May meeting at Andrews:
Host Superintendent, Ray Etchison, has been at Andrews since May, 1954. Prior to that, Ray worked for six years at the Naval Hospital in Bethesda, Maryland, where he helped build and maintain the 9 hole course on the grounds. A Maryland boy, Ray graduated from Rockville High School and attended a course in Turf Management in Chicago. Before going to the Bethesda Hospital, Ray worked at White Flint Golf Course and summers for Dick Watson at Chevy Chase. Ray is a Civil Service employee and has been for fifteen years.

From the campus:
Reported by Eliot C. Roberts, Turfgrass Research Specialist at Iowa State University

Nutrient-Disease Relationships in Turfgrass

Whether disease problems are centered primarily on putting greens or on greens, tees and fairways alike the frequent use of fungicides will be essential to the production of quality turf. There is little possibility of obtaining turfgrass species and strains which are immune or sufficiently resistant to disease to make use of fungicides completely unnecessary. Further, at the present time, there are no turfgrass maintenance practices which can be effective against the fungus pathogen either directly or indirectly as to replace the use of chemical fungicides. It should be stressed, however, that in order for the use of these materials to insure best results the turf must have some resistance toward diseases in general. Where the grass has no ability to "fight for itself" it is extremely difficult to get 100 per cent control from the use of any fungicide.

The fungus produces it's disease symptoms in turf by feeding on the contents of cells that make up the grass plant. Basically, when a fungus pathogen infects a turf it does so in two stages. The first step is the entry of the fungus into the interior or tissue of the plant. The second step is the establishment of the fungus within the plant so that it can feed on the food substances produced by the turf. Resistance to disease may occur at either or both of these stages.

In general, the nutritional effect on creating conditions unfavorable to fungal entry into the plant tissue is limited. There has been some evidence that deficiencies of potassium accompanied by the accumulation of excess calcium leads to thin walled surface cells that are easily penetrated by the fungus. Also, excessively moist growth conditions often result in the production of soft surfaced cells that are easily entered and infected.

In regards to the second stage of infection, changes may be brought about in the chemical composition of the tissue that effect the degree to which the fungus becomes adjusted to parasitism within the grass plant. It is known that the production of certain organic acids, sugars, tannin as well as some pigments and other compounds within the cells result in specific protective reactions in favor of the grass and against the fungus. These materials may counteract the effect of enzymes or other materials produced by the fungus that act to kill the

plant cell. It is believed that such conditions as high carbohydrate to nitrogen ratio and the presence of compounds like magnesium sulfate and potassium phosphate within the cell effect the amount of harmful enzyme produced by the fungus or in some way modify it's behavior so that injury to the plant is reduced. These substances produced by the fungus not only slowly kill the cell but also may act to break down structural material between cells. This enables the fungus to spread with ease throughout the entire plant. It has been observed that cell walls with a high fiber content are more resistant to decomposition than those with less fiber.

Because of differences between turfgrass species and strains, such as special nutritional requirements; and because of the diversity of pathogens such as relative ability to infect weakened turf in comparison to vigorously growing turf; and because of differences in soil type affecting total nutrient supply and balance, it is not possible to make sweeping generalizations concerning nutritional relationships to disease control. The primary consideration in this regard is the promotion of mixi-mum productivity of quality turf and as a by-product disease resistance will be enhanced. It has been well demonstrated that least disease resistance may be expected where soils are either extremely deficient in all major plant food elements or out of balance with respect to nitrogen. (Too little or too much nitrogen in relation to other essential nutrients). The source of nitrogen has been found to influence disease susceptibility, perhaps through rate of nitrogen supply to the turf.

These relationships represent a broad field for further investigation. It is certain that a better and more complete understanding of nutrient-disease relationships will be gained through the evaluation of research results in this area.