ASP NEWS

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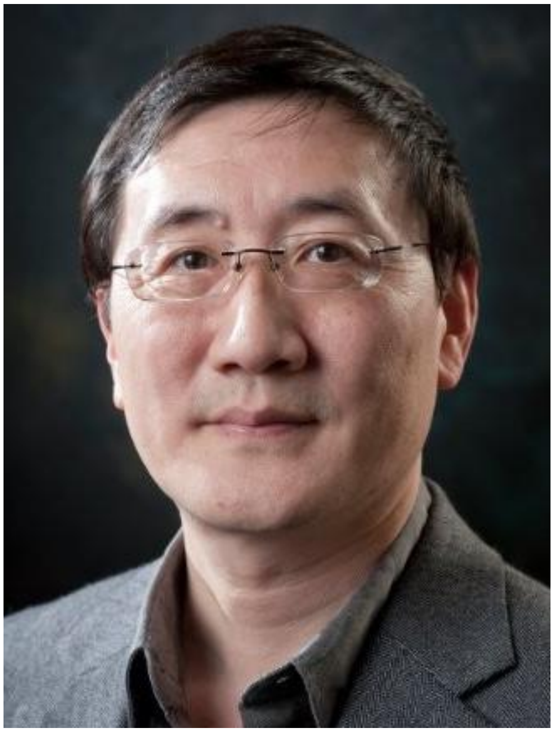
President's Note



Dear ASP members and colleagues,

As the president of ASP, I look forward to serving our community over the next two years. To start this process journey by first stating the following.

I would like to start by thanking all the officers and members of ASP. Your services, contributions and engagement have made our society lively.

The 2022 ASP Biennial meeting was hold at Albuquerque, NM from 9/25-28. I would like to thank all donors who had contributed to the success of the meeting. I would also like to thank the meeting organizers, led by Dr. Alexander Greer. They worked very hard to put together an in-person meeting after changing the date due to the pandemic. It was a pleasure to meet many colleagues in the meeting. The next ASP Biennial meeting will be hold at the Sheraton Grand Chicago from July 27-30, 2024. I hope we could expand categories in the next meeting. If you have any suggestions, please email to me. Thank you in advance.

Under the leadership of Dr. Jean Cadet, *Photochemistry and Photobiology*, the official journal of ASP, reached an impact factor of 3.521 in 2021. I would like to thank everyone who has contributed to the success of the journal. I hope all our members will continue to submit your manuscripts to the journal.

I will continue to support the international collaboration in photo sciences. I would like to thank the former presidents of ASP and the president-past, Dr. Alexander Greer, who have done a great job in establishing and maintaining good relationships with our colleagues in Europe and South America. Under the leadership of Dr. A. Greer, a Latin American Branch of the ASP (LatASP) founded. In the following years, I hope to see more interactions with our colleagues in Asia-Pacific region.

I will continue to support the career development of our associate members, who are the future of photo sciences and our society. Please be aware of that ASP official website (www.photobiology.org) posts job information freely for our members. If you have job openings or are looking for a job, please email your information to the ASP Headquarter (headquarters@photobiology.org). The more we use the site, the more active it will be. So please use this service for your job needs.

I would like to welcome Big Voice Communications (https://bigvoicecomm.com) to our team. They will be assisting ASP in improving public relations and marketing strategies. If you have any thoughts related to communications of ASP, please don't hesitate to share. You may email your ideas to the headquarter or to me directly.

Finally, I would like to hear your thoughts regarding how to improve ASP and its services to our members. Please feel free to email me if you have any suggestions and comments for our society.

Wish you all having a wonderful fall season.

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ASP 2022 Awards

We are very pleased to announce the following 2022 ASP Awardees:

ASP Research Award:
Andres Thomas

ASP New Investigator Award:
Masaoki Kawasumi

ASP Light Path Award:
Yu-Ying He

ASP Photon Award:
Georg Wondrak

ASP Lifetime Achievement Award:
James Cleaver

Editor's Student Research Award:
Houston Cole

Photocite A- Award:
Imran Ali et al. Kinetics, Thermodynamics, and Modeling of Amido Black Dye Photodegradation in Water Using Co/TiO_2 Nanoparticles Photochem Photobiol 2018; 94:935-941.

Photocite B – Award:
Michael R. Hamblin, Mechanisms and Mitochondrial Redox Signaling in Photobiomodulation**,** Photochemistry and Photobiology, 2018, 94, 199-212.

Frederick Urbach Memorial Student Travel Awards:
1 - Veronica Bahamondes
2 - Chanda Bhandari
3 - Sharayu Chandratre
4 - Natalia Gutierrez
5 - Brittany Rickard
6 - Nimit Shah
7 - Dennis Sourvanos
8 - Marvin Xavierselvan

9 - Yuxi Zhou
10 - Ryan Grant
11 - Jonathan Church

•Please visit the ASP website for further information.

Meet a Photobiologist

Tom Coohill, recently-retired, former ASP president

How did you start working in Photobiology?

My thesis was on ultraviolet radiation, studying with Reg Deering at Penn State. Our interest was in photobiophysics especially ultraviolet effects. In particular, I studied biological action spectra – i.e., how different wavelengths affect cellular functions, particularly survival and mutation. We assumed a peak response for mammalian lethality at the DNA absorption maximum (260 nm), but, unexpectedly, found it at 270 nm between DNA (260 nm) and protein (280 nm). Our explanation was that differential absorption by wavelength as the UV beam penetrated through the cytoplasm accounted for this 10 nm shift. Subsequently, my career evolved around applying action spectrum techniques to a variety of human cells and viruses. We had a first class UV monochromator at Penn State, When I started my own lab the first thing I did was to build a similar one. I submitted a grant to look at UV action spectra to study yeast, but it wasn't funded. I then proposed using action spectra to study mammalian cell functions which was funded and became the direction I followed.

How did you get involved in the ASP?
Some time after I set-up my own research group I got a call from George Cantor informing me about a new society, the ASP. I joined the 2nd year after it started. I immediately enjoyed the mix of biologists, physicists, chemists and medical doctors that comprise the ASP. Or, rather, I should say photophysicists, photobiologists, photochemists, and dermatologists. After about 10 years, I ran for council- I can't remember why; I think someone nominated me. Then in the late 1980s I ran for president. I stayed involved after that.

What was the ASP like then?
Well, compared to other societies I was involved in like the American Physical Society and the Biophysical Society, the ASP was much smaller. That had many benefits, e.g., you got a sense of camaraderie that larger societies lacked. When I was President, ASP was under financial stress. As president I had to cut expenses to balance the budget. For example, we took newsletter production and mailing in-house to bring that cost nearly to zero. To balance the books, I also had to raise ASP membership dues. I had support from David Kessel and Homer Black (both ASP Treasures) who advised how to "gently" break the

news to the society that we were going to need to double membership fees.

What have been your photobiology research interests?

My whole career revolved around ultraviolet action spectra. As I prepared to retire, UV action spectra for viruses and cells became a hot topic again. COVID blindsided us and showed the need for UV sterilization (including solar UV). I became involved, advising how ultraviolet light could be used to disinfect gathering places (court houses, labs, hospitals). Specifically, which wavelengths and exposures were needed to kill bacteria and viruses. I also recently worked with the NASA Mars2020 program as a UV advisor to help determine how ambient light on Mars could sterilize collected materials before they return to Earth. In fact, the Mars Rover Perseverance is up there right now collecting samples for a 2032 return.

What is your long-term outlook for the ASP?

There are exciting areas that will emerge for photobiology. Within the ultraviolet range, there are lots of new developments. At hospitals, we are now sterilizing with wavelengths as short as 220 nm. That is an interesting wavelength that, because of limited penetration, can selectively kill microbial pathogens without harming mammalian cells. So light-based disinfection is an area that will remain important. Low-level-laser therapy also has potential. I recall going to Rochester with Kendric Smith to discuss photobiological processes in that wavelength region a while ago. There were some interesting applications presented then, some with a lot of potential. LLLT is a field that could grow substantially, and might develop into a solid area that could dovetail with ASP. After all, photons are photons

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Harnessing the Sun to Disinfect Water

Poor access to safe drinking water is a major issue for a third of the world's population, especially for those living in rural areas. Because of the abundant sunlight in many of these regions, solar disinfection technology has great promise. It's unclear, though, which form of solar disinfection would work best.

A team of researchers, led by Jaehong Kim, the Henry P. Becton Sr. Professor of Engineering at Department of Chemical & Environmental Engineering, has studied the pros and cons of five of the most common solar-based disinfection technologies that are applied at their point of use: semiconductor photocatalysis to produce hydroxyl radical, dye photosensitization to produce singlet oxygen, UV irradiation using LED powered by a photovoltaic panel, distillation using a solar still, and solar pasteurization by raising the bulk water temperature to 75 °C. The results are published in *Nature Sustainability*.

“It's really the first analysis based on how much sunlight there is around the globe, and how we can utilize the sunlight for water disinfection," Kim said. "Disinfection is the most important treatment goal in many cases because waterborne diseases are one of the leading causes of mortality and morbidity around the globe."

As part of their analysis, the researchers conclude that solar pasteurization may hold the most promise. It's less dependent on breakthroughs in materials, less affected by the types of pathogens, and it achieves a much larger disinfection capacity on average.

"The reason it's effective is because every microorganism will die if the temperature is above 75 degrees Celsius for a few minutes," Kim said. "Maybe it comes down to simply raising the temperature of the water - a simple but effective solution."

Comparing the different methods can be tricky, Kim said, since conditions vary significantly around the globe - these include pathogen type, solar intensity, and water quality.

"We decided to do a holistic view in our approach to this problem by doing testing simulation, so this whole paper is based on computer simulations," he said. "We did extensive sensitivity analysis and changed the variables to see how the performance depends on variations of certain parameters."

The researchers focused on point-of-use technologies since many of the regions they studied have a very poor infrastructure and are off the grid. As a result, centralized water treatment and distribution is not a viable solution due to the high investment and maintenance costs involved. Point-of-use water treatment technologies, though, have relatively low costs and are simple to operate.

The paper could potentially serve as a guide for other researchers in the field of solar water treatment.

"This paper for the first time critically compares technologies that people have been studying over the past many decades," Kim said. "I'm hoping that it becomes an important reference and guideline for anyone studying and practicing solar disinfection for water treatment."

Source: Yale

The Quest for a Better Sunscreen

Many summer days start with slathering on sunscreen to prevent sunburn, skin damage, and skin cancer. A common ingredient in sunscreens is avobenzone, which works by absorbing the sun's ultraviolet rays.

Despite its role as a protector from the sun, avobenzone itself breaks down when exposed to sunlight, rendering it ineffective in a matter of hours.

"I have two small kids, and I'm always telling them to reapply sunscreen every hour or two because as avobenzone decomposes, it doesn't do its job anymore," says Marcus Weck, a professor of chemistry at NYU. "Several years ago, my research group included a graduate student, Elizabeth Kaufman, who was passionate about skin care. We started thinking, what can we do to need less of the active ingredient and reapply it less frequently?"

Weck, a materials chemist, leads a lab that creates support structures out of polymers (materials made up of repeating chains of large molecules). When attached, these polymer structures can stabilize or enhance the active ingredients in everything from drugs to environmental compounds.

Kaufman—at the time, a PhD student in Weck's lab, and now the head of production chemistry at specialty chemical supplier BYK Wallingford—suggested that they look at the active ingredient in many sunscreens. The result of their investigation: a more stable, long-lasting avobenzone, for which Weck and Kaufman were awarded a patent this spring.

What led you to begin studying sunscreen?
It actually started with anti-cancer drugs. My group had developed a support structure for doxorubicin and other cancer drugs.

In chemistry, there's a concept called "click chemistry"—a technique for linking molecular components. This strategy has some legs, because once you develop a support structure that does "click chemistry," you can just click on components like drugs or dyes. In our cancer research, we developed biomaterials with multiple click sites.

That got Elizabeth and me thinking about whether we could apply this to something that prevents cancer, not just treats it. We knew that avobenzone decomposes, but we wanted to see what would happen if we put the active ingredient on a support structure.

What did you find?
The goal was to find a support structure for avobenzone that would stabilize the compound, not interfere with UV activity, and would be easily synthesized with readily available materials.

We decided to use a support structure called a dendrimer. Dendrimers are spherical, three-dimensional polymers that contain branches like a tree—that's where they get their name, from the Greek word for tree, "dendron." Dendrimers are used for other biomaterials applications and have several characteristics that make them a perfect support system for avobenzone.

We added avobenzone to the dendrimer support structure, resulting in what we called an "avobenzone-dendrimer conjugate," which we then exposed to UV radiation. We found that the supported avobenzone did not decompose when exposed to UV light over time, even after 24 hours—and you're not on the beach for 24 hours! Our tests even showed that adding the dendrimer support not only eliminated decomposition but increased avobenzone activity over time.

It sounds like there are some advantages to using these support structures with avobenzone. With the supported avobenzone, the idea is to have longer activity or sun protection, and less of the ingredient is needed. Another advantage: when you put avobenzone on a polymer, you make the molecules significantly larger, so it cannot diffuse as easily through the skin. This means that the sunscreen sits on the surface rather than being absorbed. Both of these are important because there's evidence that some active ingredients in sunscreen are carcinogenic in large doses.

Finally, dendrimers have film-forming properties that make them feel smooth, which has advantages for a product that you're applying to skin.

Source: NYU

Modernizing the ASP Newsletter

I started handling the ASP Newsletter in 2013, shortly after I started working at the University at Buffalo. I remember even at that time, the format of a mailed letter, delivered by email, seemed somewhat dated. That being said, I believe that some among us could enjoy such a style that is reminiscent of getting a magazine or letter or catalog in the mail, something that may be nostalgic but is no doubt decreasingly common for anyone today. A society newsletter could be considered a throwback to simpler times; to the way things were communicated in the days before email's pervasiveness, let alone Facebook, Twitter and or TikTok.

In the early 1980s, the newsletter was produced monthly. In recent years, the pace has been less than quarterly. The future ASP newsletter is aiming to return to a more frequent pace in a more modern format. I will be stepping down and handing the reigns over to Joe Huang, who is deeply dedicated to the society and has been already doing a lot in many aspects.

Incredibly, over 100 prior editions of the ASP Newsletter have been archived and can be browsed online for your reading pleasure:
https://photobiology.org/publications/newsletter-asp-news/

Over these nearly 10 years of editing the ASP news, I have learned a great deal by interacting with ASP presidents, ASP historians (i.e. David Kessel) and also interviewing photobiologists for the Meet a Photobiologist feature. I have enjoyed these greatly. I think Kendric Smith's vision to strive for active representation of all pedals of the photobiology flower as well as the goal for scientists to self-identify as photobiologists first and foremost should continue to be a major goal for the ASP.

I remain excited for photobiology and look forward to seeing great things in coming years from the ASP and its members.

-Jonathan Lovell