weeds from the playing surfaces during the previous fall.

To make matters worse, golfers who play plenty of golf during April and May generally expected 4th of July conditions by Memorial Day. Unreasonable expectations made for one long, busy season.

Quite a few superintendents experimented with Embark applications on one or two fairways and had excellent results. It seems the timing and the weather following the treatments was just about perfect, which provided equally perfect results. Word spreads quickly and there will undoubtedly be many more acres of fairways treated with Embark this spring.

In my opinion, if Embark treatments were foolproof, then everyone would be controlling *Poa annua* seedheads on fairways each spring. Most older, successful superintendents realize through experience that an Embark treatment is a hit or miss endeavor, highly dependent on timing the application just right and not without the risk of discoloring or injuring the turf. Furthermore, the success regarding seedhead suppression on fairways will no doubt encourage the use of Embark on *Poa annua*/bentgrass greens, where a heavy crop of seedheads can affect the quality of a putting surface. There is nothing quite like the look of a burnt orange *Poa* green that was treated with Embark during early spring and then hit with a few heavy frosts a day or two later. The several week period before recovery occurs usually feels like several months to the superintendent when the hottest topic in the grill room is whether or not the greens will ever be green again.

Whether or not the heavy early season play had any influence on the invasion of moss into greens across the Region is debatable. Over the past two seasons the courses that always had a little moss in greens are finding that the moss has spread and many courses that have never had this concern are now seriously affected by moss encroachment.

I felt more like a "psychic friend" than an agronomist this past summer at several TAS visits to courses I had never seen before. We typically discuss the day-to-day maintenance practices before touring the course.

Q. What is the mid-season height of cut?

A. About 0.120 from late May through September. We really raise the height of cut way up to 0.130, after our last major outing in early November, the Frostbite Open.

Q. Groomers on the mowers?

A. On one set of triplexes, rotated on and off a particular green every other day.

Q. How deep are the groomers set?

A. Set just deep enough to tickle the turf, you know, about a dime or a nickel below the bench setting. It really cleans up those *Poa* seedheads, eliminates the grain, and dethatches the green. What a great management tool, no need to set up the verticut reel anymore. Been brushing the greens more too, it really stands up the turf and helps manage green speed.

Q. Do any rolling?

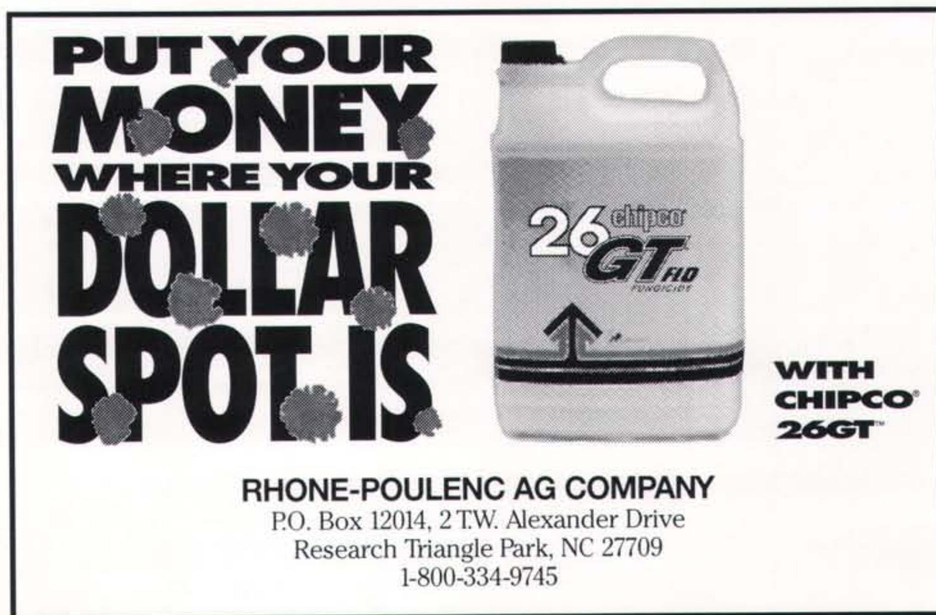
A. On Men's Day and on the weekend, but sometimes three times a week.

Q. How much play?

A. About 30,000+ rounds a year, seven to eight minutes between tee times, and there are always a few early-bird members that they allow out on the course as soon as it's light.

Q. Any policy regarding green speed?

A. There wasn't until two years ago when the incoming club president appointed my new Green Committee Chairman. What a player, he can really turn it up a notch or two after a press on the back nine. Pretty knowledgeable too, he has played many of the Top 100 courses in Golf Digest and is a member at several of the nearby new courses as well. It runs in the family, his daughter was just awarded a full golf scholarship to Stanford. First thing he did was appoint the current Men's and Women's Club Champs to the Green Committee. Anyway, we have initiated a policy of keeping



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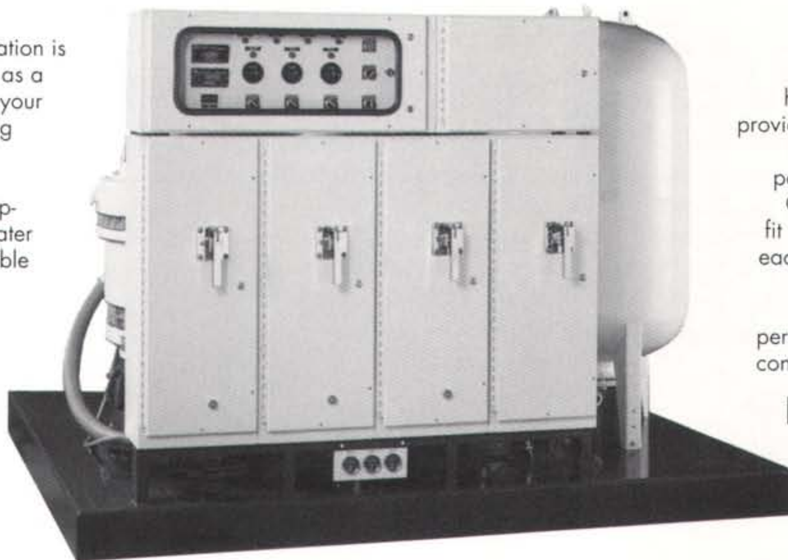

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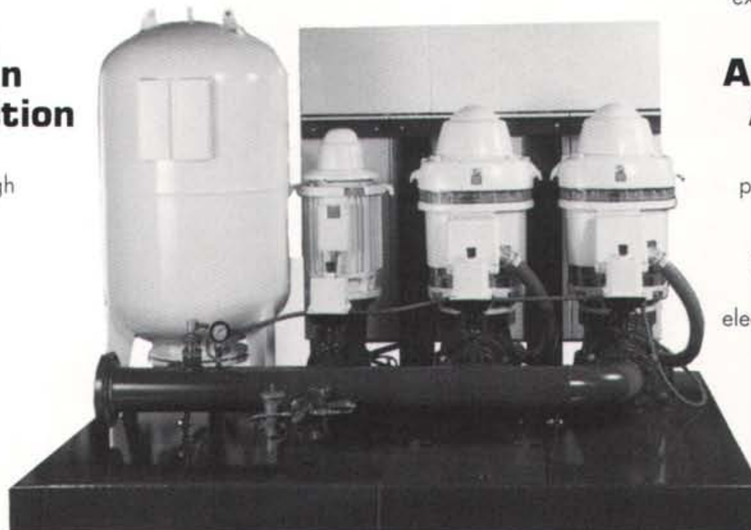

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greens about 10', especially on days when members may be having guests playing. We used to keep the greens about 9' to 9'6" all year, but a few of the better players wrote a letter to the Board saying that some of the greens just don't feel like they roll 9'6" - maybe because the front nine greens are so flat. Well, we sure addressed that problem when we designed and built the back nine, but that's another story.

Q. Any shade problems on greens?

A. The greens get plenty of sunlight, except for three holes on the original front nine and the eight holes on the new back nine that the members designed and pitched in to build about twenty years ago. The back nine really has some character; it was cut right through a wooded swamp - spectacular in fall when the leaves change color. The pace of play also improves in the summer because you can't take too many practice swings with all those mosquitoes.

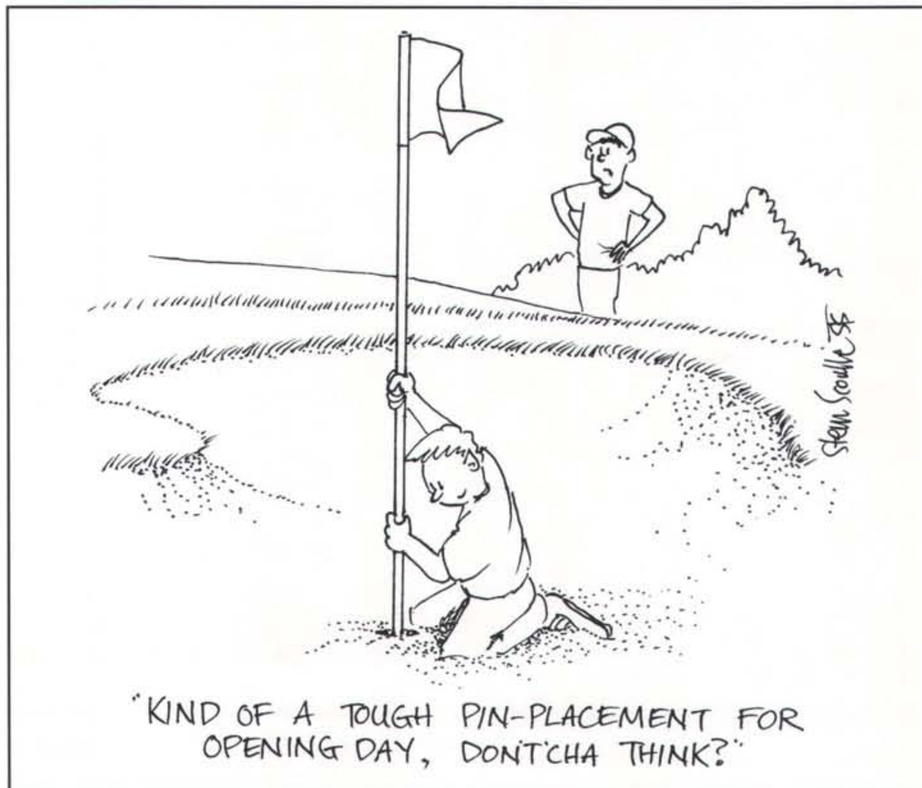
Q. What is a typical irrigation cycle in summer?

A. Averages about 15 minutes a night or so, depending on whether or not it rains. All the sprinklers around greens go on or off as a block.

Q. How many pounds of nitrogen would you say you apply to greens each season?

A. About 1.5 to 2.0 pounds a year. An old soil test indicated we had plenty of phosphorus in the greens so we haven't applied any for 12 years. Well, it doesn't move through the soil profile and there really isn't any need to encourage *Poa annua* in the greens.

Considering the answers to these question, I usually ask to visit the greens that have the most moss encroachment first, when we tour the course. Eyes open wide, jaws drop, and suddenly I'm a psychic who can predict moss on a green at a course I have never seen before. The tongue-ion-cheek answers to putting surface maintenance questions, however, allude to the underlying causes to moss encroachment, which is overly intense management of a green. The bottom line is that moss cannot compete with a healthy, vigorously growing stand of turf and it has no problem becoming well established in a weak, thin green.



"KIND OF A TOUGH PIN-PLACEMENT FOR OPENING DAY, DON'TCHA THINK?"

As the long season dragged on, many areas were subjected to extended periods of drought. Drought put extra stress on *Poa annua* playing surfaces and severe losses of turf occurred after several bouts with severe thunderstorms inundated previously dry courses with several inches of rain. High winds associated with lines of thunderstorms also cause extensive damage to trees on many courses during the summer. Acres of *Poa annua* turf on fairways died or were severely injured after a few days of heavy rainfall during August. Preventative fungicide applications and grub control did little to prevent the loss of *Poa annua* last summer, which took superintendents and golfers by surprise. Scalping the turf after the heavy rain probably contributed to the injury. Golfers grumbled about poor fairway conditions well into October and were typically unwilling to accept that the injury was weather related and beyond the superintendent's control.

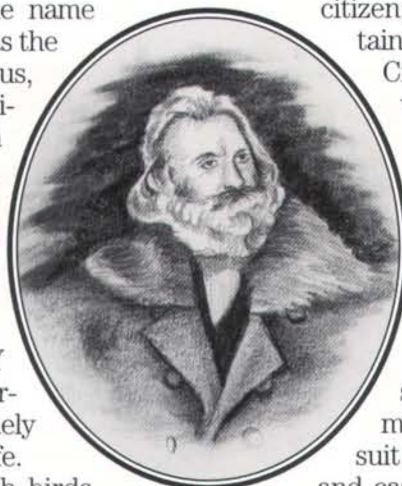
Atypical weather persisted well into fall. A warm November and early December had many superintendents second-guessing themselves regarding the use of covers on greens. Covers encouraged turf growth on greens at some courses until late December. some superintendents removed covers, mowed the greens, and then reapplied snow mold fungicides, while others did nothing. The implications of delaying the normal hardening off process by covering turf will not be known until this spring.

What will the last season of the millennium hold for your course? Only time will tell.

John James Audubon

By Monroe S. Miller, *Blackhawk Country Club*

In the world we live and work in, the name "Audubon" is as recognized these days as the names Morris and Muir, Noer and Nicklaus, and Leopold and Love. The program initiated by the USGA and the Audubon Society of New York has been successful way beyond, I suspect, the hopes of Jim Snow and Ron Dodson, the two most responsible for it. Most courses seem to have embraced the concepts of the Cooperative Sanctuary Program and participate at some level. Bravo to the ASNY and the USGA; their plan came at the perfect time in our history and has genuinely made golf courses better places for wildlife.



Most people associate Audubon with birds, nature, conservation, wildlife, and the environment. The Audubon Society manages 150,000 acres of natural areas and habitat, sponsors annual bird counts, and publishes *Audubon* magazine. I most surely did, and our course has participated, albeit at a modest level, in the Coop Sanctuary Program.

But I knew little about John James Audubon himself, ignorant even of exactly when he lived or where he was from. So, to answer that question, I spent significant time reading about the man, his life and his art. Also, for me, part of learning about a person's life involves visiting significant places he lived and worked. I did that in this search for who Audubon was and why the memory of him is so important to our society in general and our business in particular. The study took me to Mill Grove near Philadelphia and Henderson, Kentucky, and finally to New York City.

It was quite an adventure, not unlike my searches for Aldo Leopold, John Muir and John Burroughs. Here is a syntheses of what I learned about J.J. Audubon.

He was born on April 26, 1785, a lot longer ago than I would have guessed. He was not a natural born citizen; he was the love child of a French sea captain (Jean Audubon) and a French Haitian Creole woman (Mademoiselle Rabin). He was born in Santo Domingo, Haiti. He had a half sister Rose (also illegitimate, by a different woman) and both children were adopted by Captain Audubon's French wife. He was born Jean Jacques Rabin Fougere Audubon, and at an early age displayed an artistic talent and drew birds and mammals. When he was 17 he studied art formally in Paris for six months. The confinement of that formality - trapped in an art studio - did not suit him, and he disliked drawing from models and casts. He preferred to do his drawing from nature. So, at the age of 18 in 1803, he left France for America and his wealthy father's estate, Mill Grove, north and west of Philadelphia.

The stately entrance to Mill Grove, J.J. Audubon's first home in America, near Philadelphia.

Audubon loved his life at Mill Grove, hunting and fishing and drawing and painting. He learned English, influenced by Quakers in the area, met an English girl (Lucy Bakewell) who would become his wife, roamed the forests of our then unsettled country. And he studied the birds and wildlife of the area around Mill Grove.

One story about Audubon and his early time at Mill Grove that I particularly found interesting involved Perkiomen Creek, which traversed the "plantation." He discovered a cave along the banks of the Perkiomen and spent hours there with a pair of phoebes. He studied their form and habits and coloring; they accepted his presence, to the point where he was able to catch them and tie colored thread around their legs, the first time birds had ever been banded. It allowed him to see if they returned to the cave the next nesting season. Time has eroded the cave - I asked about it when visiting Mill Grove - but it is easy to imagine since the

John James Audubon's first home, Mill Grove.

A view of Perkiomen Creek from the porch of the house at Mill Grove.

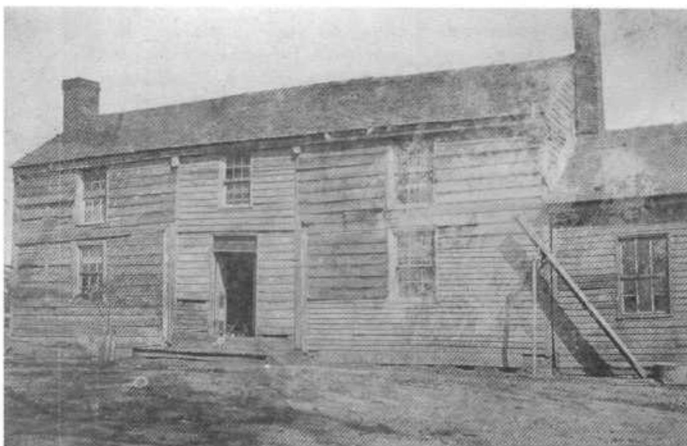
creek still flows along the property at Mill Grove, a quick walk from the house.

The other thing Audubon figured out during these early days at Mill Grove was his technique of "drawing from nature," as he called it and even wrote on his paintings. He worked from the birds themselves. It required clean killing of a specimen, but he wanted to draw them as if they were alive. So he developed a technique of running wire through the dead bird at several points of its body and posed the bird as it would appear in the wild. The specimens rotted quickly, which required that John work quickly. He also needed to shoot fresh birds quite often.

I am sure the thought of his killing birds (and animals he drew, as well) probably offends many now in the society that bears his name. In fact, it all reminds me a little of Aldo Leopold who, when younger, loved to hunt and has written about the thrill of shooting wolves. Audubon boasted about times when he would shoot 100 birds a day! And he wrote about being among four hundred hunters blasting away at clouds of Golden Plovers with each hunter killing about 30 dozen birds. There was a similar story of shooting so many pigeons that the dead birds were used to fatten hogs. These stories must send shivers up purists' spines, those who forget that J.J. Audubon lived in a different time with very different attitudes. Another jolt is the fact that Audubon owned slaves while he lived in Henderson, Kentucky.

In 1807 Audubon and a partner headed west from Pennsylvania to Kentucky to set up a business as merchants. They went through Pittsburgh, Lexington and finally stopped in Louisville where they set up their business. Reports are that Audubon spent little time as a merchant and a lot of time hunting, exploring and drawing. Audubon was, however, willing to make the buying trips back east, and on one of those he returned to marry Lucy Bakewell. It was April 4, 1808. They moved back west to near Louisville.

Although Audubon may have fancied himself other-



This old building was John and Lucy Audubon's home in Henderson, Kentucky. Today...

a bronze plaque on this bank building marks where the house was.

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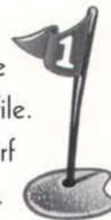

wise, he was not a good businessman. In the next decade he sold whiskey, established a store with Lucy's brother in Henderson, Kentucky, bought and sold land (which actually made him some money), built and ran a gristmill and sawmill in Henderson. The mill never made it; he was part owner of a steamboat, the Henderson, that was also a financial loser.

Henderson was home for John and Lucy and their children for six years. One little girl - Lucy - died in Henderson and is buried in an unmarked grave. I visited Henderson and found it to be a treasure trove for those interested in Audubon's life. That judgment extends to the citizens today. I pulled into Henderson a little short of time and stopped to inquire about Audubon's store, mill, the museum and park, and whatever else might be significant. As luck would have it, I stopped at a business on Main Street, between First and Second Streets. A man, about my age, was helpful and listened to my inquiries. It turned out that Audubon's store was literally across the street where I was parked and is now marked by a bronze plaque on a bank building. More conversation led to an invitation to his parents house to see their framed, original (and now very valuable) print from one of the elephant folios. I took a picture of it as it hangs in their living room, and it is one of the best ones, a painting of the loon. The only sad note is that when it was framed years ago, the size was trimmed to make framing more reasonable!

This photo shows a framed, trimmed double elephant print from one of the original sets by Audubon. It hangs in the livingroom of a Henderson Family.

The New York Historical Society has an excellent collection of Audubon art and artifacts.

Henderson also has the John James Audubon Museum, located in the Audubon State Park on the northeast side of Henderson. The building is impressive, built of limestone and brick. It was built by the WPA in the 1930s and was renovated in 1993 and added to at the same time. It is a superb example of the French Norman style of architecture. This collection is the best in the world, the envy of the curator of the Mill Grove museum. L.S. Tyler gifted most of what appears in the Henderson museum. This person had the foresight years and years ago, when Audubon furniture, art, books and other artifacts were available and affordable, to bring together most of it. JJA's death mask is there to see. Stones from his mill are visible from a park on the Ohio River, just off Main Street. You can also sense in Henderson that the area was rich with birdlife and wildlife and can understand why he enjoyed his years in Henderson. Today it is a beautiful old river town.

Audubon left Henderson to assume a position at Cincinnati College's Museum of Natural History, as the curator. But that project didn't pan out and he didn't even draw a single paycheck from the college.

But always, during his various ventures, he painted and he drew - birds mostly, but landscape settings and even some portraits. On occasion, portrait painting brought in a little money.

In 1810 Audubon had met a Scotchman named Alexander Wilson; Wilson came to America in 1803 to do a book about the birds of North America. Audubon was enthralled with the idea of making a living with his artwork of birds, like Wilson was able to do. Wilson was the better writer, but Audubon was far and away the better artist.

The Wilson encounter and his subsequent success at selling his artwork inspired Audubon. In the spring of 1820, after the Cincinnati museum failed to pay him, he and his wife made a decision that would affect the remainder of both their lives; J.J. Audubon was going to challenge the work of Alex Wilson with his own book, a book he knew he could make bigger and better.

For the next five years or so he traveled around the country in search of birds. He neglected his family, leaving Lucy in charge of those affairs. He neglected business, too, spending most of his hours on bird observation and drawings for the book. He was a true back woodsman, and very soon known as an "American Woodsman" like Daniel Boone and Davy Crockett. He

A statue of J.J. Audubon tops an Ionic column in front of the American Museum of Natural History in New York.

admired them both, so the reputation, to him at least, was a compliment!

Audubon tried to get to know scientists and academic types, people who might add to the credibility of his work. But he was considered less than seriously and more as the backwoods type he really was. His artwork, though excellent, was not gaining much support in America at that time, so he traveled to Britain in 1826.

The move to Europe was smart. In Scotland he met William Lizars, an engraver and a printer who agreed to print Audubon's work. Lizars did good work, and he taught JJ some valuable lessons in selling and printing. It was a key move by Audubon. With Lizars' work, he had something to show people. Audubon went to London to sell "subscriptions" of his bird artwork, and he met a new engraver, Robert Havell. Havell had the capability to turn Audubon's dream into reality.

The reality - *Birds of America* - was produced five plates at a time, with a total of 87 parts. That meant 435 pages that depicted 1063 birds in life size. Subscribers paid for the book over years, as each part was completed. The prints were bound in four volumes and the book was expensive - about $1,000.

And big. The plates were printed on the largest size of paper available, the so-called double elephant. It measured about 27"' X 39", and until I saw one with my own eyes at the museum at Mill Grove, I didn't appreciate how big that really is. The *Birds of America* was accompanied by an "Ornithological Biography", which was notes, observations and comments on each bird species made by Audubon. The whole project was completed when he was 54 in 1839.

After the double elephant folio edition was done, Audubon and his family started to produce a smaller version, the Octavo Edition. Samples of it can also be seen in Mill Grove and at the Henderson museum.

Audubon worked in many mediums - paint, drawings, watercolors, charcoal and oils. At Mill Grove, you can see examples of each. Most impressive in their collection is an oil on canvas called "Eagle and the Lamb." It is formidable in size, occupying the wall of one of the downstairs rooms; he painted it while he was in London. A small colored pencil sketch of False Foxglove is in the same room; it emphasizes his flexibility as an artist.

Volumes have been written about his life; my attempt to share highlights in these few paragraphs seems nearly futile. But a few more details will add to your understanding of this talented and unique man.

Although mostly remembered for the *Birds of America*, Audubon was also interested in mammals. In 1839, J.J. and his two sons - John Wodehouse Audubon and Victor Gifford Audubon - made plans to prepare a book called *The Viviparous Quadrupeds of North America*. They were assisted by Rev. John Bachman, a Charleston, SC Lutheran pastor. Although a preacher by training, Bachman was well regarded as a naturalist and he is credited with pushing the Quadrupeds to completion.

The Quads, for a century and a half after it publication, had no equal. It was also big, and "imperial size" of 28" X 22" and contained 150 hand-colored lithographs by Philadelphian J.T. Brown. It was sold in three volumes for a cost of $1,300. The text was sold separately, also in three volumes. After the imperial publications, they created a smaller octavo edition, sold with the text included and an extra five plates. The artwork of the Quads is as impressive as the Birds, to my untrained eye.

He had four children, two sons who were very artistic and two daughters who died in early childhood. Rose died in Louisville and is buried there. The sons actually finished the Quads book after their father died in New York.

This photo shows the house J.J. Audubon built for his family at Minniesland in New York City. It was replaced at the turn of the century.

Significant to Audubon's life was his trip in 1834 on a steamboat up the Missouri River. Its purpose was to gather material for the Quadrupeds book. He was 58 and losing physical strength. It was disappointing to him in terms of data he hoped to gather, but he was able to realize his dream of visiting the American West. This was his last field trip.

Before he left for the West, Audubon made plans for a permanent home for his family. He wanted to move away from

his New York City address on White Street, but not so far away that getting to New York City was difficult. So he chose 24 acres in the wooded countryside along the Hudson River, about nine miles north of Manhattan. He called his little estate Minniesland, after the Scottish word "Minnie", which means "Mother". The Audubon boys had called Lucy "Minnie" ever since the years they had lived in Scotland. The construction of Minniesland started in 1842, before he left. There was enough land for some crop farming, gardens and orchards. He had some livestock, mainly hogs and chickens.

Audubon's last coherent writing took place in 1847. It is not known for certain what happened to him, but the guesses range from a series of strokes to the development of Alzheimer's disease. His mind became childish, shocking family and friends.

Trinity Cemetery in New York City. It is John James Audubon's final resting place. The cemetery land was originally part of Minniesland.

This past January, while Cheryl and I were vacationing in New York City, we decided to visit Minniesland and John Audubon's final resting place. We took a cab to 155th Street and Riverside Drive in upper Manhattan to see the Trinity Cemetery where Audubon is buried.

The Trinity Cemetery was the rural cemetery for Wall Street's Trinity Church on lower Manhattan. New York City passed an ordinance that prohibited any more burials in lower Manhattan in 1843, so the church opened this uptown garden cemetery.

The site is awesome. It is a big cemetery, from Riverside Drive to Amsterdam Avenue (two blocks) and W. 153rd to W. 155th Streets. Here's the interesting history of the cemetery: it used to be part of Audubon's Minniesland! It is an historic site for another reason. On November 17, 1776, under General George Washington's command, some of the fiercest fighting of the Battle of Washington Heights took place.

This huge oil on canvas painting, Eagle and the Lamb, was painted by J.J. Audubon in 1828 in London. Today it is displayed at the Mill Grove Museum.

It is a beautiful site. As I said, it is hilly and rocky and wooded and overlooks the Hudson River and the New Jersey Palisades. John Audubon is buried on the north end of the property, along 155th Street and in back of the Church of Intercession which is inside the burying ground. He had chosen this spot himself. Cheryl and I were there two weeks short of the 148th anniversary of John's passing. He died on January 27, 1851 and was interred on a stormy, wintry January 31, 1851.

During the spring of that year, Lucy Audubon wrote that she planted shrubs and creepers that were favorites of John's. I would bet those shrubs and creepers planted so long ago still grow there near his grave.

Of course, the area today looks totally different from Audubon's time. It is on the edge of Harlem, not far north of Columbia University or Grant's Tomb. Most of the buildings in the neighborhood were built at the beginning of the 20th century. In an adjacent area known as Audubon Terrace are a number of museums and cultural institutions that are worth visiting.

New York clearly reveres its place in J.J. Audubon's life. At 79th Street and Central Park West is the American Museum of Natural History. The museum has more than 34 million artifacts and specimens in its collection housed in a building with four giant Ionic columns at the entrance. On top of one of the four columns is a statue of J.J. Audubon. Two blocks south is the New York Historical Society, which has in it collection a complete set of the original Audubon double elephant folios of Birds of America. They weren't, much to my enormous disappointment, on display when we visited there. And I couldn't convince a curator to let me view their collection even though it was in storage.

It is no surprise that the ASNY is such an active chapter; clearly, they are proud of their state's place in Audubon's life.

So, there it is, the story of John James Audubon as I learned it and have come to understand it. Visits to Mill Grove, Henderson and New York City had amplified and accented all the reading I have done about him. I have a new feeling for the Audubon program and feel awe that this well accepted and practical activity is well suited to its namesake. And both the man and his life's work match up well with America's golf courses. J.J. most likely would approve.

Turf and the Biomolecular Revolution

By Steve Millett, *Department of Plant Pathology, University of Wisconsin–Madison*

The year is 2010, and the effects of the biomolecular revolution generated by the University of Wisconsin have spilled over into everyday life. Golf courses are no exception. The Turfgrass Biotechnology Center (TBC) has led the way in the turfgrass arena by generating more than 500 patents in its short five year history. Golf course superintendents are now called Turf Engineers and turfgrass maintenance has never been like this.

One of the best places to view the huge impact of the biomolecular revolution on golf course maintenance is at the Aldo Leopold Biotech-Hybrid Golf Course and Wildlife Conservatory. The first biotechnology products generated by the TBC were tested at the Leopold Hybrid Course. Back in 1999, this idea from the creative minds at the UW-Madison and the Wisconsin Turfgrass Association was met with skepticism and derision by some. But Oscar Peterson, head architect and Turf Bioengineer of the Leopold Hybrid Course, says, "I think Aldo would be happy with what we have done here at the Hybrid Course. Leopold, known as the 'Father of Wildlife Conservation,' pioneered the first UW-Madison program in wildlife management in 1933. And here we are, 77 years later with a beautiful golf course and conservatory area that lets humans, biotechnology and wildlife live in harmony."

Peterson, a UW-Madison graduate of the last century, has witnessed many biotechnology advancements in the turfgrass

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