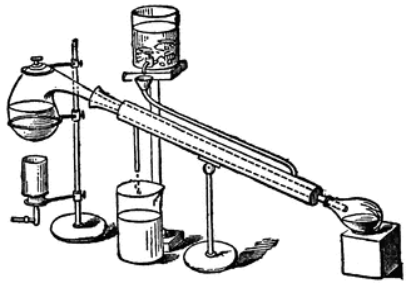
SOUTHWEST RETORT



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and Chemistry in this area

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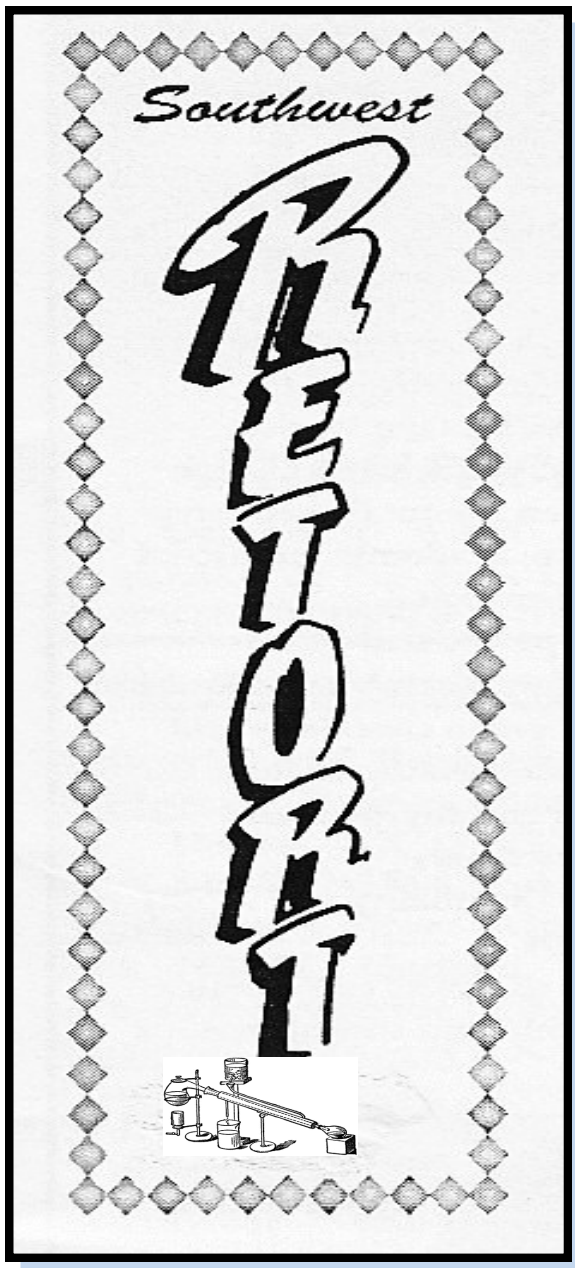

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Fifty Years Ago in the *Southwest Retort*

Apologies. This column began in 1998 when *The Southwest Retort* reached its 50th birthday! To my knowledge it has always appeared every month since, except for last month when I was tied up with a family medical emergency. I hope that never happens again. Remember that, thanks to previous Managing Editor **Jim Marshall,** all old issues of this magazine are available online through the University of North Texas library. To make up for last month, this column will have items from both the December, 1971, and January, 1972, issues of *The Retort*.

The upcoming ACS tour speakers for January are **Welch Professor Malcolm Dole** of Baylor and **Dr. Richard Cadle** of the National Center for Atmospheric Research. Prof. Dole's topics are "The Radiation Chemistry of Polyethylene" and "Molecular Beams of Macroions." Dr. Caudle will speak on either "Formation and Chemical Reactions of Atmospheric Particles" or "The Nature and Cure of Photochemical Smog"

Wilfred T. (Doc) Doherty, age 73, President of the Robert A. Welch Foundation, died in Houston on Dec. 16. **Dr. Henry Shine**, Chair of the Chemistry Department at Texas Tech University, had these words of tribute. "Doc Doherty was a down-to-earth, blunt business man, who devoted the last decade or so of his life to the growth of chemistry in Texas.

Dr. Bruno J. Zwolinski of Texas A&M University, most recent winner of the ACS Southwest Regional Award, gave his award address at the recent ACS Southwest Regional Meeting in San Antonio. Two faculty members from Tarleton State College, **Dr. Thomas Hinkson** and **Mr. Gerald Brooks**, gave presentations at the San Antonio regional meeting. **Dr. Donald Rapp** of UT-Dallas was an invited symposium speaker at the regional meeting. All the chemistry faculty from TCU attended the Welch meeting in November in Houston. **Dr. Daniel Blake** from UT-Arlington received a $5050 grant from Research Corporation. At the University of Arkansas **Dr. Lothar Schafer** was one of 16 scientists to receive a Teacher-Scholar Grant from Research Corp.

The ACS tour speakers for February will be **Dr. John R. Thirtle** of Eastman Kodak speaking on "The Inside Story of Color Photography," **Dr. John F. Baxter** of the University of Florida lecturing on "The Knowledge Explosion, the Teacher, and TV," and **Dr. Kenneth Kustin** of Brandeis University talking on "Fast Reactions."

Compiled by E. Thomas Strom

Dr. Harold Werbin of UT-Dallas has been selected as the new Editor of *The Southwest Retort*, succeeding **Dr. Herman Custard** of the Mobil Field Research Laboratory. Dr. Custard will also be Chair of the DFW ACS Section this year. Ten North Texas State chemistry faculty attended the San Antonio ACS regional meeting, giving a total of 14 presentations. NTSU faculty member **Dr. James L. Marshall** gave a seminar on NMR at the University of Oklahoma. At the Mobil Field Research Lab **Dr. Donald E. Woessner** gave a seminar on pulsed NMR at UT-Austin. The chemis-

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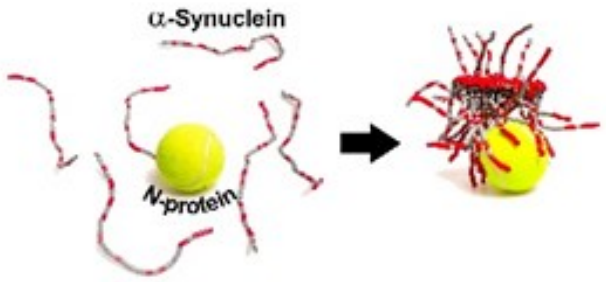
From the ACS Press Room

SARS-CoV-2 Protein Interacts with Parkinson's Protein, Promotes Amyloid Formation

"Interactions between SARS-CoV-2 N-Protein and α-Synuclein Accelerate Amyloid Formation"

ACS Chemical Neuroscience

Case reports of relatively young COVID-19 patients who developed Parkinson's disease within weeks of contracting the virus have led scientists to wonder if there could be a link between the two conditions. Now, researchers reporting in ***ACS Chemical Neuroscience*** have shown that, at least in the test tube, the SARS-CoV-2 N-protein interacts with a neuronal protein called α-synuclein and speeds the formation of amyloid fibrils, pathological protein bundles that have been implicated in Parkinson's disease.



In addition to respiratory symptoms, SARS-CoV-2 can cause neurological problems, such as loss of smell, headaches and "brain fog." However, whether these symptoms are caused by the virus entering the brain, or whether the symptoms are instead caused by chemical signals released in the brain by the immune system in response to the virus, is still controversial. In Parkinson's disease, a protein called α-synuclein forms abnormal amyloid fibrils, leading to the death of dopamine-producing neurons in the brain. Interestingly, loss of smell is a common premotor symptom in Parkinson's disease. This fact, as well as case reports of Parkinson's in COVID-19 patients, made Christian Blum, Mireille Claessens and colleagues wonder whether protein components of SARS-CoV-2 could trigger the aggregation of α-synuclein into amyloid. They chose to study the two most abundant proteins of the virus: the spike (S-) protein that helps SARS-CoV-2 enter cells, and the nucleocapsid (N-) protein that encapsulates the RNA genome inside the virus.

In test tube experiments, the researchers used a fluorescent probe that binds amyloid fibrils to show that, in the absence of the coronavirus proteins, α-synuclein required more than 240 hours to aggregate into fibrils. Adding the S-protein had no effect, but the N-protein decreased the aggregation time to less than 24 hours. In other experiments, the team showed that the N- and α-synuclein proteins interact directly, in part through their opposite electrostatic charges, with at least 3–4 copies of α-synuclein bound to each N-protein. Next, the researchers injected N-protein and fluorescently labeled α-synuclein into a cell model of Parkinson's disease, using a similar concentration of N-protein as

would be expected inside a SARS-CoV-2-infected cell. Compared to control cells with only α-synuclein injected, about twice as many cells died upon injection of both proteins. Also, the distribution of α-synuclein was altered in cells co-injected with both proteins, and elongated structures were observed, although the researchers could not confirm that they were amyloid. It's unknown whether these interactions also occur within neurons of the human brain, but if so, they could help explain the possible link between COVID-19 infection and Parkinson's disease, the researchers say.

The authors acknowledge funding from Stichting ParkinsonFonds.

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From the ACS Press Room

People with IBD have more Microplastics in Their Feces, Study Says

"Analysis of Microplastics in Human Feces Reveals a Correlation between Fecal Microplastics and Inflammatory Bowel Disease Status"

Environmental Science & Technology

Microplastics — tiny pieces of plastic less than 5 mm in length — are everywhere, from bottled water to food to air. According to recent estimates, people consume tens of thousands of these particles each year, with unknown health consequences. Now, researchers reporting in ACS' ***Environmental Science & Technology*** found that people with inflammatory bowel disease (IBD) have more microplastics in their feces than healthy controls, suggesting that the fragments could be related to the disease process.

The prevalence of IBD, which includes Crohn's disease and ulcerative colitis, is rising globally. Characterized by chronic inflammation of the digestive tract, IBD can be triggered or made worse by diet and environmental factors. Microplastics can cause intestinal inflammation, gut microbiome disturbances and other problems in animal models, so Faming Zhang, Yan Zhang and colleagues wondered if they could also contribute to IBD. As a first step toward finding out, the researchers wanted to compare the levels of microplastics in feces from healthy subjects and people with different severities of IBD.

The team obtained fecal samples from 50 healthy people and 52 people with IBD from different geographic regions of China. Analysis of the samples showed that feces from IBD patients contained about 1.5 times more microplastic particles per gram than those from healthy subjects. The microplastics had similar shapes (mostly sheets and fibers) in the two groups, but the IBD feces had more small (less than 50 μm) particles. The two most common types of plastic in both groups were polyethylene terephthalate (PET; used in bottles and food containers) and polyamide (PA; found in food packaging and textiles). People with more severe IBD symptoms tended to have higher levels of fecal microplastics. Through a questionnaire, the researchers found that people in both groups who drank bottled water, ate takeaway food and were often exposed to dust had more microplastics in their feces. These results suggest that people with IBD may be exposed to more microplastics in their gastrointestinal tract. However, it's still unclear whether this exposure could cause or contribute to IBD, or whether people with IBD accumulate more fecal microplastics as a result of their disease, the researcher say.

The authors acknowledge funding from the National Natural Science Foundation of China.

Now accepting applications for fall 2022 Ph.D Program

The Department of Chemistry and Biochemistry at the University of Texas at Dallas is now accepting applications for the fall 2022 Ph.D. program. We have 24 tenure-track research active faculty, 8 professors of instruction, and 120 graduate students. The Ph.D. program focuses on innovation and problem-solving in interdisciplinary, cutting-edge research areas such as organic and inorganic materials, nanotechnology, biochemistry, and polymer chemistry, preparing graduates with the following skills:

- **Laboratory and chemical synthesis skills**
- **Independent research**
- **Operation of modern analytical instrumentation**
- **Problem-solving skills and critical thinking**
- **Creativity and innovation in experimental design**
- **Scientific writing and communication**
- **Career guidance and networking opportunities**

We can waive the application fee based on requests from graduate student applicants.

https://chemistry.utdallas.edu/research-faculty/

https://graduate-admissions.utdallas.edu/steps-to-admission/apply-now/

Scan for answers to FAQ and an Application Link!

From the ACS Press Room

Devising new Meat Alternatives with 3D Printing — and Cocoa Butter

"3D Printing of Soy Protein- and Gluten-Based Gels Facilitated by Thermosensitive Cocoa Butter in a Model Study"

ACS Food Science & Technology

No longer just a dream of vegetarians and vegans, fake meat is becoming more widely available in grocery stores and restaurants. And more options are almost certainly on the way. In a study reported in ***ACS Food Science & Technology***, one team has developed a new combination of plant-based ingredients tailored for 3D printing meat alternatives. Their most successful recipes required an odd-sounding addition: cocoa butter, derived from cocoa beans of chocolate fame.

From animal welfare to environmental sustainability, there are plenty of reasons people choose to avoid eating meat derived from animals. Many current meat alternatives rely on plant-based proteins, most often from soy and wheat, which can readily mimic the texture and nutritional value of the real thing. While 3D printing has already been tested for meat alternatives, none of the current formulations include proteins from these particular plants. So, Songbai Liu and Shanshan Wang wanted to figure out an approach to making a meat "dough" with soy and wheat protein that could be produced effectively with a 3D printer.

The researchers tested soy and wheat proteins in formulations containing several other ingredients using a 3D printer. They evaluated their concoctions based on the accuracy with which the dough could be laid down by the printer and how well it held its form. They also examined its texture and microstructure. The experiments revealed the importance of several additional ingredients, including the emulsifier Tween-80 and sodium alginate to control the texture. Heat-sensitive cocoa butter turned out to be a particularly important ingredient, making the dough more fluid at warm temperatures for printing, but then hardening afterward at room temperature, allowing the dough to retain its printed shape. One drawback, however, is that people who cannot eat wheat gluten or soy because of allergies or celiac disease would not be able to partake of the new alternatives. To address this issue, the researchers attempted to replace the soy protein with that from peas, but the resulting dough was too soft for printing. Even so, these experiments have identified a new strategy for formulating meat alternatives using this versatile technology, according to the researchers.

That's not cookie dough — it's a meat alternative created with a 3D printer and plant-based ingredients, including cocoa butter.

Continued on Page 13

From the ACS Press Room

An Ice-inspired Lubricant Improves Osteoarthritis Symptoms in Rats

"Ice-Inspired Lubricated Drug Delivery Particles from Microfluidic Electrospray for Osteoarthritis Treatment"

ACS Nano

With the Winter Olympics approaching, many people will soon be tuning in to watch events that take place on ice, such as figure skating, speed skating and ice hockey. An ultrathin, super-lubricating layer of water on the ice's surface is essential for skaters' graceful glides. Inspired by this surface, researchers reporting in ***ACS Nano*** have developed a treatment for osteoarthritis that enhances lubrication and reduces friction and inflammation in a rat model of the disease.

Osteoarthritis, a chronic disease common in middle-aged and older people, is characterized by persistent inflammation and degeneration of cartilage in the joints. Anti-inflammatory drugs can help relieve pain and inflammation, but long-term use can reduce their effectiveness or cause gastrointestinal problems. Corticosteroids injected directly into the joint provide temporary relief, but frequent treatments can sometimes damage the cartilage. Yuanjin Zhao and colleagues wanted to develop drug delivery particles that, when injected into a joint, could safely enhance lubrication and decrease inflammation.

The researchers based their particles on hyaluronic acid (HA), a natural polysaccharide already used as a lubricant to treat osteoarthritis, but this molecule degrades rapidly inside the body. So the researchers used a microfluidic device to make tiny methacrylate anhydride-HA gel particles, which they reasoned might be stronger and persist longer in the body than an HA solution. To enhance the lubrication of the particles, the team coated them with 2-methylacryloyloxyethyl phosphorylcholine (MPC), which has positively and negatively charged chemical groups that attract a thin layer of water, similar to ice. In addition, the particles' pores were loaded with an anti-inflammatory drug, which could be slowly and continuously released. The researchers then injected drug-loaded HA-MPC particles into the knee joints of rats with early-stage osteoarthritis. The joints of treated rats were more lubricated and had less cartilage destruction, joint friction and inflammation compared with a control group. The treated rats also expressed higher levels of collagen II and aggrecan, two markers of healthy cartilage. The particles have great potential for clinical applications, but first they must undergo additional animal and biosafety tests, the researchers say.

The authors acknowledge funding from the National Key Research and Development Program of China, the National Natural Science Foundation of China, the Natural Science Foundation of Jiangsu and the Shenzhen Fundamental Research Program.

From the ACS Press Room

Making apple spirits taste better

"Monitoring of Carboxylic Acids by In-Line Conductivity Measurement to Determine Optimum Distillation Strategy for Distilling Apple Spirits"

ACS Food Science & Technology

The holiday season is a time of celebrations and festive drinks, some of which are made with apple liquors. These classic spirits have a long history, and surprisingly, many decisions about their processing are still subjectively determined. Now, researchers in *ACS Food Science & Technology* report that measuring the liquor's conductivity could give a more objective assessment, and they also found a way to make the process more energy-efficient.

For hundreds of years, apples have been a

good base for liquors, such as Calvados in France and applejack in the U.S., because they're full of sugar and desirable flavors. As the mashed fruit ferments, alcohol evolves along with additional flavor compounds, which add to the complex taste of the final liquor. Distilling the fermented apples with heat concentrates the alcohol and removes unpleasant fermentation byproducts, such as carboxylic acids that can impart unclean, rancid, cheesy and sweaty flavors. Most producers use batch columns to make apple spirits because it provides a clean-tasting, high-alcohol distillate in a large volume. But the exact time to stop the distillation process — and achieve the most flavorful liquor — has been uncertain. Previously, Andreas Liebminger and colleagues showed that a rapid increase in apricot brandy distillate's conductivity reliably indicates the ideal time to stop the distillation. So, the researchers wanted to see if this would also hold for apple liquors.

The researchers crushed and fermented apples into a mash, which they distilled in a German-style batch column still. As the mash was heated, they continuously monitored the conductivity of the distillates and measured the levels of nine carboxylic acids. They found that as the conductivity rose, so did the levels of the bad-tasting carboxylic acids. In additional tests to find a more energy-efficient distillation strategy, they noted that heating up the mash too quickly produced a distillate with lower conductivity and fewer of the unwanted flavor compounds, but it smelled bland. In contrast, raising the temperature of the still's cooling tower produced a liquor with a good aroma intensity, while also reducing the carboxylic acid levels. By keeping the cooling tower a few degrees warmer, the researchers didn't expend as much energy overall com-

From the ACS Press Room

pared to the conventional approach. The researchers say that monitoring the conductivity in the distillates afforded them a simple way to identify the best conditions for producing apple spirits with the most desirable quality and taste.

The authors do not acknowledge a funding source for this study.

"Devising new Meat Alternatives

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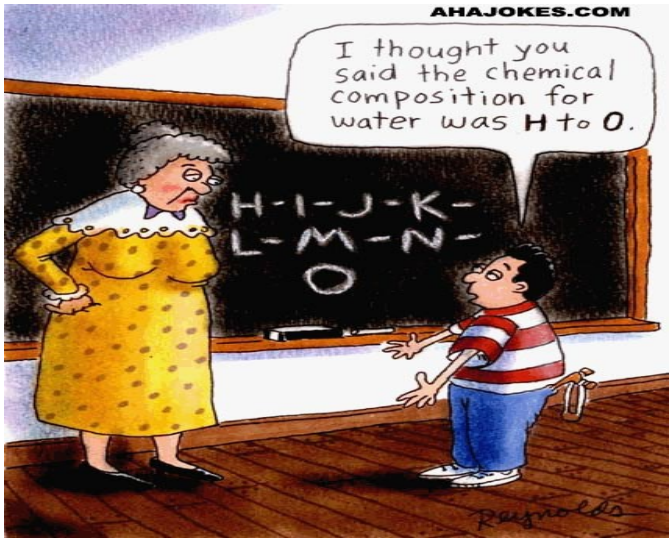
The authors acknowledge funding from the National Key R&D Program of China, the Zhejiang Public Welfare Technology Research Program, the Qinghai Science and Technology Program and the Foundation of Fuli Institute of Food Science at Zhejiang University.



Fifty Years Ago

Continued from page 5

try faculty of East Texas State University gave eleven presentations at the regional meeting in San Antonio. In January **Dr. Lynn A. Melton** joined the UT-Dallas chemistry faculty.

At Baylor University **Dr. W. O. Milligan**, Director of Research at the Welch Foundation, was presented with the 1971 ACS Southeastern Texas Section Award. In the Southeastern Texas ACS Section, Professional Relations Committee Chair **Dr. J. M. Fitzgerald** arranged for a six week course on "Introduction to Polymer Chemistry" to be given on Monday nights at the University of Houston.

The San Antonio ACS Section has hosted one of the most successful regional meetings for 1971, with 981 registrants and 420 papers presented.

At Eastern New Mexico University, **Dr. R. G. Taylor** has received a $6100 grant from the New Mexico Water Resources Research Institute.

From the Editor

What can you make with a 3D printer? Almost anything, as I discovered. After reading the article on 3D printed vegetarian "meat," googling revealed a plethora of projects. As well as figurines, vases, tree ornaments, and the like, that includes guitars, kazoos, camera lenses, precision tweezers, scissors, pliers, bicycle frames, records (as in LPs)...and **laboratory equipment**.

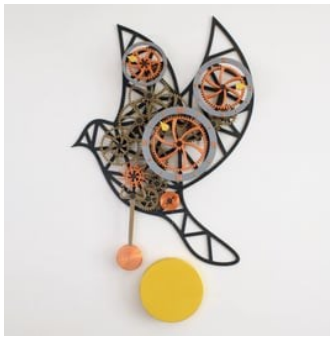
https://all3dp.com/2/3d-printed-lab-equipment-great-curated-models-to-3d-print/

https://open-labware.net/

https://www.thingiverse.com/thing:1483

This last is a centrifuge head designed to fit on a rotary tool; used with a drill at 3000 RPM, the Dremelfuge will deliver over 400g,

Here are a few photos of printed objects and some general info links. The bird clock requires assembly, and the birdhouse is for a high wren district.



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Best regards,
Connie