



# The Smilodon

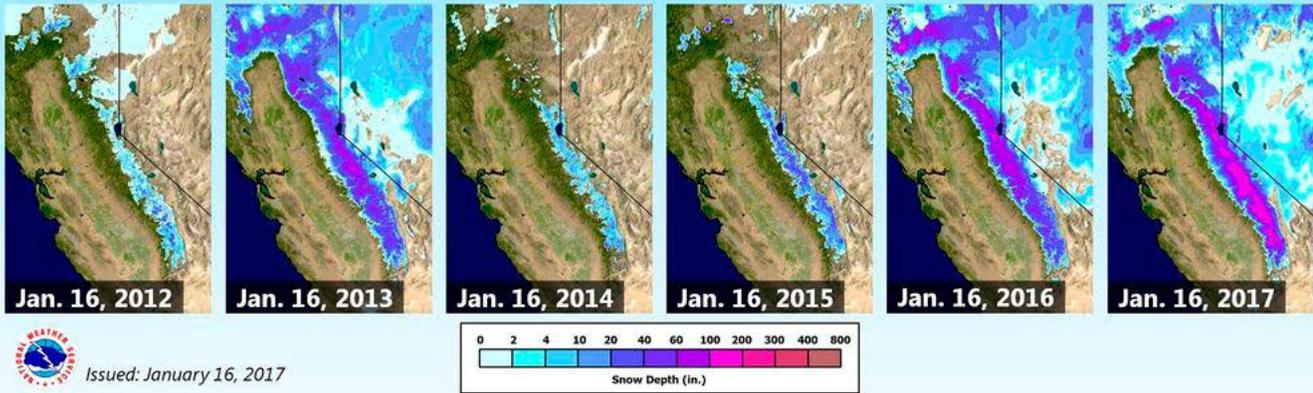
The Newsletter of the Southern California Academy of Sciences  
December 20, 2016

## SIERRA SNOWPACK BIGGER THAN LAST FOUR YEARS COMBINED: NASA

By Carol Rasmussen, NASA's Earth Science News Team

### Sierra Snowpack Through The Drought

2012-2017



New NASA data show that snowpack in the Tuolumne River Basin in California's Sierra Nevada — a major source of water for San Francisco and California's Central Valley — is currently larger than the four previous years of snowpack combined. NASA's Airborne Snow Observatory (ASO) measured the Tuolumne Basin snowpack on April 1, a critical annual measurement of snow for states and their inhabitants, at 1.2 million acre-feet (1.5 cubic kilometers). That's enough snow to fill the Rose Bowl in Pasadena, California, nearly 1,600 times.

The Airborne Snow Observatory is the only program that measures snow depth, snow water equivalent (the water contained in snow), and how much sunlight snow reflects over an entire basin, using two scientific instruments (a scanning lidar and an imaging spectrometer) on a King Air aircraft. All other snow-monitoring programs sample only a few locations on the ground or give an average over a broad area. The Airborne Snow Observatory flies in California, Colorado, Oregon, Nevada and Idaho, and is flying a research version in the Swiss Alps.

Frank Gehrke, chief of the California Cooperative Snow Surveys of California's Department of Water Resources, said, "In such a huge snow season, the data available from ASO will provide critical guidance for water managers as we enter into the peak melt season later this spring."

Principal Investigator Tom Painter of NASA's Jet Propulsion Laboratory in Pasadena, California, explained, "Before ASO, water managers had intense stress worrying about how much potential runoff was stored in the mountain snowpack, with little historical information about snowpack years as large as this to guide reservoir management and allocation decisions. With ASO, we will be precisely quantifying this volume and how it changes through the spring." Before 2013, when the ASO program began, errors in forecasting the total Sierra Nevada snowmelt-season runoff were frequently greater than 20 percent and occasionally greater than 40 percent. Now, errors in forecasting runoff from basins that ASO monitors have dropped to less than 2 percent.

The 2017 California snowpack is close to the largest on the record, which consists of decades' worth of snow measurements made at ground level. ASO mapping showed that Tuolumne Basin's snowpack is twice the volume of last year's snowpack and 21 times larger than the snowpack of 2015, the lowest on record. The combined April 1 snow water equivalent of 2013 through 2016 -- years when California was in an intense drought -- added up to only 92 percent of this year's April 1 measurement. In much of the Central Sierra, snow lies 25 feet deep (8 meters). In some high mountain basins, it's deeper than 80 feet (24 meters). And since April 1, it has continued to snow.

*continued on page 4*

## PRESIDENT'S CORNER...

With the annual meeting just around the corner, this is always an exciting time for SCAS as we look forward to meeting new people, catching up with old friends, and sharing new ideas.

SCAS is an important part of the southern California scientific community. The research, scholarship, and professional development opportunities offered by the Academy can benefit students at all levels of their academic career. For many of our members (including several past presidents), SCAS was the first scientific organization they joined as a student and, in some cases, may have been the forum for them to present their first scientific paper at a professional conference.

I'd like to invite each of you to this year's annual meeting, which will be held on April 28 as a one-day event on the campus of Santa Monica College. We'll kick off the 2017 meeting with three concurrent symposia that focus on Coastal Marine Ecology, Tropical Ecosystems, and Parasitology, respectively. Immediately following these sessions, our plenary speaker, Dr. Sharon Walker from UC Riverside will discuss her research in a talk titled, "Environmental Implications of Nanotechnology: A Wastewater Case Study." In the afternoon, contributed paper presentations will cover a variety of topics ranging from marine and terrestrial ecology and physiology to conservation biology and ecosystem change. And, finally, we will cap off the day with an evening poster session, which (for the first time) will include our Junior Academy members enrolled in the Research Training Program.

I am proud to announce that SCAS, now in its 126th year, has fully embraced the digital age! In addition to registering for the annual meeting, renewing your membership, applying for grants, and submitting manuscripts to the Bulletin online – all of

our publications are now paperless (paper copies available upon request). None of this would be possible without the support of the Natural History Museum of Los Angeles County who hosts both our website and archives; thank you and we hope to continue our longstanding relationship.

If you have scientific papers to publish, remember that the SCAS Bulletin publishes papers by members without page charges. The goal of the Bulletin is to report on research activities of SCAS members, scientific research conducted in southern California, and research that is of interest to the membership.

As the President of the SCAS Board of Directors, and on behalf of the Board, I would like to take this opportunity to thank all of the members, past and present, for your support of the Academy. I also would like to personally thank all of the members of the Board for helping me through my first year as President enjoyable and successful.

Thank you for your continued participation in and support of SCAS. The more active members we have, the stronger and more dynamic our Academy will be, which will bring forth a greater benefit to all.

I look forward to seeing you on April 28 at Santa Monica College!

Dave Ginsburg, President

## ANNOUNCING SCAS' 2018 ANNUAL MEETING

California State  
Polytechnic University,  
Pomona

## 13TH INTERNATIONAL CONFERENCE ON COPEPODA



Every three years since 1981, the scientific society known as the World Association of Copepodologists (WAC) has held an International Conference on Copepoda (ICOC). Each conference is unique, teeming with the individuality and culture of the host nation and city. This summer Cabrillo Marine Aquarium in San Pedro will host over 100 scientists for the 13th ICOC (<http://www.13icoc.org>) from July 16-21, 2017.

### What is a copepod?

Copepods (meaning "oar-feet") are a group of small crustaceans found in the ocean and nearly every freshwater habitat. They are among the most abundant animals on Earth and can be found almost everywhere there is water - from high-altitude lakes to deep ocean trenches. Copepods dominate the zooplankton, but they are also abundant in sediments, and many are parasitic (virtually on every group from sponges to chordates, including fishes and mammals). Copepods are important to global ecology and are a major food source for many organisms (from fish to birds to whales).

### What's planned for the 13th ICOC?

Following the Opening Ceremony on Monday, July 17, there will be two symposia, one on **Climate Change** (organized by Hans Dam from the University of Connecticut) and the other on **Planktonic Copepods** (organized by Mark Ohman from Scripps Institution of Oceanography). Other symposia planned for the week include **Symbiotic Copepods** (organized by Rony Huys, Natural History Museum, London, UK), **Freshwater Copepods** (organized by Eduardo Suárez-Morales, ECOSUR, Mexico), and **Molecular Phylogeny and Evolution - Pace and Processes** (organized by Leocadio Blanco-Bercial, Bermuda Institute of Ocean Sciences, Bermuda).

On Wednesday, July 19, the scientists will go on a mid-conference tour called "**City of Los Angeles Highlights.**" Stops will include the Hollywood Walk of Fame, Griffith Observatory, Space Shuttle Endeavour, and Battleship Iowa Museum. The conference will end on Friday, July 21 at a farewell dinner at the Natural History Museum of Los Angeles County.

SCAS has partnered with Cabrillo Marine Aquarium and the WAC to publish the Proceedings of 13th ICOC as a Supplement to the Bulletin of the Southern California Academy of Sciences. We are grateful to SCAS for partnering with us to sponsor the 13th ICOC proceedings.

Registration closes on June 15, 2017. SCAS members receive a \$100 discount.



Cordially,  
Dr. Julianne Kalman Passarelli  
Cabrillo Marine Aquarium  
Exhibits and Collections Curator  
13th ICOC Local Secretary



## SEA ICE EXTENT SINKS TO RECORD LOWS

by Maria-José Viñas, NASA's Earth Science News Team (originally published March 23, 2017)

Arctic sea ice appears to have reached on March 7 a record low wintertime maximum extent, according to scientists at NASA and the NASA-supported National Snow and Ice Data Center (NSIDC) in Boulder, Colorado. And on the opposite side of the planet, on March 3 sea ice around Antarctica hit its lowest extent ever recorded by satellites at the end of summer in the Southern Hemisphere, a surprising turn of events after decades of moderate sea ice expansion. On Feb. 13, the combined Arctic and Antarctic sea ice



The March 7, 2017, Arctic sea ice maximum extent was a record low, due to warmer-than-average temperatures, winds unfavorable to ice expansion, and a series of storms. Antarctic sea ice also broke a record with its annual minimum extent on March 3. Credits: NASA's Goddard Space Flight Center

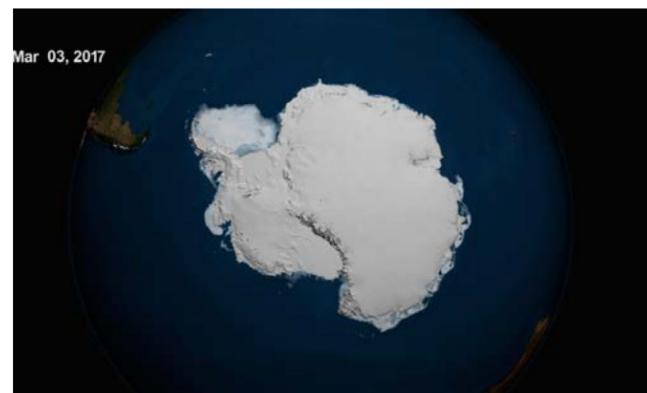
numbers were at their lowest point since satellites began to continuously measure sea ice in 1979. Total polar sea ice covered 6.26 million square miles (16.21 million square kilometers), which is 790,000 square miles (2 million square kilometers) less than the average global minimum extent for 1981-2010 – the equivalent of having lost a chunk of sea ice larger than Mexico.

The ice floating on top of the Arctic Ocean and surrounding seas shrinks in a seasonal cycle from mid-March until mid-September. As the Arctic temperatures drop in the autumn and winter, the ice cover grows again until it reaches its yearly maximum extent, typically in March. The ring of sea ice around the Antarctic continent behaves in a similar manner, with the calendar flipped: it usually reaches its

maximum in September and its minimum in February.

This winter, a combination of warmer-than-average temperatures, winds unfavorable to ice expansion, and a series of storms halted sea ice growth in the Arctic. This year's maximum extent, reached on March 7 at 5.57 million square miles (14.42 million square kilometers), is 37,000 square miles (97,000 square kilometers) below the previous record low, which occurred in 2015, and 471,000 square miles (1.22 million square kilometers) smaller than the average maximum extent for 1981-2010.

"We started from a low September minimum extent," said Walt Meier, a sea ice scientist at NASA's Goddard Space Flight Center in



On March 3, 2017, the sea ice cover around the Antarctic continent shrunk to its lowest yearly minimum extent in the satellite record, in a dramatic shift after decades of moderate sea ice expansion. Credits: NASA Goddard's Scientific Visualization Studio/L. Perkins

## SIERRA SNOWPACK, CONT...

This year, the program began mapping the San Joaquin River Basin in California's Central Valley, with funding from the Friant Water Authority in Friant, California, and NASA's Western Water Applications Office. In that basin, this year's April 1 snow water equivalent was about 2.9 million acre-feet (3.6 cubic kilometers). Jeff Payne, water resources director for Friant, said, "This is a critical path to better water management for the San Joaquin River and Friant Dam, particularly in a year like this one, where annual inflow from snowmelt might be 10 times the operating capacity of our reservoir. A lot of the snow in our basin accumulates in protected wilderness areas where conventional monitoring is restricted or prohibited. ASO is leading us to earlier and better water management decisions."

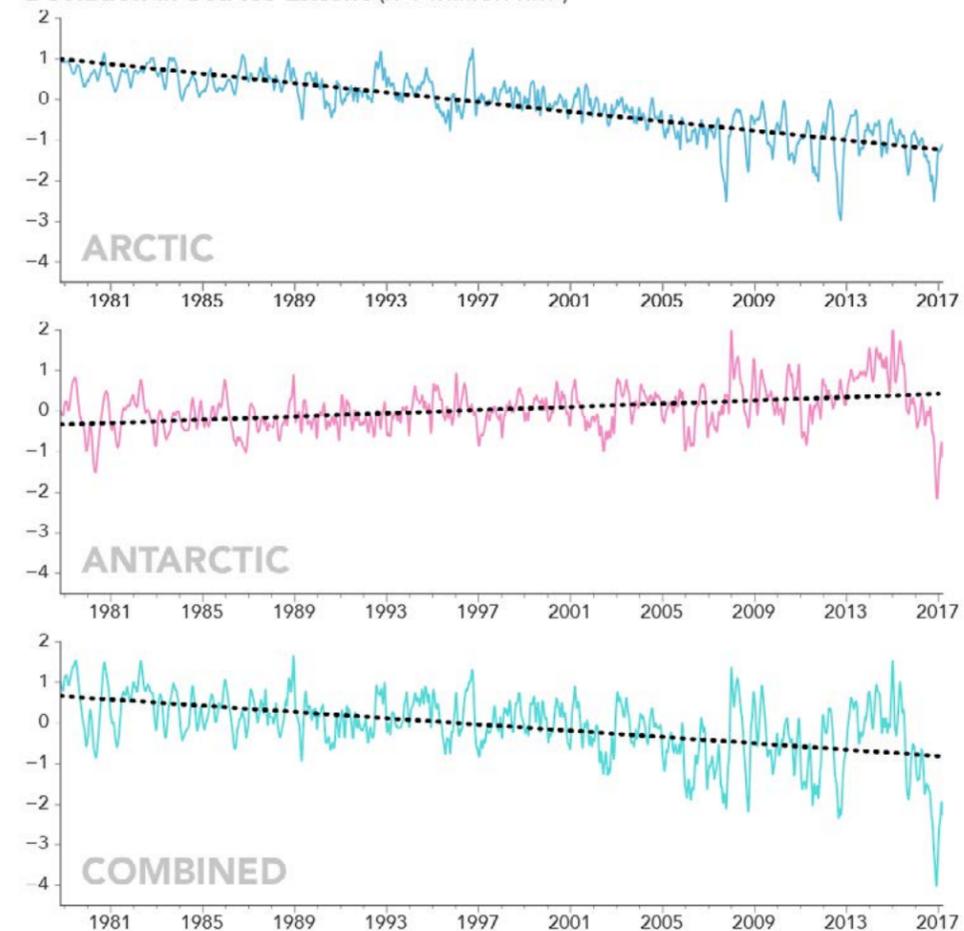
With the addition of the San Joaquin Basin, the Airborne Snow Observatory now maps the snowpack of the entire Central Sierra Nevada range from Kings River in the south to the Tuolumne River in the north, a milestone in a planned expansion of the program to cover the entire Sierra Nevada and other key regions in the West.

## SEA ICE EXTENT, CONTINUED...

Greenbelt, Maryland. "There was a lot of open ocean water and we saw periods of very slow ice growth in late October and into November, because the water had a lot of accumulated heat that had to be dissipated before ice could grow. The ice formation got a late start and everything lagged behind – it was hard for the sea ice cover to catch up."

The Arctic's sea ice maximum extent has dropped by an average of 2.8 percent per decade since 1979. The summertime minimum extent losses are nearly five times larger: 13.5 percent per decade. Besides shrinking in extent, the sea ice cap is also thinning and becoming more vulnerable to the action of ocean waters, winds and warmer temperatures.

Deviation in Sea Ice Extent (x 1 million km<sup>2</sup>)



This year's record low sea ice maximum extent might not necessarily lead to a new record low summertime minimum extent, since weather has a great impact on the melt season's outcome, Meier said. "But it's guaranteed to be below normal."

In Antarctica, this year's record low annual sea ice minimum of 815,000 square miles (2.11 million square kilometers) was 71,000 square miles (184,000 square kilometers) below the previous lowest minimum extent in the satellite record, which occurred in 1997.

Antarctic sea ice saw an early maximum extent in 2016, followed

by a very rapid loss of ice starting in early September. Since November, daily Antarctic sea ice extent has continuously been at its lowest levels in the satellite record. The ice loss slowed down in February.

This year's record low happened just two years after several monthly record high sea ice extents in Antarctica and decades of moderate sea ice growth.

"There's a lot of year-to-year variability in both Arctic and Antarctic sea ice, but overall, until last year, the trends in the Antarctic for every single month were toward more sea ice," said Claire Parkinson, a senior sea ice researcher at Goddard. "Last year was stunningly different, with prominent sea ice decreases in the Antarctic. To think that now the Antarctic sea ice extent is actually reaching a record minimum, that's definitely of interest."

Meier said it is too early to tell if this year marks a shift in the behavior of Antarctic sea ice.

"It is tempting to say that the record low we are seeing this year is global warming finally catching up with Antarctica," Meier said. "However, this might just be an extreme case of pushing the envelope of year-to-year variability. We'll need to have several more years of data to be able to say there has been a significant change in the trend."

# SCAS JUNIOR ACADEMY SPRING 2017 NEWS

by Gloria Takahashi

## RTP ALUMNA UPDATE: ALICIA WEI

RTP Program Director Gloria Takahashi wrote to let us know that Alicia Wei, and RTP alumna who participated in the program from 2012 to 2014, has moved on in the world and is doing great things. She is currently a junior at the University of Rochester. In May 2016, she received a Dean's Award (pictured), an article for which she was a researcher has been published in Nature (abstract and link follow), and this summer she will be conducting research at the University of Rochester's Medical Center for which she received a scholarship of \$20,000. Well done, Alicia!! Keep representing SCJAS and the RTP!!



The article published by the University of Rochester research team of which Alicia was a part is entitled "Chromophore-Assisted Light Inactivation of Mitochondrial Electron Transport Chain Complex II in *Caenorhabditis elegans*."

Authors were Andrew P. Wojtovich, Alicia Y. Wei, Teresa A. Sherman, Thomas H. Foster, and Keith Nehrke. The article was submitted to Nature April 15, 2016, was accepted June 21, 2016, and was published online July 21, 2016. The abstract follows:

"Mitochondria play critical roles in meeting cellular energy demand, in cell death, and in reactive oxygen species (ROS) and stress signaling. Most *Caenorhabditis elegans* loss-of-function (lf) mutants in nuclear-encoded components of the respiratory chain are non-viable, emphasizing the importance of respiratory function. Chromophore-Assisted Light Inactivation (CALI) using genetically-encoded photosensitizers provides an opportunity to determine how individual respiratory chain components contribute to physiology following acute lf. As proof-of-concept, we expressed the 'singlet oxygen generator' miniSOG as a fusion with the SDHC subunit of respiratory complex II, encoded by *mev-1* in *C. elegans*, using Mos1-mediated Single Copy Insertion.

The resulting *mev-1::miniSOG* transgene complemented *mev-1* mutant phenotypes in *kn1* missense and *tm1081(lf)* deletion mutants. Complex II activity was inactivated by blue light in mitochondria from strains expressing active miniSOG fusions, but not those from inactive fusions. Moreover, light-inducible

phenotypes *in vivo* demonstrated that complex II activity is important under conditions of high energy demand, and that specific cell types are uniquely susceptible to loss of complex II. In conclusion, miniSOG-mediated CALI is a novel genetic platform for acute inactivation of respiratory chain components. Spatio-temporally controlled ROS generation will expand our understanding of how the respiratory chain and mitochondrial ROS influence whole organism physiology."

Read the full article at the following link:  
<https://www.nature.com/articles/srep29695#auth-2>

## SCJAS REPRESENTED AT AJAS MEETINGS IN BOSTON



SCJAS students arrive in Boston to participate in the AJAS Annual Meeting February 2017. Pictured left to right: Uniss Tan, Jinwoo Park, Ashley Abing, Jennifer Choi, Benjamin Liu, and Matthew Tang. (photo: Jonathan Baskin)

# FROM AN AHA! MOMENT TO A UNIVERSITY LAB: MY EXPERIENCE AS AN RTP STUDENT

by Karishma Muthukumar

It is an understatement to say that the Southern California Academy of Sciences Research Training Program (RTP) has opened my eyes to an entirely new world of scientific research. Being a high school student still deciding whether working in a lab setting would be the right fit, the SCAS RTP program seemed to be the perfect opportunity. After writing a research proposal for my novel idea and submitting an application to the program, I received exciting news in August that I had been accepted into the program. I was also informed that the acceptance was conditional on finding a mentor in time. I started by sending a total of five emails to various professors in different universities. Within the next day, a UCI neurology professor from the Brain-Computer Interface Lab contacted me to set up a meeting. With a combination of serendipity and the prestige of SCAS, I found out at the meeting that I would have the opportunity of working with Dr. An Do of the University of California, Irvine.

Over the next few months, I worked under the guidance of Dr. Do as I developed an emoji communication board intended for patients with little to no mobility. After integrating emojis, small images typically used in electronic communication, into an electronic communication board, I compared the effectiveness with a standard picture communication board. With the results from my research, I continued onward to pair Brain-Computer Interface with my emoji board. Integrating Brain-Computer Interface would allow the board to be navigated using the brain signals acquired along with the use of a microcontroller, or computer-like device. With Brain-Computer Interface, patients with complete "locked-in" status, including patients with Amyotrophic Lateral Sclerosis (ALS) or individuals with Locked-in Syndrome could gain a voice. Even though this year's research training program nears its end, I am continuing my research as I perfect the Brain-Computer Interface aspect.

As a first year RTP student, I was not sure what to expect, yet I was quite thrilled by the opportunity to explore and learn more about the research field. The SCAS meetings that I attended were instrumental as I developed an abstract and research paper in preparation for the conference. At each meeting, we were instructed by top scientists on a variety of topics, including ethics in research and the nuts and bolts of presenting a poster presentation. In addition to learning how to conduct scientific research, RTP students were also exposed to university lab settings and research facilities, including the Cabrillo Marine Aquarium.

My research experience has been unforgettably amazing, and I am grateful for the SCAS RTP program, especially Mrs. Takahashi, for being a crucial part in the advancement of my research. The resources and lessons that I received during the program were beyond those found in any textbook or website. As I recall the first day when I found out about my acceptance into the RTP program, it is an understatement to say that the RTP program has transformed me into a budding scientist.

**For more information about the RTP program, or if you have (or know) a student who might be interested in participating, please contact RTP Program Coordinator Gloria Takahashi at [myopick@aol.com](mailto:myopick@aol.com).**

# THE LAST WORD

In an effort to regularize the publication of this organ, the editorial board of the Smilodon (in consultation with the SCAS Board of Directors) have decided to revise the aforementioned publication's production schedule. The Smilodon will be published twice annually:

## April 15 and November 15

To facilitate this schedule, the following deadlines for receipt of articles/input/photographs/etc. will be adhered to.

### Deadlines for April 15 (Spring) issue:

Receipt of articles/input:	March 15
Draft Smilodon to Board for review:	April 1
Board comments on Draft Smilodon to editor:	April 8
Smilodon distributed to membership:	April 15

### Deadlines for November 15 (Autumn) issue:

Receipt of articles/input:	October 15
Draft Smilodon to Board for review:	November 1
Board comments on Draft Smilodon to editor:	November 8
Smilodon distributed to membership:	November 15

If you have any questions or concerns about this schedule, or better yet, if you have content to provide (this can be an abstract of a paper or presentation you are working on, an idea you want to share or receive feedback on, an essay on a field experience that was singular and noteworthy, a particularly good photo you want to share...), please contact [sgraff@psomas.com](mailto:sgraff@psomas.com) or [bblood@psomas.com](mailto:bblood@psomas.com). Thank you!