1993 from the journal Fragmenta Floristica et Geobotanicanew Series Polonica has been separated. In addition, the editorial cycle was shotened to about 3–12 months.

These and other changes have attracted not only Polish but also foreign authors to seek publication in journals and editorial series of the Institute. Thus, most of the best Polish manuscripts, and also valuable contributions of foreign authors, have appeared in the publications of the Institute, increasing their scientific and commercial value.

Journals and editorial series of the Institute, which are crucial for Polish botany, are available to all scientists and assist researchers throughout Poland.

LIST OF TITLES AND EDITORIAL SERIES PUBLISHED IN THE INSTITUTE OF BOTANY OF THE POLISH ACADEMY OF SCIENCES

Journals

Acta Palaeobotanica (ed. L. Stuchlik)

Fragmenta Floristica et Geobotanica (ed. R. Ochyra)

Fragmenta Floristica et Geobotanica, Series Polonica (ed. R. Ochyra, L. Frey)

Polish Botanical Studies (ed. Z. Mirek)

Polish Botanical Studies – Guidebook Series (ed. Z. Mirek)

Wiadomości Botaniczne (ed. B. Zemanek)

Floras

Flora Polski. Glony (ed. J. Siemińska)

Flora Polski. Grzyby (ed. A. Skirgiełło)

Flora Polski. Porosty. (ed. J. Nowak)

Flora Polski. Rośliny Naczyniowe (ed. Z. Mirek)

Mala flora grzybów (ed. S. Domański – series ended in 1992).

Flora słodkowodna Polski (ed. J. Siemińska)

Atlases

Atlas of the Geographical Distribution of Mosses in Poland (ed. R. Ochyra and P. Szmajda)

Atlas of the Geographical Distribution of Lichens in Poland (ed. S. Cieśliński)

Atlas of the Geographical Distribution of Liverworts in Poland (ed. J. Szweykowski)

Iconographies

Atlas flory polskiej i ziem ościennych (ed. J. Mądalski) (discontinued in original format).

Bibliographies

Bibliografie botaniczne (ed. J. Siemińska).

5.6. Administration

5.6.1. Secretariat and Bookkeeping Department

Employees: Ms. Helena Jurkiewicz (secretary); Ms. Anna Rusocka (scientific secretariat and personnel affairs); Ms. Zofia Rzepka (senior bookkeeper); Ms. Bogumiła Bakowicz, Ms. Bogusława Leśniak, and Ms. Urszula Rzepka (75% time bookkeepers).

5.6.2. Administration and Support Service Department

Employees: Mr. Marek Tyszkiewicz, M. Sc. (head); Ms. Wanda Kielar, Mr. Roman Dudzic (driver); Mr. Piotr Węgiel (worker), and three janitors.

6. IMPORTANT SCIENTIFIC ACCOMPLISHMENTS OF THE INSTITUTE

A modern basis for scientific research in the areas of taxonomy, plant ecology, and paleobotany has been established at the Institute. The book *Flora of Poland. Vascular Plants* has been published, as well as two volumes of *Flora of Poland. Mosses* and publication of *Flora Grzybow* (*Flora of Fungi*) (20 volumes), *Flora of Poland – Lichens* (6 volumes). Similarly, *Flora Słodkowodna (Fresh-water Flora)* has been submitted for publication as well. Keys for determinations of fungi and lichens have also been developed and published.

The modern Laboratory of Bryology has been very important in the area of taxonomy of sporous plants. This Laboratory has become an important center for studying bryophytes of the world. Materials from Antarctica, Africa and South America have been studied in this Laboratory, and 4 new families, 2 sub-families, 19 genera, and 11 species (total of 36 taxons) have been described.

The first Polish center for studying algae has been established in the Institute. Taxonomic, chorologic and ecological studies of algae, editorial acti-

vities, training of specialists, consultations, and scientific advice for the Polish and foreign scientists have characterized the Institute's center for studying algae. On the basis of J. Rostafiński's work, a unique Kraków phycological school has been established by K. Starmach. Currently, this school has been solicitously developed by J. Siemińska.

From the inception of the Institute's geobotanical and ecological studies in the 1950's and 1960's, geobotanical monographs have been published about various regions of southern Poland (the Bieszczady Mountains, the Pieniny Mountains, Gubałówka, Polica, and others). Subsequently, "ecological numbers" for Polish flora were also prepared. Interdisciplinary studies that have been conducted for many years by Prof. Zarzycki's group resulted in preparation of the book *Plan of Organizing Non-forest Ecosystems of the Pieniny National Park*. A list of threatened and endangered species in Poland has also been prepared and a Polish Red Book has been published.

Results of the population studies conducted in the Białowieża National Park which, among others, explained some of the secondary succession mechanisms in the Park, are among the major accomplishments of the Institute. Physiographic studies of lichens in the Carpathian Mountains have also been initiated in the Institute. As a result of these studies, lichen flora of southern Poland is one of the best described in Europe.

Studies on the ecological effects of industrial pollution, which were initiated in 1976, have been intensively developed. As a result, the Institute has become a prominent center for bioindication and monitoring studies in southern Poland, and has a good reputation both in Poland and abroad. For example, Sweden has cooperated with the Institute on biogeochemical studies in forest catchments, and the USDA Forest Service on studies about the effects of ozone on vegetation. In addition, Prof. Grodzińska's group has also finished studies on accumulation and health effects of heavy metals in vegetables from the Kraków allotment plots. Investigations on heavy metal contamination in forest ecosystems resulted in identification of three unique mechanisms of heavy metals behavior found in trophic chains.

The Kraków paleobotanical school was established in the Institute on the basis of early work of Marian Raciborski, Władysław Szafer, and his students. The Kraków paleobotanical school is characterized by a botanical focus – not exclusively geological-stratigraphic approach – of the fossil floras. In that approach various paleobotanical methods, such as pollen analysis, carpologic analysis, and analysis of leaves are combined with other paleoecological methods. The esteemed scientific status of the Kraków paleobotanic school is supported by the fact that several leading palynologists from the Czech Republic, Bulgaria, Hungary and Finland were trained at the Institute. Many Polish scientists have received their palynological education at the Institute and later developed independent paleobotanical centers on the Universities of Poznań, Łodź, Gdynia and Lublin. The Kraków paleobotanists have been invited to co-author or co-editor various works of a synthetic character, international textbooks (e.g. M. Ralska-Jasiewiczowa, B. E. Berglund, *Handbook of Holocene Paleoecology and Palaeohydrology*), or textbook chapters (K. Wasylikowa, in: W. van Zeist, K. Wasylikowa, K. E. Behre and A. A. Balkema, eds., *Progress in Old World Palaeoethonobotany*, Rotterdam, 1991).

Interdisciplinary studies on the changes of the environment in the last 15,000 years have been conducted within the international program IGCP-158B. An unquestionable accomplishment of that program was the introduction of severalnew scientific methods, development of several informal domestic research groups consisting mostly of young scientists, and presentation of the results of the young scientists to the European arena.

Another indubitable accomplishment of the Kraków paleobotanical school has been publication of many monographs on the Tertiary floras (for such locations as Krościenko, Czorsztyn, Domański Wierch, the Orawa-Nowy Targ Basin, the Gdów Bay, the Holy Cross Mountains, the Rypin, of the Pleistocene (the Eemiany Interglacial period) and

Holocene floras (the Bieszczady Mountains, the Sandomierz Basin, Podhale, the Tatra Mountains, Pleszów, Mikołajki, Woryty, Witow, and others); and many descriptions of foreign floras (Antarctica, the Czech Republic, European Georgia, Iran, Minnesota, and Norway).

7. EDUCATION OF THE SCIENTIFIC STAFF

One of the basic functions of the Institute since its beginning has been the education of young scientists. The Institute has always had the opportunity to acquire new scientists from the graduates of the Department of Plant Systematics and Geography of Plants of the Jagiellonian University (which is located in the Institute's building). Because of this contact with that Department, the Institute has also participated in the education of its students. Senior students often participate in research of the Institute's departments or laboratories, frequently working on their Master of Science theses. Most of the M. Sc. graduates who performed research required for a degree in the Institute have later been employed by the Institute. This was especially true in the late 1950's and early 1960's.

Since 1959 the Institute has awarded the degree of Doctor of Natural Sciences, and since 1992 the degree of a Habilitated Doctor. Until 1994, 50 persons have been awarded the degree of Doctor of Natural Sciences. Most of them (30 persons) have been employed by the Institute. Two recipients of the degree of Doctor of Natural Sciences have been from Cuba. After receiving their Doctoral degrees, some of the scientists have moved to other scientific institutions in Poland, often receiving management positions. Those remaining in the Institute have continued their scientific careers working towards a Habilitated Doctor degree, which they later defended at the Jagiellonian University or other Polish universities. Sixteen persons have received a degree of the Habilitated Doctor before 1990, and twelve of those have later received a degree of a Full Professor. Between 1992 until July 1994 the Scientific Council of the Institute presented the degree of Habilitated Doctor to four persons (one of which was not employed in the Institute).

In addition to the training of Doctors of Science and Habilitated Doctors, other types of professional training are also performed in the Institute, such as specialty courses in methods of determining variability of plants, palynology, phytosociology, library training, etc.. Summer training for students of various colleges consist of different kinds of workshops (e.g. archeobotanical) or summer school for college students and young scientists.

Scientists from other Polish and foreign institutions can also participate in different training activities of the Institute. Young scientists from abroad come to various departments and laboratories of the Institute, mainly to the Department of Paleobotany to participate in speciality courses (ranging from 2-weeks to about 1-year). After returning to their home institutions, these scientists establish new laboratories or centers specializing in subjects they studied at the Institute.

8. INTERNATIONAL SCIENTIFIC COOPERATION

Scientific contacts with foreign institutions have been very successful since the Institute's inception. Because Prof. W. Szafer and Prof. B. Pawłowski had many contacts with foreign institutions and outstanding scientists, the Institute was recognized by an international scientific community in its first years of existence. Many famous botanists wished to visit the Institute – initially, in 1954–55 only sporadic individual visits occurred; however, since 1956 the number of foreign visitors to the Institute gradually increased (33 persons in 1956, more than 40 in the 1960's and 1970's, and up to 52 people in 1989). The record year was 1961 when the Institute was visited by 103 scientists.

The Institute has been visited by such famous scientists as: J. Braun-Blanquet, F. Ehrendorfer, G. Erdtman, K. Faegri, F. Firbas, H. Gams, H. Godwin, J. Iversen, A. Tachtadjan, E. Zaklinskaya, A. Zimmerman, and others. The Institute has frequently organized or co-organized various types of international activities. The largest meeting co-organized by the Institute was the 6th (INQUA) Congress in 1961. Later, various conferences and scientific symposia were organized, such as the Third Paleoethnobotany Symposium in 1974, and field trips after the Fourteenth Botanical Congress in Berlin in 1987, the Vistula Basin in 1988, the IPE in 1989, and others. Many workshops and meetings of international teams of scientists have also occurred at the Institute.

Another type of international cooperation at the Institute is training, especially in the discipline of paleobotany. For instance, the Kraków school of paleobotany has trained many paleobotanists from Bulgaria, Czechoslovakia, Finland, Yugoslavia, Rumania, Hungary, and other countries. After completing scientific training for a period of 6 to 12 months, the trainees have initiated scientific activities in their own countries, often leading research teams. Many of those people trained in the Institute have become leading European specialists of fossil flora.

Almost half of the scientific projects have been performed in cooperation with the foreign institutions in a framework of bilateral scientific agreements on cooperation (15 agreements were signed in 1994). Based on some agreements, the scientists of the Institute have been invited to prepare monographs of various floras, e.g. bryophytes and other floras for *Flora Neotropica* (USA), *Flora Criptogamica de Tierra del Fuego* (Brasil), *Flora and Fauna* of Australia, etc.

In the last decade the Institute has participated in many international programs as a primary or secondary coordinator of such endeavours. The multi-year international program IGCP – 158B was finished in 1987 (Prof. M. Ralska-Jasiewiczowa, coordinator). After completion of that program, the group of the Institute's paleobotanists was involved in an international program "Global Changes in the Past."

The scientists of the Institute have participated in the following international scientific programs:

1. On the basis of an agreement with the Swedish Royal Academy of Sciences and the Swedish Royal Academy of Agriculture and Forestry, the Institute is working on ecological studies in forest watersheds in Poland and Sweden. These studies deal with biogeochemical cycling in forest ecosystems such as "Deposition and biogeochemical runoff investigations," and forest health evaluation such as "Deposition and monitoring of forest health." Prof. K. Grodzińska coordinates portions of these studies.

2. European Environmental Monitoring Programme-Studies are conducted on evaluation of contamination of European environment with heavy metals using bryophytes as bioindicators. These studies are coordinated by Prof. K. Grodzińska.

3. Global Changes in the Past – The Polish paleobotanists conduct versatile studies of sediments annually deposited in the Gościąż Lake. The study is coordinated by Prof. Ralska-Jasiewiczowa.

Signing of an agreement between the Institute of Botany Polish Academy of Sciences and the Pacific Southwest Research Station, USDA Forest Service

4. European Pollen Data Base – These studies are conducted at Centre Universitaire d'Arles, France. The coordinator for Poland is Prof. M. Ralska-Jasiewiczowa. Palinologic data from the territory of Poland have been included in the program's database.

5. Natural Environment of North-East Africa in the Pleistocene and Holocene – The project is done in cooperation with the Southern Methodist University in Dallas, Texas and the Institute of Archeology of the Polish Academy of Sciences, Warsaw.

6. A Memorandum of Understanding between the Institute and the Pacific Southwest Research Station of the USDA Forest Service was signed on June 3, 1993 that formalized a cooperation on the "Effects of atmospheric deposition and climate change on forest ecosystems in Central and Eastern Europe and the United States." Establishment of an International Bioindication Station in the Institute's field station in Szarów is a part of that cooperation. The field station is being equipped with US instrumentation and will be available to ecologists from Poland and other countries. This research is coordinated by Prof. K. Grodzińska.

7. Mycological monitoring in European oak forests – Copernicus Programme 1994–1996., coordinator University Siena (Italy). Detailed studies of fungi on 4 experimental plots in the Niepołomice Forests are being carried out.