Tifgreen bermuda nutrition studies being harvested for analysis. Wallace Menn, graduate student at Texas A&M University, obtains samples being grown on a hydroponic system.

A Green Section Report on Turfgrass Research

by **MARVIN H. FERGUSON, Mid-Continent Director, USGA Green Section**

Research was one of the primary responsibilities of the USGA Green Section at the time of its establishment in 1921. For 30 years the staff continued to expend most of its efforts in this activity.

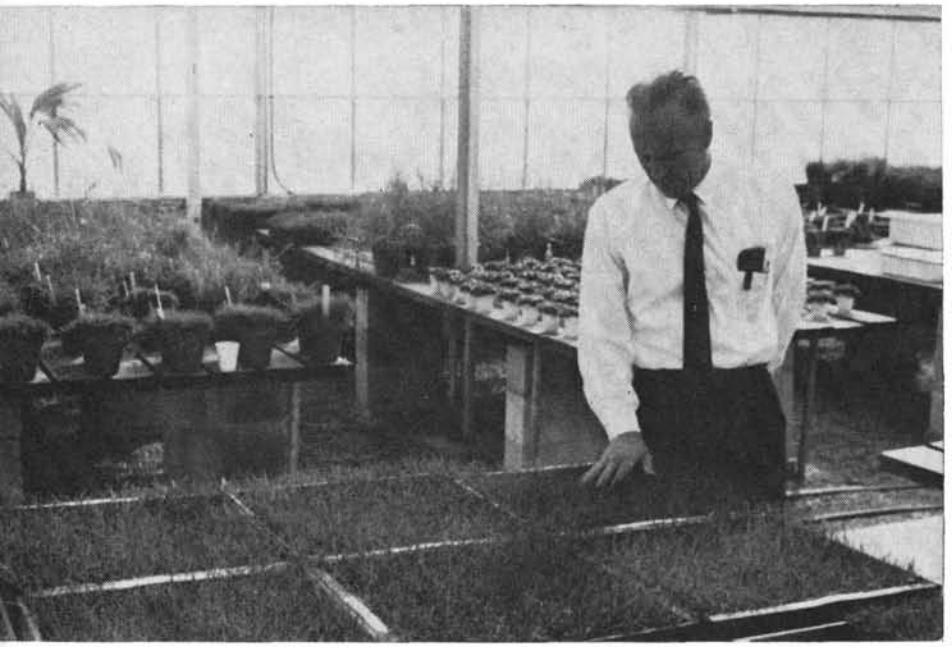
In 1951 the USGA changed the Green Section's plan of operation somewhat and placed greater emphasis upon the dissemination of information. While the staff is engaged primarily in an extension type of work, research is still an important part of the Green Section effort.

Through the U.S.G.A. Green Section Research and Education Fund, Inc., grants are made each year to universities for the purpose of supporting research that promises to be of value to golf clubs. Since 1953 grants have been made at 21 universities. The research which these grants support covers a broad range of subjects. Some of it is research of a fundamental nature, with no immediately discernible application. Much of it, however, is concerned with immediate and pressing problems, such as **Poa annua** control and the effects of certain herbicides upon permanent turfgrasses.

Perhaps the most effective way of describing the Green Section's research efforts is to provide some examples of work under way at the present time.

Rhode Island Research

The University of Rhode Island is working with plastic mesh fabrics in an attempt to alleviate winter damage caused by desiccation and excessive heaving. Dr. Richard Skogley re-



Dr. Victor B. Youngner, University of California, looks over one of his research projects — an improved variety of bermudagrass known as Santa Ana. It has out-performed all others in tests to date.

ports that this technique is quite promising. There is less heaving, earlier "green-up" of turf, and covers stayed in place satisfactorily even in strong winds.

Wilt at Purdue

Purdue University investigated the possible role of wilt reducers on bentgrass putting greens. Dr. William H. Daniel reports that wilt reduction can be accomplished and demonstrated under greenhouse conditions. However, more than normal moisture stress is necessary to be able to see the benefits of such materials on putting greens. These investigations are continuing.

Such a technique possibly could be applied in connection with tournaments. On hot summer afternoons, putting greens may need showering to prevent wilt. However, if a tournament is in progress, officials are very reluctant to apply water because of the possible change in playing conditions. A wilt-reducer would be worthwhile in such a case even if it provided only temporary relief.

Texas A & M Studies

For a great many years the Green Section's research grant at Texas A&M was used to support soil studies. From this research came the information which formed the basis for the USGA Specifications for a Method of Putting Green Construction.

At present, however, the emphasis has been placed on nutritional studies. Dr. George McBee and Wallace Menn have devised a water culture method whereby they can provide varying levels of nutrients, and can determine responses to given levels of nutrients in the turf foliage. Such information may lead to a diagnostic technique in which clippings from a putting green may be analyzed to determine nutrient content, and fertilizer amounts necessary to restore optimal levels may be calculated. This study involves the use of Tifgreen bermuda. The nutrient elements being studied are nitrogen, phosphorus, potassium, calcium, and magnesium.

Work at University of California

Research grants supporting work at the Riverside campus of the University of California are not designated for any specific use but are used as needed in the program. Dr. V. B. Youngner has a great many problems under investigation.

Breeding studies are being carried on with bentgrasses, bluegrasses, tall fescue, and zoysia. There are studies on carbohydrate reserves of bermudagrass in relation to winter survival, and planting quality of stolons. Cultural practices which affect carbohydrate reserves are being studied.

Growth retardants for turf provide another area for investigation and these studies are quite promising. A material which will retard top

growth without damaging the root system would certainly be a welcome addition to the list of management tools.

The University of California at Davis has received grants in recent years for the purpose of investigating turfgrass research techniques. Dr. John Madison has observed that some of the difficulties confronting turf investigators are created by the lack of an ability to define and measure turf quality. His work is an attempt to measure in meaningful terms the effects of management treatments. This is an area of study that may not yield direct benefits to golf clubs, but indirectly it may be extremely valuable because it will strengthen the work of other investigators.

Pennsylvania State University

Since 1958 Pennsylvania State University has been engaged in a study of colonial bentgrass. The aims are to investigate the breeding behavior of this species and, if possible, to develop better turf types of plants within the species. Dr. Joseph Duich is the project leader. Since the study began, Dr. A. E. Dudeck has used it as the basis for a doctoral dissertation. A. T. Perkins is presently carrying on the work.

This is an example of a slow, tedious research project that does not yield quick spectacular results. However, the research grant contributes to the advanced study of two scientists who will have the opportunity to make future contributions to our knowledge.

Turf Projects at Tifton

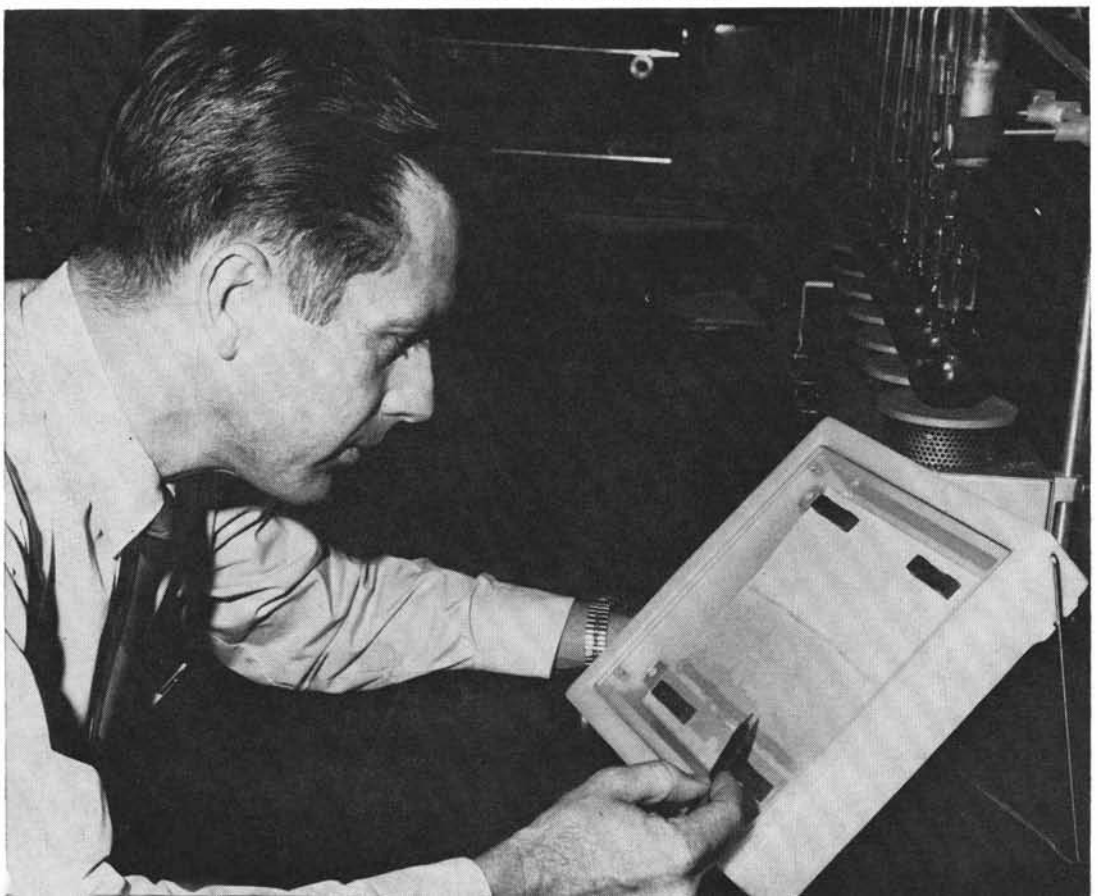
Probably no research station has done more with a given amount of financial support than the Georgia Coastal Plain Experiment Station at Tifton, Ga. Dr. Glenn Burton is the leader of the turf project. From this station have come most of the improved bermudagrasses, including Tiflawn, Tiffine, Tifgreen, Tifway, and Tifdwarf.

It is difficult to calculate the magnitude of the impact these grasses have made upon the quality of turf for golf in the South. The Tifton station has made other notable contributions to management practices, but these are overshadowed by the tremendous value of the improvement in grasses.

Oklahoma and Bermuda

Dr. Wayne Huffine, of Oklahoma State University, has made a worldwide plant exploration trip during which he collected approximately

Chromatographs are being examined as part of turfgrass shade tolerance studies by Dr. George G. McBee, Texas A&M University.



Nobuo Maekubo research scholar of Kansai Golf Union, Japan, discusses with Dr. John Madison, University of California, Davis, the behavior of turfgrasses and their responses to management treatments.

700 types of bermudagrass. From these the turf types have been separated. The evaluation of these selections for turf purposes is a project being supported in part by a grant from the U.S.G.A. Green Section Research and Education Fund, Inc.

Michigan State and Poa annua

The grant at Michigan State University supports a study of fundamental facts about **Poa annua.** The studies now under way involve seeding, vegetative growth habit, and heredity variability, environmental adaptation studies, and relative flooding tolerance of annual bluegrass. In addition to these studies, a master's thesis has been published by James Alan Fischer entitled "An evaluation of high temperature effects on annual bluegrass."

These fundamental studies have two aims. They are to learn the fundamental weaknesses of **Poa annua** that would permit the synthesis of an approach to control the species selectively, and to learn how to compensate for its weaknesses in a management program which is based upon keeping **Poa annua** turf.

Kansas and Rutgers at Work

In addition to these studies, Kansas State University is involved in improvement of bermudagrasses and zoysias in the "transition zone" between cool-season and warm-season grasses. Rutgers University has just begun a program of bluegrass improvement.

These brief sketches provide some idea about the scope and diversity of studies supported by the U.S.G.A. Research and Education Fund, Inc. Research is one of the most profitable ways in which money may be invested. It is the source of new information which will provide for continued improvement of turf on golf courses.

Moreover, the same grants which provide the support for an investigation usually help also to further the career of a student. There is a long list of men currently involved in the academic area of turfgrass management who received some support from these grants during their student careers. The importance of the contribution to the education of these men far outweighs the cost even if no value were placed upon the results of the investigations they carried out.