FOREST GENETIC RESEARCH AT THE INSTITUTE OF PAPER CHEMISTRY

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Forest genetics research is carried on in the Genetics and Physiology Group at The Institute of Paper Chemistry. The Institute is located in Appleton, Wisconsin, and has a staff of approximately 300 people. It is a nonprofit research and educational institution that was started in 1929 and is affiliated with Lawrence University. The Institute is a graduate school granting M.S. and Ph.D. degrees. Research at the Institute encompasses not only work in the area of pulp and paper technology but also includes studies in biology, chemistry, chemical engineering, mathematics, and environmental control.

Work in forest genetics began in 1954 under the direction of Dr. Philip Joranson and emphasizes poplar species, primarily aspens, and includes some studies involving cottonwood and closely related species. Several species of *Larix* have also been outplanted with the view to future work with this genus.

Predictions made by the USDA Forest Service indicate that pulpwood consumption is expected to increase from 50.7 million cords (1966) to 127 million cords in the year 2000. Loss of good quality forest land to agriculture, recreation, and urban and industrial development suggests increased production will need to be accomplished on less-productive lands. The magnitude of the increased production suggests several approaches will be required to prevent serious raw material shortages. The most promising include (1) improved utilization, (2) intensive forestry, and (3) forest genetics. Studies under way that speak to these problems include the following research projects.

1. *Aspen genetics and tree improvement project.*— The objectives of this long term investigation include (a) developing trees of exceptional growth rate and wood quality and (b) developing trees for several types of soils including those that will do well on sandy soils of low fertility and respond to such intensive forestry practices as fertilization and irrigation. Forest genetics procedures employed include selection, hybridization, and polyploidy. Naturally and artificially produced triploids have been obtained and show considerable promise in the area of improved wood quality and improved growth rates.

2. *Investigation of method's for the production of maximum growth in natural and improved aspen.* — This project has the overall objective of demonstrating the biological potential of aspen and aspen hybrids. More specifically, the program emphasizes the intensive aspects of forest management and has the goals of (a) exploiting presently available genetically improved species of *Populus,* (b) developing rotation age and harvesting system information, and (c) establishing the biological feasibility of such intensive forestry practices as fertilization and irrigation.

3. *Investigation of methods of separating chip and bark mixtures.* — *Utilization* of small-size trees and better utilization of the limbs and tops of trees hinges upon chipping in the woods, bulk handling of the chips, and separating chip/bark mixtures prior to pulping. The objective of this project is to develop chip/bark separation procedures.

4. *Tissue culture research.* — Research on the use of tissue culture in forest genetics began at the Institute in 1962 under the direction of Dr. Martin Mathes and was taken over in 1964 by Dr. Lawson Winton. The objectives of this work were to investigate the usefulness of tissue culture techniques in studying growth and differentiation with the ultimate objective of starting with a single cell and developing an intact, normally functioning tree. Several trees have been produced from callus tissue; this apparently is a "first" with woody plants. Dr. Winton acknowledges the assistance of Dr. Karl Wolter, of the Forest Products Laboratory, in suggesting several chemicals which have helped make this feat possible.