

Silicon Valley Chemist

Silicon Valley Section

American Chemical Society

Volume 39 No. 12

DECEMBER 2017 NEWSLETTER TOPICS

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Connect with Chemists

An early morning chat with fellow chemists
Thursday, December 14, 2017, at 7 a.m.
 Coupa Café, 538 Ramona Street, Palo Alto.
 Contact Ean Warren (ewarren@scvacs.org)
 for more information or ask for Ean at Coupa.

Golden Gate Polymer Forum Dinner Lecture on Wednesday, December 20th From Fundamental Polymer Synthesis to Applications Polythioaminals from the Stabilization of Reactive Intermediates for Tailorable Surfaces

Dr. Rudy J. Wojtecki

Abstract:

1,3,5-hexahydro-1,3,5-triazines (HTs) and their thermosetting polymer analogues, PHTs, have attracted recent attention in the materials space as they exhibit a number of attractive properties such as healability, facile preparation of anti-microbial surfaces, and even as detectors for heavy metals.¹ HTs also demonstrate unique reactivity towards sulfur containing compounds. Hydrogen sulfide will, for instance, readily react with HTs at room temperature to form dithioazine, where the six-member HT ring undergoes replacement of two nitrogen atoms with sulfur. Organic thiols will also react with HTs to produce thioaminals, a transformation that was recently exploited to generate a new class of linear step-growth polymers, polythioaminals.² The synthesis of polythioaminals are tolerant to a variety of substituents, functional groups, and monomers, and the subsequent polymers enable access to interesting post-polymerization chemistries such as the facile introduction

of end-groups to produce functional oligomers. Subsequent studies of the formation of HTs have shown the use of electron withdrawing substituents on aromatic diamines extend the stability of reaction intermediates. In the presence of these intermediates dithiols could be readily reacted to form polythioaminals without the use HTs. The resulting reac-

continued on next page

Golden Gate Polymer Forum Dinner Lecture

Date: Wednesday, December 20, 2017

6:00 p.m. Social Hour

7:00 p.m. Dinner

8:00 p.m. Presentation

Speaker: Dr. Rudy J. Wojtecki
 IBM Almaden Research Center
 San Jose, CA

Location: Michael's at Shoreline Park
 Mountain View, CA

<http://michaelsatshoreline.com/>

Cost:

Before and on December 15:

\$30 for employed, \$15 for others

December 16 to 19:

\$35 for employed, \$20 for others

Walk in (availability NOT guaranteed):

\$40 for employed, \$25 for others

(No credit card payment at the event)

Menu: Broiled salmon, lemon beurre blanc
 Breast of chicken, Florentine
 or Mushroom crepes

Registration: www.GGPF.org
 or Nayan Ashar 408-316-1619
nayandevyani@gmail.com

Penalty-free cancellations are allowed up until the deadline for reservations (Tuesday, December 19, 5 p.m.).

Chair's Message

Todd Eberspacher



Following tradition, I will try to summarize some of the highlights of the year. First, I would like to welcome the new officers to the section. Here are the results:

Grace Baysinger (Chair-Elect 2018), Jigisha Shah (Secretary 2018), Ihab Darwish (Treasurer 2018), Ean Warren and Natalie McClure (Councilors 2018-2020), Madalyn Radlauer and Jane Frommer (Alternate Councilors 2018-2020), and Howard Peters (Alternate

Councilor 2018). I think the section is in good hands.

Looking back at the year, a few events stand out for me as significant accomplishments. We co-hosted a national meeting in San Francisco; as an incoming chair I had heard all sorts of stories about doing this. Let me extend my thanks to Jigisha for her role in organizing our section's efforts. We changed our section's name from Santa Clara Valley ACS to Silicon Valley ACS, and discovered a significant bit of our own history in the process. Steven Liu represented our section at the

continued on next page

GGPF Dinner Lecture, continued from front page
tion leads to linear polymers that possess monothioaminal linkages, moieties found to be latent crosslinks activated at higher temperatures and leading to the formation of chemically stable network polymers. This reactivity enabled access to a broader substrate diversity of polymers and polymer networks. Furthermore, using the chemically responsive behavior established in linear polythioaminals produced from HTs, end-group functionality could be introduced to these networks to produce tailorable surfaces and the introduction of desired functional groups. These networks possess an attractive characteristic of easy-to-process fluorinated polymers with applications that include hydrophobic coatings and adhesives and lithography.

Notes:

1. R. J. Wojtecki, A. Y. Yuen, T. G. Zimmerman, G. O. Jones, H. W. Horn, D. J. Boday, J. L. Hedrick, J. M. Garcia, *The Analyst* 2015, 140, 5184–5189.
2. R. J. Wojtecki, G. O. Jones, A. Y. Yuen, W. Chin, D. J. Boday, A. Nelson, J. M. Garcia, Y. Y. Yang, J. L. Hedrick, *J. Am. Chem. Soc.* 2015, 137, 14248–14251.

Biography:

Dr. Wojtecki graduated from Case Western Reserve University with a Ph.D. in Macromolecular Science and Engineering under the guidance of Stuart J. Rowan, now at the University of Chicago. His research focused on the synthesis of mechanically interlocked polymers composed of catenanes, chemical units that were the subject of the 2016 Nobel prize in chemistry on molecular machines (catenanes and rotaxanes). This work was recently accepted into the journal *Science* in a report titled “Poly[n]catenanes: The Synthesis of Molecular Chains.” Rudy joined IBM Almaden Research Center after completion of his graduate work. He is an author/co-author of 19 peer reviewed scientific publications including a Nature Materials Review article. In 2017, he was recognized as an IBM Master Inventor for work highlighted in 35 issued patents. Rudy’s current research efforts are geared to address ongoing challenges for lithography and patterning materials used in the manufacturing of semiconductors that include selective deposition schemes using atomic layer deposition and extreme ultraviolet lithography.

Chair’s Message, continued from front page

Chemistry Olympiad, and won a gold medal at the international competition. I look forward to Sally Peters’ report about the Olympiad at the annual picnic next summer. Sally

Events of Interest for the Materials-Chemistry Audience

Compiled by Clayton Henderson of the Golden Gate Polymer Forum

December 6-7, San Jose

BIOMEDevice meeting

<http://biomeddevicesj.mddionline.com/>

December 12, anywhere, 8 a.m. Pacific Time

Particle Measurement Systems webinar:

Reducing Sampling Variation in Offline Particle Counting

<https://register.gotowebinar.com/register/5025318281241719809?source=Email>

December 17-20, San Diego

ACS POLY Division Workshop: Polymers and Nanotechnology

<http://polyacs.net/Workshops/17Nanol/home.html>

January 10, details TBA

ASM dinner lecture from Applied Spectra, Inc

Laser-Ablation-based Chemical Analysis

For more information, contact asm.scv.secretary@gmail.com

January 27-February 1, San Francisco

Photonics West 2018

<https://spie.org/conferences-and-exhibitions/photonics-west?SSO=1>

February 6-7, San Diego

Two day short course

Inkjet Academy: Theory of Inkjet Technology

<http://www.imiconf.com/ija-feb2018.html>

February 7-9, San Diego

Inkjet Printing Conference 2018

<http://www.imiconf.com/ijc-feb2018.html>

February 25-March 1, San Jose

Annual SPIE Advanced Lithography meeting

<https://spie.org/conferences-and-exhibitions/advanced-lithography>

February 22, San Jose

NCCAUS 2018 Annual Equipment Exhibition

<https://www.avs.org/Chapters/NCCAUS/Symposia-Exhibitions>

February 23 – March 1, San Diego

Adhesion Society Annual Meeting + 6th World Congress on Adhesion and Related Phenomenon

<https://www.adhesionsociety.org/TAS/ASAnnualMeeting/Home/ASAnnualMeeting/Home.aspx>

Note: Two-day short course Feb 23-24

has headed up the local section Olympiad effort for many years and the 49th competition will be hard to top. (I know she is already working on it!) Bonnie Charpentier was elected as the President Elect of the national ACS. Bonnie is not the first member of our section to run, but I believe she is the first to be elected! Closer to my work home, the Annual Awards Picnic was held in the reborn Old Chemistry building on the Stanford Campus. Old Chem sat dormant for ~30 years and many of our local section members had classes there or worked in the building. Many will remember the original Chemistry Library well, before on-line journals. Our Chair-Elect has an office there now. Finally, there were many

successful events: dinner meetings, a new book club, the undergraduate research symposium at San Jose state, awards programs, teach the teachers, and the many outreach activities.

This is the last edition of the Chair’s Message for my term. I would like to thank the section members for allowing me to serve as Chair. I would like to thank Stanford University for granting me time to take care of section duties and give us a place to meet and for hosting the annual awards picnic. I would also like to thank everyone behind the scenes that make the section run, from Kevin and Partha for editing the newsletter to all the committee chairs/members and everyone who does outreach on behalf of the ACS. Thank you all.

This Month in Chemical History

December 2

First atomic pile produced self-sustained nuclear chain reaction under Stagg Field, University of Chicago (1942).

December 3

Born in 1933, Paul Crutzen, researcher in chemistry of the atmosphere; Nobel Prize in Chemistry (1995) with Mario Molina and F. Sherwood Rowland "for their work in atmospheric chemistry, particularly concerning the formation and decomposition of ozone."

December 4

Born in 1908, Alfred D. Hershey, researcher in microbial genetics; Nobel Prize in Physiology or Medicine (1969) with Max Delbrück and Salvador E. Luria "for their discoveries concerning the replication mechanism and the genetic structure of viruses."

December 5

Born in 1901, Werner Heisenberg, researcher in quantum mechanics; developed the Heisenberg Principle (1927); Nobel Prize in Physics (1932) "for the creation of quantum mechanics, the application of which has, inter alia, led to the discovery of the allotropic forms of hydrogen."

December 6

Born in 1778, Joseph L. Gay-Lussac discovered law of expansion of gases with heat (1802); law of combining volumes of gases (1809); isolated boron; and researcher on fermentation, prussic acid, and composition of water.

December 9

Born in 1868, Fritz Haber synthesized ammonia from hydrogen and nitrogen under high pressure (Haber process); Nobel Prize in Chemistry (1918) "for the synthesis of ammonia from its elements."



December 11

Vitamin B12 isolated by Merck, Sharp & Dohme Research Laboratories (1947).

December 17

Born in 1778, Humphry Davy discovered potassium (K, 19) and sodium (Na, 11) in 1807, barium (Ba, 56) and strontium (Sr, 38) in 1808; and invented Davy mine safety lamp.

December 23

First full-scale nuclear power plant in U.S. began operation at Shippingport, PA (1957).

2018 ACS President-Elect



Bonnie Charpentier, senior vice president for regulatory, quality, and safety at Cytokinetics, has been elected 2018 American Chemical Society President-Elect.

2017 National Chemistry Week Illustrated Poem Contest Winner Chemistry Rocks!

Allison Wong, 9th Grade, San Mateo High School



ACS Book Club

Interested in joining the ACS Book Club? Add yourself to the email list svacs-book-club+subscribe@googlegroups.com or contact Ean Warren (ewarren@scvac.org).

Flavors of Chemistry Event

UC Davis, September 30, 2017

The 3rd Annual “Flavors of Chemistry” was held Saturday, September 30, 2017, at the UC Davis Activities and Recreation Center. Over 100 chemists attended. For more information:

www.brownpapertickets.com/event/2948881

The Speakers/Tastings included:

Bill Ristenpart, Professor of Chemical Engineering, Director of the UC Davis Coffee Center, and instructor for the “Design of Coffee” course at UC Davis spoke about Coffee. The tasting of coffee was in collaboration with Chocolate Fish Coffee Roasters. The coffee tasting featured Chocolate Fish’s well-known nitro brew tasted with a cold brewed coffee – both using coffee beans of the same origin to emphasize the taste difference acquired through the nitro brew process. Peet’s Coffee is now supporting a coffee research center at UC Davis.

Selina Wang, Assistant Adjunct Professor of Food Science and Technology and Research Director of the UC Davis Olive Center spoke about Olives. Dr. Wang heads a UC program of olive and olive oil research. Samples of olive oil were provided for tasting.

Howard and Sally Peters, AKA Mr. and Mrs. Chocolate (from local ACS Silicon Valley) and winners of the ACS 2016 Helen M. Free Award for Outstanding Public Outreach, spoke about “Chocolate – Food of the Gods.” Many samples of different varieties of Scharffenberger Chocolate (kindly provided by the parent company – Hershey) were provided for tasting and comparison. The Peters’s held their usual chocolate raffle – for bittersweet chocolate – for those who stayed to the

bitter end.

Members of the ACS Sacramento Local Section with 50 or 60 years of ACS membership, the High School Teacher Award winner, and the Volunteer of the Year were all honored in an award ceremony.



The Chocolate Raffle winners with Sally Peters on the far left and Howard Peters on the far right

Chemistry Quiz

Which amino acid is erroneously blamed for the soporific effect of a turkey dinner?

The answer will appear in next month’s newsletter.

Last Month’s Chemistry Quiz

Which familiar Thanksgiving spice is illegal in Saudi Arabia because it contains the hallucinogenic compounds myristicin and elemicin?

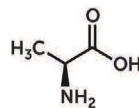
Nutmeg, which is obtained from the *Myristica fragrans* tree

THE CHEMISTRY OF SPIDERWEBS

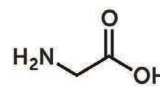
October is mating season for some spiders. Like them or loathe them, these arachnids use some fascinating biochemistry to spin webs with unique material properties that scientists want to emulate.



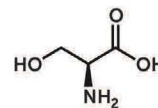
SPIDER SILK'S ELASTICITY AND STRENGTH



ALANINE



GLYCINE



SERINE

Spider silk is a protein fiber. Major amino acids in the silk proteins are alanine and glycine. Serine and proline are also present in significant quantities in some types of silk. Glycine-rich regions give spider silk its elasticity, forming amorphous areas in its structure. Alanine-rich regions link together through hydrogen bonds to form crystalline areas that give spider silk its strength.

EUROPEAN GARDEN SPIDER SILK VS. KEVLAR

DRAGLINE SILK



27%
ELASTICITY
(% increase in length when stretched)
1.1
STRENGTH
(GPa)
180
TOUGHNESS
(MJ·m⁻³)

FLAG SILK



270%
ELASTICITY
(% increase in length when stretched)
0.5
STRENGTH
(GPa)
150
TOUGHNESS
(MJ·m⁻³)

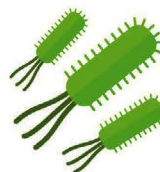
KEVLAR



2.7%
ELASTICITY
(% increase in length when stretched)
3.6
STRENGTH
(GPa)
50
TOUGHNESS
(MJ·m⁻³)

SYNTHETIC SPIDER SILK

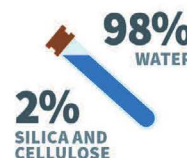
Materials scientists want to find a way to reproduce spider silk’s strength and stretchiness. So far their attempts have been met with mixed success; they’ve yet to produce synthetic spider silk on a large scale.



Some research has used bacteria to produce spider-silk-like proteins.



In the U.S., goats were genetically modified to produce spider silk proteins in their milk.



U.K. researchers made artificial spider silk with silica- and cellulose-based fibers.

Silicon Valley ACS Monterey Bay Subsection Nanomaterials Lecture at Cabrillo College

By Rene Jaramillo and Ricardo Mendez

From circuits in satellites to the gas valves in a lab, we are surrounded by innumerable materials. As students of Hartnell College, we have been exposed to different ones and their uses across different facets of life. The local Naval Postgraduate School (NPS) in Monterey is known to design new materials and inquiring minds in the student body have wondered about the chemistry of these processes. The opportunity to attend the ACS lecture on Design, Fabrication and Testing of Functional Nanomaterials could not have been more exciting because its speaker was NPS's own Dr. Claudia Luhrs!

Some of us were nervous when we arrived at Cabrillo College, but, when we saw Dr. Slava Bekker, we were relaxed to see a familiar and friendly face. The socializing and networking before the lecture gave us the chance to meet other students and professionals from the area and learn what they study. It also allowed us to appreciate how the lecture may tie into their work. Many of the students in the audience are simultaneously enrolled in physics

and chemistry courses and always welcome an opportunity to see how the two disciplines come together and yield practical applications. As the evening went on, we were able to engage in interesting conversations with Dr. Luhrs and other faculty members over dinner.

Soon after everyone was settled, Dr. Bekker introduced Dr. Luhrs to the audience and the lecture began. Dr. Luhrs started with an overview of nanomaterial development, which includes the mixing of gases to generate hot plasma, and microwave exposure to yield

nanoparticles. She went on to discuss encapsulating nanoparticles around existing metals to change their properties and ultimately their capabilities. The materials she designed and synthesized are used in Toyota engines and engine molds to increase their resistance to heat, which in turn minimizes the risk of engine failure.

As Dr. Luhrs' lecture came to an end, it left us with an extended horizon of knowledge. Thank you to all those who made this presentation available to us! We're grateful to learn that much more about the universe we're in and to see more of the underlying science for the materials around us.

Welcome to the Silicon Valley Section of ACS

Each month, the section receives a spreadsheet from national ACS with the names of members new to our section. The members are either new to ACS, have transferred in from other areas, or are the newest members -- students. To welcome you to the section and get to know you, the Executive Committee offers new members a free dinner! To encourage you to attend a monthly section seminar meeting, we would like you to be our guest. When you register, make certain to mention that you are a new member and you and a friend will be our guests. The seminar meetings are held at a number of local venues. If you are unable to attend in the evening, perhaps you would join us for an outreach event, like judging a science fair, proctoring the Chemistry Olympiad or participating in a National Chemistry Week event in October. Then, there is our annual wine tasting and awards picnic in July. The local section is a volunteer organization. Please attend an event, volunteer to help and get to know your local fellow chemists. Welcome!

New SVACS Members

Donald Albert
Matthew Alexander
Dr. Neri Amara
Maryam Ashtari
John Bissell
Caroline Bosmajian
Dr. Xin Chen
Dr. Po Jun Cheng
Zhi Cheng
Jacqueline Chisholm
Cheol Keun Chung
Shizhong Dai
Anushree Das
Natsuko Egawa
Christopher Evans
Dr. Corinne Foley
Dr. Thomas J. Greshock
Dr. Yngve Gust Hendrickson
Dr. John David Higgins III
Celia Catherine Homyak

Matthias Ihme
Amy Nicole Jacobson
Anna Johnston
Mason Christopher Julian
Lesley D. Kana
Holland Keefe
Grant Andrew Koch
Derek Lee
Ji Luo
Dr. Tamlin D. Matthews
Grace McKenna
Magi Mettry
Thomas Edward Nelson
Jeremy O'Connell
Bora Park
Egan Peltan
Quang Nhat Phan
Dr. Hima K. Potturi
Dr. Longwu Qi

Todd Ritsema
Dr. Alice O. Robertson
Edward A. Rodriguez
Giulio Joseph Salerno
Perry Scheetz
Dr. Thorsten Staudt
Dr. Hanafi Tanojo
Fan Tong
Guillaume Tremintin
David Chester Upham
Dr. Robert Jan Visser
Breanna Vollmar
Kecheng Wang
Stephanie Wang
Rebekah Wong
Xufei Wu
James T. Yeary
Kenya Yniguez
Dr. Ge Yu



Dinner at Sesnon House, Cabrillo College



Dr. Claudia Luhrs discussing manufacturing of novel nanomaterials



SILICON VALLEY SECTION
AMERICAN CHEMICAL SOCIETY
P.O. Box 395, Palo Alto, CA 94302



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http://scvacs.org/?page_id=99

SILICON VALLEY SECTION

2017 Section Officers

Chair	Todd Eberspacher	650-723-2505	eberspacher@stanford.edu
Chair Elect	Melody Esfandiari	408-924-4973	melody.esfandiari@sjsu.edu
Past Chair	Jane Frommer	408-927-2224	frommer@scvacs.org
Secretary	Richard Bone	650-714-7897	rgab@scvacs.org
Treasurer	Ihab Darwish	650-624-1389	darwishis@yahoo.com

Councilors

2015-2017	Ean Warren	650-329-4554	ewarren@scvacs.org
2017-2017	Charlie Cox	650-485-1041	ctcox@stanford.edu
2016-2018	Bonnie Charpentier	650-380-5353	charpentierbon@yahoo.com
2016-2018	Linda Brunauer	408-554-6947	lbrunauer@scu.edu
2016-2018	Sally Peters	650-447-3027	sallybrownpeters@gmail.com
2017-2019	George Lechner	408-226-7262	glechner@aol.com
2017-2019	Matt Greaney	510-410-0195	greaney19@gmail.com

Alternate Councilors

2015-2017	David Parker	408-615-4961	drdrparker@comcast.net
2017-2017	Howard Peters	650-447-3027	peters4pa@sbcglobal.net
2017-2017	Heddie Nichols	310-435-2133	nichols@scvacs.org
2016-2018	Natalie McClure	650-906-7831	nmclure@drugregulatoryaffairs.com
2016-2018	Heidi Vollmer-Snarr	650-723-9518	hrvsnarr@stanford.edu
2017-2019	Elizabeth Pollom	408-924-5012	elizabeth.pollom@sjsu.edu
2017-2019	Slava Bekker	831-759-6005	sbekker@hartnell.edu

Newsletter

Editor	Kevin Greenman	408-634-2309	editor@scvacs.org
Assoc. Editor	Partha P. Bera		partha.pb@gmail.com

ChemPloyment Abstracts

Director:	Liang Cao	liang.cao@aol.com
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FUTURE EVENTS

- Dec 13** Computer History Museum Live
Leslie Berlin
Troublemakers: The Story of Silicon Valley's
Coming of Age
<http://www.computerhistory.org/events/upcoming/>
- Dec 20** Golden Gate Polymer Forum Dinner Lecture
Dr. Rudy J. Wojtecki
Michael's at Shoreline Park
Mountain View, CA
- Jan 5** First Friday Family Night
CuriOdyssey at Coyote Point
San Mateo, CA
<https://curiodyssey.org/calendar/index.php?eID=21105>
- Feb 13** 23rd Annual Stauffer Lectureship
Dr. Scott Denmark
Stanford University
<https://chemistry.stanford.edu/events/23rd-annual-stauffer-lectureship-day-1-2-professor-scott-denmark>
- Mar 18-22** National ACS Meeting and Expo
Nexus of Food, Energy and Water
New Orleans, LA
https://www.acs.org/content/acs/en/meetings/national-meeting.html?sc=home_4up_NO1
- Click on links for more information or
see this newsletter at http://scvacs.org/?page_id=99