SoCal SETAC News

Society of Environmental Toxicology and Chemistry
Southern California Chapter

Volume 25 Number 2 SPRING 2018

FEATURE ARTICLE

Passive Sampling for Measuring Freely-Dissolved Hydrophobic Organic Contaminant Concentrations (C_{free})

Rachel Adams, Loyola Marymount University

Passive sampling is gaining acceptance as a useful method for measuring the freely-dissolved concentration (C_{free}) and chemical activity of hydrophobic organic contaminants in the environment (e.g., sediment, water, soil, biota). Because the measurements are directly related to the bioaccumulation of these contaminants, they provide important insight into the health and ecological risk associated with contaminated environments. Their use has been demonstrated in multiple research applications and they have been shown to be effective for monitoring regulated ambient water and sediments (Booij et al., 2015). In fact, at the SoCal SETAC Annual Meeting in April (www.socal-setac.org/annual-meeting), studies using passive samplers to assess water column, sediment porewaters, soils, plants, and the sediment-water interface at locations in California and throughout the United States demonstrated the wide range of environments where passive sampling has been successfully demonstrated.

Traditional methods for measuring contaminants in the water column have involved collecting a large water volume and using liquid-liquid extraction.

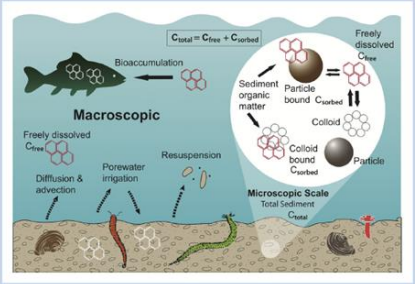

Figure 1. *Conceptual view of cycling of contaminants in the aquatic environment (Mayer et al., 2014)*

Similarly, in traditional sediment methods, the bulk sediment is collected and extracted. These bulk methods are labor intensive and over predict the available concentrations of contaminants measuring total concentrations (freely dissolved + sorbed; Figure 1; Mayer et al., 2014). Beginning in the 1990s, passive samplers, which are based on the passive equilibrium partitioning of contaminants into a selected polymer, were introduced in order to measure the freely dissolved (Cf_{ree}) and bioavailable concentrations of contaminants in the environment. The efficacy of multiple types of passive samplers using varying

President's Corner

Keith Maruya, SCCWRP

While still fresh on my mind, I wanted to share a few thoughts from our Chapter's Annual Meeting, held at Loyola Marymount University on April 12-13. First, major kudos to Past President and LMU Professor Rachel Adams for securing the spectacular venue. From the state-of-the-art auditorium to the multi-level patios with sweeping views of the Los Angeles basin, the Frank R. Seaver College of Science and Engineering was the perfect spot for our yearly get together.

Next in line for my gratitude were the Chapter Board members who volunteered their time to make sure the event went off smoothly. Misty Mercier, our beloved Secretary, who

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FEATURE ARTICLE (continued)

calibration methods has been demonstrated by numerous researchers (Lydy et al, 2014; Booij et al, 2015). More recently U.S. regulators and authorities have promoted the use of passive sampling by publishing guidelines for using passive samplers (U.S. EPA, 2012, https://clu-in.org/download/contaminantfocus/sediments/Sediments-Passive-Sampler-SAMS_3.pdf and a passive sampling user's manual (U.S. EPA/SERDP/ESTCP, 2017, https://www.serdp-estcp.org/Program-Areas/Environmental-Restoration/Contaminated-Sediments/ER-201216/ER-201216-UM) signaling that these are acceptable methods for monitoring regulated sites.

Several types of passive samplers have been demonstrated including dual phase [e.g., solid phase membrane devices; (SPMDs)] and single-phase samplers [e.g., solid phase microextraction (SPMEs), low-density polyethylene (PE), silicone, and polyoxymethylene (POM); Figure 2]. For any of these samplers, the basic method for estimating the freely dissolved concentration of contaminants of interest are the same and can be calculated with two key parameters: equilibrium partitioning coefficients (e.g., K_{PS}) and fractional equilibrium (f_{eq}). These samplers can be used under equilibrium or non-equilibrium conditions. Equilibrium can be confirmed using time series measurements or varying surface-to-volume ratios. Under non-equilibrium conditions, performance reference compounds (PRCs) may be added so that the fractional equilibrium may be estimated. Both first-order and diffusion models have been demonstrated for estimating fractional equilibrium (Mayer et al., 2014). The multiple samplers available and the options available for equilibrium corrections can leave end-users uncertain about the most appropriate method to use. A recent passive sampling comparison study demonstrated interlaboratory variability with a factor of 10, but showed that standardization of methods halved the variability (Jonker et al., 2018). The same study demonstrated much lower variability (< factor of 1.7) when all analysis was performed in one laboratory. More development of standardized methods will promote the use of passive sampling for assessing regulated contaminated environments. The U.S. EPA guidelines (U.S. EPA, 2012) and the user's manual (U.S. EPA/SERDP/ESTCP, 2017) mentioned previously are a good starting point for those new to passive sampling.

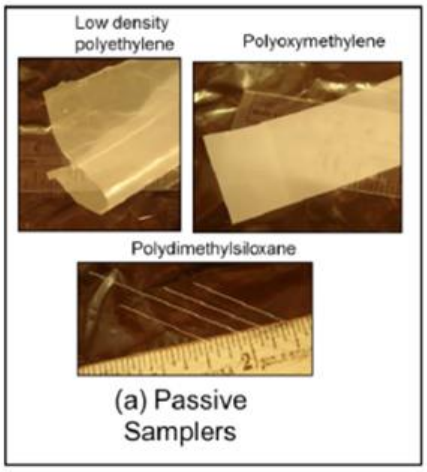

Figure 2. *Figure 2. Low density polyethylene (PE), polyoxymethylene (POM), and polydimethylsiloxane (PDMS) passive samplers (U.S. EPA, 2012)*

The range of environmental systems assessed using passive sampling is demonstrated by the presentations at the recent SoCal SETAC Annual Meeting (https://www.socal-setac.org/annual-meeting): the use of SPMEs to detect low level water column PCBs and DDX (Hovel et al., 2018); actively shaken in situ measurements of contaminants in sediment porewater (Jalalizadeh & Conder, 2018); comparisons of PE passive sampling and in vitro approaches for PAH bioavailability for skeet-impacted soils (George et al., 2018); in vivo SPME sampling of trace organic compounds in plants (Zhu & Gan, 2018); measuring the flux of persistent organic pollutants across the sediment-water interface using PE passive samplers (Tang et al., 2018). Jay Gan concluded the session by discussing passive sampling gaps and research needs including standardization to promote the efficacy of passive sampling.

Recently here in SoCal in March scientists from the Southern California Coastal Water Research Project (SCCWRP), and Space and Naval Warfare Systems Center Pacific (SPAWAR) deployed passive samplers in San Diego Bay in order to assess potential sediment sources of PCBs and pesticides to the overlying water column (Figures 3 & 4). These measurements will be compared to biota measurements and inform bioaccumulation modeling tools for sediment quality objective assessment.

The use of passive sampling for ambient water and remediated contaminated sediment monitoring has been promoted by environmental regulators with the understanding that these methods allow for a better scientific basis of risk assessment compared to traditional measurement methods (Booij et al., 2015). More work is needed by both scientists and

FEATURE ARTICLE (continued)

regulators to develop standardized methods for passive sampling so that these bioavailable and freely dissolved concentrations can be accurately measured.

Figure 3. *Passive Push sampler frame with polyethylene passive sampler, mounted in deployment system with attached timed-release recovery buoy (SPAWAR Systems Center Pacific, 2018).*

Figure 4. *PE passive samplers for water column sampling (Southern California Coastal Water Research Program, 2018).*

References

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US EPA/SERDP/ESTCP, R. Burgess, S. Driscoll, G.A. Burton, U. Gosh, P. Gschwend, D. Reible, S. Ahn, T. Thompson, 2017, EPA/600/R-16/357, ORD.

U.S. EPA. Guidelines for Using Passive Samplers to Monitor Organic Contaminants at Superfund Sediment Sites., OSWER Directive 9200.1-110 FS.; United States Environmental Protection Agency, Office of Superfund Remediation and Technology Innovation, and Office of Research and Development, Washington, DC, 2012. https://clu-in.org/download/contaminantfocus/sediments/Sediments-Passive-Sampler-SAMS_3.pdf.

Call for SoCal SETAC Board Member Nominations

The following Board of Director positions are open for the 2018 – 2020 term:

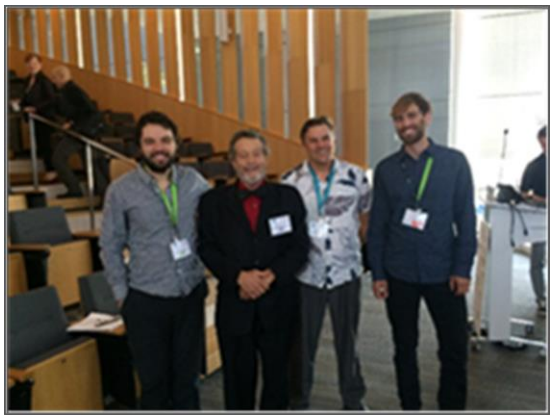
- **1 Student**
- **2 Public/Government**
- **2 Academic**
- **1 Private**
- **1 Non-Government Organization (NGO)**

Serving on the SoCal SETAC Board is an outstanding and rewarding opportunity to collaborate with our local community. We are now looking for nominations for the 2018-2020 term. Please see the attached form at the back of the newsletter due to Misty on June 30.

PRESIDENT'S CORNER (continued)

once again took charge of attendee registration. Without Misty, we would all have been staring at each other without much of a clue. Scott Coffin and Rachel also deserve recognition for helping develop and organize the program, which I thought was among the most diverse and engaging ever at a Chapter meeting. We were thrilled to host notables such as Anna Marie Cook, EPA's resident expert on debris and microplastics, and of course, everybody's favorite oceanic trash guru Captain Charles Moore of Algalita. Charlie's passion and enthusiasm for advancing the science of marine debris is unparalleled, and we are all the benefactors of his energy, curiosity and determination.

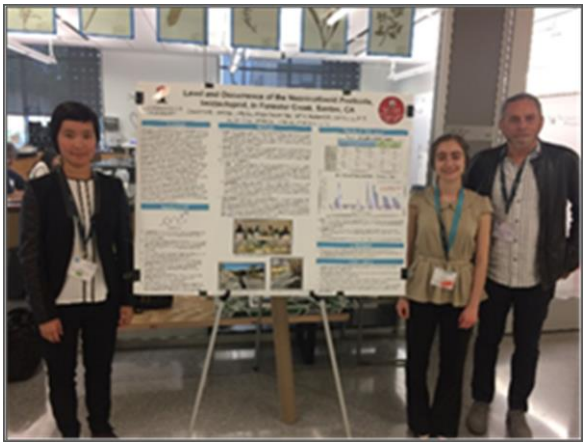
A special shout out to Jeff Steevens of the US Geological Survey for traveling all the way from his home in Columbia, MO, to attend our meeting. An aquatic toxicologist at the Army Corps of Engineers for many years, Jeff's talk on the challenges of interpreting toxicity testing results was engaging and humorous. On the Board of Directors for SETAC North America, Jeff also shared what is new at the national level and previewed the upcoming N/A 2018 meeting to be held in Sacramento. It was nice to meet Jeff, and swap a few fish tales over a bottle of suds.



Capt. Charles Moore (second from left), Founder of Algalita Marine Research and Education, presented on the "Great Pacific Garbage Patch".

The meeting started with a tribute to Brock Bernstein, who passed away earlier in the year after a bout with pancreatic cancer. Brock was remembered not only for his prowess as a facilitator, but for his role as a father and friend to many in the southern California environmental science community. Thanks to Ken Schiff and Chris Stransky for putting Brock's tribute together in advance of our session on sediment quality. Not coincidentally, Brock profoundly influenced statewide policy, bringing together stakeholders in establishing sediment quality objectives for bays and estuaries. RIP Brock.

The Thursday evening poster social is always a great way to get the latest research updates from collaborators and to meet new students and shoot the breeze with their mentors. This year was no exception as I spent some time (although not enough) chatting with the next generation of environmental scientists and professionals. I was impressed with posters on diverse topics such as the occurrence of neonicotinoids in urban creeks and microplastics on LA area beaches. Thanks to all the folks for presenting and attending the poster social.



Professor Rick Gersberg and his SDSU students at the poster social.

As is custom, the meeting finished with recognition of Board members and Officers who completed their service to the Chapter and community. Thanks Dan, Denise, Eilleen, Kimbrie and Rachel for your dedication and collegiality. We hope to see you back involved soon! The Board also confirmed 2 new official positions – Denise Li as Outreach Coordinator and Alvina Mehinto as Co-Secretary, and are more than pleased to have retained Violet Renick as our Webmaster. We hope Violet's new supervisors at OCSD see the value in allowing her to continue in her vital role. We also welcome Erika Holland, Assistant Professor at CSULB, as our Vice President for 2018-19. Your volunteerism is much appreciated!

PRESIDENTS CORNER (continued)

To fill the massive void left by those rotating off, we encourage you all to consider serving our Chapter and community by running for a Board position. This is the best way to ensure our functions meet the entire Chapter's needs, and to foster change for the better. It is vital that we incorporate feedback from all sectors – public, private, academic and grassroots – that form the unique partnership that is SETAC. If you would like to nominate someone (including yourself!), please see the nomination information provided elsewhere in this issue.

I'll finish my thoughts with an extra special recognition of our Chapter V.P. Chris Stransky. I see Chris frequently "both on and off the ice". He seems to be literally everywhere. The day after our Annual Meeting, Chris organized the Chapter's Earth Day booth, hosted by LACSD at their Whittier WRP. Chris arranged to have live tide pool animals shipped up from Scripps just for the event. I am amazed at the energy and most of all, the friendly demeanor with which Chris carries himself. It must be all those quality waves he gets down in San Diego. Thanks for the inspiration, Bud.

SoCal SETACers manning the Chapter's science discovery booth at LACSD's Earth Day event.

Until next time,

Keith

MEET THE BOARD

Daniel Schlenk, UC Riverside

Department Vice Chair, Professor of Aquatic Ecotoxicology

As a Southern California resident, I grew up in Torrance and basically lived at the beach throughout my childhood. During my junior year in High School, I was fortunate to take a class from Nick Furjanick in Oceanography and he recommended that I apply for a National Science Foundation Summer Science Program at Humboldt State University. In mostly field-oriented course-work, Dr. Gary Brusca taught me Marine Biology and I was hooked. However, I was very concerned about the likelihood of finding employment as a "Marine Biologist" and paying for my education. Consequently, I left SoCal and did my undergraduate training at Northeast Louisiana University (now known as University of Louisiana at Monroe) where I obtained several scholarships and graduated in 1984. Originally a Pre-Med major, I became disillusioned with what my life would be like as a physician during my junior year. I met Dr. Paul Ferguson who was beginning an undergraduate Toxicology degree program (one of only eight in the US at the time). I was able to do some research in his laboratory and he suggested that I could pursue "Marine Biology" as a "Marine Toxicologist".

After attaining my BS in Toxicology, I only applied to one graduate program. At the time, only Oregon State University had a graduate program in Toxicology where the Director of the Marine Laboratory was on the Toxicology faculty. Unfortunately, after gaining acceptance to the PhD program, I was informed he was no longer taking students. Since I didn't have any other options, I decided to go anyway and spent the first 3 years of graduate school moving from department to department trying to decide what I wanted to do. One of the laboratories in which I worked isolated Marine Natural Products (i.e. potential therapeutic agents) from Marine algae (Dr. William Gerwick).

Continued on Page 6.

MEET THE BOARD – DAN SCHLENK (continued)

I became very interested in "how" these compounds caused the bioactivity observed in the field and transferred to the laboratory of Dr. Donald Buhler who became my mentor and provided me with an NIEHS pre-doctoral fellowship. In his laboratory, I learned about how marine organisms biotransform chemicals to detoxify, or in some cases bioactivate them to more toxic intermediates. I became very interested in mechanisms of toxicant action and the role of biotransformation in this process. Since many of these enzymes are induced upon exposure to potential substrates, I also became interested in the use of biomarkers or bioindicators to provide mechanistic insight into ecological risk assessments.

After finishing up my dissertation in 1989, I was fortunate to obtain a NIEHS postdoctoral fellowship at Duke University. Here, I worked in the laboratory of Dr. Marius Brouwer learning recombinant DNA methodologies and characterizing various metal binding proteins (Metallothioneins) in marine arthropods. This work was done primarily at the Duke University Marine Laboratory.

In 1991, I was hired as an Assistant Professor at the University of Arkansas for Medical Sciences. I have always been grateful to those who mentored me during my high school, undergraduate and graduate years, so I chose academia as a career in the hope that I too may positively influence the lives of others and provide hope and encouragement as I was by those who mentored me. In addition, the "freedom" to travel and meet new people and learn as much as I can from others have been important factors in guiding my career. However, this initial academic experience was quite painful, as I was trying to basically be an aquatic toxicologist in a human-health oriented environment. After 3 grueling years essentially working alone, I moved to the University of Mississippi where I was able to work in close collaboration with Dr. William Benson. This was truly the epitome of the academic experience as we essentially combined laboratories and worked on a number of very interesting issues including Environmental Estrogens and other Endocrine Disrupting compounds. We also began work examining the effects of natural marine products derived from sponges and corals on specialist predatory organism (tropical invertebrates and fish) trying to understand how these organisms cope with the toxicity from chemical defended prey.

In 1999, Dr. Benson left the University of Mississippi, and I finally realized I was a long way from the ocean. Consequently, in 2000, I decided to move back to SoCal and accepted a position at the University of California, Riverside as Professor of Aquatic Ecotoxicology. Since moving to California, I have been so fortunate to meet a plethora of fantastic scientists with whom to collaborate, and to be gifted with some amazing students and postdocs. We currently have projects ranging from the effects of climate change on pesticides in salmonids, to assessing the impacts of unknown emerging contaminants in surface waters and sediment, and evaluating the transcriptomic and epigenomic effects of oil on fish development.

Currently residing in Oceanside and commuting to UCR 3 times a week (when not on the road), my favorite activities are surfing and eating….hopefully one counteracts the other.

Dan enjoying an early morning dawn patrol surf at his local break in Oceanside. Hard to do this out in Arkansas or Mississippi, another great reason for the move!

STUDENT CORNER

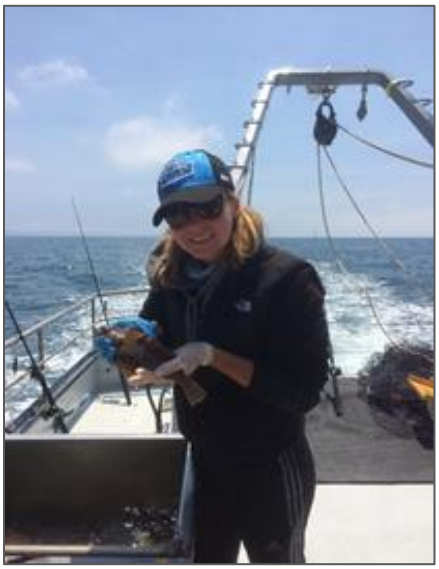
Echelle Burns, California State University, Long Beach

Echelle Burns, Interviewed by Eilleen Salas, SoCal SETAC Board Member- Student Representative

Echelle Burns was our 2018 SoCal SETAC Annual Conference Poster winner. Her poster was entitled: "*Movement Patterns and Habitat Association of Five Demersal Fish Species along the Orange County Sanitation District Outfall."*

Echelle is originally from Oakland, California. When she has time outside of her busy grad life, she enjoys programming as well as watching an occasional hockey game, specifically rooting for the Anaheim Ducks. She knew she wanted to be a marine biologist at a young age after she was scuba certified at only 12 years old and began exploring the ocean shortly thereafter. She would spend the majority of her summer's scuba diving with her dad off the coasts of Hawaii.

These underwater adventures led her to attend the University of Hawaii where she received her bachelor's degree in Marine Biology with a minor in English.



Echelle tagging an English sole offshore of Los Angeles on another beautiful sunny day in SoCal.

Echelle interned as an undergraduate in the Shark Lab with Dr. Kim Holland where she assisted with the lab's shark tracking project and conducted research on the behavioral response of sharks with GoPro cameras. She also worked for the Pacific Islands Ocean Observing System (PacIOOS) where she learned how to code in JAVA and HTML and helped build the webpages showcasing sea level rise and coral distribution data.

Currently, Echelle is an MS candidate at California State University, Long Beach working in Dr. Chris Lowe's Shark Lab. Her thesis is focused on researching the movement patterns of rockfish and flatfish along the Orange County Sanitation District outfall. She has spent months tagging English sole, Hornyhead turbot, Pacific sanddab, Vermilion rockfish and California scorpionfish, and is currently using acoustic receivers placed in the water to track their movements.

Echelle's thesis has allowed her to gain skills such as surgically implanting fish with acoustic tags. She was able to utilize these skills in another larger study on juvenile great white sharks and their movement patterns. She will now have the opportunity to attend and present findings from this project at the Sharks International Conference this year in João Pessoa, Brazil.

Echelle performing surgery and inserting an acoustic tag on a rockfish.

STUDENT PRESENTATION WINNERS

Once again we had a tremendous turnout of excellent student poster and platform presentations at our Annual Meeting in April at Loyola Marymount University. It's always impressive to see the exceptional quality of research being conducted by students in our region. It was a challenging decision for our judges, but in the end we had the following stand out winners that received a nice Certificate and $50 restaurant gift cards. Please join me in congratulating them next time you see them in the halls or out there doing there research.

Our winners were:

Best Platform Presentation (Overall):

Kara Wiggins, CSULB

"*Identification of Microplastic Pollution below 500µm in the Highly Urbanized Aquatic Environments Surrounding Long Beach, CA*"

Kara Wiggins – Best Platform Presentation

Best Poster Presentation (Undergrad):

Samantha Geier, LMU

"*Assessment of Fecal Indicator Bacteria Diversity and Density during Tidal Exchanges in an Urbanized Saltwater Marsh System (Ballona Wetlands*"

Samantha Geier – Best Presentation (Undergrad)

Best Poster Presentation (Graduate Student):

Echelle Burns, CSULB

"*Movement Patterns and Habitat Association of Five Demersal Fish Species along the Orange County Sanitation District Outfall*"

See photos of Echelle on Page 7.

SOCAL SETAC CALENDAR

June

June 20-23
Association for Environmental Studies and Sciences Conference 2018 | *Washington, DC*

June 25-28
Dredging Summit & Expo 2018 | *Norfolk, VA*

August

August 5-10
Ecological Society of America 2018 Annual Meeting | *New Orleans, LA*

August 6-10
National Environmental Monitoring Conference 2018 | *New Orleans, LA*

August 12-16
StormCon: The Surface Water Quality Conference & Expo | *Denver, CO*

September

September 16-19
SETAC Asia-Pacific 2018 Annual Meeting | *Daegu, KR*

September 9-12
33rd Annual Water Reuse Symposium | *Austin, TX*

October

October 15-17
California Stormwater Quality Association Annual Conference | *Riverside, CA*

August 6-10
National Environmental Monitoring Conference 2018 | *New Orleans, LA*

August 12-16
StormCon: The Surface Water Quality Conference & Expo | *Denver, CO*

SOCAL SETAC CALENDAR

Continued.

November

November 4-8
SETAC North America 39th Annual Meeting | ***Sacramento, CA***

Website Update and Reminder

Violet Renick

Greetings SoCal SETAC!

Just a reminder here again that SoCal SETAC has a new website. While it continues to be a work in progress, we are very excited about the possibilities that the new website will bring for our community. Please check it out and learn more about our SoCal SETAC family.

Features of the new website include:

- A blog for members to share accomplishments, news, and regulatory updates
- Photo gallery of previous SoCal SETAC events
- Easy payment/registration for dinner and annual meetings

In order to make this website as awesome and useful as possible, please consider contributing:

- Photos of yourself or colleagues at SoCal SETAC events (like national!)
- News of scientific/professional accomplishments, publications, regulatory updates
- Links to jobs for the job board
- Anything else that might be relevant

And last but not least, stay tuned for future upgrades including:

- An up-to-date calendar of events
- A social media stream including Facebook and/or Instagram posts

If you have any requests or suggestions for improvement, please contact Violet at violetrenick@gmail.com. Thank you and happy clicking!

https://www.socal-setac.org/

SOCAL SETAC OFFICERS AND BOARD MEMBERS

SoCal SETAC 2017–2018 Officers

Past President	**Rachel Adams** Loyola Marymount University Rachel.Adams@lmu.edu
President	**Keith Maruya** Southern California Coastal Water Research Project keithm@sccwrp.org
Vice President	**Chris Stransky** Amec Foster Wheeler chris.stransky@woodplc.com
Treasurer	**Joe Freas** Aquatic Bioassay & Consulting Joe@aquaticbioassay.com
Secretary	**Misty Mercier** Physis Environmental Laboratories, Inc. mistymercier@physislabs.com
Webmaster	**Violet Renick** City of San Diego vrenick@sandiego.gov

SoCal SETAC 2016–2019 Board Members

Board Member (2016–2018) Academic	**Daniel Schlenk** University of California, Riverside daniel.schlenk@ucr.edu
Board Member (2016–2018) Private	**Kimbrie Gobbi** Amec Foster Wheeler kimbrie.gobbi@woodplc.com
Board Member (2016–2018) Student	**Eilleen Salas** California State University, Long Beach eilleensalas@hotmail.com
Board Member (2016–2018) Public	**Denise Li** City of Los Angeles denise.li@lacity.org
Board Member (2017–2019) Academic	**Erika Holland** California State University, Long Beach erika.holland@csulb.edu
Board Member (2017–2019) Private	**Wendy Rose Hovel** Anchor QEA whovel@anchorqea.com
Board Member (2017–2019) Student	**Scott Coffin** University of California, Riverside scoff003@ucr.edu
Board Member (2017–2019) Public	**Alvine Mehinto** Southern California Coastal Water Research Project alvinam@sccwrp.org

SETAC SCENES

Earth Day Outreach Event at Los Angeles County Sanitation Districts

by Chris Stransky, SoCal SETAC VP

To celebrate Earth Day SoCal SETAC once again hosted a booth at an annual oureach event sponsored by the Los Angeles County Sanitation Districts. The event was held on April 14th, the day after our local chapter annual meeting at Loyola Marymount. Our booth was outfitted with touch tanks and microscopes highlighting local marine and freshwater species frequently used to monitor the health of our oceans and watersheds. As always the booth was a big hit and provided a rewarding opportunity to share common assessment methods we use, and also highlight the importance of being a good steward in our daily lives to help protect our valuable natrural resources. Many of our visitors, though living locally in Los Angeles, have never seen many of the species we had on display. A huge thank to you to our Chapter Pres., Keith Maruya, Alexi Gabriel of Amec/Wood for bringing up critters loaned from Scripps Institution of Oceanography, and Student Board Member Scott Coffin, along with two of his student collegues from UC Riverside, Norma Menjivar-Cervantes and Jannely Villegas.

Top left – Scott carefully holding one of the spiny attractions – a large red sea urchin.

Top right – Keith showing off a red abalone and other touch tank critters.

Right - Norma and Jannely at the microscopes teaching young future scientists about the juvenile life stages of *Ceriodaphnia*, sea urchins, and abalone.


CALL FOR
BOARD NOMIATIONS
SoCal SETAC
2018 – 2020
BOARD
• ACADEMIC
• PUBLIC
• STUDENT
• PRIVATE
• NGO
Interested in running for a two-year term or nominating a fellow student / colleague?
for more info contact
mistymercier@physislabs.com

Southern California Regional Chapter of the Society of Environmental Toxicology and Chemistry

2018 Board of Directors Nomination Form

SoCal SETAC is currently accepting nominations for positions on the Board of Directors

Board of Director positions open for the 2018 – 2020 term: 1 Student
2 Public/Government
2 Academic
1 Private
1 Non-Government Organization (NGO)

NOMINEE (Please Print):

Name: _____

Affiliation: _____

Phone: _____ Email: _____

CATEGORY (Check One):

- ☐ Student, undergraduate/graduate
- ☐ Public/Government
- ☐ Academic
- ☐ Private
- ☐ NGO

NOMINATOR (Please Print):

Name: _____

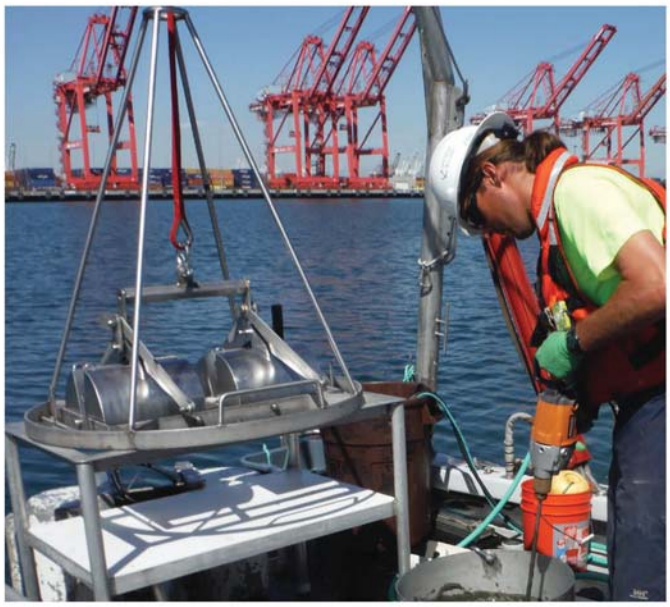
Phone: _____ Email:_____

Note:

Regional Chapter Board members are elected to a 2-year term by a vote of all Chapter members held in July. *You may self-nominate, but all nominees must be a current Regional Chapter member*. Nominees will be asked to provide a brief bio to be circulated in advance of the election. Only student members are eligible to vote for the student position.

Nominations are due **June 30, 2018** to:

Misty Mercier
SoCal SETAC Secretary
mistymercier@physislabs.com

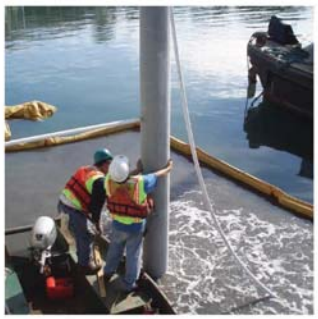


Design, Implementation, and Evaluation of Water and Sediment Quality-related Studies

- Site-specific criteria
- Toxicity identification evaluation
- Sediment quality objectives
- Total Maximum Daily Loads (TMDLs)
- Ultra-low detection limit
- Source tracking
- Stormwater monitoring
- Bioaccumulation modeling
- Chemical fate and transport

Local SETAC Supporters:

Wendy Hovel
Steve Cappellino
Andy Martin
Jack Malone
Adam Gale



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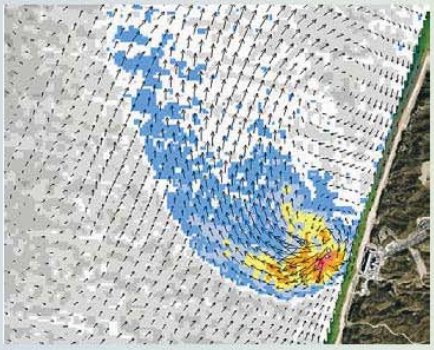

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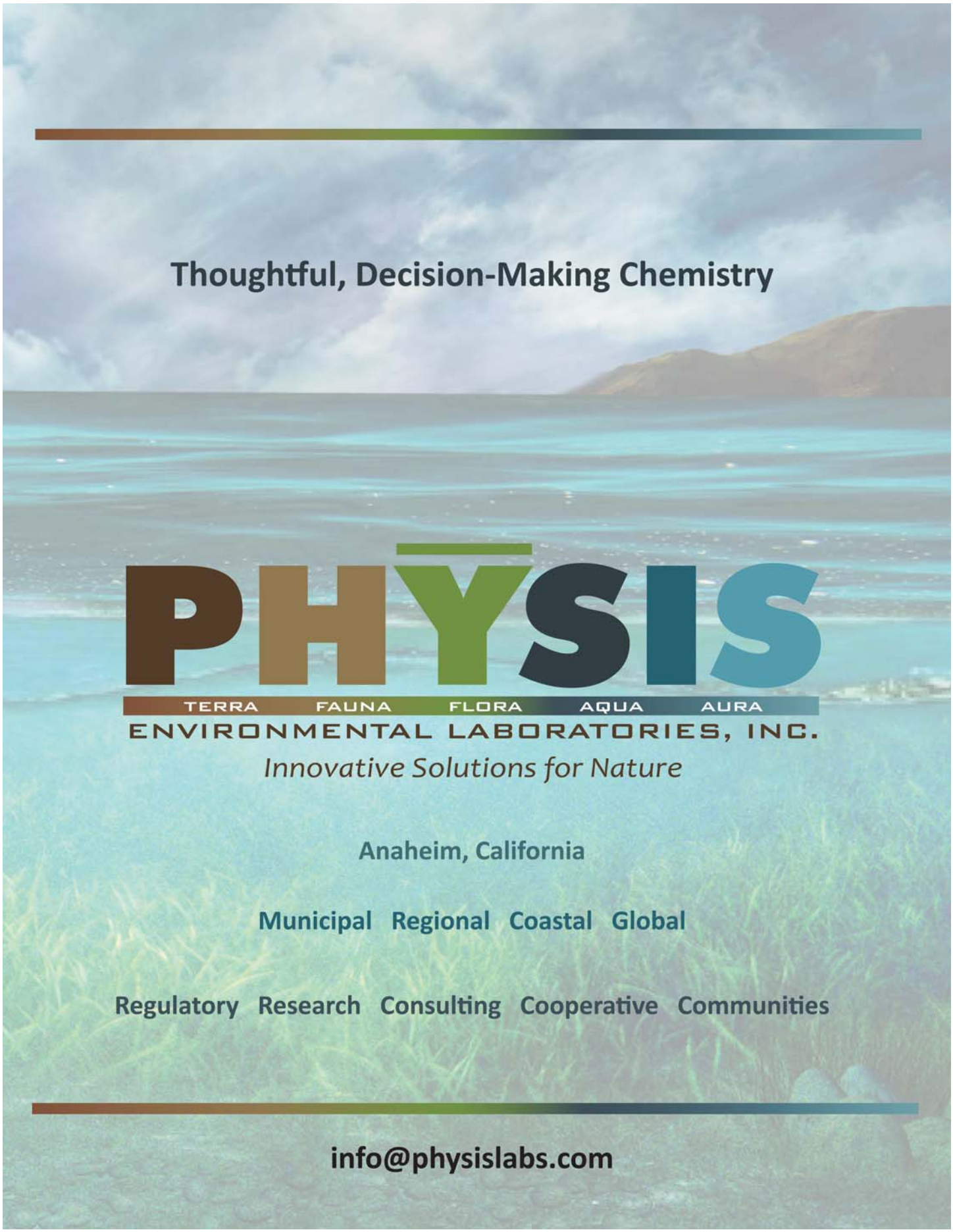
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