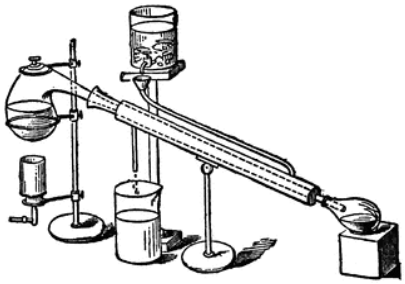
SOUTHWEST RETORT



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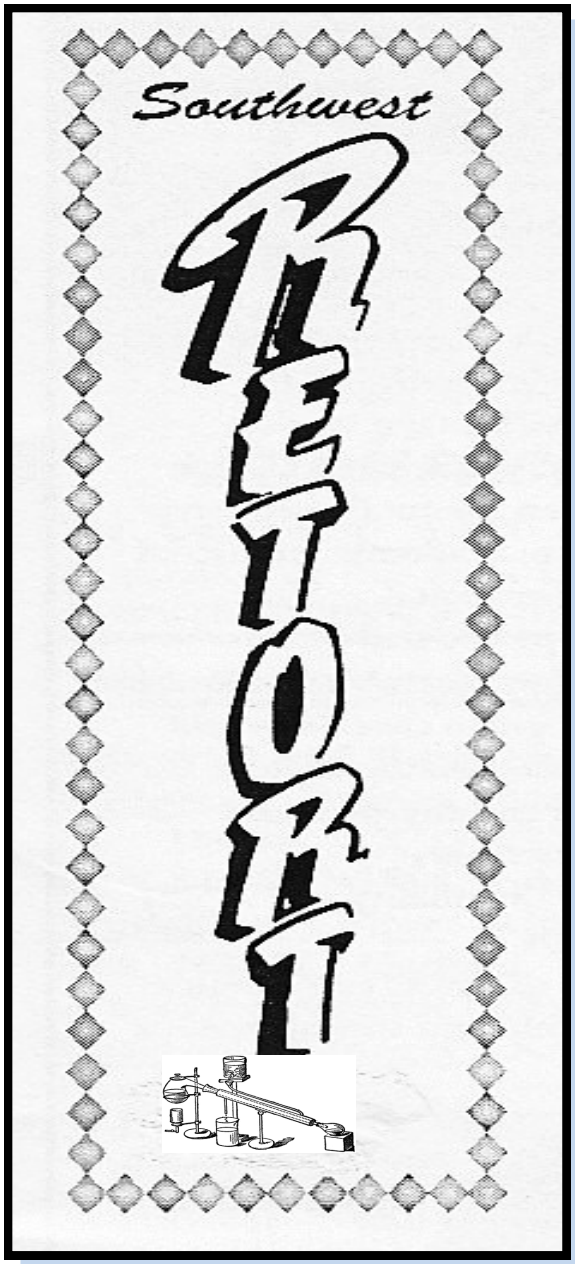

TABLE OF CONTENTS

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SERVICES and ANNOUNCEMENTS

FIFTY YEARS AGO IN *THE SOUTHWEST RETORT*

Two of the three ACS tour speakers this month are actually staff members in ACS national headquarters in Washington, D.C. The third is from an oil company. At this time we do not yet have the topics of their talks. **Mr. Earl Klinefelter** is the head of the ACS Member and Local Section office. **Mr. Marshall W. Mead** is in charge of Local Section and Member services. **Dr. Ernest L. Pollitzer** is Associate Director of Research at Universal Oil Products in Des Plaines, IL.

The ACS Council met in Chicago and approved the fission of the former Ark-La-Tex ACS Section. The Texas part of the section will be known as the East Texas Section when it is chartered. The eastern section is to be known as the Louisiana-Arkansas Border Section. However, the new section's Executive Committee initiated moves to change the name to Northwestern Louisiana Section, while deleting the three counties in Arkansas from its territory. Stay tuned for future events.

In the Central Texas ACS Section **Mrs. Clara Weisser** of Stephen F. Austin High School was awarded the District 5 James Bryant Conant Award for Excellence in High School Teaching. At UT-Austin **Welch Professor Michael Dewar** presented the Kahlbaum Lectures this summer at the University of Basel in Switzerland. **Dr. Allen Bard** lectured this summer at universities in Sweden, Denmark, and Israel.

In the Dallas-Fort Worth ACS Section the Meeting-in-Miniature was held last May and hosted by the student affiliate chapter at East Texas State University (*now Texas A&M University Commerce*). A total of 48 papers were given representing groups from UT-Arlington, NTSU, TCU, Baylor, Stephen F. Austin, Texas Woman's University, and East Texas State. First prize in the graduate division was given to **David Minter** of Stephen F. Austin, while the first prize winner in the undergraduate division was **Leo W. Brown** of Baylor.

Compiled by E. Thomas Strom

At SMU **Dr. Ralph Shriner** attended the ACS fall national meeting in Chicago, while **Dr. Edward Biehl** has just returned from his year long sabbatical at the University of Munich, where he worked with **Professor Rolf Huisgen.** At UT-Arlington **Dr. Shirley Chu** has relocated to the Material Science Department at SMU. The Varian HA-100D and T-60 nmr spectrometers have arrived and are in operation. At the Mobil Field Research Laboratory the head of the petroleum geochemistry analytical services, **Mr. Ernest D. Evans**, has just received an M.S.Chem degree from SMU, working with **Dr. C. T. Kenner. Dr. Wilson L. Orr, Dr. J. B. Davis,** and **Mr. Ellis E. Bray** attended the Gordon Research Conference on Petroleum Geochemistry.

In the South Plains ACS Section at Texas Tech **Dr. Henry Shine** gave a paper at the Chicago ACS National Meeting. Dr. Shine has received a continuing two year, $50,000 NSF grant on "Cation Radical Chemistry." **Welch Professor C. W. Shoppee** gave a seminar on "Walden Retention" at the Universities of New Mexico and Oklahoma.

From the ACS Press Room

A Single-application Treatment for Ear Infections that Doesn't Need Refrigeration

"Single Application Cold-Chain Independent Drug Delivery System for Outer Ear Infections"

ACS Biomaterials Science & Engineering

Outer ear infections, which affect millions of people each year, are typically caused by the bacteria *Pseudomonas aeruginosa* or *Staphylococcus aureus*. Repeatedly administering antibiotic drops, the standard treatment, can be a problem for some people, and the only single-use suspension currently available needs to be kept and handled cold. Now, researchers reporting in ***ACS Biomaterials Science & Engineering*** have developed a single-use treatment that doesn't require refrigeration.

Treatment for ear infections usually involves a patient or caregiver administering antibiotic drops for 7–14 days, multiple times each day.

Researchers have developed a single-use treatment for ear infections that doesn't require refrigeration.

Credit: didesign021/Shutterstock.com

However, this regimen can be difficult for some, especially for people with hand or head tremors, nursing home residents, those in the military and people lacking access to regular health care. Incorrect or missed applications can mean the infection lasts longer than it should, or keeps coming back. In addition, the microbes could develop resistance to the drug. The U.S. Food and Drug Administration recently approved a treatment for ear infections that can be administered in a single dose by healthcare workers, but the medication requires refrigeration and several preparation steps prior to application. This would limit its use, particularly in remote areas. Monica Serban and colleagues wanted to develop a simple, safe, single-dose drug delivery system for ear infections that wouldn't need to be kept cold.

The team tested two delivery systems by mixing activated tetraethyl orthosilicate with large molecular weight polymers. The materials are liquids when squeezed through a syringe, but they rapidly form gels upon entering the ear, where they can release an antibiotic by diffusion. The hydrogels are stable through a range of temperatures, from 39.2 F

to 104 F. The antibiotic ciprofloxacin doesn't require refrigeration, and when added to the gels, the materials killed *P. aeruginosa* or *S. aureus* in cultures at a 100-times lower antibiotic dose than that used in most ear drops. Also, the gels didn't harm or irritate model human skin. When placed in mouse ears, the materials were eliminated within 10 days, and they didn't impact the mice's hearing more than traditional ear drops.

The authors acknowledge funding from the National Institutes of Health

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From the ACS Press Room

Pandemic Provides Unique Opportunity for Atmospheric Chemists

"COVID-19 lockdowns had strange effects on air pollution across the globe"

Chemical & Engineering News

As the COVID-19 pandemic slowed travel and business around the world, pollution emission rates dropped in response. With fewer cars on the road and clearer skies, atmospheric chemists jumped at the opportunity to study the impact of reduced emissions outside the lab. A news story in ***Chemical & Engineering News***, the weekly newsmagazine of the American Chemical Society, details early findings, which could help address climate change and air quality problems.

The first atmospheric indicators came from China, which imposed strict lockdown procedures in January to slow the spread of the novel coronavirus. As a result, emissions decreased "at a rate and scale never observed before," writes Senior Correspondent Katherine Bourzac. As the rest of the world later reacted with stay-at-home orders and other safety measures, atmospheric chemists leapt into action to capture what data they could about the environmental impact. Typical atmospheric chemistry experiments require complex computer models and reaction chambers in the lab because emissions in the real world usually change very slowly. The dramatic shift in everyday life caused by the pandemic lockdowns allowed researchers to collect information in real time, which they say could lead to a deeper understanding of atmospheric chemistry as a whole.

As lockdowns dramatically reduced traffic, carbon dioxide (CO_2) and nitrogen dioxide (NO_2) emissions dropped in kind. For example, in New Zealand, researchers observed 80% lower CO_2 emissions, matching the lower number of cars on the road. Similar trends were observed in major metropolitan areas across the world. While these changes lasted only as long as the stay-at-home or

Continued on Page 11

From the ACS Press Room

Engaging Undergrads Remotely with an Escape Room Game

"Escape the (Remote) Classroom: An Online Escape Room for Remote Learning"

Journal of Chemical Education

To prevent the spread of COVID-19, many universities canceled classes or held them online this spring — a change likely to continue for many this fall. As a result, hands-on chemistry labs are no longer accessible to undergraduate students. In a new study in the ***Journal of Chemical Education***, researchers describe an alternative way to engage students: a virtual game, modeled on an escape room, in which teams solve chemistry problems to progress and "escape."

While some lab-related activities, such as calculations and data analysis, can be done remotely, these can feel like extra work. Faced with the cancellation of their own in-person laboratory classes during the COVID-19 pandemic, Matthew J. Vergne and colleagues looked outside-the-box. They sought to develop an online game for their students that would mimic the cooperative learning that normally accompanies a lab experience.

To do so, they designed a virtual escape game with an abandoned chocolate factory theme. Using a survey-creation app, they set up a series of "rooms," each containing a problem that required students to, for example, calculate the weight of theobromine, a component of chocolate. They tested the escape room game on a class of eight third- and fourth-year undergraduate chemistry and biochemistry students. The researchers randomly paired the students, who worked together over a video conferencing app. In a video call afterward, the students reported collaborating effectively and gave the game good reviews, say the researchers, who also note that it was not possible to ensure students didn't use outside resources to solve the problems. Future versions of the game could potentially incorporate online simulations or remote access to computer-controlled lab instrumentation on campus, they say.

The authors did not receive funding to support this work.

This article is part of the "Insights Gained While Teaching Chemistry in the Time of COVID-19" August 2020 special issue.

From the ACS Press Room

How a Toxic Chromium Species could Form in Drinking Water

"Hexavalent Chromium Release in Drinking Water Distribution Systems: New Insights into Zerovalent Chromium in Iron Corrosion Scales"

Environmental Science & Technology

The water crisis in Flint, Michigan, brought much-needed attention to the problem of potentially toxic metals being released from drinking water distribution pipes when water chemistry changes. Now, researchers reporting in ACS' ***Environmental Science & Technology*** have investigated how hexavalent chromium, known as Cr(VI), can form in drinking water when corroded cast iron pipes interact with residual disinfectant. Their findings could suggest new strategies to control Cr(VI) formation in the water supply.

The metal chromium, known as Cr(0), is found in cast iron alloy, which is the most widely used plumbing material in water distribution systems. As pipes corrode, a buildup of deposits, known as scale, forms on the pipes' inner walls. Trace chemicals in water can react with scale, forming new compounds that could be released into the water. Some of these compounds contain Cr (VI), which, at high doses, can cause lung cancer, liver damage, reproductive issues and developmental problems. In 2014, California set a drinking water standard of 10 µg/L Cr(VI), but the guideline was later withdrawn because no economically feasible treatment to remove Cr(VI) from tap water existed. Haizhou Liu and colleagues wanted to find out how exactly Cr(VI) makes its

Scale on the inside of cast iron alloy pipes can react with residual disinfectant in the water to release Cr(VI).
Credit: Adapted from *Environmental Science & Technology* 2020

way into drinking water, which might reveal new ways to prevent its formation.

The researchers collected two sections of cast iron pipe from two drinking water distribution systems in the U.S.: one from a system using groundwater with naturally high Cr(VI) levels (11–24 μg/L), and the other from a system using surface water with undetectable Cr(VI). The team scraped off scale from the pipes and analyzed its composition. The levels of total Cr were about 18 times higher in the first pipe than in the second. In both pipes, chromium existed in two oxidation states, Cr(0) and Cr(III). When the researchers added a chlorine- or bromine-containing disinfectant to the scale, it quickly reacted with Cr(0), rather than Cr(III) as previously suspected, to form Cr(VI). To help mitigate Cr(VI) levels, adding less-reactive disinfectants to treat drinking water could be explored, and cast iron pipes with chromium alloy should be used with caution, the researchers say.

The authors acknowledge funding from the National Science Foundation.

Pandemic Opportunity

Cont. from Page 8

ders, atmospheric researchers say they provide a strong model to help persuade policymakers to adopt more climate-friendly legislation. There were a few unexpected observations, too. For example, ozone levels increased in some cities despite lower NO_2 emissions. Despite the challenging circumstances of the pandemic, atmospheric chemists hope that the data collected will have a positive impact on their field.

"Physics is fine and good, but without chemistry, we'd all just be rubbing sticks and rocks together."

John Genova
Harvard Med. School

From the ACS Press Room

How Microbes in 'Starter Cultures' make Fermented Sausage Tasty

"Identification and Quantitation of Hydroxy Fatty Acids in Fermented Sausage Samples"

Journal of Agricultural and Food Chemistry

Microbes in "starter cultures" impart a distinctive tang and longer shelf life to food like sourdough bread, yogurt and kimchi through the process of fermentation. To get a better grasp of how microbes do this in fermented sausages, such as chorizo and pepperoni, researchers reporting in the ***Journal of Agricultural and Food Chemistry*** carefully show that these tiny organisms change the composition of fatty acids in these meats, contributing to many desirable traits.

Fatty acids and related compounds can influence the quality of fermented foods. For example, one species of bacteria in sourdough cultures produces a type of fatty acid that increases bread's resistance to mold. Scientists, however, haven't had a good handle on how specific cultures drive the formation of these and other similar compounds in meat, partially because some of the previous studies on meats have not included a bacteria-free control. To better understand the link between microbes and molecules, Nuanyi Liang and colleagues wanted to see how the production of fatty acids within sausages varied depending on the microbial culture used to ferment it. To do so, they prepared the meat three ways. In one method, they included only the bacterium *Latilactobacillus sakei*; in another *L. sakei* and *Staphylococcus carnosus* were used. Both of these samples were made in such a way as to prevent contamination from bacteria in the environment. They treated the third sample — the control — with an antibiotic solution

Continued on Page 15

ACS SWRM
High School Teaching Award

The ACS DFW local section is proud to announce that **Jo L. King** of Plano West Senior High has won the ACS SWRM High School teaching Award for outstanding contributions to high school chemistry education.

Jo L. King teaches AP Chemistry at Plano West Senior High in Plano, TX and is currently learning the nuances of virtual teaching. In her many years of teaching, Jo has taught many levels of high school chemistry: on-level, Pre-AP, AP, Dual Credit, Organic, and Biochemistry. She received her B.S. in Psychology with a minor in Chemistry from Midwestern State University, her M.A. in Religion from Wayland Baptist University, and her M.S. in Chemistry-Chemistry Education from the University of North Texas. She is in her 33rd year of teaching chemistry. She is currently the co-chair of the ACS Pre-College Committee for the Division of Chemical Education. She has been a Reader for the AP Chemistry exam for the past seven years. She was a pre-college co-chair for BCCE 2010 hosted in Denton. She was also a co-program chair for the international ChemEd 2007 conference held in Denton. Jo has served on the ACS Advanced High School Exam Committee and has written questions for the TExES exam for those seeking to become a certified teacher in Texas. She is the sponsor of the Plano West ChemClub and Key Club. Jo has given numerous presentations at local and national meetings. Dedicated to staying current with new techniques, Jo has committed to attending several conventions and workshops each year, and she is also active in a greyhound rescue group.

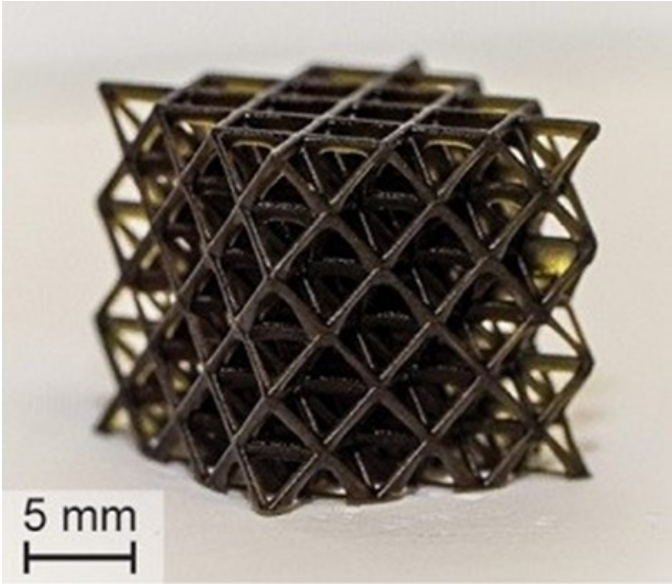
From the ACS Press Room

Rapid 3D Printing with Visible Light

"Rapid High-Resolution Visible Light 3D Printing"
ACS Central Science

3D printing has driven innovations in fields ranging from art to aerospace to medicine. However, the high-energy ultraviolet (UV) light used in most 3D printers to cure liquid resins into solid objects limits the technique's applications. Visible-light curing, which would be more appropriate for some uses, such as tissue engineering and soft robotics, is slow. Now, researchers reporting in ***ACS Central Science*** have developed photopolymer resins that boost the speed of visible-light curing.

With the help of computer-aided design, 3D-printed objects are made by the successive layering of a material into a 3D shape, with each layer solidified or "cured" using UV light. Being able to use visible light for curing would have advantages, including reduced cost, improved biocompatibility, greater depth of light penetration and reduced light scattering. These attributes could open up new applications for 3D printing, such as making opaque composites, multi-material structures or hydrogels containing live cells. However, because visible light is lower in energy than UV, visible-light curing is currently too slow to be practical. Zachariah Page and colleagues wanted to find a way to speed up the process.

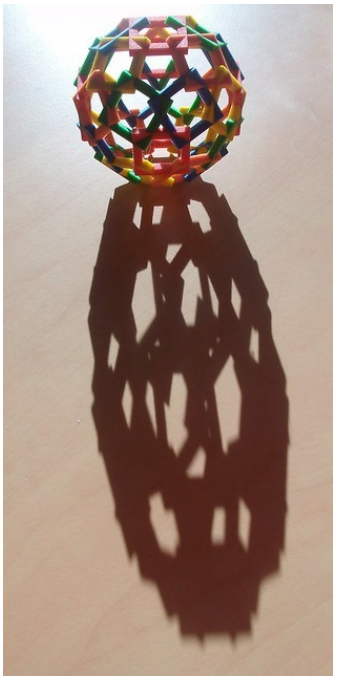


This complex object was 3D printed in about 2.5 hours using visible light.
Credit: Adapted from *ACS Central Science* 2020,

The researchers developed violet-, blue-, green- and red-colored resins that contained a monomer, a photoredox catalyst (PRC), two co-initiators and an opaquing agent. When the PRC absorbed visible light from LEDs, it catalyzed the transfer of electrons between the co-initiators, which generated radicals that caused the monomer to poly-

merize. The opaquing agent helped confine curing to the areas struck by light, which improved spatial resolution. The optimized mix of components allowed the researchers to print stiff and soft objects with small features (less than 100 µm), mechanical uniformity and build speeds up to 1.8 inches per hour. Although the best build speed is still less than half that of the fastest rate obtained using UV light, it could be further improved by increasing the light intensity or adding other components to the resin, the researchers say.

The authors acknowledge funding from the U.S. Department of Defense and the Welch Foundation.



'Starter Cultures' Continued from page 12

to eliminate the microbes naturally living within the sausage. Over the course of 20 days, they checked the sausages and found a markedly different profile for microbe-free sausage compared to the sausage containing either of the two microbial cultures. For example, the researchers observed that linolenic acid, an unsaturated fatty acid, was accumulating in the microbe-free sausage but not in the cultured sausage. Differences emerged between the two sets of microbes as well, with the sausage containing the *L. sakei* culture alone, for example, producing higher levels of coriolic acid, which has antifungal activity and, at higher concentrations, also imparts bitter taste. A better understanding of the biochemistry by which microbes influence the quality of sausage and other fermented foods will aid the production of consistent, long-lasting and good-tasting products, the researchers say.

The authors acknowledge funding from the Natural Sciences and Engineering Research Council of Canada Discovery and CREATE programs, the University of Alberta's Meat Education and Training Network, the Canada Research Chairs program and Mitacs.

Around the Area

UT Dallas

The Department of Chemistry and Biochemistry welcomes two new members to our Faculty, Drs. Allison Stelling and Hedieh Torabifard. Dr. Stelling is an Assistant Professor of Analytical Chemistry who did her postdoctoral research at Duke following her Ph.D. at Stony Brook. Dr. Torabifard is an Assistant Professor of Physical Chemistry who did her postdoctoral research at Michigan following her Ph.D. at Wayne State.

Dr. Allison Sterling

Dr. Hedieh Torabifard

Associate Professor Steven Nielsen, Senior Lecturer Yu (Tony) Huang, and Graduate Student Muhammad Abbas were recipients of School of Natural Sciences and Mathematics Teaching Awards for the 2019/2020 academic year.

Associate Professor Jeremiah Gassensmith was a recipient of a three-year NSF award, Associate Professor Ron Smaldone was a recipient of a two-year PRF award, and Professor Jie Zheng was a recipient of a three-year NSF MRI award.

Senior Lecturer Dr. Amandeep Sra was promoted to Full Professor of Instruction, and Dr. Christina Thompson was promoted to Associate Professor of Instruction.

Doctoral student Shashini Diwakara (Professor Ron Smaldone's Group) was honored as a Fall 2020 outstanding poster presenter by the ACS Division of Polymer Chemistry, and Doctoral student Mónica Rivas (Professor Vladimir Gevorgyan's Group) was awarded a two-year NIH Fellowship.

From the Editor

Congratulations to Jo King of Plano West Senior High, this year's winner of the ACS SWRM High School teaching award for outstanding contributions to high school chemistry education.

The article in which I was most interested this month 3D printing with visible light. Currently, 3D printers use UV light for polymerization. Zacariah Page of the University of Texas Austin and his research group have developed a resin containing photoredox catalysts and the monomer. The ability to use visible light for curing would have many advantages, including "...reduced cost, improved biocompatibility, greater depth of light penetration and reduced light scattering". The authors also point out that these attributes could open up new applications such as hydrogels containing live cells. At this stage, however, visible-light curing is currently too slow to be practical, but Page and colleagues are working on a way to speed up the process.

Best regards,
Connie