



The Plant Doctor's LANDSCAPE TIPS

By Dr. David L. Roberts, The Plant Doctor LLC a.k.a. The Tree Doctor

SCIENCE & CONTROVERSY

INTRODUCTION

Science can be defined as seeking knowledge about the natural world. Why do we want to learn about the natural world? Because, if we understand living entities such as plants, animals, and micro-organisms, and if we can comprehend the importance of non-living things such as soil, elements, and chemical compounds, we as humans can better manage our environment for our pleasure and benefit (Photo 1). For centuries, Science was depressingly slow in development. For example, the Miasma Theory was accepted for a millennia as the reason people contracted diseases and were affected by other maladies. Miasma was believed to occur because of "poison air". In other words, diseases such as cholera appeared spontaneously out of the air and could not be prevented, except, perhaps, by the grace of God. It is estimated that during Black Death (bubonic plague) in the middle 1300's that approximately 50 million people (about half the population of Eurasia and North Africa) perished due to this polluted air, which they believed originated from rotting matter. Much later it was found that a bacterium spread by fleas was the culprit for Black Death.

For centuries upon centuries, superstition played a major role in people's daily lives, influencing their thinking about matters of importance. Eventually, the field of "Science" developed to help us understand and explain some of those occurrences. Ironically, it was sometimes the clergy of religious centers in Europe that advanced and discovered various aspects of the natural world (Other locations and cultures, i.e. China and India, etc., also accelerated human understanding of the natural world and are not intended to be diminished herein). Why Clergy? Because

Clergy had time on their hands, and they could read and write to exchange knowledge among intellectuals of the day, who were generally few and far between. The average "Joes" who could not read or write, spent much of their time just scrounging for the basic things needed for survival, largely at the mercy of Mother Nature. Or, as they were told, the mercy of God.

THE GERM THEORY

In the 1500's, the basics for the Germ Theory were proposed and later expanded upon in the 1700's. However, through this period, the Germ Theory did not take hold because the Miasma Theory was widely held as fact by most "scientists" and medical experts of the day. The formal Germ Theory is generally credited to French Chemist and Microbiologist Louis Pasteur (i.e. pasteurization) in the mid-1800's, although others were also involved. Please note that it took more than three centuries for the Germ Theory to be formally introduced but still not widely accepted. Pasteur demonstrated that fermentation and/or putrefaction (spoilage) of media (nutrients) occurred by microscopic organisms carried in the air. These microbes could not be seen by humans without the aid of magnification (Photo 2 & Photo 9B); their microscopic

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Photo 1

Photo 1: Whether for natural woodlands and forests, or for landscapes and nurseries, Science has enabled us to deal with challenges to better understand the nature of diseases and pests, and the needs of plants for a healthy environment. Many people in the plant industry and public may not always comprehend how Science has shaped our world and daily lives.

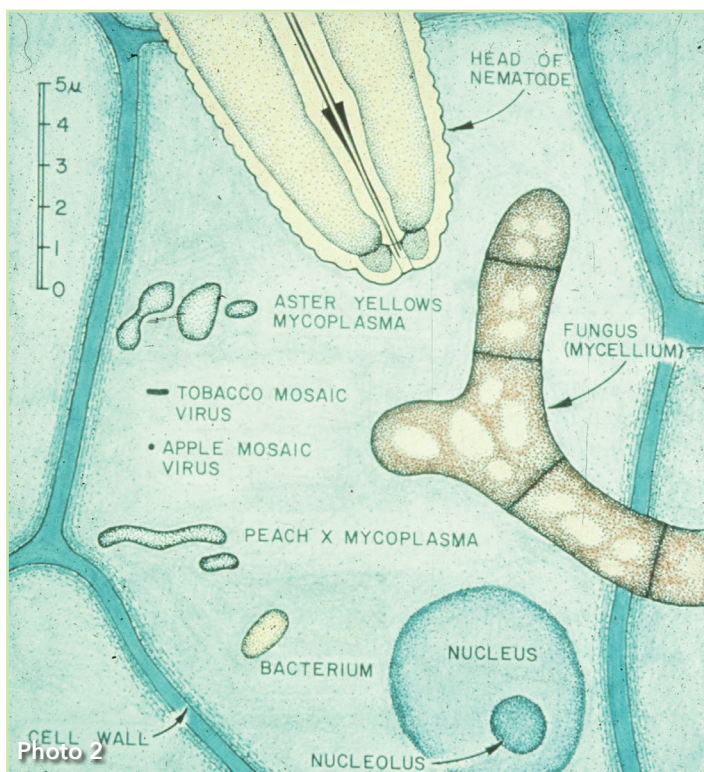


Photo 2

Photo 2: This sketch from the American Phytopathological Society illustrates the relative sizes of microorganisms in relation to the size of a single plant cell, which is also microscopic. Little wonder that people in ages past were superstitious about their natural world and the maladies that affected them.



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nature is largely the reason diseases were “mysterious” and supernatural for most millennia prior to the 20th century. The Germ Theory proposed that microorganisms (germs) known as pathogens could cause disease in humans. These pathogens, which were eventually identified as bacteria, fungi, viruses, etc. were believed to cause “infectious disease”, according to the Germ Theory. Like all new ideas, the Germ Theory was slow to take hold despite the evidence. There are probably people to this day who do not believe in “germs” or microorganisms (if you can’t see them!); some of these disbelievers likely belong to the Flat Earth Society, which was held up as the physical design of Planet Earth, until Christopher Columbus sailed off into the sunset in search of the new world, disappearing over the horizon in the process and returning to Spain the following year. Some conspirators also believe the moon landings were faked.

The field of Plant Pathology (Phytopathology) was born in the United States partly out of a scientific clash of theories between young, upstart American Erwin F. Smith and well-established German botanist, Alfred Fischer. This became known as the Smith-Fischer Controversy. Smith held that bacteria could cause plant diseases while Fischer believed in the more traditionally accepted idea that aligned with “supernatural” events. Eventually, Smith was proven correct and is considered the Father of Phytobacteriology. The bacterial disease agent, *Erwinia amylovora*, which causes Fireblight of Rosaceae plants, was named after him.

OTHER CONTROVERSIES

There have been numerous controversies in science. One of the most prominent controversies is, of course, Evolution (Photo 3), proposed by Charles Darwin in his book *On the Origin of Species* (by Means of Natural Selection, or the Preservation of Favored Races in the Struggle for Life), published in 1859, just before the start of the American Civil War. Even though there is exhaustive scientific evidence, Evolution is still a highly controversial concept in our modern day society. It is important to note that in the scientific community, a “theory” is something that has undergone extensive research and for which there is an abundance of evidence.

Scientific Theory Defined: *A scientific theory is an explanation of an aspect of the natural world and universe that can be repeatedly tested and corroborated in accordance with the scientific method, using accepted protocols of observation, measurement, and evaluation of results.*

So, even though there is ample scientific evidence for the formation of new species through natural selection, the process is still referred to as “The Theory of Evolution”, because we will never be able to find all the transitions, which we often call “missing links”. In an analogous example, most of us do not question gravity just because the phenomenon is referred to as “The Theory of Gravity”.

The scientific development of the atomic bomb by America in The Manhattan Project during World War II is still a highly controversial issue among many people. The movie “Oppenheimer”, based on

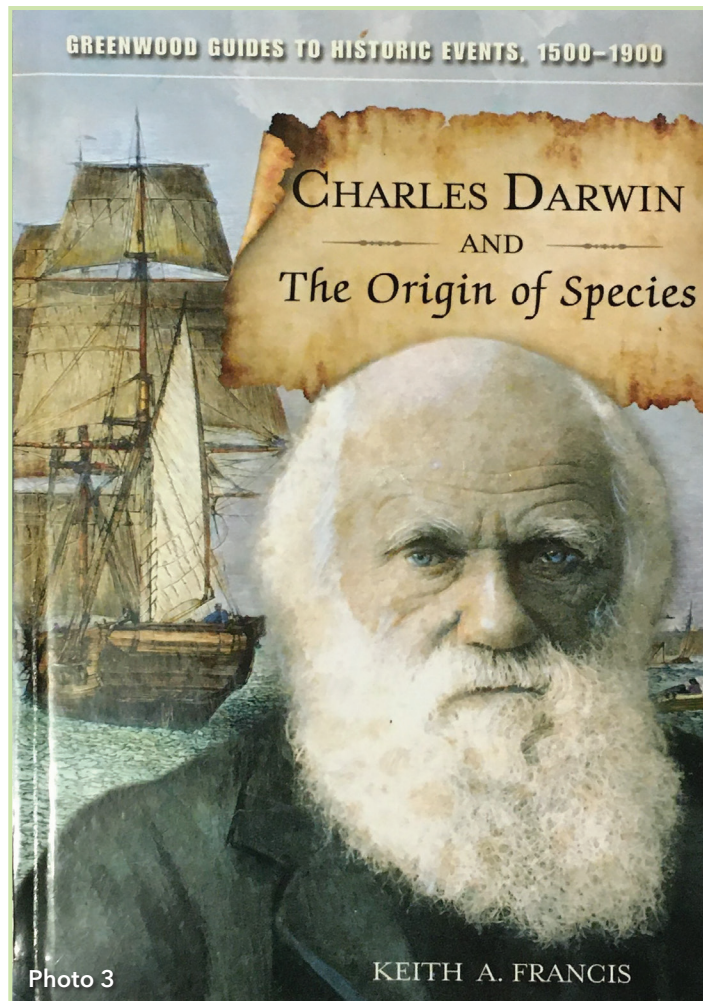


Photo 3

KEITH A. FRANCIS

Photo 3: One of the most controversial scientific discoveries was Evolution, which is still quite controversial 165 years after its publication by Charles Darwin in 1859. There are many books published about Evolution that provide various avenues for better understanding.

the book *American Prometheus* by Kai Bird and Martin J. Sherwin, did a credible job (in my opinion) of revealing the science and scientists involved in the urgency of developing “The Bomb” to thwart the prospect that adversaries of the Allied Forces in World War II might develop it first (Photo 4).

50 YEARS OF CONTROVERSY

Recently, I was asked to speak briefly at a turfgrass conference where Dr. Joseph Vargas was being honored upon his retirement from Michigan State University (Photo 5). It was this request that served partly as the impetus for this article. Furthermore, I think that most non-scientists, i.e. the public, do not understand science very well, likely because scientists do not promote what they do as effectively as they should. Dr. Vargas came to MSU in 1968 as a Turfgrass Pathologist. He put Turfgrass Pathology on the map not just in Michigan but nationally and internationally. He has visited countries on every continent on the planet when

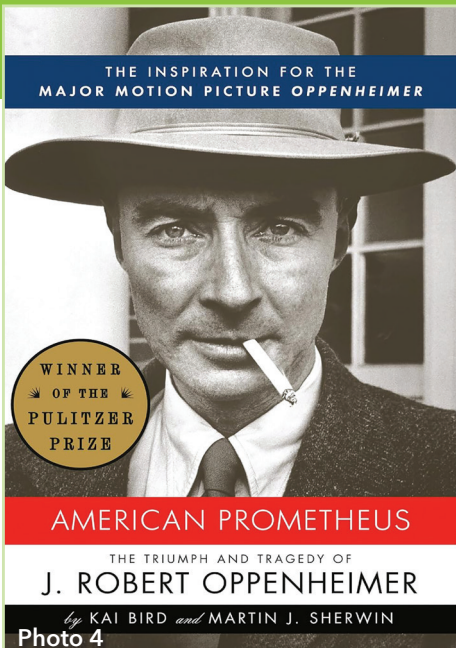


Photo 4: Another scientific controversy was the development of the atomic bomb via the Manhattan Project during the midst of World War II. The Allied forces, especially the United States, were worried that the Axis alliance would develop the bomb first and possibly win the war . . . or destroy humankind. The development of nuclear warheads presaged nuclear energy, which also proved to be another controversial issue created by science.



Photo 5: Dr. Joseph Vargas had a highly successful career at Michigan State University for 56 years. The Joe Vargas Endowed Chair in Turfgrass Pathology is being created in his honor. Donations are welcome.

requested for his advice on turfgrass issues. In 2018, he was interviewed at his 50-year anniversary with MSU and asked to surmise his career, which is often described as “highly controversial” (Photo 6). I thought it might be useful to describe just a couple examples of controversy with which he was involved.



By Peter McCormick • December 21, 2018

Frankly Speaking with Dr. Joe Vargas: 50 Years of Controversy

Original Publish Date: 12/21/2018



Photo 6: In 2018, a special production entitled “50 Years of Controversy” was created from interviews with Dr. Vargas. Joe was involved in controversy for much of his 50+ years as a scientist at MSU. Good scientists do not acquiesce to popular aspects or prevailing beliefs just to “get along”. Science is about seeking the truth regardless of how popular or unpopular the research.

The C-15 Problem (aka the “Creeping Crud”): I joined the Vargas lab in 1979 as a candidate for the Ph.D. degree. I was Joe’s first student (Photo 7) and elected to work on an issue that was plaguing many golf courses throughout the Midwest. ‘Toronto’ creeping bentgrass (Selection #15 or Cultivar #15) was considered the Cadillac of bentgrasses for golf greens, which is the reason it was utilized on so many golf courses. Because this “Creeping Crud” was affecting so many prominent golf courses where tournament play was televised on weekends, the “Mystery Disease” gained lots of press both locally and nationally (Photo 8). Many scientists examined the problem but were unable to determine the cause. The United States Golf Association (USGA) put together a large grant and awarded the funds to Virginia Polytechnic Institute (now Virginia Tech), The Ohio State University, and University of Illinois, referring to the awarded project as “The Team Approach”. Note that MSU received none of the funding. In the Vargas lab investigations, we were

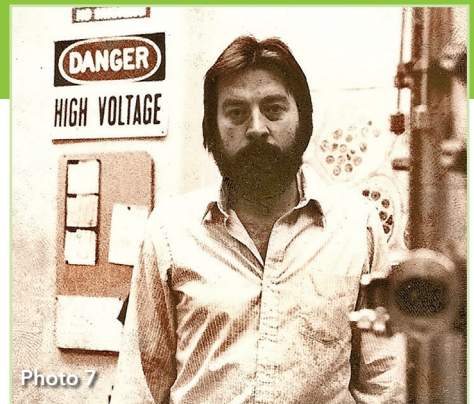


Photo 7: As Dr. Vargas’s first graduate student in 1979, this photo shows the author (Roberts) shortly after joining the Vargas lab. This photo reminds everyone that science is high voltage, and therefore dangerous, if we don’t keep an open mind regarding the revelations of the mysteries of our natural world.



Photo 8: As my Ph.D. Dissertation research, I tackled a highly controversial turfgrass disease, which no one had been able to solve. The Mysterious Disease gained national attention in many media outlets, especially because many Midwestern golf courses were affected by the disease in national tournament play televised on weekends. In this article, the C-15 problem was referred to as the “Creeping Crud”.

able to determine that a bacterium was involved by Electron Microscopy (Photos 9A & 9B). The revelation of a bacterium involvement in the C-15 problem would elicit the discovery of the first bacterial wilt disease on turfgrasses in North America. In pursuing possible resolution of the disease, we received grant funds from Pfizer Corporation to test the possibility that antibiotics might inhibit this newly discovered bacterial disease. Two antibiotics were tested: Streptomycin Sulfate and Oxytetracycline. Oxytetracycline proved highly effective

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Photo 9A

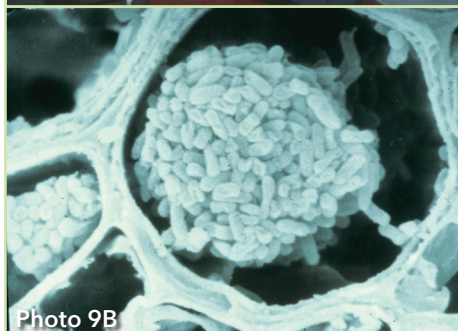


Photo 9B

Photos 9A & 9B: With a Transmission Electron Microscope, we were able to determine that a bacterium was the cause of the "Creeping Crud", setting the turfgrass world on its rear. It would become the first Bacterial Wilt disease of turfgrasses ever found in North America. The disease was named Bacterial Wilt of Toronto Creeping Bentgrass ("Toronto" aka selection C-15). In Photo 9A, Karen Klompars and I pose for a photo of the discovery - the "famous photo" on the background wall shows four xylem vessels completely plugged by bacteria. I took Photo 9B with a Scanning Electron Microscope in 1980 or 1981. The Scanning Electron Microscope provides a 3D image compared to the thin section 2D image of the Transmission Electron Microscope in Photo 9A.

while Streptomycin exhibited no verifiable impact upon the disease (Photo 10). Emergency 24C labels were applied in Michigan and elsewhere, enabling turf managers to apply the antibiotic to temporarily suppress the disease until they could renovate their golf greens with a different, non-susceptible cultivar of creeping bentgrass. Demonstrating the ruthlessness of some scientists, a scientist

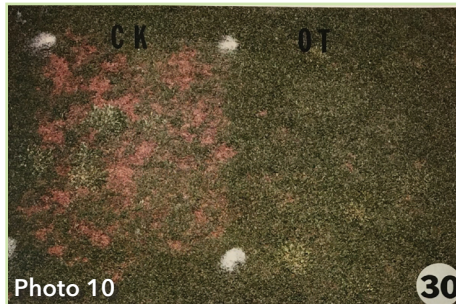


Photo 10

Photo 10: In this Photo (#30) from my Ph. D. Dissertation, antibiotics were trialed with Pfizer Corporation funding in field research to try to control the bacterial wilt disease. Oxytetracycline was applied to the 'Toronto' Creeping Bentgrass on the right while the untreated plot on the left served as a control. From this photo, we can discern that Oxytetracycline provided excellent control. Streptomycin sulfate, another antibiotic, had no impact upon the disease and appeared similar to untreated control plots. Based on this research, Oxytetracycline was given a 24C Emergency Label as a stopgap measure until C-15 areas could be renovated with a different cultivar of turfgrass.

from "The Team" sponsored by the USGA stopped by one of my antibiotic field plots in Chicago, had his picture taken next to our oxytetracycline plots (Photo 10), and declared he had discovered the cause and the solution to the C-15 problem; his picture next to my plots was published in newspapers. This violation of ethical standards was a rude awakening for a Doctoral Candidate in Science.

Poa annua and Anthracnose: Annual Bluegrass (*Poa annua*) is considered the scourge weed of high quality turfgrass, especially golf courses. Most "experts" claimed *P. annua* was weak and tended to die out in the heat of the summer, leaving fairways and greens in aesthetically and physically displeasing condition. If annual bluegrass was so weak as many claimed, why was this species often encroaching and taking over quality turfgrass areas? In his research with technicians and students, Dr. Vargas found that a fungal disease known as anthracnose was associated with the diseased turf. Furthermore, he found that well-timed fungicide applications would control the disease. The problem was how to convince the scientific community and turfgrass managers of this scientific development when there was so much

disdain for annual bluegrass. Whenever Dr. Vargas visited a golf course to assist the superintendent and members with their turf problems, he would try to get them to treat for anthracnose on annual bluegrass. Invariably, the answer was "no budget" for such treatments, because the hatred for *Poa annua* was so ingrained in everybody's mind. Dr. Vargas was often successful, however, at convincing the superintendent to surreptitiously treat half of a fairway. Without fail, the treated half fairway would remain green and healthy all season long. The Board and members would ask the superintendent why that half of the fairway looked so good. After explaining, the membership and Board seemed to always find a way to provide funds to treat the fairways (and greens) for anthracnose on annual bluegrass. Unfortunately, because of the recalcitrance for change, Dr. Vargas has been engaged in this controversy and others for his entire career.

CONCLUSIONS

Science is often controversial . . . largely because of egos, ignorance, and other characteristics of human nature involving recalcitrance to embrace new ideas and change. Also, Science is not infallible, largely because there are outside influences that compromise the integrity of Science. For Science to function properly there are basic tenets that need to be followed. "Dissent" is without question one of the most important tenets in science. We need to be able to disagree and pursue new theories and ideas to advance our knowledge of the natural world without restrictions or interference, which, unfortunately, happens all too often. Science in the United States essentially follows the 1st Amendment to the United States Constitution, which specifies free speech, free inquiry, and free pursuit of creative (research) endeavors. We need to protect those freedoms even if we don't always agree with their outcomes. 🌿

Dr. David Roberts has retired from Michigan State University but remains active with the industry. He can be reached at 248-320-7124 or treedoctor-dave@gmail.com.

The Tree Doctor will be speaking on "Proper Management of Oak Wilt in Michigan" on Tuesday, March 5th at the MGIA 37th Annual Trade Show & Convention at the Suburban Collection Showplace in Novi, Michigan.