

International Turfgrass

The Newsletter of the International Turfgrass Society

September 2016

Conference and Hotel Registration for the 13th International Turfgrass Research Opens 15 October 2016

by Dr. Bruce Clarke, ITS President
Director, Center for Turfgrass Science,
Rutgers University, New Brunswick, NJ USA

The 13th International Turfgrass Research Conference (ITRC) will be held at the Hyatt Regency Hotel in New Brunswick, NJ USA from 16-21 July, 2017. The Hyatt is a state-of-the-art hotel and conference center that is a perfect location for the ITRC in 2017. The hotel is in close proximity to three international airports and a short train ride to the heart of New York City. This is one conference that you will not want to miss. The ITRC will be packed with educational and social activities, so be sure to check out the ITRC Website (<http://www.turfsociety.com/itrc2017/?p=home>) for updates and additional details about the conference.

Online Conference and Hotel Registration Opens 15 October 2016

Conference and Hotel Registration (<http://www.turfsociety.com/itrc2017/?p=reg>) opens 15 October 2016. So, register next month to join the more than 500 participants from 26 countries who are anticipated to attend the 13th ITRC in New Brunswick, New Jersey, USA in 2017.

ITRC 2017 Highlights

There will be a special Pre-Conference Turfgrass Industry Session in the afternoon on Sunday, 16 July just prior to the evening welcome reception. This event will feature a brief mixer followed by a 1-hour
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Please note the quickly approaching deadline for short communications. It is my understanding submitted manuscripts are being processed and some have already been submitted in the “first look” format. Save some money and join ITS. **If you don’t know if you are a member, then go to <http://turfsociety.com/test/ismember.php>** and type in your email address that you used when first registering for ITS, and you will receive an instant response if you are in good standing.

Also, if you have any newsworthy stories or information for readers of International Turfgrass, I hope you will consider submitting an article for the next newsletter in January 2017.

I hope you enjoy the very good articles in this edition.

Sincerely,
Nathan R. Walker

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session highlighting recent advancements in the turfgrass industry. The Conference itself will kick off with a grand reception on Sunday night with a *Mardi Gras* theme. The reception is something that the entire family will enjoy and will feature a Dixieland band, jugglers, card tricks, and plenty of Mardi Gras beads. This is an opportunity to socialize and just sit back and enjoy a night of music, drinks and hors d'oeuvres. This will be followed by a week packed with educational and social opportunities (<http://www.turfsociety.com/itrc2017/pdf/Preliminary-Meeting-Schedule.pdf>) that will allow you to reengage with old friends and network with new acquaintances from all over the world.

Some major highlights of the 13th ITRC will include keynote addresses from internationally renowned scientists focusing on the conference theme "*Meeting the Challenges of a Changing Environment*" a graduate student oral and poster competition (see article on page 5) that will showcase some of the future stars in our discipline, and an evening reception on Monday, 17 July to recognize Dr. Jim Watson - one of the pioneers in the turfgrass industry. Posters will be displayed on Monday, Tuesday and Thursday (17, 18 and 20 July) and, for the first time at an ITRC, one-minute oral synopses of posters will be featured. This, as well as a late afternoon social hour in the poster viewing area, will entice meeting attendees to meet poster authors and discuss their latest findings over light refreshments and hors d'oeuvres.

A full day of technical tours is planned for Wednesday, 19 July highlighting the extraordinary range of turf venues in the New Jersey/New York City region. Depending on the tour you choose, attendees will visit Yankee Stadium or Citi Field (home of the world famous New York Yankees and New York Mets Major League Baseball Teams, respectively); the United States Golf Association Museum and Testing Facility; Bayonne Golf Course, called "the most audacious golf course in the world" by Sports Illustrated Magazine; Baltusrol Golf Club (the host location for the 2016 PGA Championship); Tuckahoe Sod Farm (one of the largest and most successful sod farms in the USA); Monmouth Park Racetrack (the site of the 2007 Breeders Cup, one of the premier horse racing events in the world); Met Life Stadium Practice Facility (Home to the New York Giants and Jets American Football Teams); Central Park (the iconic green space on Manhattan



The Great Lawn at Central Park

Island), the Bronx Botanical Garden, and the Red Bull Arena (home of the New York Red Bulls Major League Soccer Team). Be sure to "register early" for the conference since many of these tours will fill up quickly and space will be limited. The day will conclude with a cocktail reception, an American-style BBQ, and an opportunity to view research plots at the Rutgers Turf Research Facility at Hort Farm 2. Wednesday night's BBQ will have a 'Beach Party' theme, so dress casually and be ready to have a great time under the stars.

Immediately following the ITS Quadrennial Business Meeting and the Graduate Student Awards Presentations on Thursday, 20 July, attendees will board buses for a night on the town featuring a Twilight Dinner Cruise of the NY/NJ Harbor and Statue of Liberty with awesome views of the New York City Skyline, great food and dancing. This is a once in a life time event that your entire family will



Twilight Dinner Cruise Dining Room

want to attend.

The last day of the conference will include oral presentations and a Zoysiagrass Symposium Friday morning (see article on page 5) showcasing invited speakers who will give a world-wide perspective on

Continued on next page

this important and underutilized turfgrass species. The Conference will conclude with an optional afternoon tour of the world-famous Rutgers Breeding Program's Adelphia Research Farm.

Student Travel Awards

There will be multiple awards available to support student travel to the 2017 ITRC. Award recipients will receive partial to full travel support for airfare, lodging, registration, and meal expenses. To apply for a student travel award, applicants should visit the ITRC Website (<http://www.turfsociety.com/itrc2017/?p=home>) after 15 October 2016 to download the 2017 ITRC Student Travel Award Application. Applications should submit a copy of the abstract(s) to be presented at the 2017 ITRC, a 1-page personal statement explaining how attendance at the meeting will help the student achieve their career goals, and a signed statement from a major advisor verifying that the student is studying turfgrass science and is in good academic standing at their institution.

Applicants must be a current student studying turfgrass science at the time of the 2017 ITRC and be scheduled to give an oral or poster presentation at the conference. Students entered in the Graduate Student Competition will receive priority for a travel award. Applicants will be judged on their personal statement, the quality of their abstract(s), and their involvement and leadership at their respective universities. Applications will be accepted from 15 October to December 31, 2016, and award recipients will be notified by 1 February 2017.

Bring the Family

Accompanying persons will have a full range of enjoyable activities to choose from during the week of the conference (<http://www.turfsociety.com/itrc2017/pdf/Accompanying-Persons-Tours.pdf>) including Broadway matinees, New York City bus tours, trips to museums and planetariums, local zoos and aquaria, and even a day trip to beautiful white sand beaches in the state.

So, join us for one of the largest and most comprehensive gatherings of turfgrass professionals anywhere in the world. Learn about the latest discoveries in turfgrass science and get inspired by the scientific sessions, field tours, and stimulating discussions. Share your research with colleagues from throughout the world, meet friends, network,

and see all that the New York City/New Jersey area has to offer.

Pre- and Post-Conference Tours Associated with the 13th ITRC

A Pre-Conference Tour will take in the sites of Washington, DC and Philadelphia, Pennsylvania during a 5-day trip that will provide a mix of history, fun and, of course, turfgrass. Hotel accommodations will be in close proximity to the Nation's Capital, the Lincoln Memorial, and a myriad of museums including the Smithsonian in Washington, DC. There will be plenty of time for sightseeing and visits to turf-related venues that will include the newly renovated National Mall, the Grass Roots exhibit at the National Arboretum, the National Botanical Gardens, and National Park (home of the Washington Nationals Major League Baseball Team). In Philadelphia, participants will visit Lincoln Financial Field (home of the Philadelphia Eagles American Football Team), PPL Park (home of the Philadelphia Union Soccer Team), as well the iconic Liberty Bell, Independence Hall, local museums, and Longwood Gardens (the former summer home of Pierre DuPont and one of the most spectacular private gardens and conservatories in the world).



Reconstructing the National Mall, Washington DC

A Post-Conference Tour had previously been planned for Miami, Florida; however, due to the recent Zika outbreak in southern Florida, this 3-day tour will be redirected to the beautiful mountains of Asheville, North Carolina. Participants will visit the world famous Biltmore Estate (America's largest house), as well as top-tier golf courses and plenty of time for sightseeing. What a relaxing way to unwind after the 13th ITRC. Additional details and the cost of both tours will be provided on the ITRC Website (<http://www.turfsociety.com/itrc2017/?p=home>) when conference registration opens on 15 October 2016.

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Excellent Sponsorship Opportunities are Still Available

More than a dozen organizations including Syngenta, Bayer, Aquatrols, the USGA, BASF, TORO, and the New Jersey Turfgrass Association/ Foundation have already become major supporters of the 2017 ITRC (<http://www.turfsociety.com/>

[itrc2017/?p=reg%20-%20sponsors#sponsors](http://www.turfsociety.com/itrc2017/?p=reg%20-%20sponsors#sponsors)) and plenty of excellent sponsorship opportunities are still available (<http://www.turfsociety.com/itrc2017/pdf/ITRC-Sponsorship.pdf>). So show your organization's support of turfgrass research and become a 2017 ITRC Sponsor today!

13th International Turfgrass Research Conference Sponsors

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To become an ITRC Sponsor see (<http://www.turfsociety.com/itrc2017/pdf/ITRC-Sponsorship.pdf>)

Zoysiagrass Symposium Scheduled for Friday of International Turf Research Conference in 2017

by Jack Fry, Ph.D.,
Kansas State University
Manhattan, KS, USA

There is worldwide interest in zoysiagrass (*Zoysia* spp.). In 2015, an International Zoysiagrass Symposium was held in Okinawa, Japan with speakers from Japan, Korea, China, and Australia. Interest arising from this gathering led to an informal meeting of those involved with zoysiagrass research and management at the Golf Industry Show in San Diego in 2016 at which individuals from eleven countries attended.

We will continue building on this interest by holding a half-day zoysiagrass symposium on the morning of Friday, 21, July 2017 at the International Turf Research Conference (ITRC) in New Brunswick, NJ USA. Invited speakers will provide a worldwide view of zoysiagrass research, use, and culture. In addition, a panel including industry professionals will offer their perspective on zoysiagrass management. Before and after the symposium, and during a one-hour break, attendees will have an opportunity to view posters and interact with others conducting research on *Zoysia* spp. Those presenting research on zoysiagrass at the ITRC in an oral session earlier in the week have the additional option to create a poster for viewing during the symposium, and those presenting a poster earlier in the week can show their poster again during the symposium (there is no need for these authors to submit an additional title summary).

Titles and presenters:

Implications of *Zoysia* Species, Distribution and Adaptation for Management and Use of Zoysiagrasses
Don Loch, The University of Queensland, Brisbane, Queensland Australia

Evaluation and Breeding Zoysiagrass using Japan's Natural Genetic Resources
Masumi Ebina, Forage Crop Genome Unit, Institute of Livestock and Grassland Science, Tochigi, Japan

Zoysiagrass Use and Culture in Europe
Simone Magni, University of Pisa, Pisa, Italy

Occurrence, Distribution and Introduction of *Zoysia* spp. and their Management and Current Use in Australia

Peter McMaugh, Turfgrass Scientific Services, Carlingford, New South Wales Australia

Zoysiagrass History, Utilization, and Improvement in the United States

Aaron Patton, Purdue University, West Lafayette, Indiana USA

Molecular Advances in Zoysiagrass Development
Ambika Chandra, Texas A&M AgriLife Research, Dallas Texas USA

Panel Discussion – several industry professionals

Re-announcing the Graduate Student Competition at the 2017

ITRC

Paul Koch¹ (chair), Erik Ervin², and Kelly Kopp³
ITRC Graduate Student Competition Committee

¹University of Wisconsin, Madison, WI

²Virginia Tech, Blacksburg, VA

³Utah State University, Logan, UT

The ITRC will host a graduate student competition for both oral and poster presentations. Students can submit manuscripts for consideration as an oral or poster presentation under any of the following categories: 1) Pest management strategies, 2) Turfgrass physiology and soil health, 3) Genetics and breeding, and 4) Environmental aspects of turfgrass management. Contestants will be judged on the innovativeness of their research goals, the

robustness of their scientific methods, and the delivery of their oral presentation or appearance of their poster. Modest cash prizes and a complimentary ITS membership will be made available to the top three contestants in each category. Only one submission per student is allowed, and contestants must be enrolled as an active graduate student at the time of the meeting to be eligible for the competition.

Submission of Keynote, Symposium and Short Communication Papers 13th International Turfgrass Research Conference

By Jim Murphy,
Rutgers University, New Brunswick, NJ USA

The deadline (October 1st is rapidly approaching for submitting keynote, symposium and short communication papers to be presented at the 13th International Turfgrass Research Conference (ITRC) in New Brunswick, New Jersey, USA, 16-21 July 2017.

Keynote and Symposium Papers

Since the deadline for submitting full papers has already passed and the option has been removed from the Manuscript Central site (<https://mc.manuscriptcentral.com/crop>), please submit keynote and symposium manuscripts as 'Original Research' on the Crop Science Manuscript Central site, then send Brett Holte an e-mail (bholte@sciencesocieties.org) and he'll will make sure your paper is routed to ITSRJ for review.

Short Communications

Short communications represent a category of papers that describe unique experimental techniques and apparatus, recent observations of unique phenomena, or other trial information. It also provides authors the opportunity to submit papers addressing unique work that is in progress, exploratory, or hypothesis-testing. These articles typically will be shorter than research papers; for example, not more than four printed pages. [Click here for details on ITSRJ journal standards](#). Additionally, Crop Science publishes short communications and Agronomy Journal publishes notes. Please review the respective journal standards for more information.

Thus, you are reminded that a title-summary for a short communication paper at the 2017 ITRC can be submitted at the Confex web site. [Click here to access the Confex system](#) and submit a title-summary.

Please note that the manuscripts for short communications must be submitted no later than October 1st through the Manuscript Central web site (<https://mc.manuscriptcentral.com/crop>). Reminders on this deadline will be sent out and posted on the [2017 ITRC web site](#).

Publishing Timeline

	Paper Type
Timeline	Short Communications and Notes
2016	
1 Oct.	Final due date for Short Communication manuscript submission
1 Dec.	Short communication reviews due back to authors
2017	
1 Feb.	Final manuscript versions due
1 July	ITRC registration confirmed before papers published
16 July	Published on USB drive and handed out to delegates at the conference

¹All papers published in the ITSRJ, Crop Science and Agronomy Journal will also be included on an electronic (flash drive) proceedings provided to delegates at the conference. The electronic proceedings will also be available through members-only section of the ITS website.

2016 Japanese Society of Turfgrass Science Annual meeting

27-29 May, 2016 at Chiba University

by Shin Nakamura and Hideaki Tonogi
International relations committee
Japanese Society of Turfgrass Science

The 2016 Japanese Society of Turfgrass Science Annual meeting was held from 27 to 29 May, 2016 at Chiba University, Chiba, Japan. On the 27th we had a half day bus tour starting from Chiba University research facility where we looked at a plant therapy project, then Kashiwa Soccer complex and Izumi Country Club. At the Chiba University research facility plant therapy project, Dr. Miyazaki gave a lecture on how plant greenery does an excellent job for us by motivating between sympathetic and parasympathetic based on his research data. We also had experienced a demonstration of this there. Another group on the 27th played 18 holes at Takanodai Country Club and they discussed how to maintain 18 holes including putting greens and other turf areas.

On 28th, we had a group meeting which included discussion on golf course management, school yards, parks and ground cover plants. Specially, during the golf course management portion we discussed intensively the applying of microbe-based products for golf courses and many superintendents introduced their own efforts with these products.



Kashiwa Soccer Stadium

After the group meeting, we had a Symposium titled “Meeting together on Turfgrass”. We invited three speakers and their titles are as follows:
Dr. Miyazaki, Chiba University, “Wondering of comfortable brought by the greenery plants” and “Relationship between sympathetic and parasympathetic based on greenery plants”
Mr. Mizuki Harada, Novelist, “Charming issue by turfed pitch from the side for citizen”
Mr. Akira Teramachi, Izumi Country Club, “Meeting together on Turfgrass, both positions from the side of club manager and also from side of superintendent”
We discussed why many people meet together on turfgrasses based on the three speaker’s approach above.

We had oral and poster presentations on 29th and had 300 attendees at the conference. Thirty oral presentations were classified into plant physiology, morphology, pathology, breeding, turf maintenance, and chemicals. Regarding new pesticides, the features of three novel herbicides were presented by Riken

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Chiba University Research Facility



Chiba University therapy project



Oral presentations on 29th

green, SDS biotech and Maruwa biochemical. The physiological and ecological characteristics or the control of problematic weeds; *Poa annua*, *Paspalum nortumm*, *Lespedeza striata* and *Bidense pilosa* were introduced by Utsunomiya University, the Japan

Association for Advancement of Phyto-Regulator, Riken green and University of Ryukyu. Two topics related to snow-mold diseases were discussed by Riken Green and Bayer. In 7 poster sessions, the national institute of Korea presented two posters regarding physiological studies of turf. The cutting edge technology of turf quality evaluation using drones by Shizuoka Prefecture Turfgrass Research Institute interested attendees. Besides from mentioned topics, in all sessions most participants deeply and intensively discussed the new findings in each oral and poster session on the shiny Sunday morning at Chiba University.

Our 2016 fall meeting will be held at Obihiro, Hokkaido from 23 to 25 of September, 2016 which is in the cool season turfgrass adaptation area. Please contact : jsts@jcom.home.ne.jp

STERF Call for proposals

Project period 2017-2019
by Maria Strandberg
STERF, Sweden



STERF

STERF (Scandinavian Turfgrass and Environment Research Foundation) is an independent research foundation that supports existing and future R&D efforts and delivers 'ready-to-use' research results that benefit the golf and turfgrass sector. STERF was set up in 2006 by the golf federations in Sweden, Denmark, Norway, Finland, Iceland and the Nordic Greenkeepers' Associations. STERF's vision and strategic objectives can be found in 'Guide for applicants' at www.sterf.org.

Challenges and programs

Over the next decade, the golf and turfgrass industry faces a number of major challenges, including providing a high quality arena for golf and other sports, and at the same time responding to increased environmental regulation, rising pressure on natural resources (notably water, energy and land), and rising operating costs of key inputs including labour, energy, water and fertilizers. The challenges

also include the emerging role of turf management in supporting ecosystem services and enhancing biodiversity, the continued need to promote integrated pest management, and the challenges posed by a suboptimal and changing climate,

The challenges need concerted and collective solutions, underpinned by robust, applied science. To meet the challenges the sector has to face STERF has created four international and trans-disciplinary R&D sub-programs, including:

- Integrated pest management;
- Sustainable water management;
- Turfgrass winter stress management, and;
- Multifunctional use of golf facilities and ecosystem services

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In the present call for proposals, STERF has decided to prioritize research and development within the four R&D sub programmes.

STERF R&D programmes can be found on www.sterf.org

Guide for applicants

STERF has reserved about 2 million SEK per year for, 2017, 2018 and 2019 for new ordinary research projects, and about 100.000 SEK for new large scale trials / demonstrations on golf courses.

Instructions for those wishing to apply for funding for research projects from STERF can be found in the “**Guide for applicants**” at www.sterf.org. The “**Guide for applicants**” also describes how applications for project funding are assessed by STERF.

Deadline

Deadline for application is December 12th 2016. Agreement for approved project will be written for one to three years, however continuation of the project will be determined annually based on status reports delivered to STERF. Decisions on funding can be expected approximately by March 15th, 2017.

The proposals should be sent as a PDF-file to:

Scandinavian Turfgrass and Environment Research Foundation

Att: Maria Strandberg

maria.strandberg@golf.se

If more information or clarification is required, please contact:

Maria Strandberg

STERF

Telephone: +46 (0)8 622 15 27 alt.

+46 70 620 17 87

E-mail: maria.strandberg@golf.se

5th European Turfgrass Society Conference **Turfgrass – Towards Sustainability and Perfection for Aesthetic, Recreational and Sports** by Carlos Guerrero, The Convener University of Algarve, Portugal

The 5th European Turfgrass Society Conference, a biannual meeting, was held at the Salgados Palace Hotel (Salgados, Albufeira, Portugal) between June 5th - 8th 2016, under the responsibility and organization of the University of Algarve.

The meeting aimed the share of knowledge, experiences, research results, data, ideas, services, products advertising, among researchers, turfgrass specialists, stakeholders, towards sustainability and perfection for aesthetic, recreational and sports lawns.

Scientifically this meeting was divided in seven main topics:

- Turfgrass genetics and breeding
- Turfgrass and Landscape
- Turfgrass pests (diseases, insects, weeds)
- Technology advances and turfgrass maintenance
- Water Management
- Turfgrass nutrition and physiology
- Turfgrass for sports

Regarding the participation, although the economic problems that most of us are facing nowadays, 115 participants were involve in this scientific programme. These participants came from 21 countries, from Europe, America (North to South), Asia, Oceania and Africa.

The first two days were dedicated to plenary sessions where more than 80 oral communications and posters were presented and discussed in those seven thematic sessions. The third day was a technical tour where sustainability was the main focus, respectively 1) at a golf course which is totally irrigated with treated wastewater (The Herdade dos Salgados golf course), 2) at a golf course project approved after a long environmental study has been done (Quinta da Ombria, Loulé), and 3) at a Bermuda sod farm.

During the first two days, 5 keynote speakers delivered respectively 5 interesting talks:

Continued on next page

- José António Monteiro, from the University of Algarve, spoke about turf, mankind and landscape;
- Jason Kruse, from the University of Florida, had his talk focusing the maximization of turfgrass performance, looking for micronutrients and turf nutrition;
- Richard Snyder, from the University of California Davis, gave his talk focusing water management through low-cost urban ET measurements and estimates;
- Filippo Lulli, from Turf Europe, showed how precision farming practices in sports turf management, can help and solve new and old problems in football pitches, such as the French stadiums that are being used in the football European championship 2016;
- Tom Hsiang, from the University of Guelph, who gave his presentation on disease resistance activators and their benefits.



ETS Board Members: Alessandro de Luca, Carlos Guerrero, Claudia de Bertoldi, Stewart Brown, Anne Mette Dahl Jensen, Fritz Lord and Wolfgang Praemassing

To the former ETS Board, a special word: Thank you for your commitment to the association.



Participants at the 5th European Turfgrass Society Conference

On the second day, the ETS had its General Assembly where a new Board was elected. For the next four years, the actual ETS Board has the following members:

- Stewart Brown, Myerscough College (UK), President
- Anne Mette Dahl Jensen, University of Copenhagen (DEN)
- Alessandro de Luca, Italian Golf Federation (ITA)
- Claudia de Bertoldi, Turf Europe (ITA)
- Tatsiana Espevig, Norwegian Institute of Bio-Economy Research (NIBIO) (NOR)
- Carlos Guerrero, University of Algarve (POR)
- Bernd Leinauer, New Mexico State University (GER/USA)
- Fritz Lord, COMPO EXPERT (GER)
- Wolfgang Praemassing, DEULA Rheinland GmbH (GER)



The third day was a technical tour

A special acknowledgment to Messinagro, Syngenta, Itelmatis, Novarelva, Bayer, Sapec, the Portuguese Foundation for Science and Technology, the Luso-American Development Foundation, and the Algarve Tourism Office for the financial support given.

Applied Soil Physical Properties, Drainage, and Irrigation Strategies

Book review by Clint Waltz
University of Georgia, Griffin, GA

Applied Soil Physical Properties, Drainage, and Irrigation Strategies. L.B. McCarty, L.R. Hubbard Jr., and V. Quisenberry. 2016. Springer International Publishing. 314 p. \$159. ISBN 978-3-319-24224-8.

This is a soil physics book! It was written for turfgrass systems and meets the needs of an applied turfgrass soil physics course. Because it is applied and uses real-world examples, it is an excellent reference book but its real application is as a text for the classroom. While a practitioner might use the tables and figures within the book for specifics to compare and contrast various sports field drainage designs, there are topics and details that are beyond everyday use. For example, a turfgrass student should be exposed to the intricacies of Darcy's law to understand hydraulic conductivity in a saturated soil. These types of concepts are well covered within a narrative, equations, and turfgrass specific example calculations.

The book is well constructed covering four topics (soil physical and moisture properties, soil drainage, rootzone selection, and water management and conservation), each a chapter. Each chapter is broken into subsections that build upon each other, showing the experience the authors have teaching the applied concepts of soil physics. Each chapter concludes with a "Questions" section that includes applied problems and answers. Where formulas are needed to answer the questions, the formula is presented then the student is taken step-by-step through rearranging the formula and solving for the proper variable. This approach allows the student to understand not only how to ask the right question to a problem, but also a step-wise solution to answer their specific problem.

The first chapter, *Soil Physical and Moisture Properties*, ranges from basic soil physical properties (e.g. particle size, porosity, and bulk density) to how water moves within a soil matrix. The authors provide in-depth discussion on the development and interpretation of soil moisture retention curves. They use the basics of moisture retention curves to provide information on evaluating commonly used amendments (e.g. sphagnum peat, calcined clay, and



zeolite) to sand-based systems.

The second chapter, *Soil Drainage*, may be the most comprehensive turfgrass specific drainage discussion available. Like drainage systems, built from the bottom up, this chapter begins with the basics of drainage (surface, subsurface, and lateral soil water movement) as a foundation. From there, the chapter delves into the specifics associated with golf course putting greens and fairways, and sports fields. Topics include gravel size and shape, drainage systems, design, and importance of interceptor drains. A practitioner, architect, or engineer will find the section on sports fields useful as the book presents multiple rootzone profiles and drainage options for all types of playing surfaces (e.g. football, soccer, baseball, and softball).

Chapter three, *Rootzone Selection*, helps the student understand the how to select a rootzone mixture, typically sand-based, for a golf course putting green, bunker, or to sand cap a sports field. Topics within this chapter include the interaction of gravel layers associated with drainage, how rootzone mixtures change over time and how these changes affect the soil physics, and the influence of sand depth on moisture retention. This chapter is just about turfgrass systems and has little application to other horticultural or agronomic systems.

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The last chapter, *Water Management and Conservation*, may seem out of place for a soil physics text but it is well integrated into the concepts and principles of the discipline. Turfgrass managers, and students, need to fully understand water use and continually strive to improve irrigation efficiency, lending toward water conservation. This chapter offers multiple methods of measuring soil moisture and how to use that information to properly irrigate turf. The chapter also covers the impact of poor water quality on soil physics and drainage and offers remedies to remediate salt affected sites. Water conservation is given a separate subsection and suggests best management practices (BMPs) the turfgrass manager can employ to improve water use efficiency. Also in this chapter is a discussion on hydrophobic soils and their management.

The real value of *Applied Soil Physical Properties, Drainage, and Irrigation Strategies* is its application to turfgrass systems. Few other texts or reference materials meld the science of soil physics with the application specific turfgrass related issues. For example, few other agronomic systems use sand capping like turf (i.e. golf and sports fields). The use of sand and how sand behaves is a reoccurring theme throughout the book and is specifically addressed for golf course putting greens and sports fields. This is the most comprehensive turfgrass soil physics book available. It is well written and offers the student an excellent resource they will reference throughout a career.



B. McCarty (left), V. Quisenberry (Middle), L. Ray Hubbard, Jr., (right): The book is authored by a trio of Clemson University employees with over 90 combined years in soil science teaching, research, and demonstration recently released the book, *Applied Soil Physical Properties, Drainage, and Irrigation Strategies - A Practical Guide*. Bert McCarty, PhD; L. Ray Hubbard, Jr., PhD, PE; and, Virgil Quisenberry, PhD.

INTERNATIONAL TURFGRASS SOCIETY
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