

October 2013

The STEM in Stadiums

SHARE    MORE...

in this issue... science writer Becky Stewart highlights sports

I took my father to see his team, the [Chicago Cubs](#), play at the Philadelphia Phillies' modern marvel of a facility back in August on a fabulous night for baseball. We got there early, and amused ourselves watching the grounds crew prep the field while we ate our obligatory hot dogs. A lot goes into getting the base lines and the grass just right for the start of the game. So Dad turned to me and said, "You know, stadiums would make a good topic for *The STEM Classroom*. You should research that." And then he proceeded to root for the Phillies, because we live in Delaware now, and he knows all the players' names. *Mirabile dictu*, the Phillies were winning, too.

Sports can be an excellent vehicle for teaching students about STEM topics. The National Science Teachers Association has partnered with NBC Learn to produce several series of STEM-themed lessons, including the Science of Golf, Football, Hockey, and the Summer Olympics. The well-known science evangelist, [Ainissa Ramirez](#), has a new book out with Allen St. John called *Newton's Football*. I have an advance reading copy, and I recommend it for your football-fan students.

Science Connection: Infield Ins and Outs

Some professional and collegiate stadiums are surfaced in [Astroturf®](#), an artificial grass that was originally designed by Monsanto for the Houston [Astrodome](#), the world's first multipurpose domed stadium. Houston's professional baseball and football teams both used the stadium. The facility was designed to be enclosed to avoid rained-out games. The field's first surface was a special variety of Bermuda grass for indoor use. The dome's roof originally had panels of clear Lucite to allow transmission of sunlight. However, glare from the Lucite panels made tracking fly balls difficult, and the panels were painted white. Then, of course, the grass died. That led to Monsanto's solution of what is essentially carpeting that looks like grass. Today's third-generation artificial turf is infilled with sand and recycled rubber for a more realistic look as well as a softer surface.

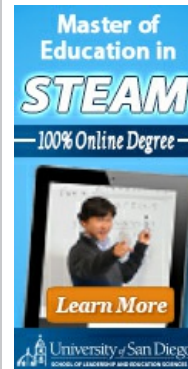
At [Citizens Bank Park](#) the infield is made of real grass and dirt. In recent baseball stadium designs, grass infields have experienced a renaissance as architects attempt to evoke the feel of older baseball venues, like the [Friendly Confines of Wrigley Field](#) or the carefully renovated [Fenway Park](#). Of course, a grass infield is high maintenance. Like everything else in modern sports, there's a [detailed set of regulations and instructions](#) for that. Many fields with grass surfaces hire a particular brand of horticulturalist, called a turf manager or head groundskeeper, to care for their fields. This is often a two-year degree program and perhaps a good career choice for sports nuts in your classes.

You may or may not know that regulation game balls at every professional baseball stadium in the United States, from those of the major leagues all the way down to the triple-A farm teams, gets rubbed with a particular kind of mud before it enters play. I know this because rumor has it the mud comes from the New Jersey side of the Delaware River, not too far from my home. Shiny new game balls are slippery, so umpires used to rub them with wet dirt from the infields to make them easier for the pitchers to grip. But the water made the leather fall apart. A [particular kind of muck](#) discovered by the third base coach of the old Philadelphia Athletics, Lena Blackburne, provided just the right grip without soaking or discoloring the leather. The source of

Sponsored by:



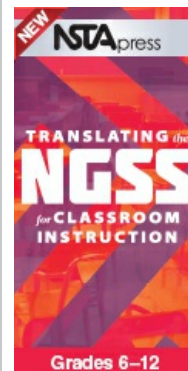
Introducing
Ward's
DataHub
See all 4
models
in action
ward's
science+



Master of
Education in
STEAM
100% Online Degree
Learn More
University of San Diego
SCHOOL OF LEADERSHIP AND INNOVATION



SHARE
YOUR
IDEAS!
NSTA's 2014
STEM
Forum & Expo
New Orleans
May 14-17
Submit Proposal
Proposal Deadline
December 2, 2013



NEW
NSTA press
TRANSLATING the
NGSS
for CLASSROOM
INSTRUCTION
Grades 6-12



NSTA
CONFERENCES
ON SCIENCE

this muck [remains mired in mystery](#).

Technology Connection: Night Games

The topic of night games is still a bit of a sore spot for many Cubs fans. Wrigley Field held out until 1988, with many fans feeling that the lights and poles would change the atmosphere too much. The Cubs had played only daylight games at Wrigley Field for 72 years before that. The [first major league night game](#) had been played at Crosley Field in Cincinnati in 1935, between the Reds and the Philadelphia Phillies. In an interesting coincidence, the [first night game at Wrigley Field](#) was also played against the Phillies. As a historical side note, I wish to point out that the [Wrigley family had bought lights](#) and supporting equipment for the stadium in 1941 for use in the 1942 season, but after the attack on Pearl Harbor those materials were donated to the war effort and the subject of lights at Wrigley Field was put aside. Night games are economically important, as they allow baseball games to be broadcast live across the country during prime time, greatly increasing the fan base and advertising revenue.

Today's baseball stadium lights are [high-tech, metal halide lamps](#). These lamps put out a high amount of light for their size and allow designers to efficiently light a space with fewer fixtures. Color fidelity is also preserved under these lights, an important consideration for television broadcasting of night games. Details of how metal halide lamps work can be found [here](#) and [here](#).

How Many Bathrooms, Did You Say? Are There Windmills on that Roof?

New stadiums have an impressive range of engineering advancements. Citizens Bank Park was built in 2004 to be [universally accessible](#). There are 11 elevators in the stadium, 9 of which are for public use, and three escalators. All of the 61 restrooms have baby-changing facilities; there are 24 of each for men and women with 13 family restrooms. There are 13 water facilities, each with a standard and an accessible fountain. A student presentation about the engineering design of Citizens Bank Park can be found [here](#).

In 2011, the Phillies [upgraded their video system to HD](#). The new LED display in left field is 7,372 square feet, among the largest in the world. The display has 1,512 lines of resolution, exceeding the HD standard of 1,080 by almost 50%. Wi-fi access is now an expected part of any entertainment experience, and both [Comcast](#) and [AT&T](#) have made improvements to their networks in and around Citizens Bank Park. Another sports career field that some of your students may be interested in is that of broadcasting and video services for a stadium. Most stadiums also employ some level of general engineering staff.

From our seats on the third base line, we had an impressive view of the Eagles' home, [Lincoln Financial Field](#). The Linc, as it is popularly known, is another relatively new venue that opened for the 2003 season. In 2012, the team had [14 micro wind turbines](#) installed on the roof of the stadium, all of which could be seen lazily turning in the warm breeze blowing over South Philly that night. The turbines are connected to the stadium's electrical grid and help to reduce its energy consumption. Lincoln Financial Field also has some solar panels, and more are planned for installation. This facility generates [more alternative energy than any other stadium in the National Football League](#). Stadiums are good locations for alternative energy like solar and wind, because many of them have significant expanses of roof. Another alternative energy installation on a sports facility is the [University of Delaware's solar array](#), a significant portion of which is on the field house roof.

Math Connection: The Area of an Infield

One reason many cities now have separate facilities for each of their sports teams is the simple one that the fields of play are different sizes and shapes. Couple that with the extended seasons that have become necessary with the expansion of most major leagues, and you begin to realize that converting a stadium from one configuration to another in less than 48 hours (and in some cases less than 24) can be more trouble than it's worth. Many cities have large underutilized areas in their centers, so it can make sense to build separate facilities.

All professional sports have regulations for the size of the playing fields. For instance, a baseball diamond is 90 feet square. Outfields can vary in shape, with the foul lines along first and third base lines ranging from 302 to 355 feet. Distance from home plate to the center field fence line also varies from 390 to 435 feet. Football fields are



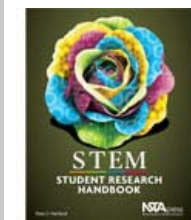
EDUCATION
Denver, CO
DECEMBER 12-14
REGISTER TODAY
FOR A PROFESSIONAL
DEVELOPMENT EXPERIENCE
YOU CAN'T MISS!



DID YOU KNOW?
NSTA Members
get their choice of
NSTA Monthly
Journal
— and —
Free online
access to NSTA
journal archives
Join Today →



NEW NSTA press
THE New
Science
Teacher's
HANDBOOK
WHAT YOU DIDN'T LEARN
FROM STUDENT TEACHING
Grades K-12



STEM
STUDENT RESEARCH
HANDBOOK
Grades 9-12

Learn the many stages of large-scale science research projects. Handouts, checklists, observations sheets, and sample rubrics included.



Predict, Observe, Explain
Grades 7-12

Foster student inquiry and challenge students' preconceptions with 100 field-tested student activities.



NEW NSTA press
The Case for
STEM
Education

160 feet wide and 360 long. Some stadiums were built to fit a football field and a baseball field, with removable seats for flexible configurations. Notable examples of dual sports fields are the Astrodome and the old Veterans Stadium in Philadelphia. Beyond geometry, football and baseball are rife with statistical analysis, making either sport a good hook for lesson planning. A video of a Statistics lesson with a baseball theme can be [seen here](#).

The last remaining dual-sport stadium in use by the major leagues is the [Oracle Arena \(Oakland Coliseum\)](#) in Oakland, California, where both the A's of baseball and the Raiders of football make their homes. This year, the Oakland A's have made the playoffs, and the Raiders' season is already underway. A recent Raiders game was pushed back to a 5:35 p.m. (Pacific time) kickoff to allow the stadium crew time to convert the fields. Find out how they did it in just under 24 hours, [here](#), and watch a video of how it happens, [here](#). For a number of years in the 1930s and 1940s, almost all professional football teams shared their stadiums with a professional baseball team. After a peak in 1971, the trend has been toward separate facilities.

Inquiry-Based Investigations to Support STEM, K-8

Sponsored by Exemplars

[Exemplars](#), real-world investigations for grades K-8, are designed to captivate students' interests and provide support for STEM. These inquiry-based performance tasks include rich teaching notes, interdisciplinary links, assessment rubrics, annotated anchor papers, and alignments to math concepts and skills, national STEM standards, and NGSS. Material can be used to enrich instruction, assessment, and professional development.

Exemplars investigations have been reviewed and approved by NSTA Recommends. Download sample tasks to try with your students today!

Albert Einstein Distinguished Educator Fellowship Program

Sponsored by the Albert Einstein Distinguished Educator Fellowship Program

**Now accepting applications for the 2014-15 fellowship year!
Applications are due 5:00 p.m. EST, December 4, 2013**

The Albert Einstein Distinguished Educator Fellowship Program is now accepting applications for the 2014-2015 fellowship year. The Einstein Fellowship seeks experienced and distinguished K-12 educators in fields of science, technology, engineering, and mathematics (STEM) to serve an 11-month fellowship appointment in a Federal agency or U.S. Congressional office.

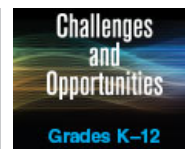
Information about the Albert Einstein Distinguished Educator Fellowship Program, including eligibility requirements, program benefits, application requirements, and access to the online application system can be [found online](#).

eCYBERMISSION STEM Competition

Sponsored by eCYBERMISSION

Science teachers and the U.S. Army are on a mission to increase student interest in STEM education through the eCYBERMISSION program. Administered by NSTA, eCYBERMISSION is an online learning competition aligned with the Next Generation Science Standards where students in grades six through nine compete by developing solutions to real-world challenges in their communities.

After selecting a problem they would like to solve, teams engage in scientific inquiry using scientific practices or the engineering design process to propose a solution. Students can win on a state, regional, and national level, with national winning teams receiving up to \$8,000 in U.S. EE Savings Bonds, valued at maturity. Enter your



Grades 3-8
Create an outdoor classroom where simple, inexpensive lessons meet curriculum objectives and standards.

students before January 15, 2014 and get a free STEM Research kit! Register online at www.ecybermission.com or email us at missioncontrol@ecybermission.com.

Don't Miss Out

[NSTA Area Conference on Science Education](#), November 7–9, Charlotte, NC

The second annual [Family STEMM Expo](#), November 23, 2013, Dayton OH; part of the 10-day [Dayton Regional Science Festival](#)

STEM Forum & Expo Proposals Accepted Through December 2: Attention Science, Technology, Engineering, and Mathematics educators, we need you! We are accepting session proposals for our NSTA 2014 STEM Forum & Expo in New Orleans (May 14–17, 2014). The deadline for submissions is December 2. [Read the strand information and submit a proposal.](#)

[NSTA Area Conference on Science Education](#), December 12–14, Denver, CO

[NSTA National Conference on Science Education](#), April 3–6, 2014, Boston, MA

[NanoDays 2014](#), March 29–April 6, 2014, nationwide

The [USA Science & Engineering Festival](#), April 26–27, Washington, DC

[NSTA 2014 STEM Forum & Expo](#), May 14–17, 2014, New Orleans, LA

If your organization is planning a STEM event and you'd like a notice to appear in this newsletter, please e-mail the editor, Becky Stewart, at STEMClass@nsta.org.

Get Involved

If you've got a question you'd like answered in the newsletter, an idea for a STEM theme, a lesson plan that worked for you, or any other comments or suggestions, e-mail the editor, Becky Stewart, at STEMClass@nsta.org. We'd love to hear from you.



Follow us    

[Forward this message to a colleague](#)

[Sign Up/OptOut](#) | [Feedback](#) | [Archive](#) | [NSTA News Digest](#) | [Career Center](#)
[NSTA Home](#) | [Member Benefits](#) | [Conferences](#) | [Member Journals](#) | [Science Store](#) | [Learning Center](#)

This e-newsletter is brought to you by the National Science Teachers Association
1840 Wilson Boulevard • Arlington, VA 22201-3000 • Phone: 703-243-7100 • www.nsta.org

If you do not want to receive this e-newsletter, please follow this link:
<http://ecommerce.nsta.org/optout/default.asp?source=scienceclass>