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"If the thermometer had been an inch longer, we would have frozen to death."

— Mark Twain

Fall triggers a number of changes in plant growth, most notably the appearance of "fall color" among various deciduous tree species. The degradation of chlorophyll in the leaf allows for the expression of other leaf pigments.

Warm-season turfgrasses, too, can undergo a color change. However, this change is associated with a plant stress known as chilling.

Chilling injury is defined as low-temperature stress in the absence of freezing that readily occurs on warm-season grasses when temperatures drop below 54 degrees Fahrenheit (12 Celsius) in the fall. Although chilling is most often associated with bermudagrass, it occurs on most warm-season turfgrasses. If you're not aware of the environmental conditions present and recognize the symptoms, chilling injury can be rather striking and disconcerting, but more importantly misdiagnosed.

In addition to cool temperatures, sunlight is essential for injury and leaf bleaching to occur. Chilling injury causes several metabolic or physiological dysfunctions to the plant, including: 1.) disruption of the conversion of starch to sugars (amylolytic activity); 2.) decreased carbon dioxide exchange; 3.) reduction in net photosynthesis; and 4.) the destruction/degradation of chlorophyll (DiPaola & Beard, 1992).

Given the temperature range from 32 F to 54 F (0 C to 12 C), chilling symptoms can vary depending on the conditions. The most striking symptoms occur under high light intensities with rapid temperature drop to or close to freezing. Under this scenario, symptoms are expressed in 24 hours to 48 hours. Bleached-out turf areas appear as a mosaic or camouflage pattern across the turf. The bleached-out leaves are due to rapid pigment degradation.

Although we are not aware of any data or studies, the consensus opinion among researchers in this area is that the serpentine or camouflage pattern occurs because of differential set-

Fall Brings Chilling Effects

BY KARL DANNEBERGER



The reddish leaf blade of centipedegrass is due to low-temperature stress.

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ting of cold air. In other words, cold air settles into the lower areas of the turf causing more injury, similar to what occurs in a valley or at the base of a mountain range. Chilling injury can occur multiple times when temperatures drop but then rise for an extended time allowing for the turf to literally grow out of the injury.

At temperatures in the high 40s F to the low 50s F, chilling injury occurs much slower and is not as dramatic. Chilling symptoms appear more uniform and the turf color is a combination of purple, blue and red shades because of the slow degradation of chlorophyll and the corresponding expression of other pigments and carotenoids. A bluish or purple discoloration is sometimes misdiagnosed as leaf spot.

Preventing chilling injury is nearly impossible if temperatures get cold. If conditions can be predicted prior to occurring, covering the turf can help reduce the severity. Applications of gibberellic acid within hours of discoloration can help reduce the discoloration (follow label directions). Most of these practices work best if the chilling period is of short duration. Painting the turf green is another option if the discoloration is objectionable.

Karl Danneberger, Ph.D., Golfdom's science editor and a turfgrass professor from The Ohio State University, can be reached at danneberger.1@osu.



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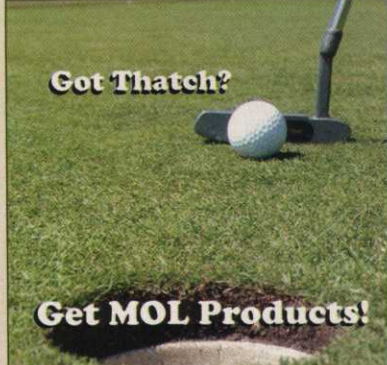


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Wii bit of fun

A year ago in this column, I dismissed the Nintendo Wii. It wasn't out yet, but I figured there was no way it would work. Nintendo makes kids' games, my reasoning went, how would this be any different — the Wii and its funny-looking remote would be an also-ran in the track meet between PlayStation 3 and Xbox 360.

With apologies to singer Dinah Washington, what a difference a year makes.

After Thanksgiving last year, my friend Mitch asked me to come to his classroom to see something. Usually Mitch shows me extremely cool manly things — robots, hi-powered rockets or new power tools. But on this day, he showed me a white box and a controller shaped like a skinny remote control. It was a Wii, somehow finagled from his 17-year-old son, who had camped out for a few days to snag one at a local toy store.

I slid the oblong Wii remote on my hand and looked at what appeared to be a cartoon tennis match. Mitch told me to swing the remote like a tennis racket. I did ... and voila! The man on the screen turned a nice forehand. For the next 10 minutes, I couldn't stop smiling. I was hooked, sore arm and all.

I explained to anyone I saw how thoroughly cool the Wii was, how I

EVEN EBENEZER WOULD HAVE A HARD TIME
HOLDING A FROWN WHILE PLAYING THIS VIDEO

GAME TRIUMPH **BY MARK LUCE**

had never experienced anything like it in some 30 years of playing games. I needed one. Yesterday.

Demand was beyond high. In June, after six months of searching, I finally found one. I dropped \$250 for the system and another \$50 for a game and extra controller.

Since then, our house has been a virtual training ground. We've played baseball, skeet, bowling, golf, pool and any number of midway games. We've participated in the Wii Fitness Test, where we are challenged in games for a particular age; my first pathetic attempt resulted in an age of 76, but now I am down to about 26 (20 is the best score). We've cut onions and stirred soup in a particularly fun but weird game called Cooking Mama Cook Off. We've saved Bikini Bottom with a Sponge Bob game, skated with Tony Hawk and even played old-school NES favorite Super Mario Brothers (the Wii has WiFi and a store to download older games at \$5 a pop).

Of course, I still think the Wii remote simply possesses magic powers, but really its loaded with accelerometers and



infrared detectors, which help the remote understand where it is. Thus, your physical movement — be it a roll, a toss, a pitch, a swing or just shaking — gets immediately translated into movement of your character on the screen.

While adults will flip for the Wii, the kids will, too, and there are already several Wii educational titles, such as Big Brain Academy.

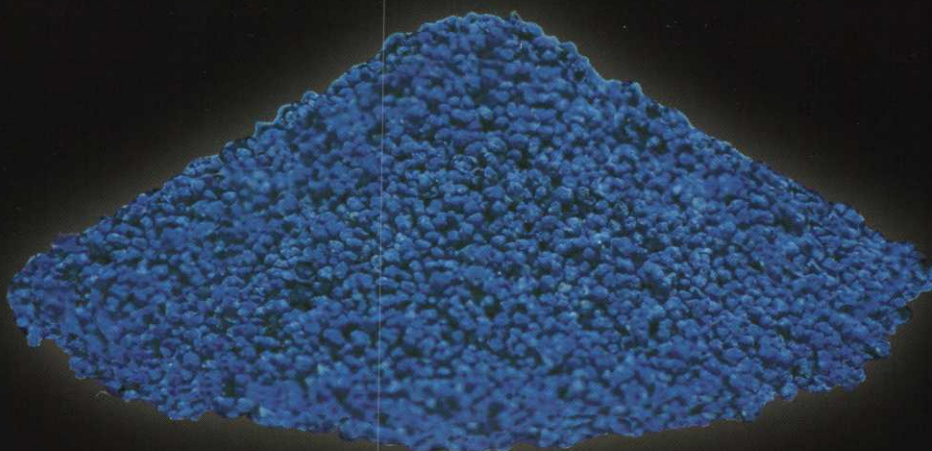
I guess my small brain should learn not to judge a game system before I play it. It takes a man to admit he's wrong, but it takes a curmudgeon not to enjoy the Wii.

Mark Luce is a freelance writer in Kansas City, Mo., where his 5-year-old son still beats him at Wii Bowling.

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