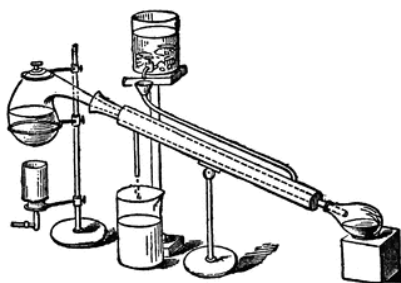




# ***SOUTHWEST RETORT***



**SEVENTY-THIRD YEAR**

**December 2020**

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and Chemistry in this area*

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## FIFTY YEARS AGO IN *THE SOUTHWEST RETORT*

The ACS tour speakers for this month are **Mr. Raymond N. Rogers** of Los Alamos Scientific Laboratory and **Dr. R. Stuart Tobias** of Purdue University. Mr. Rogers' topic is "Chemistry of Explosives," while Dr. Tobias's topics are "Stereochemistry and Reactivity of Heavy Metal Alkyls" and "Some Recent Trends in Inorganic Chemistry."

In the ACS Baton Rouge Section, **Dr. W. H. Daly** of LSU announces that The Mardi Gras Symposium in Organic Chemistry will be held Feb. 22 at LSU. In the ACS Central Texas Section, **Dr. Roger J. Williams** of UT-Austin was recently made an Honorary Member of the American Association of Clinical Chemists. He is the fifth person to be so honored. In the ACS San Antonio Section, **Dr. John A. Burke** of Trinity University attended the recent combined ACS Southeast and Southwest Regional Meeting.

In the Dallas-Ft. Worth ACS Section at the Mobil Field Research Laboratory (FRL), **Dr. Donald E. Woessner** was appointed to the Board of Editors of the *Journal of Chemical Physics*. Also at FRL, **Dr. E. Thomas Strom** attended the ACS Southwest-Southeast Regional Meeting Dec. 2-4, where he presented a paper on nitroxide radicals. He then took part in the Division of Physical Chemistry Symposium on Electron Spin Resonance Dec. 7-9 in Athens, GA, where he chaired one of the sessions. Early this fall the TCU chemistry department made its long-awaited move into new quarters in the Sid W. Richardson Science Building. This 6.1 million dollar structure houses the Departments of Chemistry, Physics, and Geology and The Computational Facilities. This fall also marked the retirement of TCU faculty

member **Dr. E. R. Alexander**. At North Texas State University (now UNT), **Dr. J. L. Carrico** was honored at a dinner Oct. 13 at the Denton Country Club. The occasion was in recognition of his many contributions as former department chair in the development of the Department of Chemistry. At UT-Arlington **Dr. Andy Armstrong** presented a lecture at TCU, while **Dr. D. J. Blake** gave a talk at East Texas State University (ETSU). At ETSU **Dr. Kenneth Ashley** gave a seminar at New Mexico State University.



Compiled by **E. Thomas Strom**  
At Baylor University the following faculty members attended the Welch Foundation Conference in Houston Nov. 9-11: **Professors John S. Belew, T. J. Bond, Malcolm Dole, Thomas C. Franklin, James L McAtee, David E. Pennington, A. G. Pinkus, Charles E. Reeder, and Virgil Tweedie.** **Dr. James L. Marshall** of NTSU gave a seminar on Nov. 6, while **Dr. William B. Smith** of TCU is scheduled to give a seminar on Dec. 11.

At the University of Arkansas **Dr. Paul Kuroda's** AEC contract has been renewed. **Dr. T. D. Roberts** gave a seminar at Vanderbilt University on Nov. 11. **Dr. S. Siegel** gave a seminar at Missouri Southern College on Dec. 9, while **Dr. W. L. Meyer** presented a seminar at Indiana University on Nov. 6.



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## From the ACS Press Room

# Neuropeptide Discoveries could Someday Help Defeat the Dreaded Cockroach

### Genomics- and Peptidomics-Based Discovery of Conserved and Novel Neuropeptides in the American Cockroach

#### Journal of Proteome Research

Cockroaches are notorious for their abilities to survive and reproduce, much to humanity's chagrin. In addition to scurrying around at night, feeding on human and pet food, and generating an offensive odor, the pests can transmit pathogens and cause allergic reactions. Now, researchers reporting in ACS' *Journal of Proteome Research* have identified neuropeptides produced by the American cockroach (*Periplaneta americana*) that could someday be targeted by new, more selective and effective pesticides.

Neuropeptides are small proteins produced by neurons or endocrine cells that



send messages to other cells. In insects, neuropeptides often act as neurotransmitters, hormones or growth factors, influencing an organism's development, growth, metabolism, behavior and reproduction. Therefore, disrupting these processes by targeting neuropeptides or their receptors is a potential

new approach to pest control. Recently, Na Li and colleagues determined the genome sequence of *P. americana*. Now, they wanted to use this sequence, combined with peptide analysis, to characterize the neuropeptides of the American cockroach and study how their expression varies by tissue, developmental stage and sex.

The researchers searched the *P. americana* genome for genes predicted to encode neuropeptides and found 67 potential neuropeptide precursor genes. Then, they isolated peptides from four different cockroach tissues. Using mass spectrometry, the team identified 35 neuropeptides that were predicted by the genome sequence, as well as one new neuropeptide that hadn't been previously predicted or identified. Some of them were expressed in only a single tissue, whereas others were found in many tissues. Neuropeptide expression also varied between developmental stages and sexes, with most neuropeptides being more abundant in adult males. One neuropeptide, called sNPF, that was more highly expressed in females appeared to stimulate feeding behaviors, the researchers say, so it could be an attractive target for pest control measures.

The authors acknowledge funding from the [National Natural Science Foundation of China](#), the Department of Science and Technology in Guangdong Province, and Shenzhen Science and Technology Program.



# *From the ACS Press Room*

## *Sous Vide Cooking Method*

### *makes Beef Protein more Digestible*

*Insights into Digestibility and Peptide Profiling of Beef Muscle Proteins with Different Cooking Methods*

*Journal of Agricultural and Food Chemistry*

Once used to prepare cuisine in only the finest restaurants, sous vide is now making its way into home chefs' kitchens. French for "under vacuum," the technique involves vacuum sealing food in a plastic pouch and then slowly cooking it in warm water. Now, researchers reporting in ACS' *Journal of Agricultural and Food Chemistry* have found that, compared with boiling or roasting, sous vide increases beef protein digestibility during simulated digestion.

The heat of cooking causes meat proteins to undergo various changes, such as in their structure, oxidation and aggregation, which could affect how easily the proteins are broken down by digestion into small peptides or amino acids that can be absorbed into the bloodstream. The relatively low heat of sous vide — typically about 140 F — and the low-oxygen conditions can produce a tender, juicy, evenly cooked steak. Wangang Zhang and colleagues wondered if the culinary technique could also increase beef protein digestibility compared with boiling (cooking in water at 212 F) or roasting (cooking in an oven above 300 F). Beef that is more digestible could be more nutritious and less likely to cause gastrointestinal problems.

The researchers studied the effects of the different cooking methods on changes in beef protein oxidation and structure, which are known to influence digestibility. In cooked meat, they examined two markers of protein oxidation, finding that roasted meat was the most highly oxidized, followed by boiled meat and then the sous vide beef. Sous vide

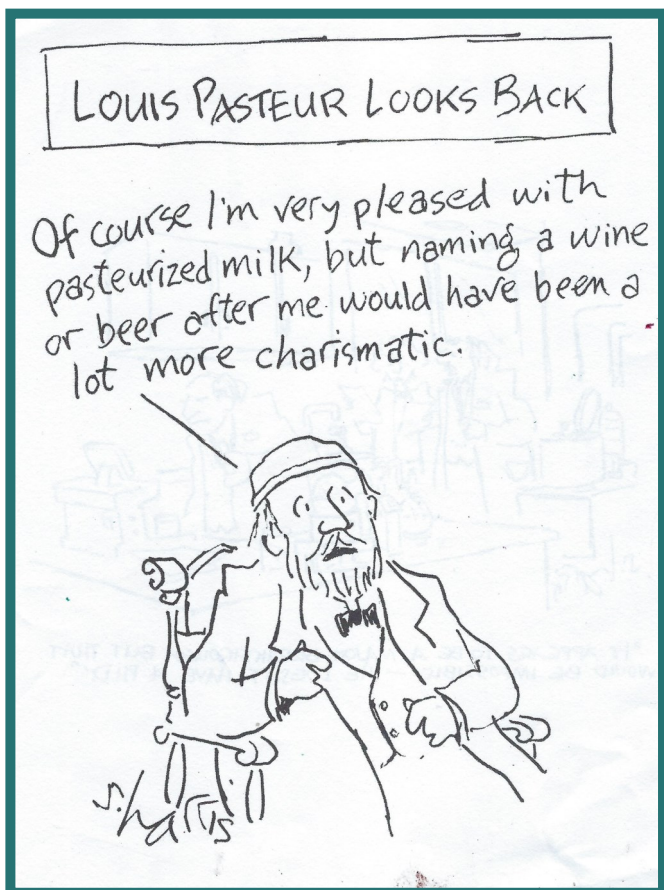


also caused less protein aggregation and fewer changes in the proteins' structures than the other

cooking methods. When the team placed the cooked beef in simulated gastric and intestinal fluids, the meat cooked by sous vide released a greater quantity and variety of peptides than meat cooked by the other methods, indicating increased digestibility. Further studies are needed to determine the effects of peptides from meat cooked with different methods on the gut microbiome and human health, the researchers say.

The authors acknowledge funding from the Jiangsu Agricultural Science and Technology Innovation Fund and the National Key R&D Program of China.





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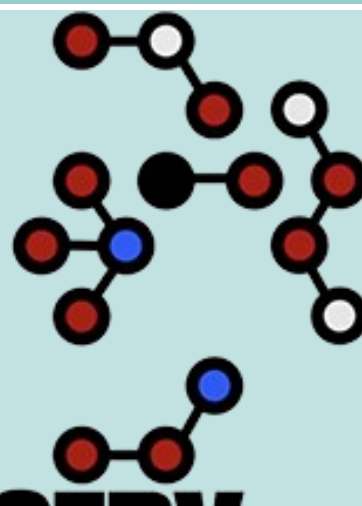
E. Thomas Strom, and Jason McAfee

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# SHORT FILMS ABOUT CHEMISTRY



A graphic of a molecular structure with red, white, and blue spheres connected by black lines, positioned to the right of the title.

**Introducing Chemistry Shorts:** a new series of brief films that spotlight innovative ways that chemists and chemical engineers are working to solve important problems and create new opportunities. Each film is accompanied by a lesson plan that offers suggestions on how to integrate it into the classroom.

The first three films and lesson plans are available at:

<https://chemistryshorts.org>

\* Direct Air Capture & The Future of Climate Change, with Christopher

Jones (Georgia Tech)

\* Under the Skin, with Zhenan Bao (Stanford)

\* Rewriting Life, with David Liu (Harvard)

Chemistry Shorts is also on YouTube and Twitter:

<https://www.youtube.com/c/chemistryshorts>

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## From the ACS Press Room

# Compounds Block Stress-enhanced Nicotine Intake in Rats

### *Allosteric Modulation of GABA<sub>A</sub> Receptors in Rat Basolateral Amygdala Blocks Stress-Enhanced Reacquisition of Nicotine Self-Administration*

#### *ACS Pharmacology & Translational Science*

Stress is a major cause of relapse after people quit smoking. Worrying situations, such as money or relationship problems, can affect neurotransmitter levels in the brain, leading former smokers to reach for a cigarette. Now, researchers reporting in *ACS Pharmacology & Translational Science* have discovered that compounds that activate  $\gamma$ -aminobutyric acid (GABA) receptors in the brain can keep rats from self-administering increased levels of nicotine during stressful conditions in an animal model for relapse.



GABA is an inhibitory neurotransmitter that decreases nerve signaling in the brain. When a person experiences stress, their GABA levels can decrease, causing some neurons to become hyperactive. Using an animal model,

Burt Sharp and colleagues wanted to find out if giving rats compounds that stimulate GABA<sub>A</sub>, a specific type of GABA receptor, on certain neurons, called basolateral amygdala principal output neurons, could lessen the rats' relapse to nicotine during stressful conditions.

In the animal model, rats were taught to press a lever to self-administer nicotine. After a week, the animals were withdrawn from nicotine for 8 days. To cause stress, the researchers confined the rats in a small space. After releasing the rodents, the team injected one of three compounds, called positive allosteric modulators of GABA<sub>A</sub>, or PAMs, into a specific region of the stressed rats' brains, and then gave them access to the nicotine-administering levers. Untreated stressed rats pressed the levers about 1.5 times more frequently than they had before the abstinence period, while rats treated with any of the PAMs reduced nicotine intake to levels seen in unstressed rats before the abstinence period. If similar effects are confirmed in humans, novel, selective PAMs could be helpful in alleviating the stress-induced relapse to smoked tobacco, with potentially fewer side effects than GABA administration, the researchers say.

The authors acknowledge the gift of NS16085 from Karin S. Nielsen at [Saniona AB](#), Denmark and partial funding from [Lohocla Research, Inc.](#)

*From the ACS Press Room*

## *Self-repairing Gelatin-based Film could be a Smart move for Electronics*

### *A Green Strategy for Developing a Self-Healing Gelatin Resistive Memory Device*

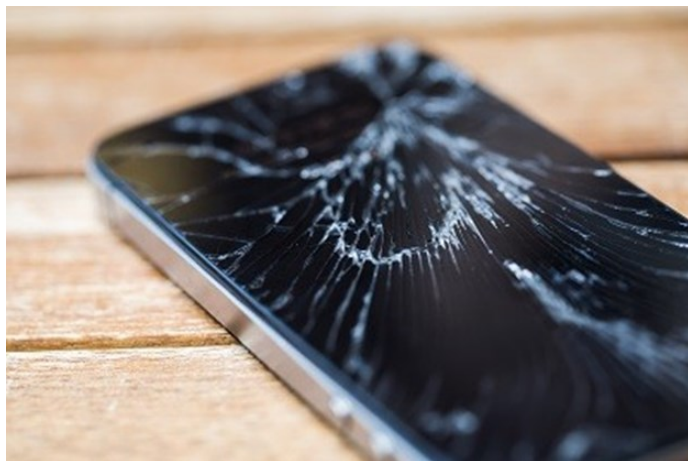
#### *ACS Applied Polymer Materials*

Dropping a cell phone can sometimes cause superficial cracks to appear. But other times, the device can stop working altogether because fractures develop in the material that stores data. Now, researchers reporting in *ACS Applied Polymer Materials* have made an environmentally friendly, gelatin-based film that can repair itself multiple times and still maintain the electronic signals needed to access a device's data. The material could be used someday in smart electronics and health-monitoring devices.

Global consumer demand for hand-held smart devices is rapidly growing, but because of their fragility, the amount of electronic waste is also increasing. Self-repairing films have been developed, but most only work a single time, and some are made with potentially harmful agents that curtail their use in biomedical applications. Researchers have tried incorporating gelatin in electronic devices because it is transparent, readily available and safe. In tests, however, damaged gelatin film was not restored quickly. Yu-Chi Chang and colleagues wanted to see if they could make a repeatedly self-healing gelatin-based film that would mend cracks in minutes and preserve electrical functionality.

The researchers mixed gelatin and glucose to create a flexible film that they sandwiched

between conductive material to simulate an electronic device. After bending the simulated electronic device, the team saw breaks in the gelatin-glucose film disappear within 3



hours at room temperature and within 10 minutes when warmed to 140 F. Gelatin without glucose did not self-repair under the same conditions. The glucose-based gelatin also transferred an electrical signal following multiple rounds of damage and repair, with an unexpected improvement to the film's electrical performance. The experiments show that glucose and gelatin probably form reversible and interlocking imide bonds during the healing process. The new film could help maintain the durability of touchscreen and flexible display devices, advanced robotics and assisted health technologies, the researchers say.

The authors acknowledge funding from the [Ministry of Science and Technology of Taiwan](#).



*From the ACS Press Room*

## *Silicone Surface Mimics Topology, Wettability of a real Human Tongue*

### *3D Biomimetic Tongue-Emulating Surfaces for Tribological Applications*

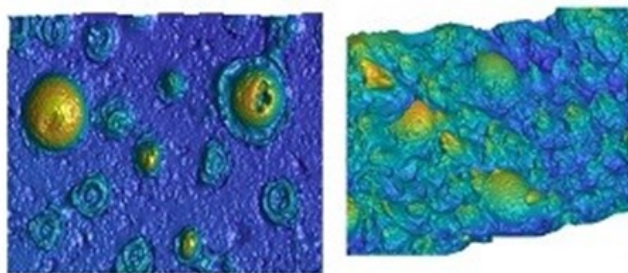
#### *ACS Applied Materials & Interfaces*

The tongue helps people taste food, but structures on its surface also help them sense textures — something that's also very important when savoring a meal. Now, researchers reporting in *ACS Applied Materials & Interfaces* have made a 3D silicone surface that, for the first time, closely mimics the surface features of the human tongue. The material could help food scientists study mechanical interactions of foods, liquids and medicines with the organ.

In humans, the tongue is essential for moving food around in the mouth, sensing taste and texture, and speech. The surface of the tongue is covered in thousands of tiny bumps, or papillae, that contain the taste buds and provide friction and lubrication. Studying how foods and liquids mechanically interact with the tongue could help food scientists, drug developers and manufacturers of toothpastes or mouthwashes make more desirable products. Currently, scientists rely mainly on human tasters to assess texture, or mouth feel, but this is time-consuming, expensive and subjective. There are electronic tongues, or e-tongues, available, but most analyze taste, and the few developed to study texture aren't very accurate. Anwesha Sarkar and colleagues

wanted to develop a soft 3D surface that replicates the topography and wettability of a real human tongue.

The team began by making silicone masks of the tongue surfaces of 15 healthy adults. Using 3D optical scanning and computational surface reconstructions, they created digital models and measured the average density, diameter and height of the two ma-



The topography of a 3D-printed, tongue-mimicking surface (left) looks like a mask made from a real human tongue (right).

For two types of papillae. Next, they designed a master mold with the appropriate spatial distribution of these papillae and 3D printed it. Then, they used the mold to make soft, tongue-like surfaces out of silicone, with a surfactant added to improve wettability. Testing showed that the 3D biomimetic surface demonstrated similar frictional properties to an actual human tongue, and simulations showed similar mechanical sensing properties. The tongue-like surface could help accelerate the development of

nutritional, biomedical and clinical products, as well as find applications in soft robotics, the researchers say.

The authors acknowledge funding from the [European Union's Horizon 2020 research and innovation program](#).



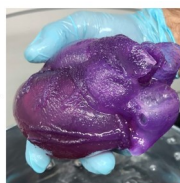
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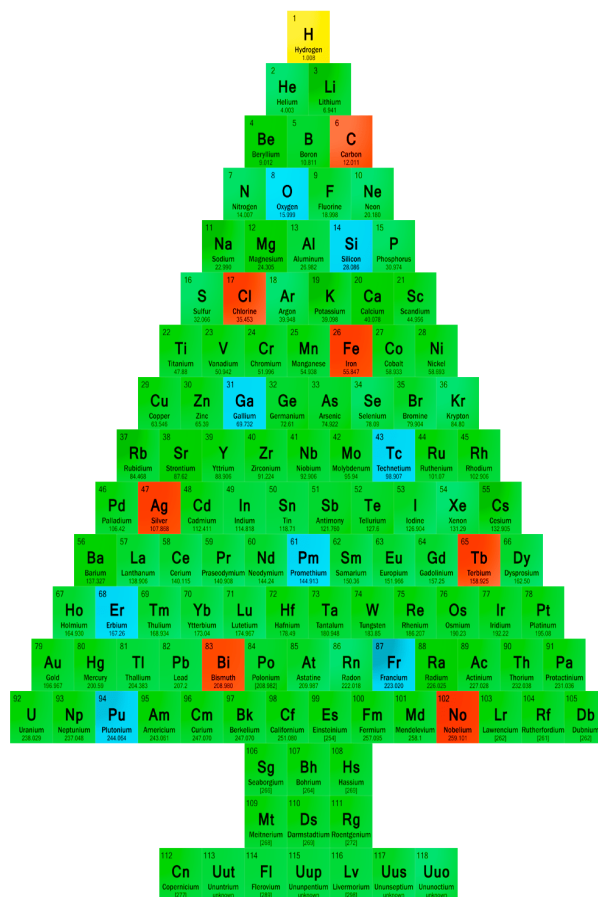
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**CHEMISTREE**

## *From the Editor*

December's Southwest Retort is always a slim issue, but this year it's slimmer than most years...not much going on, what with the COVID crisis. But PITTCON will persist—always!—and is virtual in 2021.

My favorite Press Room release this month is the self-healing gelatin films used in electronic devices, gelatin-glucose blends which heal cracks repeatedly and preserve electrical functionality. Sorry, it's not the cracked cover, but the electronic data-storing material.

Happy holidays and a Happy New Year. Be safe and keep well.

*Best regards,  
Connie*