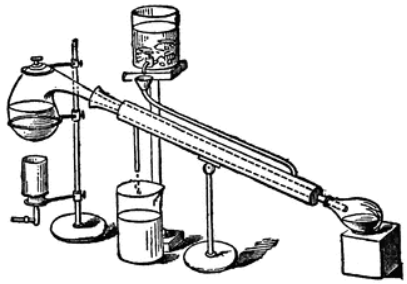
# SOUTHWEST RETORT



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***and Chemistry in this area***

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**Editorial and Business Offices:** ***Contact the Editor for subscription and advertisement information.***
**Editor: Connie Hendrickson: retort@acsdfw.org**

**Copy and Layout Editor: Lance Hughes: hugla64@gmail.com**

**Business Manager: Martha Gilchrist: Martha.Gilchrist@tccd.edu**

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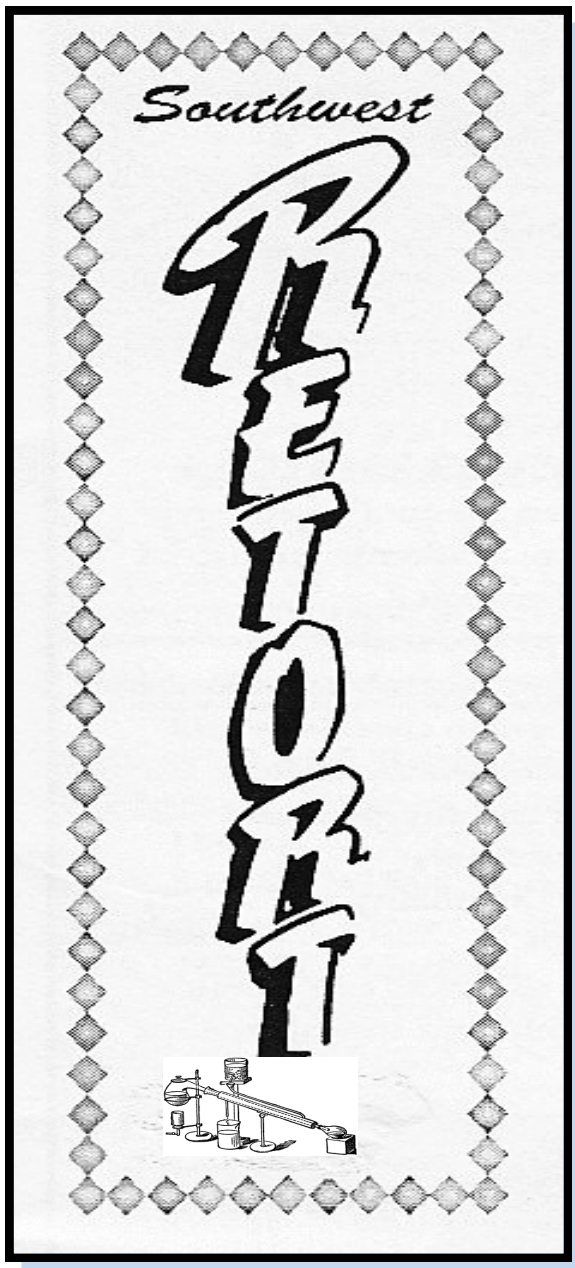


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*Contact the DFW Section*

**General: info@acsdfw.org**

**Education: ncw@acsdfw.org**

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# SERVICES and ANNOUNCEMENTS

# FIFTY YEARS AGO IN *THE SOUTHWEST RETORT*

**Compiled by E. Thomas Strom**

Major talks were given at the December 2009 Southwest Regional ACS meeting by Nobel Laureate **Melvin Calvin** of the University of California at Berkeley and by 1969 Southwest Regional Award winner

**Nugent F. Chamberlain** of Esso Corp. Calvin talked about "Molecular Paleontology," while Chamberlain's topic was "Hydrogen Nuclear Magnetic Resonances in Phosphorus Compounds."

At Mobil Field Research Laboratory in Dallas **Dr. Arthur C. Hall** wrote the introduction and edited the proceedings for a symposium on "Recent Advances on Ellipsometry." The material was Volume 16 of *Surface Science*. **Dr. James C. Melrose** presented a paper at the 19th Canadian Chemical Engineering Conference in Edmonton, Alberta, Canada. At North Texas State **Dr. Leroy J. Theriot** has been promoted to Associate Professor. **Dr. W. T. Brady** presented a seminar at TCU. At SMU **Drs. Perry Reeves, John Banewicz, Bright Lowry, John Maguire,** and **Ralph Shriner** attended the Welch Conference in Houston. At UT-Dallas **Dr. David Creed** attended the ACS National Meeting in New York. **Dr. Harold Werbin** gave a paper at the 12th West Central States Biochemistry Conference in Stillwater, OK.

At the University of Arkansas both a PRF and an NSF grant were received by **Samuel Siegel**, while **R. P. Quirk** received a PRF grant. **Dr. John D. Roberts** of Cal Tech was the featured speaker at the Annual Open House---Chemical Education Conference.

The ACS radio program "Men and Molecules" is now heard at the University of Texas at Austin radio station KUT-FM. This as made possible by a gift of tapes by the Central Texas ACS Section. **Welch Professor Michael J. S. Dewar** was the Barton Lecturer at the University of Oklahoma in October.

## *Announcing*

## 2020 DFW Section Officers

**Chair - Mihaela C. Stefan**
**Chair-elect - Trey Putnam**
**Secretary - Heidi Conrad**
**Councilor - Linda D. Schultz**
**Alternate councilor - Daniela Hutanu**

# *From the ACS Press Room*

# *Estimating the Environmental Impact of Bitcoin Mining*

***"Life Cycle Assessment of Bitcoin Mining"***

***Environmental Science & Technology***

As an alternative to government-issued money, the cryptocurrency Bitcoin offers relative anonymity, no sales tax and freedom from bank and government interference. But some people argue that these benefits have an enormous environmental impact, particularly with regard to Bitcoin mining — the process used to secure the cryptocurrency. Now, researchers reporting in ACS' *Environmental Science & Technology* have estimated that past and future environmental impacts of Bitcoin mining could be lower than previously thought.

In contrast to traditional banks, which keep records of balances and transactions at a centralized location, in Bitcoin all transactions are stored digitally as "blocks" in a chain that is kept by a network of peers. Using special computers, Bitcoin miners in this network compete to solve a mathematical puzzle. The winner, who earns the right to add the next block of data to the chain, is rewarded with new Bitcoin currency. This mining requires substantial electricity to power the special computers, but current estimates of the impact associated with this energy use suffer from a lack of accurate data. Susanne Köhler and Massimo Pizzol wanted to conduct a life cycle assessment to better understand the total environmental impact of Bitcoin mining.

The researchers estimated the electricity consumption and carbon dioxide emissions in 2018 for each stage of Bitcoin mining, from the extraction of raw materials to make the equipment to its production, use and recycling. They calculated that the Bitcoin network consumed 31.3 Terawatt-hours of electricity and generated 17.3 megatons of carbon dioxide equivalents in 2018, which were lower than previous estimates. About 99% of the environmental impact came from the use of the mining equipment, with minimal contributions from production and recycling. The location of the miners had the largest impact on the environment, with areas that use mostly fossil fuels for electricity, such as Inner Mongolia, China, contributing more to the carbon footprint than regions using renewable resources, such as Sichuan, China. The analysis also predicted that the environmental impact per miner will shrink if mining equipment becomes more efficient, use of renewable energy sources increases, or miners relocate to cooler climates, where less energy is needed to cool the computers. However, the overall number of miners is likely to continue increasing, at least in the short term, the researchers say.

The authors acknowledge funding from the Independent Research Fund Denmark.

ACS Local Section
Dallas-Fort Worth

Dear ACS-DFW Local Section-

As of 1/1/2020, I'll be the Past Chair of the Section. Congratulations to the new and incumbent Executive Committee members, and many thanks for their willingness to volunteer on behalf of chemists and chemistry.

I greatly appreciate all those who participated in 2019 activities, especially those volunteers whose service on the Local Section Executive Committee also ends on 12/31/19, and everyone who assisted with meetings and activities. Special thanks to Dr. Daniela Hutanu for the dedicated and effective work on re-establishing our website at acsdfw.org, Ms. Mandy Dark for the extensive efforts required to put the ACSDFW Annual elections together, and to Dr. Connie Hendrickson, dedicated Executive Editor of the Southwest e-Retort. (Remember to submit information, announcements, job openings, notices, and articles to retort@acsdfw.org!)

Enjoy the great programming that 2020 will bring, and best wishes for a great year.

Happy Holidays to All Who Celebrate!

—Denise

# *From the ACS Press Room*

# *Brewing Beer That Tastes Fresh Longer*

### *"Higher NADH Availability of Lager Yeast Increases the Flavor Stability of Beer"*

***Journal of Agricultural and Food Chemistry***

Unlike wine, which generally improves with time, beer does not age well. Usually within a year of bottling, the beverage starts to develop an unpleasant papery or cardboard-like flavor that drinkers describe as "stale." Now, researchers reporting in ACS' *Journal of Agricultural and Food Chemistry* have engineered lager yeast to make more molecules that protect beer against staling, resulting in improved flavor stability.

Scientists have linked stale beer flavors to aldehyde compounds, such as (E)-2-nonenal and acetaldehyde. Many of these compounds are produced by yeast during fermentation, and chemical reactions during beer storage can increase their levels. Brewers have tried different approaches to reduce levels of these compounds, such as controlling the fermentation conditions or adding antioxidants, but staling remains a problem for the beer industry. That's why Qi Li and colleagues wanted to genetically modify lager yeast to produce more of a molecule called NADH. Extra NADH could boost the activities of natural yeast enzymes that change aldehydes into other types of compounds that don't contribute to a stale flavor, the researchers reasoned.

The researchers used a genetic technique called "overexpression," in which they artificially increased the levels of various genes related to NADH production. With this method, they identified four genes that, when overexpressed, increased NADH levels. The team found that beer from the overexpressing yeast contained 26.3–47.3% less acetaldehyde than control beer, as well as decreased levels of other aldehydes. In addition, the modified strains produced more sulfur dioxide, a natural antioxidant that also helps reduce staling. Other flavor components were marginally changed. This approach could be useful for improving the flavor stability and prolonging the shelf life of beer, the researchers say.

The authors acknowledge funding from the National Natural Science Foundation of China, Priority Academic Program Development of Jiangsu Higher Education Institutions, Program of Introducing Talents of Discipline to Universities, Postgraduate Research & Practice Innovation Program of Jiangsu Province, the Fundamental Research Funds for the Central Universities and China Scholarship Council.

## *From the ACS Press Room*

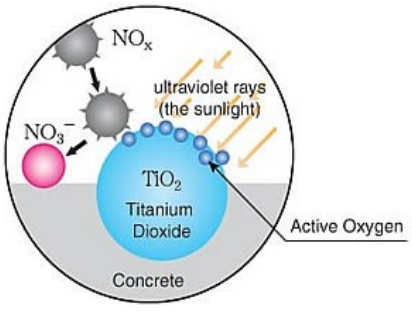
# *'Self-cleaning' Concrete Could Keep Buildings Looking New (video)*

***"Simple Fabrication of Concrete with Remarkable Self-Cleaning Ability, Robust Superhydrophobicity, Tailored Porosity, and Highly Thermal and Sound Insulation"***

***ACS Applied Materials & Interfaces***

Building materials that clean themselves could save immense time and labor in homes and businesses, as well as reduce disease risk in settings such as hospitals. Now, researchers reporting in ACS *Applied Materials & Interfaces* have made a new type of concrete that is strong, heat-insulating and soundproof — and best of all, liquids like milk and coffee bounce right off of it, taking dust particles with them. Watch a video of the self-cleaning concrete here.

https://youtu.be/PklV3Gt-7WU




Nature boasts many examples of self-cleaning surfaces, from lotus leaves to geckos' feet. Water droplets striking these superhydrophobic — or extreme water-hating — surfaces ball up into droplets if the surface is level, or completely roll off if it's tilted, at the same time removing dust particles and contaminants. Scientists have tried to introduce these self-cleaning properties to concrete by adding hydrophobic materials. However, surface coatings can scratch or wear off over time, and hydrophobic materials added to the bulk concrete before drying often weaken it. Xin Xu and colleagues wanted to develop a simple method to make porous concrete with robust mechanical and self-cleaning properties

The researchers added an oil, an emulsifier and a hydrophobic silicon polymer called polydimethylsiloxane (PDMS) to wet concrete. With the help of the emulsifier, the oil formed many tiny droplets that contained PDMS. The team then dried and heated the concrete, evaporating the oil so that PDMS-coated pores were left behind. The resulting porous concrete was lightweight, yet mechanically strong. It repelled dust particles and liquids, including milk, beer, soy sauce, coffee and dyed water, and could be immersed in the liquids and removed without leaving any stains behind. Even with mechanical grinding, heat treatment and chemical exposure, the material remained superhydrophobic. The porous concrete also absorbed sounds and insulated against heat loss, two other attractive properties for building materials.

The authors acknowledge funding from the National Science Foundation of China, the China National Petroleum Corporation–Chinese Academy of Sciences Strategic Cooperation Research Program and the Open Foundation of the State Key Laboratory of Advanced Refractory Materials.

# *Celebrating National Chemistry Week*
# *Chemistry Connection 2019*


*Courtesy of Fort Worth Museum of Science and History*


*Courtesy of Fort Worth Museum of Science and History*

## *From the ACS Press Room*

# *Newly Identified Compounds Could Help Give Fire Ants Their Sting*

***"Pyridine Alkaloids in the Venom of Imported Fire Ants"***

***Journal of Agricultural and Food Chemistry***

Native to South America, imported fire ants have now spread to parts of North America and elsewhere around the world. These invasive pests have painful stings that, in some cases, can cause serious medical problems, such as hypersensitivity reactions, infections and even kidney failure. Now, researchers reporting in ACS' *Journal of Agricultural and Food Chemistry* have identified pyridine alkaloids that, along with other venom components, could contribute to these conditions.

Imported fire ants, including red (Solenopsis invicta Buren), black (Solenopsis richteri Forel) and hybrid (S. invicta × S. richteri) species, are threats to public health, agriculture and ecosystems. Previous research has investigated the chemistry of fire ant venom, identifying various alkaloid compounds that contribute to the pain and other effects of bites. Jian Chen, Jin-Hao Zhao and colleagues wanted to dig deeper into fire ant venom to uncover compounds that might have been overlooked.

The researchers collected venom from red, black and hybrid imported fire ants by placing ants under a microscope and touching their abdomens repeatedly with a small piece of filter paper. In response, the ants protruded their stingers and released drops of venom, which the filter paper absorbed. The team then analyzed venom components on the paper. By coupling solid-phase microextraction with gas chromatography-mass spectrometry, they identified 10 pyridine alkaloids whose signals were previously hidden by other alkaloids. The various ant species had slightly different pyridine alkaloid profiles, as did worker and winged female ants within each species. These compounds could open new avenues of research on the toxicological properties of fire ant venom, the researchers say.

The authors do not acknowledge any external funding sources.

For more on ant venom, check out Periodic Graphics in the Sept. 30, 2019, issue of Chemical & Engineering News.

## *From the ACS Press Room*

# *Photoinitiators Detected in Human Breast Milk*

***"Photoinitiators in Breast Milk from United States Donors: Occurrence and Implications for Exposure in Infants"***

***Environmental Science & Technology Letters***

Photoinitators (PIs) are compounds used in the ink of many types of food packaging. The substances have been shown to migrate into food and, when consumed, show up in human blood serum. Now, for the first time, researchers report they have detected PIs in human breast milk, although they say the levels consumed by breastfeeding infants are unlikely to be a health concern. The report appears in ACS' *Environmental Science & Technology Letters.*

Photopolymerization is widely considered a "green" technology for the manufacture of light-sensitive materials, such as ultraviolet (UV)-curable inks, coatings and resins. In this process, UV light degrades PIs to free radicals and other active substances that harden, or cure, the ink. However, not all of the PIs are used up during the reaction, and scientists have detected the compounds in food, indoor dust and blood serum. At high enough levels, some PIs have toxic or carcinogenic effects. Runzeng Liu and Scott Mabury wondered whether PIs could pass into human breast milk and, if so, how much of the compounds breastfed infants were likely to ingest.

The researchers used mass spectrometry to analyze breast milk samples collected from 60 U.S. women. They detected 15 different PIs at a wide range of concentrations: from 0.46 ng/mL to 81.7 ng/mL. Benzophenone (BP) — a potential carcinogen — comprised 79% of the total PIs and was detected in 97% of the breast milk samples. The researchers

THIS IS A VERY DULL PHOTO BUT IT IS DESIGNED SO THAT YOU CANNOT READ ANY BRAND NAMES.

note that BP is a natural product also present in fruits such as grapes, which could have contributed to the levels in milk. Based on infants' average milk consumption at different ages, the team estimated that infants younger than one month have the highest daily intake of PIs. However, the maximum amount of BP ingested as calculated by the researchers would still be about 4 times lower than the safe level set by the European Food Safety Authority, suggesting no or minor health risks to breastfeeding infants. Future studies should explore potential risks caused by simultaneous exposure to several PIs, the researchers say.

The authors acknowledge funding from the Natural Sciences and Engineering Research Council of Canada.

# Around the Area

## University of Texas Dallas

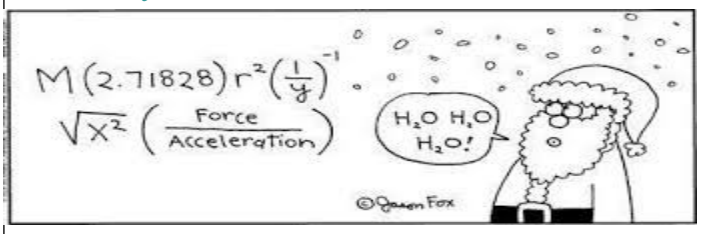
Assistant Professor, Eric Welin, was awarded a First-Time, Tenure-Track Faculty Member CPRIT grant. Professor Julia Chan and Robert A. Welch Professor Ray Baughman were named AAAS Fellows. UTD hosted an ASBMB Regional Meeting in which three travel awards to attend the national ASBMB meeting were awarded; the event was organized by undergraduate Anna Fiedler (Stefan Lab), graduate Kyle Murray (D'Arcy Lab), the UTD Biochemistry Association, and Assistant Professor Sheena D'Arcy.

The Cancer Prevention and Research Institute of Texas (CPRIT) awarded $2 million to The University of Texas at Dallas as part of the program to recruit top talent in cancer research to the state. The First-Time, Tenure-Track Faculty Member grant will support the research of Dr. Eric Welin, an assistant professor of chemistry who joined the faculty of the School of Natural Sciences and Mathematics (NSM) in the fall of 2019.

LINK THESE TO THE UTD NEWS:

https://www.utdallas.edu/news/faculty/cprit-grant-welin-2019/

https://www.utdallas.edu/news/faculty/chemistry-aaas-fellows-2019/




## University of Arkansas

### Faculty News

### On the Go

Joshua Sakon presented "Structure and function and preclinical applications of clostridial collagenases" at the Advances in Mineral Metabolism AIMM/ASBMR John Haddad Young Investigators' Meeting, April 8-12, 2019, Snowmass, Colorado.

Joshua Sakon presented a talk, "Structure, function and applications of collagenase from Hathewaya histolytica" at the Advanced Membranes and Membrane Based Separation Processes Symposium in Fayetteville, AR May 15-16. The work is co-authored by Osamu Matsushita, Perry Caviness, and Cody Brazel.

**Publications:**

Guanghui Zong, Zhijian Hu, Sarah O'Keefe, Dale Tranter, Micael J. Iannotti, Ludivine Baron, Belinda Hall, Katherine Corfield, Anja O. Paatero, Mark J. Henderson, Peristera Roboti, Jianhong Zhou, Xianwei Sun, Mugunthan Govindarajan, Jason M. Rohde, Nicholas Blanchard, Rachel Simmonds, James Inglese, Yuchun Du, Caroline Demangel, Stephen High, Ville O. Paavilainen, and Wei Shi. 2019, Ipomoeassin F Binds Sec61α to Inhibit Protein Translocation. *Journal of the American Chemical Society*, DOI: 10.1021/ jacs.8b13506.

# Around the Area

B. J. Cafferty, L. Yuan, M. Baghbanzadeh, D. Rappoport, M. H. Beyzavi, G. M. Whitesides, "Charge Transport through Self-Assembled Monolayers of Monoterpenoids" 2019, *Angewandte Chemie International Edition*, 2019, in press. DOI: 10.1002/anie.201902997.

B. Shafiee, J. Duffield, R. Timm, Liyanage, J.O. Lay Jr., A.R. Khosropour, H.A. Rudbari, M.H. Beyzavi, "Metal-free and Benign Approach for the Synthesis of Dihydro5'hspiro [benzo[ c] chromene-8,4 oxazole]-5,6(7h)-dione Scaffolds. *Green Chemistry* 2019, 21, 2656–2661.

Enayah Alhashim, Jackson Lay Jr., and Zoraida P. Aguilar. 2019, Facile Synthesis and Characterization of Biodegradable Calcium alginate nanoparticles. *Biomed J Sci & Tech Res*, 15(3) DOI: 10.26717/BJSTR.2019.15.002718.

**Honors and Awards:**

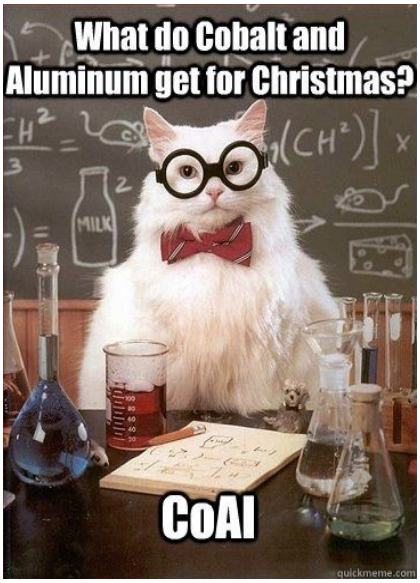
Robert Coridan won this year's Connor Faculty Fellowship. He received $5000 to support his research.

Feng Wang was awarded the 2019 Fulbright College Researcher award. He was recognized at the all college faculty meeting, and will receive a $500 annual salary increase.

Julie Stenken and Erica Westerman (BISC) got a STIR (Symposia to Trigger Interdisciplinary Research) award from the Office of the Vice Chancellor for Research and Innovation to sponsor a symposium. This will be the first STIR event sponsored by the VCRI. The title of their sub-mission was "Integrative Systems Neuroscience."

Each year the Office of Nationally Competitive Awards selects five or six faculty members who consistently (and often successfully) support students through the application process for state and national scholarships, for competitive research grants, or for other forms of recognition. Julie Stenken was presented with the office's Faculty Gold Medal. The Provost presented this medal on Monday, April 22, at 3:00 p.m. (in the Jim and Joyce Faulkner Performing Arts Center) at the annual state and national awards reception.

There was an Annual Invention Recognition ceremony April 23 for faculty filing a disclosure or getting a patent in the last year. Ingrid Fritsch and Matt Gerner were recognized for their patents in 2018. Those filing a disclosure were M. Hassan Beyzavi, Jingyi Chen, Stefan Kilyanek, Susanne Striegler, Suresh Kumar Thallapuranam, and Ryan Tian. Ross DeVol, President & CEO, Heartland Forward Fellow, was the keynote speaker. Awards were presented by Chancellor Joseph Steinmetz.



# *From the editor*

Earlier this fall, I was walking around a state park in Bosque County, not too far from Waco and into the hill country. It is dry and rocky, mostly limestone with some metamorphosized rock on the top of a flat hill, or llano. It had rained hard the day before although most of it drained off the side of the hill. I looked down and between the rocks I saw blobs of greenish grey material; picking some up, I saw that it was rubbery, not slimy, and pretty tough...it didn't tear easily. Having no idea what the heck it was, I bustled up to the cabin and used my phone to take a walk around the google.

Turns out it is a type of cyanobacteria called *Nostoc commune*, and the green blobs are colonies of single-celled cyanobacteria. Sometimes they are called blue-green algae...right color and photosynthetic (common name: witches' jelly). However, cyanobacteria are prokaryotes—their DNA not held within a membrane-bound nucleus; true algae are eukaryotes with a membrane-bound nucleus. (In fact, it is thought that the chloroplasts in green plants that carry out photosynthesis were derived during early evolution by the inclusion of cyanobacteria into their cells.) It occurs worldwide—from the tropics to the Arctic and Antarctic. As long as there is sufficient moisture you'll find Nostoc as the rubbery, green structures on the ground; but as soon as the weather gets dry, it will be there as rather unspectacular dried black mats or bunches of sticks. In China, one species of *Nostoc* is called fat choy and added to broth or soup.


It's always fun to learn something new and cool!

Best regards,
Connie