the male-producing characteristic to certain of their daughters without regard to the characteristics of the mates to which they were bred. In something over 500 matings, covering a period of 8 generations from the original parent, no failures in finding the expected male-producing genotype have occurred.

The daughters with the genotype for all male progeny produce all male offspring without regard to the mates with which they are bred. The males give no phenotypic expression of this inheritance. The male-producing genotype is thus without effect on the adult males which carry it. The inheritance is sex-limited in its action in that it affects only the females which have it, acting as a dominant.

This case completes the span for the genetic control of sex. Genotypes, which may be genetically controlled, have now been established for the most divergent sex ratios possible, 100 per cent. female in one progeny and 100 per cent. male in the other. Many problems of sex differentiation and distribution are, of course, left, but in the sense of establishing means for sex control through specific agencies under man's guidance, the problem of the predetermination of sex may be said to be solved.

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PEDIGREED PINE FOR NAVAL STORES PRODUCTION

IN the fall of 1941 the U. S. Forest Service started a project concerned with the development of an extra-high-yielding strain of naval stores pine. Efforts were directed toward the selection of naturally superior individuals and the working out of methods for their propagation. The undertaking has precedent in the notable success achieved with other tree species yielding special products. It is well known, for example, that the average output of rubber latex from *Hevea* has been greatly increased as a result of careful selection, controlled breeding and the propagation of superior clones. High-yielding strains of *Cinchona,* from which quinine is obtained, were similarly developed.

The naval stores belt was thoroughly scouted for outstanding trees—trees which for no apparent reason produced exceptional yields of oleoresin. Emphasis was placed on slash pine (*Pinus caribaea* Morel.), since this species normally yields more gum than longleaf pine (*P. palustris* Mill.), the other commercially important producer of naval stores. Of the thousands of trees inspected, twelve of the most promising were selected for further study. During the summer of 1942 the yields of these trees were accurately determined by weighing the gum produced each week. In connection with each of the twelve, equally precise data were also obtained on the yields of from fifteen to fifty control trees of the same species, age, size, growth rate and general appearance growing under similar conditions on the same site. Comparisons made near the end of the season show that the majority of the trees under test produced from two to three times as much gum as the average of their respective control groups. Because of the care used in selecting and checking the test trees, it is probable that the superiority of at least some of them is due largely to hereditary factors. In the meantime, the search continues for additional outstanding individuals.

Vegetative propagation was chosen as the most promising method for speeding up the production of planting stock having the same characteristics as the superior trees selected in the present study. The advantages and possibilities of this method and its importance in the field of forest tree genetics have been discussed by Schreiner.[1] Research in vegetative propagation, directed chiefly toward the rooting of cuttings, was started in November, 1941. Cuttings from young slash pine were used exclusively in the initial exploratory experiments. It was soon found that with proper treatment, better than 90 per cent. of this material could be rooted within five weeks from the time of planting.[2] Work was then started on cuttings from older trees, large enough to work commercially, and for which gum yield records were available. This type of material proved much more difficult to root. Thousands of cuttings from mature trees, collected at 15-day intervals, were tested during the winter, spring and summer of 1942. The material was cut and handled in different ways, given a total of 175 chemical treatments, and planted in 40 different environments provided in greenhouse and nursery. Results with the winter and spring collections were discouraging; none rooted or even calloused, and all eventually died. The first successful rooting of cuttings from mature slash pine was observed on August 19 for material collected and planted on June 20.

To date, roots have been observed only on cuttings given rather complex chemical treatments. The two most promising treatments seem to be: (1) a 24-hour treatment in a solution containing 50 ppm traumatic acid,[3] 10 ppm vitamin B_1, all essential mineral elements and 5 per cent. sugar, followed by a dust treatment with commercial Hormodin No. 2 just previous to planting; and (2) a 24-hour treatment in a solution

[1] E. J. Schreiner, *Jour. For.*, 37: 1, 61–62, 1939.

[2] H. L. Mitchell, *Naval Stores Review,* 52: 7, 10–12, 1942.

[3] Traumatic acid has been tentatively identified as 1 decene – 1, 10, dicarboxylic acid (J. English, J. Bonner and A. J. Haagen-Smit, SCIENCE, 90: 2336, 329, 1939). That used in these experiments was made available through the courtesy of Merck and Company.

containing 25 ppm indolebutyric acid, 12 ppm indoleacetic acid, 12 ppm naphthaleneacetic acid, 10 ppm vitamin B_1, all essential mineral elements and 5 per cent. sugar. The most favorable environment, according to present information, is as follows: well-drained sand as the rooting medium, full sunlight in nursery, high humidity, temperatures between 75° and 90° F., and cuttings exposed to fine spray of water (from atomizing nozzles mounted above the beds), with spray on either continuously or for 5 minutes out of each 10-minute cycle for from 10 to 12 hours each day. The spray system used is an adaptation of the spray chamber technique described by Raines.[4]

All research in propagation is being pointed toward the development of effective vegetative techniques sufficiently simple for large-scale use under nursery conditions. If successful, it is possible that certified high-yielding planting stock will be produced in public nurseries and offered for sale to land owners at or below cost. When one considers the rate at which trees grow in the naval stores belt, and that normally over 100 million trees are planted annually in the Southeast, the possibilities of this undertaking become more apparent. It is reasonable to believe that the development of high-yielding stands would contribute greatly to the solution of production problems which have long troubled the $25,000,000 a year naval stores industry, which supports some 50,000 workers and their dependents. Yield increases of 200 per cent. or more seem possible of attainment. By thus increasing the average output per tree it should be possible to reduce production costs sufficiently to meet low prices and competition from synthetics, and at the same time allow good wages for labor and an adequate profit for the producer.

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A NEED FOR MORE UNIFORM USAGE OF WORDS OF INDEFINITE MEANING

IN science it is our practice to observe, accurately measure and record and, accordingly, we are ever faced with the necessity of posing mathematical relationships. Despite the vast and rapid accumulation of recorded data which makes up the body of our respective sciences, it is nevertheless true that the greater part of our knowledge as individuals consists of a memory of casually observed phenomena which we have not yet taken the time to analyze, accurately measure or record. Thus in our general discussions we are obliged to make use of words of indefinite meanings, such as "few," "some," "very," "many," "much," "most," "frequent," "slightly" and "seldom."

During a discussion with a group of scientific friends I was interested to note that there was no agreement among them as to the relative significance of these words. If to each mind they conveyed differing impressions, these words are not as efficient as they might be as vehicles for our thoughts. It has occurred to me that as these words are such useful tools, it would be a worth-while project to attempt to increase their usefulness by more narrowly restricting their meanings and by securing a more uniform usage.

As a preliminary step I have tabulated the impression some of these words convey to me. I have expressed them in terms of approximate percentage spread of the relative frequence or intensity they indicate to me. Obviously their meanings must indicate approximations, for they indicate frequencies we do not know. In each case also their meanings will vary with the nature of the subject of discussion, but in each case the percentage noted is in relation to a maximum applicable to the particular case. I do not expect acceptance of any of my figures, but it would be of great interest to learn how great will be the variance shown by our readers.

TABLE 1

Per cent. frequency indicated		Per cent. frequency indicated	
1, 2	very few, seldom	60, 70	
3, 4, 5	few, some, slightly	80, 90, 95	most
10, 15, 20, 25	many, much, frequent	98, 99	practically all
		100	all
30, 40	very many		
45, 50, 55	about half, average (in general sense)		

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[4] M. A. Raines, *Am. Jour. Bot.*, 27: 10, 18, 1940.