



*A view of one portion of the Green Section's tests at the Arlington Turf Farms in 1940. Dr. John Montieth, whose brilliant direction of early research set the guidelines for present day maintenance and management practices on the golf course, addresses a group of turf workers at a Field Day sponsored cooperatively by the Green Section and the U. S. Department of Agriculture.*

## *Review of the Green Section Research Program*

by **ALEXANDER M. RADKO**, Eastern Director and National Research Director

Golfers are aware that the USGA has a stake in turfgrass research, but they are vague about what has resulted from it over the years. This article is an attempt to bring them up to date on the USGA's program, steadfastly directed by the Green Section, and what it has meant to the betterment of turfgrasses and specifically to golf throughout the world.

**G**olf is a relatively young game in the United States. It reportedly began with John Reid and his "Apple Tree Gang" in Yonkers, N.Y., a little over 80 years ago. Not until 1920, however, was direct research assistance first requested by a Green Committee Chairman. E. J. Marshall, of the Inverness Club in Toledo, brought the United States Department of Agriculture and the USGA together, and the result was the birth of golf turf research in the United States. On November

30, 1920, the following resolution was adopted by the USGA:

"That a Green Section of the United States Golf Association be and is hereby created for the purpose of collecting and distributing among members of the Section information of value respecting the proper maintenance and upkeep of golf courses."

Dr. C. V. Piper and Dr. R. A. Oakley, who were

then employed by the Department of Agriculture, Division of Forage Crop Investigation, became the first Chairman and Vice-Chairman respectively of the Green Section of the United States Golf Association. They and their committee lost no time in bringing together and disseminating the best available information of the day in a publication called "Bulletin of the United States Golf Association Green Section." It was first published in 1921. The Bulletins were distributed to anyone interested in golf course maintenance and management problems.

#### **Putting Science To Work**

In 1924 Dr. John Monteith, Jr., a brilliant young pathologist, joined the Department of Agriculture. Later he was persuaded to join the Green Section to direct research and all other activities. From then through 1933, the monumental work of Dr. Monteith and his associates is reported in the Bulletins, Turf Culture and other publications. As an indication of the magnitude of this work, 3,435 pages of pertinent information for golf course maintenance and management made up 13 volumes of the Bulletin of the USGA Green Section. This published research set the guidelines for golf course management, and to a large degree it is responsible for the programs followed today.

#### **In Disease Control**

Much of the information in the early Bulletins is still timely and applicable. The 1932 Bulletin on "Turf Diseases and Their Control," a classic document of 188 pages, described in detail the known diseases of the day and recommendations for their control.

From page 142:

*As the susceptibility of any grass to injury from snowmold has been found to be increased by fertilization with excessive quantities of nitrogen in late fall, putting greens in the snowmold belt should be fertilized as little as possible after August. Since there is a decided difference in the susceptibility of grasses to this disease, the ability of a grass to withstand attacks of snowmold should be given consideration in the choice of grass for putting greens in the snowmold belt. On courses where the disease is likely to be particularly serious, the Columbia, Inverness, Seaside and similar strains of creeping bent, and also red fescue, should be avoided. It has been found also that a covering of straw, particularly when left on the turf late in the spring, tends to encourage the development of the disease. The use of any covering which keeps the grass wet after the snow*

*has melted and the grass has commenced growth should therefore be avoided. The removal of snow, the sweeping off of any debris or any mass of the fungus remaining on the putting greens, and any other treatment tending to hasten the drying of the surface after the spring thaws begin, will in many instances tend to reduce late damage by snowmold.*

*In spite of all these precautions, however, snowmold is likely to develop under other favorable conditions. It is therefore well to treat the greens with one of the mercury fungicides before winter begins in order to avoid entirely attacks on the greens or at least to greatly reduce the severity of the attacks. Corrosive sublimate and calomel have proved to be entirely satisfactory for the control of the disease. These should be applied in late fall or early winter at the rate of from 2 to 5 ounces to 1000 square feet.*

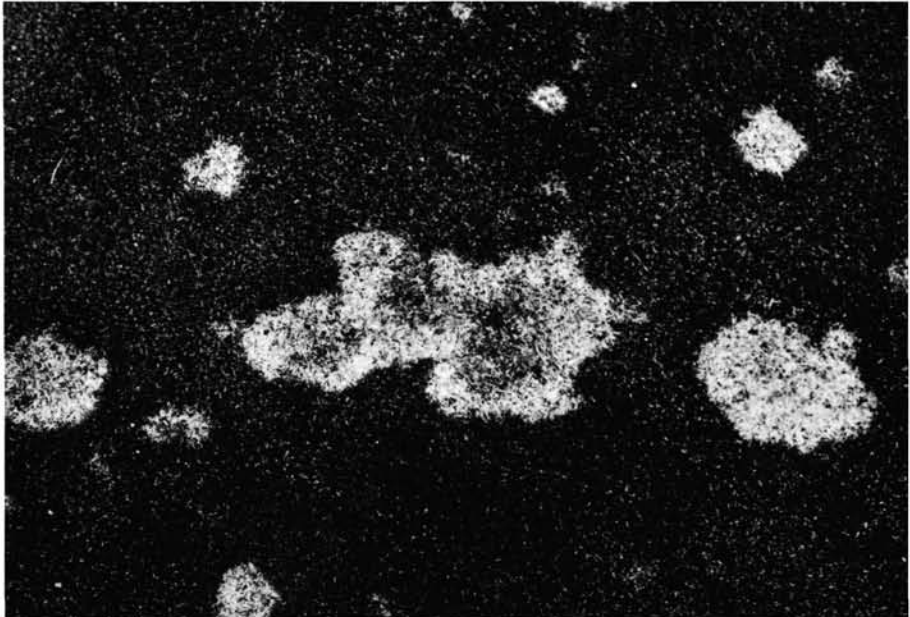
From page 116:

*In 1917 experiments were first made on golf courses to test Bordeaux mixture as a fungicide for the control of brown patch. By 1919 its use was general on courses on which the disease was serious. Corrosive sublimate was used successfully as early as 1920 in the Chicago district. The disadvantages of Bordeaux mixture led to the testing of other fungicides in brownpatch control. In 1923 careful study of turf diseases and the organisms causing them was begun by the Green Section, in the laboratory and in the field, and the results of this work have been published in the Bulletin from time to time. Many chemicals are useful as fungicides, but it is not a simple matter to find one that will kill fungi and at the same time not injure the plant on which it is used. A great many chemicals have been tested at the Arlington turf garden for the control of turf diseases.*

From page 123:

*Since corrosive sublimate and calomel each had advantages not possessed by the other, it was apparent that a combination of the two could be used to advantage. This was particularly true for brown patch. Dollar spot can be effectively controlled with calomel alone, but in the Arlington experiments active brown patch was not immediately checked. Combinations of 1/3 corrosive sublimate and 2/3 calomel proved effective for brown patch. For extremely active cases of the disease 1/2 corrosive sublimate and 1/2 calomel has been more effective. This treatment has advantages in that it checks*

*Snow mold a cold weather disease. Green Section research discovered controls in the 1920's, for which no better controls have been discovered to-date.*



*the disease immediately, due to the corrosive sublimate, and gives a long period of control due to the calomel. Combinations of the two chemicals in various other proportions have also proved effective.*

*Such combinations were first suggested by the Green Section in the Bulletin in 1927 and since that time preparations containing mixtures of corrosive sublimate and calomel have appeared on the market with trade names.*

From page 214, Vol. VII:

*Since calomel acts slowly and for that reason is not desirable for control of active large brown patch, an attempt was made to combine it with a more quickly effective chemical to provide a combination treatment which would have the advantages both of the immediately active chemical and of the more lasting calomel. Since corrosive sublimate and the oxide of mercury check large brown patch almost immediately, these two appeared to be the most promising for such a mixture since they possessed certain other desirable features besides that of lowest cost. An application of one ounce of corrosive sublimate per 1000 square feet proved to be entirely satisfactory in checking active large brown patch. Therefore, a mixture of one ounce of corrosive sublimate with two ounces of calomel was applied to a number of plots and it was found to give the desired results. Other proportions were tested, but it appeared that the ratio of one-third corrosive sublimate and two-thirds calomel was best. The demonstration plots of the turf garden, which are cared for as putting greens*

*should be, were treated with such a mixture previous to the meeting of greenkeepers in August. When a mixture of these two chemicals is combined with a little fine clay, to add more bulk, it makes a very satisfactory brown patch remedy.*

*We found that the oxide of mercury was likewise effective in combination with calomel, used in the same proportion as was the corrosive sublimate and calomel. There are two common oxides on the market (red and yellow), which proved to be equally effective against these turf diseases. The oxide is less likely to burn than is corrosive sublimate and lasts a trifle longer. It should prove to be a valuable chemical for this work.*

#### **In Improved Grasses**

Except for a brief period during the depression of the early 1930's, the Green Section has always identified with a publication and has published without interruption through today in *Turf Culture*, *Timely Turf Topics*, *The Turf Management* section of the *USGA Journal*, through *Regional Turfletters*, and now the *USGA Green Section Record*.

The program of selection and testing of hundreds of grasses began during the time when Dr. Monteith was associated with the Green Section. Promising grasses from all over the United States were brought to the Arlington (Va.) Turf Farm, near Washington, D. C., and tested for a period of several years before a decision was made whether any individual selection was worth further research. For every one selected, hundreds were discarded. Many of these selections were transferred to the Beltsville (Md.) Research Farm when the Department of Agriculture moved from Arlington to make



*An important part of the Green Section program has always kept golf uppermost in turfgrass research studies. Here the C-1 Arlington strain of creeping bentgrass is being tested for putting quality. Dr. John Montieth (center) observes technique and stroke in 1940 at the Arlington Turf Farms.*

way for new highways and construction of the Pentagon. The Pentagon now stands on the site of the old Green Section turf plots and oldtimers who religiously followed research there like to think of it as a fitting and lasting monument to the Green Section's program of research.

Dr. Fanny Fern Davis, the only woman to direct the Green Section, followed Dr. Monteith. She directed research work during World War II. She, in turn, was succeeded by Dr. Fred V. Grau, who was Director from 1945 to 1953. Under Dr. Grau's direction, zoysia, Merion bluegrass, and bermudagrass became prominent. Dr. Grau published extensively and travelled widely, promoting the cause of improved grasses while continuing to direct the Green Section's research program at Beltsville. Dr. Marvin H. Ferguson was responsible for the direction of research from 1953 to 1968. Today the author is National Research Director.

From its inception, the USGA has spent more than \$3 million on the Green Section. The U.S.G.A. Green Section Research and Education

Fund, Inc., has distributed approximately \$250,000 for research since 1953. Prior to 1953 the Green Section's activity was devoted to full time research.

Listed below is some Green Section work that greatly influenced the golf turfgrass world.

- Hundreds of creeping bentgrasses were tested in search of superior putting green selections, but only a few were chosen. Some that are still used widely include C-1 Arlington, C-7 Cohansey, C-15 Toronto, C-19 Congressional, Washington, and the Old Orchard selections. The Green Section also perfected methods of propagation and establishment of putting greens from vegetative strains.

- Green Section research discovered controls for dollar spot, brown patch and snow mold that are still used today. The mercury compounds have been standard disease control materials since the 1920's.

- Green Section research produced fungicidal green dyes which also were used widely to color weak or injured turf.

● Green Section research helped develop some of the zoysia grasses presently used on golf courses. Meyer zoysia was released jointly with the U. S. Department of Agriculture, which awarded the Green Section a special citation for this work.

#### **In Weed Control**

Green Section research helped develop techniques for the safe and selective use of weed control chemicals such as 2, 4-D and sodium arsenite. Excerpts of Dr. Fanny Fern Davis' thesis on "Turf Control with 2, 4-D" report the beginning of large scale turf and golf course weed control tests as follows:

*Dr. E. J. Kraus first suggested that some of these growth regulating compounds, when applied at concentrations of a much higher order than those which were necessary for the production of typical growth responses, killed plants of certain species. From his early observation grew the general idea that some of the growth-regulating compounds might make good herbicides. In 1942, the investigators at the Boyce-Thompson Institute stated in one of their publications that 2, 4-dichlorophenoxyacetic acid was an extremely potent growth-regulating compound. In the course of investigations with the use of this new compound for the setting of seedless fruit, the prevention of apple drop, etc., Drs. John W. Mitchell and Paul C. Marth of the Bureau of Plant Industry, U.S.D.A., observed its lethal effect on certain weeds. In August 1944 they approached the present author, who was then acting Director of the U.S. Golf Association Green Section, concerning the testing of its potentialities in the control of turf weeds. Since that date, experimental work has been underway continuously, first under the auspices of the U.S. Golf Association Green Section in cooperation with Drs. Mitchell and Marth, and subsequently with Mr. Horace Wester of the Horticultural Division of the National Capital Parks. In addition, for more than a year a large-scale weed eradication program has been in progress in the National Capital Parks in which several hundred acres of turf have been quickly and strikingly improved by judicious applications of 2, 4-D accompanied by appropriate fertilizing and seeding programs.*

#### **With Merion Bluegrass**

Green Section research resulted in the release of Merion bluegrass as an improved selection. Today it is still considered the standard by which all other bluegrasses are judged. It seems

incredible that of the millions of bluegrass selections, this one would come to the attention of researchers and be the one chosen from sixty that survived the tests imposed on it. An article by Charles G. Wilson and Fred V. Grau entitled "Merion (B-27) Bluegrass" in the April, 1950, USGA Journal and Turf Management stated:

*The selection and testing program which has resulted in the release of Merion (B-27) Kentucky bluegrass for commercial production is one of the achievements of the cooperative research program being carried on by the USGA Green Section and the Department of Agriculture.*

*This grass was tested by the Green Section for several years before the war. With the curtailment of Green Section activities in 1942, the Division of Forage Crops and Diseases, Department of Agriculture, took over the work, carrying on the clonal stock and observing plantings which had been made. At the end of the war the Green Section resumed its field work and since that time the Department of Agriculture and the Green Section both have been interested in getting Merion into production.*

*Merion bluegrass was observed for a number of years by Joe Valentine, superintendent at Merion Golf Club, in Ardmore, Pa., and a plug of turf was given to the Green Section in 1936 along with two similar strains from a tee at Merion. The name Merion was chosen for B-27 bluegrass by reason of the origin of the original material. Merion was described as a dense, dark-green turf growing in partial shade, spreading over several feet and crowding out weeds with its vigorous growth.*

Subsequently, this work was given over to Penn State University for detailed breeding and related studies.

Green Section research promoted studies in nutrition and in slow release nitrogen fertilizers (urea-formaldehyde) as a cooperative effort with the U. S. Department of Agriculture.

#### **With Tifton Bermudas**

Green Section support of the breeding work at The Georgia Coastal Plain Experiment Station resulted in the release of some outstanding bermudagrasses for greens. Specifically, Tifgreen and Tifdwarf, developed by Dr. Glen W. Burton, made golf far more enjoyable in the South. Prior to release of these selections, one English professional described putting on most bermudagrasses "like trying to putt over cables." Today, these select strains are being propagated wherever bermudagrasses can be grown.

Green Section research on traffic wear on putting greens influenced the kinds of spikes

now being used on golf shoes; its support of a study on cart tires influenced the size of tires now being used for golf carts.

### **In Green Construction**

Early Green Section research pioneered the development of practices in course care that helped minimize practical maintenance and management problems. The USGA encouraged H. B. Musser to write the book *Turf Management*, which for years was the only comprehensive book available for golf course superintendents and managers of large-scale turf areas. This publication has been called the "Golf Turf Bible" by many golf course superintendents.

Green Section research and support of studies related to putting green construction resulted in a new and revolutionary method of green construction. It is now used throughout the United States and the world. While every research director of the Green Section contributed to the thoughts involved, Dr. Marvin H. Ferguson's singular and dogged pursuit of soil research studies culminated in the publication of *The Specifications* in 1961.

### **Research the Primary Mission**

From 1920 to 1953, the Green Section's primary mission was research. In 1953 emphasis changed to extension activities centered around USGA Member Clubs with continued strong financial support of research activities. The U.S.G.A. Green Section Research and Education Fund, Inc., was developed, and today it receives support from the National Golf Fund, the Masters Tournament Committee, the New England Golf Association, various individuals and the USGA. The National Golf Fund raises its money through National Golf Day.

In this event the individual pays \$1 to play a round at his club during a period of about two weeks. On one day during this period, the United States Open Champion and the Champion of the PGA of America play a round together. The lower score of these Champions then becomes the "target score" that the club player is shooting against.

This event is a solid fund raiser for research. The National Golf Fund has contributed heavily to the support of research projects and we heartily endorse every golfer's annual participation.

### **And More**

At the Green Section Educational Conference in New York City last January, club officials had the opportunity to listen to three prominent researchers who have been or are now working on projects supported by the U.S.G.A. Research and Education Fund. These projects include re-

search on *Poa annua* by Dr. James B. Beard of Michigan State University; a colonial bentgrass breeding program by Dr. Joseph M. Duich of Penn State University; and a bluegrass breeding program by Dr. C. Reed Funk of Rutgers University. It was an opportunity for USGA Member Club officials to learn how their research funds were being used. Many of those present expressed their unanimous praise of the calibre of research conducted by these young scientists.

In addition to the three projects listed above, other USGA Green Section Research and Education grants-in-aid totalling \$32,000 are being made in 1970 to the following institutions: Georgia Coastal Plain Experiment Station, University of Connecticut, University of Georgia, University of California (Davis), University of California (Riverside), Oklahoma State University, Kansas State University, University of Rhode Island, Texas A&M University, and Virginia Polytechnic Institute. Projects include work on spring dead spot, microbial degradation of thatch, renovation studies on green-fairway-tee turf, disease, weed and insect controls, bentgrass improvement studies for southern courses, bermudagrass breeding and creeping red fescue studies for southwestern golf courses, and the general support of work in progress at these institutions.

### **A Balanced Program: Research & Extension**

Our program, integrated into the total university and experiment station program, is golf course oriented, designed to solve the problems as observed, discussed, and determined by the nationwide Green Section Staff.

Over the years the Green Section has supported numerous university research programs, many in support of advanced degrees in turfgrass culture. Several prominent authorities earned advanced degrees while working on projects supported by USGA funds. Dr. Fred V. Grau was perhaps the Green Section Director most responsible for encouraging this program of decentralization and the establishment of turfgrass research at state university levels.

Today, eight USGA agronomists are engaged in bringing the best of research and practical experience to Member Clubs. By way of its Green Section Visiting Service Program, on-site visits with the golf course superintendent and the Green Committee Chairman culminate in discussions of the total program. Findings from state university research programs, together with the rich background of Green Section research, play an important part in these discussions. As a USGA Member Club, this is your program, and we hope that you are as proud of its accomplishments as we are.