FOREST GENETICS AT THE INSTITUTE OF PAPER CHEMISTRY

by

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Research and Education in Genetics

Research and education at The Institute of Paper Chemistry in the forest genetics field have received their direction and character largely from the nature of the Institute itself. Perhaps a few remarks about the Institute are therefore in order.

Located in Appleton, Wisconsin, the Institute is a national organization of about 260 persons, supported by the membership of three-fourths of the pulp and paper companies of the United States. It comprises a graduate school with enrollment of about 50 students, all of whom are registered in a four-year Ph.D. curriculum designed to prepare men as scientific generalists for responsibilities primarily in the production, technological control, and research functions of the pulp and paper industry.

Current research and technical activities include more than 100 simultaneous projects. These include basic research--both institutional and on contract--as well as problems in the applied areas and technological services. In addition and entirely independent, is the basic research of the fourth-year students on their thesis problems. A very complete library and extensive abstracting and bibliographical services are also maintained.

Research activities are divided among a number of sections. These include pulping and papermaking technology, cellulose chemistry, organic chemistry, colloid chemistry, lignin chemistry, biology, physics, plastics, graphic arts, container, and physical testing.

The program in genetics is intended to develop, first, *as* a fundamentally oriented curiosity, within a particular province, regarding phenomena which underlie the genetic conditioning of pulpwood, and second as a concern about how new basic facts revealed by fundamental studies *may* be put to work in tree improvement applications.

The research province selected is rather sharply delimited. It is focused upon an understanding of the genetic conditioning of particular characteristics in the pulpwood raw material which register important effects during the pulping, bleaching, and papermaking operations, as well as in the properties which the product exhibits as it leaves the paper machine.

Simultaneous with these studies is a continuing effort to identify with maximum assurance certain of those frequently elusive factors in the realms of wood and fiber structure, of chemical makeup, and of chemical constituent variability across the cell wall which are of most significance in manufacturing the major types of paper and paperboard, and which would therefore--if they were known--serve as targets for more intensive tree improvement efforts.

The current lack of precision in this respect has been of increasing concern of forest geneticists, and this not only in the South. What is perhaps not so generally appreciated, however, is that even before the geneticist became conscious of the inadequacy of our knowledge in this area, it was already recognized that needed improvements in the technology of pulping, bleaching and papermaking also depend upon exactly the same kind of fundamental insight, In order to proceed intelligently with improvements in processing, the pulp and paper researcher must be in a position to guide his efforts in consideration of the same kind of cause-and-effect intelligence that the geneticist would like to have.

The Institute has participated in this particular quest for a long time, and has an especially active project at present. It has become evident from recent experiences that when there is a fusing of the curiosities of the geneticst with those of the man who probes the fundamental behaviors which underlie the technology of the industry, not only does the geneticist benefit from insight into the nature of the problems encountered in defining objectives, but the pulp and paper researcher is then also in a position to receive from the geneticist, for use in critical experiments, certain especially useful sample materials which simplify the analytical task by reducing and/or better defining some of the variables involved. In Part II of this report, we have presented a portion of a recent discussion regarding genetic improvement objectives in the southern paperboard field.

The full time Institute genetics staff of doctoral level consists of two geneticists, with backgrounds in forestry, physiology, cytology, and ecology, and a man trained in forest soils and silviculture. In addition, there is a combination greenhouseman-fieldman full time, and co-operative arrangements are in effect with the Lake States Forest Experiment Station, the University of Michigan, and Iowa State College for the early phases of pathological and entomological study, respectively, and for statistical counsel.

Working facilities include a genetics building with greenhouse attached, *a* clear 33-acre tract nearby for nursery, arboretum and testing, and additional test areas elsewhere in the woodlands of co-operating paper companies. All of the other facilities of the Institute are at the disposal of the genetics program.

During the past several years, many of these facilities have been employed for a related group of studies with aspen materials. These are polyploids, hybrids, selections, and introductions. In one current investigation which will soon be completed, an intensive comparison is being made between two groups of mature trees which differ genetically in a sharply defined and demonstrable way. The tests upon the two groups of trees involve pulping, bleaching and papermaking performance, fiber dimensions, and a chemical characterization. This and other studies are now approaching the reporting stage, and will soon be available in the journals.

Recently, some of the southern mills have prompted the Institute to consider how it might invest the specialized kind of research capital which it has accumulated over the years, in genetic studies of some of the qualitative aspects of southern tree improvement. In response to this suggestion, and also motivated by its own growing convictions on the subject, the Institute has spent roughly the past 13 months in studying the background, content, and feasibility of a genetics program addressed to southern species.

Out of these preparations, a plan has been developed which will be discussed soon with a group of companies which participate as members in the Institute. We have given special attention from the outset to the avoidance of unnecessary duplication of effort with existing activities, and have also become aware of some of the needs which are felt by colleaguef working in existing tree improvement programs.

We would like to believe that Institute participation in the over-all program of genetics and tree improvement in the South would contribute to the feeling and the substance of mutual encouragement in the many-sided task which lies ahead.

The Institute's educational program in genetics includes a course, elected by regular and special students, in basic genetics and its applications in tree improvement for the pulp and paper industry, participation in the guidance of thesis research and in a special program for orientation in-research which occupies the third year, and presentations made at conferences and at the new industrial summer seminar.

Consideration is also being given to the possibility that arrangements will be made for qualified graduate students in forest genetics in other institutions to pursue thesis research at the Institute, making use of facilities and of the guidance of the staff.