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... from the editor

Norm Schmidt

In my current part-time position as a University Supervisor (a fancy name for a person who observes and advises student teachers) for CWRU I am able to enjoy watching future science teachers tackle the challenge of working with teenagers who may or may not be motivated to learn science. These future teachers are taught well to integrate different modes of teaching in their lessons. They try to change their approach a few times each class period to keep the students interested and show appreciation that not all students learn best in the same way.

The student teachers develop a unit of study which they then teach during the second semester. It is important for them to stick to their plan so that they complete the unit on time and include all of the information that they had planned to cover. Their cooperating teacher provides lots of daily advice and helpful hints about what

may work best and what may best be tossed.

The university supervisor drops in six times during the semester and provides tidbits of wisdom to improve the instruction and class control.

What I have noticed is that when there are obvious important, critical issues occurring during the time the student teachers are engaged with their classes, those issues are often ignored so that the "planned lessons" are covered.

This year I have had the opportunity to work with two students who will be biology teachers (my main area). I have suggested that whenever they can include current events in their lessons that they should. I cited the current issues of global climate change, corona virus, water and soil quality, energy production, loss of forests, human population and sea level rise as some of the more critical developments.

I think that teachers in all three of the major science areas taught in high schools can

incorporate these important issues in their lessons and doing so enriches those lessons and may provide a trigger that will lead to one or more of those students seeking further information on that particular subject. Perhaps one of those students will become part of a solution to a critical issue or if not, at least become a more informed and responsible citizen.

Take a moment to look at your teaching. Are you engaging your students in the investigation of critical issues?

**Upcoming Science Café
Presentations – The second
Monday of each month at the Music
Box. Doors open at 5:30,
presentation at 7:00 – Go to:**
<http://www.musicboxcle.com/science-cafe-cleveland/>

What's the eco-friendliest

toothpaste to use? According to the Environmental Working Group, even “natural” toothpastes have ingredients that can be toxic to humans, animals or the environment, including titanium dioxide, limonene and sodium lauryl sulfate. One study found that SLS can give you canker sores. Also, SLS and glycerin, another common additive, may be derived from palm oil and can appear under multiple names on labels. Your toothpaste may contain palm oil in other forms – over 1,000 ingredients are derived from it. I boycott palm oil because even “sustainable” palm-oil plantations have been caught clearcutting rainforests and using child and forced labor.

The tubes are also a problem because curbside recycling doesn't take them.

But there's hopes! Make your own by mixing coconut oil with a little baking soda. Studies suggest that baking soda may be more effective at reducing plaque than store-bought. A cheap, organic option is Juturna's Remineralizing Toothpaste (Google it). Return the glass jar it comes in ; Juturna will sterilize, refill and mail it back to you. HammondHerbs Tiger Tooth Powder also comes in a refillable glass jar.
- Ms. Green March/April Sierra Magazine



More from the Sierra Club Magazine (Paul Rauber):

Trump's Energy Dept. rescinds a Bush-era ban on incandescent lightbulbs, which was to have taken effect on Jan. 1. The move will generate 38 million tons of CO₂ annually and cost US consumers \$14 billion a year.

Peter Gaynor, Trump's nominee to head FEMA, says that he doesn't know why the climate is changing.

FEMA's 2019 *National Preparedness Report*, an annual review of threats to the nation, does not mention climate change or sea level rise.

Under a new Trump administration interpretation of the Migratory Bird Treaty Act, the killing of migratory birds by oil spills, chemical contamination and construction activity will no longer be punished or fined.

The Department of Transportation announces \$900 million in infrastructure grants, 72% of which will go to roads and bridges in states that voted for Trump. Funding for mass transit has declined to 8.5% of total grants, with pedestrian and bicycle improvements zeroed out.

The catastrophic Australian bushfires burned an area larger than Tunisia. A billion animals may have perished, leaving some species on the brink of extinction. Smoke from the fires reached Argentina, 6,000 miles away.

Oxygen levels in some tropical oceans have dropped by as much as 40% in the past 50 years. Waters off California are acidifying twice as fast as the global average.

California now has 1 million rooftop solar systems.

Japan plans to build 11 solar arrays and 10 wind farms on land contaminated by radiation from the 2011 Fukushima Daiichi nuclear meltdown.

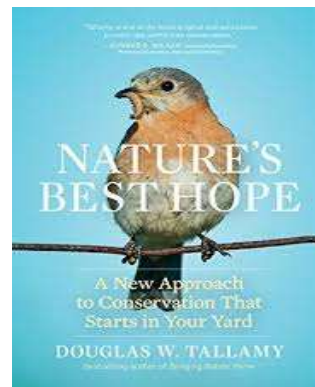
Breathing the polluted air in the Indian capital of New Delhi, population 28.5 million, is the equivalent of smoking 50 cigarettes a day.

Kansas City, Missouri, approves a plan to make public transportation free.

The Chinese paddlefish, an ancient species once native to the Yangtze River that could grow to more than 20 feet, is extinct.

A Good Book

In *Nature's Best Hope*, author Douglas Tallamy asks readers to consider how they can play a part in conservation in their own backyards. Tallamy, a wildlife ecologist at the university of Delaware, suggests homeowners change their landscaping to make their yards more akin to the natural world around them and more friendly to local wildlife. "In the world I envision, landscaping practices will no longer degrade local ecosystems," he writes, "Landscaping will become synonymous with ecological restoration." *Timber Press, February 2020. Nature.Org./Magazine*



What's up with the EPA?

EPA Flunks Science 101 With Dirty Water Rule by John Devine, Director, Federal Water Policy, Natural Resource Defense Council.

The Trump administration's plan to radically restrict which water bodies are protected by the Clean Water Act "does not incorporate best available science." It would exclude some waters whose contamination can pose "a documented and serious risk to public health and safety..."

That's not me or some other environmental advocate talking. Those quotations are from the EPA's Science Advisory Board,

including scientists appointed by Trump's EPA leaders. That's right, former administrator Scott Pruitt and his successor, Andrew Wheeler, purged a number of members from the EPA's independent panel of science advisors and handpicked their replacements. After doing so, the agency must've been expecting the new board to rubber-stamp its rollback agenda. Instead, its members gave EPA's Dirty Water Rule a flunking grade.



A recent draft letter from the board to Wheeler is the most damning evidence yet of how dangerous the EPA's scheme is and how far the agency is willing to go to help oil and gas operators, mining companies, factories, and other industrial polluters --- at the cost of the clean water we all rely on. The board's draft review of the proposal concludes that it has no basis in the available evidence and goes against the core purpose of the Clean Water Act. As proposed, the regulation "decreases protection for our Nation's waters."

The prior rule, adopted under President Obama in 2015, relied on thousands of scientific publications to demonstrate how different types of small and seasonal waters and wetlands can affect conditions in downstream rivers, lakes, and bays. The Obama rule protects those critical waters; the Trump rule wouldn't. Now Trump's own

advisors are poised to say there is no scientific justification for abandoning the protections.

So there you go. A disregard for science, a carve-out for water bodies that can sicken you, and a simplistic approach that will cause more confusion. Does this sound like a plan that's in the best interests of Americans? It doesn't to me, and that's why we (NRDC) are going to keep fighting this illegal regulation.

Distinguish Science and Religion via the Nature of Science (from NSTA Reports January 2020)

Before reviewing the various aspects of the nature of science (NOS), we need to ask a broader question: Namely, what is science? As science teachers, you may not ask yourself this question very often. But it is important because this understanding is a key part of addressing science-religion interactions, and basic misunderstandings about NOS are often central to the distrust in science and scientists that is expressed by people of faith. One particularly concise definition states that science is "the use of evidence to construct testable explanations and predictions of natural phenomena, as well as the knowledge generated through this process." (National Academy of Sciences and Institute of Medicine 2008, p. 10) This definition includes key characteristics that distinguish science from other ways of knowing: empirical evidence, testable explanations and predictions, and natural phenomena. An additional characteristic is that science involves a scientific community. This reinforces the notion that scientific research is ultimately collaborative, reproducible, and subject to expert peer review. Each of these characteristics is an essential part of the

development and acceptance of scientific knowledge. With this general understanding, let's move to NOS, which is in essence "the epistemology of science, science as a way of knowing, or the values and beliefs inherent to scientific knowledge and its development." (Lederman 2007, p. 833) While there are many lists outlining aspects of NOS, the following characteristics are commonly cited:

- *Science requires empirical evidence.* This one is straightforward. In order for something to be accepted as scientific, there must be evidence based on observable, verifiable data. No scientific explanations are considered without empirical evidence. It is important to note that empirical evidence can be both quantitative and qualitative descriptions of the natural world.

- *Science is tentative.* Scientific knowledge is not absolute, meaning it is subject to change. This happens when either new evidence is discovered or new ways are discovered to evaluate existing evidence. This process may not always be quick, but over time when new instrumentation or new evidence comes to light, scientific explanations can, and will, change.
- *Science is subjective.* This suggests that scientists' backgrounds influence what they investigate, what they observe, and how they interpret evidence. To be a detached observer in a purely objective sense is simply not possible, even though many people think that is how science works.

- *Science is creative.* Scientists use creativity and imagination throughout the scientific process. This includes developing research questions, designing investigations, and formulating explanations of their findings.

- *Science is influenced by social and cultural values.* What scientists and scientific communities value guides questions that scientists ask, influences ways scientists conduct research, and potentially advances or impedes scientific progress.

- *Scientific knowledge comes from both observations and inferences.* "Seeing is believing" is a common idiom and implies that if you cannot directly see something, then it is not real. In reality, however, scientists cannot artificially separate observations from their inferred explanations and provisional hypotheses.

- *Scientific theories and laws are distinct, but equally important, aspects of science.* Theories are not merely hunches or guesses, but rather they are the overarching frameworks based on overwhelming evidence that guide inquiry within a scientific discipline. Theories explain and predict observed phenomena. Laws, on the other hand, are the most basic descriptions of observed phenomena that apply across all disciplines. In science, theories do not grow up and become laws. Atomic theory and the law of conservation of energy (i.e., the first law of thermodynamics) are straightforward examples.

Ultimately, NOS makes it a quintessentially human endeavor, and this is what makes science so fascinating, especially when compared to other domains where the human dimension is perhaps more obviously central, like economics, politics, and yes, religion. Individual scientists bring a finite amount of knowledge and cultural experience to bear in order to explain evidence derived from experiments, observations of nature, and artifacts from

the past. Provisional hypotheses are creative, subjective assertions that are typically consistent with the currently accepted theoretical framework.

Hypotheses must be tested against further evidence. Inquiries must be repeated and subjected to review by qualified experts via peer-reviewed publications and conference presentations.

If sufficient evidence accumulates within the global scientific community, previously accepted ideas are discarded, often reluctantly. On occasion, entire underlying theoretical frameworks are altered so as to change how we perceive the natural world. These internal checks and balances are imperfect to be sure (plenty of examples of fraud exist), but the success and impact of the collective, global scientific endeavor are undeniable and unmatched.

In our view, this basic understanding of science goes a long way toward addressing misunderstandings that the public frequently has about science. The common dismissive statement that evolution is “just a theory” falls flat, as does the claim that scientists are “biased.” The inherently tentative nature of science is not a weakness, but rather a self-correcting historical reality and a strength of science that separates it from other ways of knowing about the world. Scientists rarely speak with absolute certainty, but this is not evidence of anxious doubt or irreconcilable gaps in scientific knowledge. The measured tones of science merely suggest that there is always more to know.

FREE STUFF

(from NSTA Reports January 2020)

Chemistry Shorts. M H These short (less than 10 minutes each) chemistry-centric

films produced by the Camille and Henry Dreyfus Foundation and Theorem Studios showcase recent innovations in chemistry and include accompanying lesson plans to bring the science research directly to middle and high school classrooms. Under the Skin describes the work of Stanford University professor Zhenan Bao and her research team, who are using the principles of molecular chemistry to develop “electronic skin,” a new material that, like human skin, is stretchable, conductive, and self-healing. In the accompanying lesson (for the high school level), students conduct strength tests on various crafting materials, then combine the materials in different ways to create a new material (i.e., a molecule) that exhibits properties of each contributing part. Rewriting Life discusses the history of genome editing and introduces the concepts behind the CRISPR technology. In the accompanying lesson, designed for both middle and high school levels, students apply what they learned from the movie to model various processes to edit DNA using repositionable notes and student handouts and following specific instructions. Access these resources at <http://bit.ly/2P2zTrB>.

Teaching Today to Save Tomorrow. H

This Creative Commons course has everything high school educators need to teach a comprehensive, four-week unit on climate change. Written by instructional designer Malanka Riabokin of Zofostro Science and funded by BeInteractive—a nonprofit group that helps everyday citizens produce impactful projects that make a difference—the downloadable resource includes weekly itineraries exploring themes such as “A Glowing Earth” (geologic timeline), “Your Carbon Footprint,” “The Earth’s Future Climate,”

and “Four Ways You Change the World.” Within each topic, teachers can access lecture-based PowerPoint presentations, student handouts, and rubrics for each activity. The unit also includes supplementary materials (e.g., syllabus, teacher’s manual) along with instructions for a student project, the Green Home Design Assignment. Refer to www.beinteractivehq.org/climatecourse.

What’s in Your Backyard? K12 In this citizen science soil collection program sponsored by the University of Oklahoma, participants—including K–12 students and teachers—contribute to authentic biomedical research by collecting soil samples and submitting them to university scientists for analysis. The scientists are using the data gathered from the samples to help develop new drug-like molecules from fungi identified in the soil. Visit <https://whatsinyourbackyard.org> for participation details and additional resources, such as a curriculum guide for grades 4–12, fungi facts, and a look at the processes involved in analyzing a soil sample at a university.

Bond Breaker Classroom Edition. M H Middle and high school students can delve into the worlds of atoms, molecules, and chemistry research with this chemistry-themed puzzle game developed by the Center for Chemistry at the Space Time Limit (CaSTL) and TestTube games (see the website <http://bit.ly/2RoJOe8>). The game combines rigorous science learning with gameplay, allowing students to manipulate protons, molecules, laser light, and more to solve challenging levels in a nanoscale world. The game can be played online or downloaded as an app for iOS and Android devices. In addition, lesson plans that guide teachers in using the game

as a classroom teaching tool are available at <http://bit.ly/35RkGAF>. Lesson plans support the Next Generation Science Standards (NGSS) and cover topics such as chemical reactions, thermal energy and change of state, and Van der Waals forces (for the middle level) and thermal energy transfer, atomic and molecular interactions, and attractive and repulsive forces (for the high school level).

Journey 2050. M H A multilevel farm simulation game and program focus on this question: How will we sustainably feed nearly 10 billion people by the year 2050? Targeted for grades 7–12, the simulation helps students learn to balance economic and social factors involved in sustainably feeding an increasing world population. The game is designed to complement learning standards in agriculture education classes and science, technology, engineering, and math (STEM); social studies; and geography programs. In addition, teachers can register at no charge to access lesson plans, videos, and other resources to deepen students’ understanding of the influence of agriculture in our communities and introduce new careers in the field. See www.journey2050.com.

We Are Urban Geoscientists. MH Introduce middle and high school students to careers in geoscience and environmental science with this short video from Temple University’s Department of Earth and Environmental Science. Featuring interviews with students, professors, and others involved in geoscience-related projects within the university, the video reveals the interdisciplinary nature of a major in Environmental Science and the diversity of potential careers stemming from it. Students will hear from GIS (geographic information systems) mapping specialists,

geologists, hydrology technicians, environmental researchers, and consultants while discovering facts and statistics about geoscience-related careers in the United States, including salary information and employment projections. Watch the video at <http://bit.ly/35NZMT1>.

NGS Navigators Podcast Series. K12

Seeking high-quality professional development to guide your implementation of the NGSS? Check out NGS Navigators (www.ngsnavigators.com), a weekly podcast series hosted by veteran science educator and NGSS guru Margaret O'Sullivan. This series features interviews with key science education researchers, writers, teachers, and scientists weighing in on impactful NGSS-related topics, such as Teaching for Social Justice, Five Practices for Orchestrating Task-Based Discussion, and Forming a Productive NGSS Professional Learning Community. Each approximately 30-minute podcast is accompanied by a web page with an episode summary, highlights, notable quotes, and links for further learning.

The Algae Academy. K12 This learning module introduces K–12 audiences to the fundamentals of algae growth and how algae can be used as a solution for global dilemmas. Through the module's lessons, students will grow algae, develop experiments, measure growth, analyze data, and make connections on how algae production positively impacts the global environment. The five-day curriculum fulfills the human impact education component in the NGSS, which requires students be able to apply scientific principles to design a method for monitoring and minimizing a human impact on the environment. The kit includes daily lesson plans, live algae to grow in the

classroom, and educator training and support. The curriculum is versioned for grades 2–3, 4–8, and 9–12. After completing the curriculum, educators can continue to receive free algae and consumables to teach the Algae Academy lessons each year. Resister for the Spring 2020 session at <http://bit.ly/2P75ybs>.

Little Bins for Little Hands. P E On this science-themed website and online store for educators are free science experiments, projects, and STEM ideas to try with students ages 3–9. Grouped by theme and subject (e.g., holiday, edible science, physics, chemistry, weather, space, ocean, STEM, and more), the experiments can spark interest in science and encourage experimenting, tinkering, building, observing, exploring, problem solving, and creating. For example, visitors can find recipes for various slimes, doughs, and sands; explore weather concepts through activities such as Shaving Cream Rain Clouds and Water Cycle Discovery Bottles; or learn about space science by sculpting an edible Moon cycle or whipping up a batch of Fizzy Moon Rocks. See <http://bit.ly/2Y38ytG>.

American Physical Society Outreach

Guide. K12 HE This online guide was developed to help K–college physics educators and other physics enthusiasts design and implement successful physics outreach programs in their schools or communities. The guide has information on topics such as the types of outreach programs, ways to work with schools and other audiences, safety issues, and public relations tactics to help advance the outreach effort. Links to information about popular physics demonstrations for outreach events, as well as contact information for physics experts willing to

assist colleagues in developing a new outreach program, are included. Refer to <http://bit.ly/2rHoshc>.

Engineering for Good. M Developed by PBS Learning Media and KQED Teach, this three-week, project-based learning unit for middle level science classrooms focuses on developing solutions for negative impacts of plastics on the environment. The unit supports the NGSS and promotes the engineering design process as students define a problem, brainstorm solutions, develop prototypes, and iterate on their designs. The project culminates with students producing videos about their solutions to share with the community. In addition to lesson plans and videos, the unit instructs teachers on how to create digital media artifacts such as digital stories and data visualizations. Access the unit at <http://bit.ly/2rJuiPf>.

National Geographic's Water Cycle Resources. E M H At this National Geographic Resource Library website (<http://bit.ly/2Y8z84p>), teachers will find a collection of vetted resources to deepen students' understanding about condensation, precipitation, and weather patterns that are affected by, and a part of, the water cycle. Most appropriate for grades 5–12, the standards-supported resources include encyclopedic entries on various topics (e.g., Earth, types of precipitation, air, hydrosphere, and clouds), infographics (e.g., Urban Water Cycle), and classroom activities using interactive computational models exploring water's movement above and below ground (e.g., Availability of Fresh Water; Using Groundwater Wisely).

The Dinosaur Database. K12 Built with PaleoDB, a scientific database

assembled by hundreds of paleontologists over the past two decades, this searchable resource features a rich set of dinosaur names, pictures, and facts. Dinosaur enthusiasts of all ages—including K–12 students and teachers—can search for dinosaurs by region, time period, or name. The site also features an interactive globe of ancient Earth, and students can select a period of time between 0 and 750 million years ago to view the Earth as it appeared at that time. Visit <https://dinosaurpictures.org>.

K–12 Food Education Standards. K12 The first-ever nationwide recommendations for food education for K–12 students are available at the website <http://bit.ly/34GZWeF>. The standards were developed in collaboration with chefs, nutrition and education experts, and faculty from the University of Chicago, Columbia University, the U.S. Department of Agriculture, and Chicago Public Schools. The standards provide detailed guidelines for curriculum development, instruction, and assessment of food education in classrooms. Each standard is divided into measurable competencies by grade-level bands (K–2, 3–5, 6–8 and 9–12) and is tied to a library of sample lesson plans for reference and inspiration.

Rebound: Beating Concussions. EM An interactive e-book and app teaches students in grades 4–6 about sports, concussions, and brain health. Available at <http://bit.ly/2P78hSg>, and suitable for both iOS and Android devices, the digital publication is unique not only for its age-appropriate, interactive approach to learning about concussion safety, but also because the content's reading level can be adjusted to reflect the user's reading ability. This feature makes the resource as useful

for language arts instruction as it is for teaching science.

Environmental Hero's Program at CWRU

Applications are now being accepted for Environmental Heroes 2020--2021. This authentic, after school field research program is designed for middle and high school students (minimum age 12) interested in environmental science.

Environmental Heroes collect water quality data throughout the Doan Brook watershed and monitor wildlife habitats. Heroes also engage in environmental advocacy activities beyond the required weekly sessions. All Heroes earn hours toward Presidential Volunteer Service Awards as citizen scientists.

Interested students must complete an application and be interviewed for selection to be determined. A two year commitment is required to participate in two weeks of summer training (July 21 - 31, weekdays) and weekly after school sessions year round (Wednesdays, 4:30p.m.-6:30p.m. beginning September 9th, 2020 at Gelfand STEM Center-Case Western Reserve University). A flyer is attached.

Because the application file is huge, it cannot be attached here. The application is available

at: gelfand.case.edu A hard copy of the application will be mailed via US mail as requested.

Should you have any questions, please contact: Kathryn Kwiatkowski, [216-368-5075](tel:216-368-5075) or kmk21@case.edu

4 Myths About Baby Wildlife

From the Lake Erie Nature and Science Center

Spring is almost here and soon you will see baby animals in your neighborhood. As Lake Erie Nature & Science Center's wildlife staff prepares for their busiest season of the year, here are four of the most common myths related to baby wildlife.

MYTH: "Mothers often abandon baby wildlife in nature."

Baby wildlife is rarely abandoned in nature. Mothers will often leave their young unattended for hours for a variety of reasons.

For instance, a fawn lying quietly by itself is perfectly normal. Deer do this to protect their young, as the presence of an adult would attract the attention of predators.

Raccoons and squirrels will frequently retrieve their babies when they end up out of the nest too early. They often maintain more than one nest or den site and will move their babies as needed.

MYTH: "Baby wildlife must be protected from natural dangers."

Eastern cottontail rabbits often build their nests in yards and open spaces. If you

stumble across one, do not move the baby bunnies; if you do, their mother will be unable to find them. She will return at dusk and dawn to feed and groom her babies. Baby animals are vulnerable, yet resilient. Pets, predators and automobiles are all a natural part of their urban and suburban environments. Baby wildlife must grow up among these circumstances in order to learn how to successfully co-exist with them.

Growing up in the wild is dangerous, but removing animals from their parents can be equally as detrimental to their survival.

MYTH: “Wild animals will abandon their babies if they smell the scent of humans.”

Wild animals will not abandon their babies due to the scent of humans. In fact, most birds have little sense of smell! While mammals have a strong sense of smell, human scent is not nearly enough of a danger signal to cause mothers to abandon their hormonal and maternal behaviors.

A baby bird with skin still visible or only covered in downy feathers should be placed back in the nest or in an artificial nest. If fully feathered but unable to fly, the bird is a fledgling that should be left alone, as it is in the process of learning critical survival behaviors.

MYTH: “Baby wildlife can receive the same quality of care from humans.”

Baby wildlife will never receive the same quality of care from humans as they would receive from their natural parents. Each species requires a specialized diet, and feeding an animal the wrong food can be harmful to its health. Human care can cause serious damage to the animal and should be seen as a last resort.



If you have questions about baby wildlife this spring, please contact the center's wildlife staff at 440-871-2900 or wildlife@lensc.org before intervening.

The nonprofit Lake Erie Nature & Science Center is the only wildlife rehabilitation facility in Cuyahoga County and performs wildlife rehabilitation as a free service to the public. The center is able to perform wildlife rehabilitation services under permits from the United States Fish & Wildlife Service and the Ohio Division of Wildlife.



The President's Column

*Jeff Teeter, CRCST
President*

Three Things:

1. Educate yourself about the danger and science of the Corona Virus & Covid19.
2. Consider recruiting a colleague to join CRCST. You have plenty of time to send an email, text or call. A registration form is available at www.crcst.org.
3. Make plans to come to the CRCST Fall Conference at the Cuyahoga County Educational Service Center on Saturday, Oct. 24, 2020. If you have an interest in presenting a 50 minute session, we have a place for you. Let me know if you want a presenter's packet. jpteeter@gmail.com