

THE VORTEX

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May the Songs of the Season Sing to You

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*ACS California Section
January Section Meeting
Thursday, January 25, 2018*

Speaker: Dr. Pawel Misztal, UC Berkeley,

Title: Emission of microbial volatile organic compounds by bacteria and fungi, USDA

Location: *USDA 800 Buchanan Street, Albany.*

Time: *Social-6 pm – 6:50 pm; Talk 7: 00 pm to 8:15 pm*

Cost: *\$10.00 Members, Students – \$5.00: Includes Appetizers and Non-alcoholic beverages during Social Hour. No fee for talk only.*

Reservations: *Please contact the CalACS office by email office@calacs.org or 510-351-9922 by Monday, January 22, 2018.. You may prepay by mailing your check to Cal. Section ACS at 2950 Merced St. #225, San Leandro CA 94577 or with PayPal using our email address office@calacs.org. You may also pay at the door with cash or check (credit/debit not accepted at the door).*

Abstract:

Knowledge of the factors controlling the diverse chemical emissions of common environmental bacteria and fungi is crucial because they are important signal molecules for these microbes that also could influence humans. Not only a high diversity of mVOCs but their abundance can differ greatly in different environmental contexts. Microbial volatiles exhibit dynamic changes across microbial growth phases, resulting in variance of composition and emission rate of species-specific and generic mVOCs. In vitro experiments documented time-resolved emissions of a wide range of mVOCs from diverse microbial species grown alone or co-cultured with other species. Emissions of mVOCs varied not only between microbial species at a given condition but also as a function of life stage and substrate type. Interacting microbes alter their metabolisms resulting in different compositions than when each of those microbes is grown alone. Simultaneous VOC measurements of different microbial taxa indicate that a variety of factors beyond temperature and water activity, such as substrate type, microbial symbiosis, growth phase, and lifecycle affect the magnitude and composition of mVOC emission.

Biography:

Pawel K. Misztal, Ph.D., is currently an associate specialist in the Department of Environmental Science, Policy, and Management, at the University of California, Berkeley. His research focuses on time-resolved measurements of Volatile Organic Compounds (VOCs) in the aspects of air quality and chemical ecology.

Dr. Misztal has published more than 30 peer reviewed papers including research on ground based direct fluxes from tropical oil palm plantations and rainforest ecosystems in Borneo and developed methodologies for enhanced detection of structural isomers for proton transfer reaction mass spectrometry. Dr. Misztal was responsible for planning, executing and processing the CABERNET airborne VOC flux campaign. He has demonstrated how isoprene emissions are distributed in California and led improvements to biogenic emission models to accurately simulate these emissions in California. Dr. Misztal has been active in the global chemistry community to discover new compound families from stressed plants and understand the underlying processes as well as the atmospheric fates of biogenic VOCs.

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THE VORTEX

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Chair's Report



Since December is the time to make up "wish lists" I thought I would share mine with you, but it is not the family portion of the list; it's just the ACS-related one.

First, I wish for each of you to add one ACS activity to your 2018 plans.

This is really a wish for you, not me, in that any activity you choose will add to your life.

It might add acquaintances, knowledge, enthusiasm, or any number of gifts.

Second, I hope you'll review this Vortex and maybe some past ones to appreciate the large number of volunteers who help make the Section work and contribute to so many.

Third, I hope you will identify a child (or even a classroom full of children) to invest in during 2018. From this, the appreciation of chemistry in the children's lives will improve and likely your own will as well; a good investment with plenty of dividends. And lastly, I wish for you a great Holiday Season and a happy New Year.

Jim



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There is no Section meeting in December; the next meeting as noted on page 2 is January 25

On behalf of the Executive Committee and the staff of the Vortex, I wish all a Happy Holiday Season and a rewarding New Year.

Lou Rigali, Editor

WCC October 14 2017 Meeting Report

From Indonesian Student to Industrial Scientist to UOP Pharmacy School Professor, held October 14, 2017

Sunny Xu

This WCC meeting featured a talk given by Dr. Miki Susanto Park, who is currently a professor in the pharmaceutical and medicinal chemistry department at the University of the Pacific (UOP). In her talk, Dr. Park shared with the audience her path of life and education, beginning as an Indonesian student who has worked as an industrial scientist, and now, a professor in Stockton, CA. She emphasized that her family had always valued education as a priority, especially the education of girls. With excellent grades, Dr. Park got into one of the best high schools in Indonesia, studying physical science. After graduation, she decided to go abroad and began studying physical chemistry at Brooklyn College in New York from 1993 to 1995. There, Dr. Park was involved in a summer research program focusing on physical chemistry with Professor Paul Haberfield. After learning more about physical chemistry, Dr. Park started to realize her interests were not in physical science, but rather, in biological science. Therefore, she made the decision to transfer to a larger school, the University of Texas at Austin, and received a B.S. in biochemistry in 1997. While making the decision about her future path, Dr. Park asked for advice from many people and concluded that one of the in-demand fields at that time was pharmaceutical chemistry. However, Dr. Park also found out that the University of California San Francisco, home of one of the best pharmaceutical chemistry programs, and Dr. Park's dream school, rarely accepted international students. After talking to more people and thinking by herself, she eventually decided to give it a try and apply for admission. With her courage, Dr. Park received her Ph.D. in pharmaceutical chemistry in 2002 from

UCSF. After graduation, she worked as a chemist at Genentech, a biotech company in South San Francisco. In 2004, Dr. Park decided to become a faculty member in the pharmaceutical and medicinal chemistry department at UOP. After years of teaching and research, Dr. Park attained the rank of Professor in 2016, all while parenting two young boys under the age of 10.

During the talk, Dr. Park not only shared her fascinating journey of traveling to another country, crossing cultural and language barriers and becoming a professor at one of the top ranked institutes in the United States of America, but also offered much useful advice to the audience, especially to students who are making decisions about their future education and career paths:

1. Get to know your professors and get advice from them;
2. Be involved in volunteering activities and part-time jobs to explore the possibilities of your future path;
3. Aim high and do not be afraid of setting a goal that is hard to reach;
4. Do not be afraid to try;
5. Listen to good advice.

Dr. Park mentioned that without any one of the recommended actions listed above, she would not have been accepted by her dream school and become a professor as she is today. At the end of her talk, Dr. Park offered one of the most important recommendations she had about her journey: "Find your passion, and enjoy your ride".

In the question and answer period, Dr. Park mentioned that she came to the U.S. with little English-speaking skills, so she used television to improve her communication skills. This typifies how she went about solving her difficulties. She found very feasible solutions.

Following the talk, the audience enjoyed the hospitality of the Cal State University East Bay (CSUEB) chemistry department at a reception organized by our faculty host, Dr. Monika Sommerhalter. There, the students had the opportunity to converse further with the speaker and each other. The WCC welcomes everyone to our meetings.



Graduate students protest U.S. tax plan. Proposal to make tuition taxable could make students pay thousands more each year

By Andrea Widener



Graduate students protest proposed taxes on tuition at the University of Minnesota, Twin Cities.

Photo Credit: Natalie Hudson-Smith

Thousands of U.S. graduate students walked away from their labs, teaching assignments, and classes on Nov. 29 to protest provisions in a Republican tax reform package that could force them to pay thousands of dollars in extra taxes. University of Minnesota, Twin Cities, chemistry grad student Becky Rodriguez joined hundreds of other protesters braving $-5.5\text{ }^{\circ}\text{C}$ temperatures to show her outrage at the proposal.

"I know that if this were to pass, I would have to drop out of graduate school because

I wouldn't be able to afford it," Rodriguez says.

Currently, stipends that cover tuition are tax-free for graduate students. But that would change under the tax reform bill that the U.S. House of Representatives passed in November. It could mean thousands of dollars in extra taxes for graduate students, most of whom make less than \$30,000 a year.

The Senate version of the measure currently keeps tuition waivers for graduate students tax-free, but the bill is still under negotiation.

"That is part of the reason that we wanted to escalate to a larger action across the country," says Jack Nicoludis, a chemistry graduate student who helped plan the action at Harvard University.

Nicoludis connected with other protesters nationwide through his graduate student union. He's also been participating in phone banks to call legislators.

"We want to make sure that both the Senate and the House know that this would affect us horribly, not only individual grad students but the competitiveness of higher education in the U.S.," he says.

Rodriguez is especially concerned that the additional taxes would disproportionately affect minorities and first-generation students like her, whose parents can't help shoulder the extra financial burden.

"Going to grad school shouldn't be a matter of wealth. It should be the ability to pursue science, the ability to pursue things you are passionate about," she says. "I hope that people see this as a wake-up call.

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Studying Stevia Part 3

Bill Motzer

In Part 1 (Sept. 2017 Vortex, I discussed Stevia's discovery and characteristics as a sugar substitute with essentially zero calories. This is because when steviol glycosides are ingested, they cannot be further digested in the stomach and intestines and they are transferred virtually unchanged into the bloodstream and then metabolized by the liver to steviol glucuronide, to be subsequently excreted in the urine. Therefore, there is no increase in potential bloodstream sucrose. Two 2010 review studies by The World Health Organization (WHO) determined no health concerns with stevia or its sweetening extracts. Based on long-term studies, WHO's Joint Experts Committee on Food Additives approved an acceptable daily intake of steviol glycoside of up to 4.0 mg/kg/day of body weight for steviol glycosides, which was also endorsed by the European Food Safety Authority. A 2011 review study found that stevia sweeteners as a sugar replacement could benefit diabetics, children, and those on calorie restricted diets.

Toxicity Studies. One early study indicated that in laboratory test tube testing steviol and rebaudioside A were potentially mutagenic. However, these effects were not demonstrated for the doses and routes of human exposure. Another study by the Memorial Sloan Kettering Cancer Center suggested that: "steviol at high dosages may have weak mutagenic activity;" however, a Center for

Science in the Public Interest review study noted no published carcinogenicity results for rebaudioside A (or stevioside). Other studies found that a small percentage of the population may have allergic effects to steviol glycosides, particularly if they have a sensitivity to plants in the Asteraceae or chrysanthemum- sunflower family that includes ragweed. Upon ingestion, the effects include possible mild nausea, bloating, stomach upset, diarrhea, headaches, and muscle pain.

Extraction Methods. The steviol glycosides occurring in bertonia leaves, for example, require enhanced extraction techniques. This is because the stevia cell walls are "tough," generally resisting conventional boiling and/or centrifuging methods. Therefore, to extract the active sweet compound stevioside and concentrate it up to 300 times its normal leaf concentration, stevia manufacturers resort to other methods, many of which are patented and therefore may be proprietary. However, sufficient information is available indicating that food grade alcohols (generally ethanol) are used as extraction solvents. But some manufacturers are reported using methanol, which is difficult to remove with trace amounts possibly remaining in the extract. Other extraction techniques include stevia hydrated in a water-alcohol mixture, with addition of calcium, iron, or aluminum. These are subsequently removed, by passing the solution through passed through an exchange resin using other solvents such as acetone or n-butanol. The major drawbacks here are when water is removed trace amounts of these solvents may remain.

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A Story with a Happy Ending

Scientists to Senate: Reject Sam Clovis for USDA Science Post **KAREN PERRY STILLERMAN, SENIOR ANALYST, FOOD AND ENVIRONMENT** | OCTOBER 31, 2017, 9:00 AM EST

UPDATE, Nov. 2, 2017: Sam Clovis has withdrawn his name from consideration for the USDA chief scientist position.

UPDATE, Nov. 1, 2017: Shortly after I published this post, the Sam Clovis nomination story took an interesting turn. We now know that Clovis is implicated in the Trump campaign's Russia dealings and has testified before special counsel Robert Mueller's grand jury. His confirmation hearing for the position of USDA chief scientist, previously expected Nov. 9, now seems likely to be delayed or cancelled. Read more in the Washington Post.

For months, controversy has swirled around the Trump administration's...shall we say... deeply flawed nominee for USDA chief scientist. A former business professor, talk radio host, and Trump campaign advisor, Sam Clovis has embraced unfounded conspiracy theories and espoused racist and homophobic views. And did I mention he has no scientific training whatsoever?

It's true. And while Secretary of Agriculture Sonny Perdue is standing by the nomination, thousands of the nation's scientists are having none of it.

Experts say no way to unqualified "chief scientist"

In a highly unusual move, a group of more than 3,100 scientists and researchers—including leading experts in agriculture and food systems from all 50 states and the District of Columbia—today sent a letter to the Senate agriculture committee expressing opposition to the president's choice to lead science at the USDA. The letter describes the nomination of the severely under-qualified Sam Clovis to be under secretary for research, education, and economics and chief scientist as "an abandonment of our nation's commitment to scientifically-informed governance," and calls on the Senate committee to reject it.

One of the letter's lead signers is Dr. Mike Hamm, a Senior Fellow at the Center for

Regional Food Systems, and C.S. Mott Professor of Sustainable Agriculture at Michigan State University. Dr. Hamm has a PhD in human nutrition and decades of experience at the intersection of food and agriculture, and his research interests include community-based food systems, food security, sustainable agriculture and nutrition education. In addition to his academic posts, he served as a member of the governor-appointed Michigan Food Policy Council from 2005 to 2013 and was instrumental in developing the Michigan Good Food Charter.

I asked Dr. Hamm why this nomination has him so concerned, and what the practical impacts might be if Clovis were to take charge of scientific research at the USDA.

KPS: Scientists don't usually rally by the thousands to oppose nominees for relatively obscure government positions. Why is this nomination so alarming to you personally?

MH: I was really concerned when I heard about this nomination, as were a number of colleagues. We look to the USDA as an authoritative source of scientific, economic, and statistical information about the nation's food system, and it seemed extremely careless to put all that into the hands of an

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unqualified person. Also, we rely on the USDA



Dr. Mike Hamm is C.S. Mott Professor of Sustainable Agriculture at Michigan State Univ

to develop research funding programs that not only tackle issues of concern to agricultural production and the food system right now but also look for probable challenges down the road—finding solutions takes time and thoughtfulness, and it is clear to me that the nominee hasn't demonstrated the ability to do this in a scientific manner.

KPS: This under secretary position holds the purse strings for \$3 billion in annual research grants to universities and other institutions. How significant is that investment in the universe of agricultural and food systems research?

MH: It's impossible to overstate the importance of this. Whether it's developing strategies to improve current yields while reducing environmental impacts of agricultural production, or identifying resilience strategies for increas-

ingly prevalent issues, the person in this position has to be both reactive to current events and proactive about likely future scenarios. The under secretary controls the budget for this very broad range of research needs.

KPS: What worries you most about the prospect of the USDA going backward on science?

MH: The breadth of knowledge we now have on a wide range of strategies for agricultural production and the food system is remarkable. We know a great deal about strategies for producing a greater variety and quantity of crops under different conditions and with increasingly agro-ecosystem strategies. To lose this momentum would be a disservice to the agricultural community and to consumers and the general public. Whether it's water use in California, Texas, and other water challenged states, or late frosts for tart cherries in Michigan, we can 'see' an increasing range of challenges in the near future. Going backwards means not thinking about these. Going backwards means not looking for ever more ecologically sound solutions to emerging issues and recognizing that we can often improve the situation to a range of societal issues while improving agriculture. This is frightening.

Scientists speak...but is the Senate listening?

Ecologist Irit Altman speaks to a staff person for Senator Susan Collins (R-ME) in August about the need for a qualified chief scientist to oversee USDA research on climate change and agriculture.

Scientists and their allies around the country have been mobilizing for months to oppose Clovis's nomina-

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Pruitt's RFS Decision Defies Science

Statement by Jeremy Martin, Union of Concerned Scientists

Scott Pruitt, administrator of the Environmental Protection Agency (EPA), has finalized a change to biofuels policy, lowering the amount of cellulosic biofuel required under the Renewable Fuels Standard (RFS). While political pressure from agricultural interests partly checked Pruitt's effort to roll back the RFS standards, the cuts to cellulosic biofuels remain a major policy reversal with far reaching consequences. It's an arbitrary decision that conflicts with the purpose of the RFS, according to the Union of Concerned Scientists (UCS).

Below is a statement by Jeremy Martin, senior scientist in the Clean Vehicles Program of the Union of Concerned Scientists. "There is simply no good reason to lower the cellulosic ethanol standard". In making this change, Administrator Pruitt ignored the evidence and analysis presented by his own staff. The RFS is designed to spur innovation and investment in cleaner fuels, but Administrator Pruitt's change puts those investments at risk and concentrates power over our fuel system in his allies in the oil industry. This decision is yet another example of Administrator Pruitt disregarding science and the public interest in favor of the interests of fossil fuel producers.

Advanced biofuels, like cellulosic ethanol, are a small part of the industry today, but they have the biggest potential for growth. Arbitrary policy shifts like this undermine investment in new fuels. The point of the RFS is to cut our oil use and reduce the pollution that causes climate change—this decision undermines that goal and focuses on the interest of the oil industry. It's disappointing to see Administrator Pruitt throwing an emerging and important industry into disarray. Administrator Pruitt's job is to listen to the science and enforce the law—not to make policy based on his political preferences."



(Motzer Continued from page 6)

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What can consumers do? One can read the package label and then research the ingredients on-line; however, manufacturers are not required to fully disclose all ingredients, particularly if the serving size is one gram or less. Generally, any ingredient under 0.5 grams per serving doesn't require full ingredient disclosure. Therefore, some web sites recommend growing your own stevia, as a potted plant or purchasing (generally from a health food store) raw stevia where the pure dried stevia leaf has been ground to a fine powder. In this form, it is about 30 to 40 times sweeter than table sugar but retains a peculiar aftertaste. As with many manufactured/processed products it's still the buyer beware.



(Misztal continued from page 2)

He has recently devoted much of his work in collaboration with UC Berkeley microbiologists to understand what controls microbial VOC (mVOC) emission rates from different environmental bacteria and fungi.

Dr. Misztal received his BSc and MSc degrees in Chemistry and Physics from Maria Curie-Sklodowska University in Poland, and PhD in Environmental Chemistry from the University of Edinburgh in the United Kingdom.



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tion. They've published letters to the editor in newspapers across the country, including Chicago, Illinois; Bloomington, Indiana (paywall); Wichita, Kansas; Missoula and

to Senator Collins.

Today's letter comes as the Senate agriculture committee is expected to announce that it will hold a long-awaited hearing on November 9 to hear directly from the nominee, and to dig into Clovis's credentials



Ecologist Irit Altman speaks to a staff person for Senator Susan Collins (R-ME) in August about the need for a qualified chief scientist to oversee USDA research on climate change and agriculture.

Great Falls, Montana; Scottsbluff, Nebraska; Nashville, Tennessee; and Spokane, Washington. They've also met with Senate staff and delivered petitions from UCS supporters directly to key Senate offices in Maine, Colorado, and Ohio (see photos from the Maine petition delivery above).

Dr. Altman was joined by local Maine farmers Lindsey and Jake Roche in delivering a petition opposing the Clovis nomination

and suitability for the chief scientist position. While many Senators, including key Senate leaders, have expressed opposition to the Clovis nomination, others are still uncommitted or even supportive.

Those Senators had better think hard about it, because the scientific community is watching. As 3,100+ experts have now told them, "We expect that when your committee evaluates Clovis' record and qualifications, you will similarly conclude that he is unfit for this position."



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