ASP NEWS

Winter/Spring 2021 **Vol. 50 (1)**

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President's Note

Dear ASP colleagues and friends,

I am delighted to update on what's "nu" at ASP (*pun intended*).

Our *Monthly Webinar Series* is off to a wonderful start thanks to the efforts of committee chairs Masaoki Kawasumi and Shobhan Gaddameedhi. The ASP webinar speakers have so far included:

- Dongping Zhong (Ohio State University)
- Ben Van Houten (University of Pittsburgh)
- Russell Van Gelder (University of Washington)
- Cristina Flors (Madrid Institute for Advanced Studies in Nanoscience)
- Andrés H. Thomas (National University of La Plata).

The *Monthly Webinar Series* is held on the first Thursday of the month at 1:00 pm Eastern time, in which upcoming speakers include:

- Keith Elkon (University of Washington) on April 1
- Andrzej Slominski (University of Alabama) on May 6

Many thanks to Caradee Wright, Huang-Chiao Huang, and Ruediger Birenheide for creating and launching of our new ASP website. Further work on the website continues and will include a *ASP Online Resources for Educators and Students* section, to be launched in the near future. This new website link will provide updated ASP resources and programs in an effort to engage students and professionals.

We thank the Membership Committee (headed by Andrés H. Thomas and Verónica Bahamondes Lorca) in this season's effort to attract members to join or rejoin the ASP. There was an effort in broadening the participation of photoscientists in Latin America. Presently, for Latin American scientists, there is a discount not only for new ASP memberships, but also to renew ASP memberships. The 50% discount is enabled for renewing with the discount for consecutive years. There are also special membership offers for Associate Members, including workshops on grant writing and applying for positions in industry and academics.

Amy Sullivan at ASP Headquarters is involved in seeking sponsors for our webinar series and upcoming meetings (her email address is: sponsors@photobiology.org). A job advertisements section has also been revived on our website, which presently includes an advertisement for a postdoctoral fellowship position.

We are pleased to say that special issues in *Photochemistry and Photobiology* are in process including the Karen Brewer memorial issue (guest editors: Sherri McFarland and Phoebe Glazer) and the Edward Clennan retirement issue. A special issue with a collection of papers on UV germicidal effects (editor: David Sliney) is expected to appear in the May/June 2021 issue. The special issue for the ELAFOT (Latin-American Photochemical and Photobiological Community) meeting has just appeared in the Jan/Feb 2021 issue, in which Carolina Lorente Andrés H. Thomas Denis Fuentealba served as guest editors. There are plans for another special issue on photocaging technology (guest editors: Martin Schnermann and Youngjae You) and also a 50th Anniversary ASP Issue.

We encourage you to submit manuscripts to *Photochemistry & Photobiology*. The vitality of the ASP relies on high-quality manuscript submissions to *Photochemistry & Photobiology*.
We encourage you to cast your votes for ASP councilors for rotation on at the summer council meeting. Our candidates are:

- Dae Joon Kim (University of Texas Rio Grande Valley)
- Girgis Obaid (University of Texas at Dallas)
- José Robinson-Duggon (University of Panama)
- David Sliney (Johns Hopkins School of Public Health).

Councilors will be elected by the summer council meeting.

I would like to extend by thanks to Jon Lovell, we are grateful for his efforts in editing our newsletter *ASP News*.

I encourage you to contact me with any questions that you may have: agreer@brooklyn.cuny.edu

Alexander Greer, Ph.D.
President, American Society for Photobiology
agreer@brooklyn.cuny.edu
http://academic.brooklyn.cuny.edu/chem/agreer/FirstPage.html

Meet a Photobiologist

Dr. Phoebe Glazer, University of Kentucky

How did you get introduced to photobiology?
I started my scientific career as a chemist and I didn't have strong interest in biology then. I was studying coordination chemistry but the biological side didn't come until I was a postdoc, where I fell in love with biology. I was using light activated molecules to inject electrons into proteins; photoenzymology. I have continued in my independent career working on photodynamic therapy (PDT approaches).

What type of approaches do you use for PDT?
Well, I was aware of Jean-Pierre Sauvage's work on molecular machines that could use light to control self-assembly. I thought that was an interesting area of work, and I thought that this could be applied to metal based drugs. His chemistry inspired my work in ruthenium compounds that I have been developing for PDT.

We recently interviewed Sherri McFarland who also discussed ruthenium PDT. How does your approach compare?
Actually we went to grad school together at UCSD. She is an incredible organic chemist and would help me with synthetic problems sometimes, then we would share ideas on ruthenium photophysics. Her molecules are photocatalysts that work, possibly, by singlet oxygen or electron transfer. But they are catalysts. Our approach utilizes structural distortion photochemistry. In other words, our molecules fall apart under irradiation. We recently started collaborating again after all these years.

So you make molecules that undergo chemical transformations under irradiation?
Yes. Ligands can be ejected from the metal centers, that then enable the metal centers to react with biological molecules, similar to platinum drugs. Alternatively, the ligands themselves can be toxic. But the idea is that the complex prior to irradiation is non-toxic, but after irradiation it becomes so.

Any words of advice to young photobiologists?
Be curious! What is the defining feature of a scientist? Curiosity. In academia, we have to reach certain goals and so we should reach levels of curiosity. What makes us go to work in the morning? It is curiosity. So follow your research interests.

What are you looking forward to once COVID-19 gets under control?
Getting together at conferences and talking about wild ideas. I miss seeing scientific friends in real life; not just on Zoom!

Vitamin D may prevent COVID, especially in Black patients

Higher levels of vitamin D than traditionally considered sufficient may help prevent COVID-19 infection—particularly in Black patients—or lead to less severe outcomes, two new US studies suggest.

In the first, a large single-center observational study published late last week in *JAMA Network Open*, University of Chicago researchers retrospectively assessed electronic health records of patients who had a vitamin D test in the year before testing for COVID-19 from Mar 3 to Apr 10, 2020. Those checked or treated for low vitamin D levels in the 2 weeks before coronavirus testing were excluded.

Of the 4,638 patients, the risk of a positive coronavirus test result in Black patients was 2.64 times greater if they had a vitamin D level of 30 to 39.9 nanograms per milliliter (ng/mL) than if they had concentrations of at least 40 ng/mL. And the odds of infection dropped by 5% for every 1 ng/mL increase in patients with a vitamin D level of at least 30 ng/mL, the concentration generally considered sufficient. Similar associations were not found for White patients.

Among the 4,638 patients, 27% were deficient in vitamin D (less than 20 ng/mL), 27% had insufficient levels (20 to less than 30 ng/mL), 22% had concentrations of 30 to less than 40 ng/mL, and 24% had levels greater than 40 ng/mL. Black patients tended to have lower vitamin D levels than their White peers (36% vs 16% at 20 ng/mL).

Seven percent of all participants tested positive for COVID-19, including 5% of White and 9% of Black patients. In multivariate analysis controlling for time since vitamin D level was last measured, positive COVID-19 test results were significantly linked to vitamin D levels in Black but not White patients.

Compared with patients with a concentration of at least 40 ng/mL, those with less than 20 ng/mL were 2.55 times more likely to be diagnosed as having COVID-19, while those with 30 to greater than 40 ng/mL were 2.64 times more likely. Estimated coronavirus infection rates in Black patients, stratified by vitamin D level, were 9.72% for a concentration of 20 ng/ml, 6.47% at 20 to 30 ng/mL, 10.10% at 30 to less than 40 ng/mL, and 3.82% at 40 ng/mL or higher.

Mean patient age was 52.8 years, 69% were women, 49% were Black, 43% were White, and 8% were another race or ethnicity. Vitamin D levels are influenced by exposure to sunlight and through the diet or supplements.

Lead study author David Meltzer, MD, PhD, said in a University of Chicago Medical Center press release that current vitamin D guidelines come mainly from bone health studies. "But there's also some evidence that vitamin D might improve immune function and decrease inflammation,"

"Based on these results, we think that earlier studies may have given doses that were too low to have much of an effect on the immune system, even if they were sufficient for bone health. It may be that different levels of vitamin D are adequate for different functions."

The researchers are now recruiting for two clinical trials testing whether daily vitamin D supplementation can lower the risk and severity of

COVID-19, particularly for Black people. "Currently, the adult recommended dietary allowance for vitamin D is 600 to 800 international units (IUs) per day," Meltzer said in the release. "The National Academy of Medicine has said that taking up to 4,000 IUs per day is safe for the vast majority of people, and risk of hypercalcemia [excessively high calcium levels] increases at levels over 10,000 IUs per day."

The second study, presented virtually at the Endocrine Society's annual meeting late last week, involved 124 adults with low vitamin D measured as long as 90 days before hospitalization for COVID-19 to compare the outcomes of those who had received at least 1,000 units of the vitamin weekly with those who had not, according to a society press release.

Patients who took supplements of at least 1,000 vitamin D units a week had slightly lower chances of requiring mechanical ventilation or dying of their infections (33.3% vs 37.5%), although the finding was not statistically significant. More than half of the patients who should have been taking supplements owing to a deficiency were not.

-source: cidrap.umn.edu

We need YOU!

Please submit content (science highlights, suggested links, personal stories, etc.) to ASP News.
Email: jflovell@buffalo.edu

Photosynthesis could be as old as life itself

Researchers find that the earliest bacteria had the tools to perform a crucial step in photosynthesis, changing how we think life evolved on Earth.

The finding also challenges expectations for how life might have evolved on other planets. The evolution of photosynthesis that produces oxygen is thought to be the key factor in the eventual emergence of complex life. This was thought to take several billion years to evolve, but if in fact the earliest life could do it, then other planets may have evolved complex life much earlier than previously thought.

The research team, led by scientists from Imperial College London, traced the evolution of key proteins needed for photosynthesis back to possibly the origin of bacterial life on Earth. Their results are published and freely accessible in BBA – Bioenergetics.

Lead researcher Dr Tanai Cardona, from the Department of Life Sciences at Imperial, said: “We had previously shown that the biological system for performing oxygen-production, known as Photosystem II, was extremely old, but until now we hadn’t been able to place it on the timeline of life’s history.

"Now, we know that Photosystem II shows patterns of evolution that are usually only attributed to the oldest known enzymes, which were crucial for life itself to evolve.”

Photosynthesis, which converts sunlight into energy, can come in two forms: one that produces oxygen, and one that doesn’t. The oxygen-producing form is usually assumed to have evolved later, particularly with the emergence of cyanobacteria, or blue-green algae, around 2.5 billion years ago.

While some research has suggested pockets of oxygen-producing (oxygenic) photosynthesis may have been around before this, it was still considered to be an innovation that took at least a couple of billion years to evolve on Earth.

The new research finds that enzymes capable of performing the key process in oxygenic photosynthesis – splitting water into hydrogen and oxygen – could actually have been present in some of the earliest bacteria. The earliest evidence for life on Earth is over 3.4 billion years old and some studies have suggested that the earliest life could well be older than 4.0 billion years old.

Like the evolution of the eye, the first version of oxygenic photosynthesis may have been very simple and inefficient; as the earliest eyes sensed only light, the earliest photosynthesis may have been very inefficient and slow.

On Earth, it took more than a billion years for bacteria to perfect the process leading to the evolution of cyanobacteria, and two billion years more for animals and plants to conquer the land. However, that oxygen production was present at all so early on means in other environments, such as on other planets, the transition to complex life could have taken much less time.

The team made their discovery by tracing the 'molecular clock' of key photosynthesis proteins responsible for splitting water. This method estimates the rate of evolution of proteins by looking at the time between known evolutionary moments, such as the emergence of different groups of cyanobacteria or land plants, which carry a version of these proteins today. The calculated rate of evolution is then extended back in time, to see when the proteins first evolved.

hey compared the evolution rate of these photosynthesis proteins to that of other key proteins in the evolution of life, including those that form energy storage molecules in the body and those that translate DNA sequences into RNA, which is thought to have originated before the ancestor of all cellular life on Earth. They also compared the rate to events known to have occurred more recently, when life was already varied and cyanobacteria had appeared.

The photosynthesis proteins showed nearly identical patterns of evolution to the oldest enzymes, stretching far back in time, suggesting they evolved in a similar way.

First author of the study Thomas Oliver, from the Department of Life Sciences at Imperial, said: "We used a technique called Ancestral Sequence Reconstruction to predict the protein sequences of ancestral photosynthetic proteins.

"These sequences give us information about how the ancestral Photosystem II would have worked and we were able to show that many of the key components required for oxygen evolution in Photosystem II can be traced to the earliest stages in the evolution of the enzyme."

Knowing how these key photosynthesis proteins evolve is not only relevant for the search for life on other planets, but could also help researchers find strategies to use photosynthesis in new ways through synthetic biology.

"We could develop photosystems that could carry out complex new green and sustainable chemical reactions entirely powered by light."

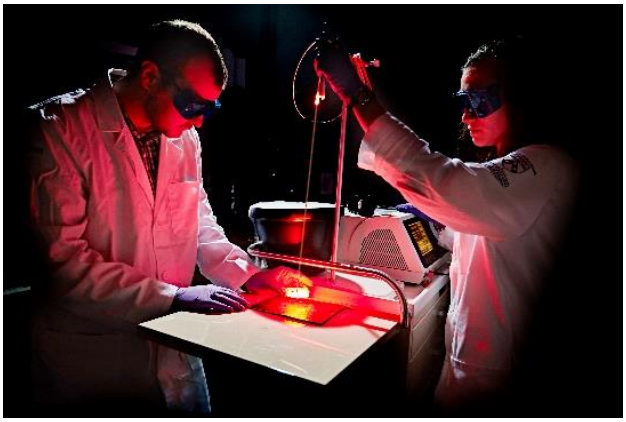
-source: Imperial College London

Upcoming Photobiology Events

2021 ASP Symposium

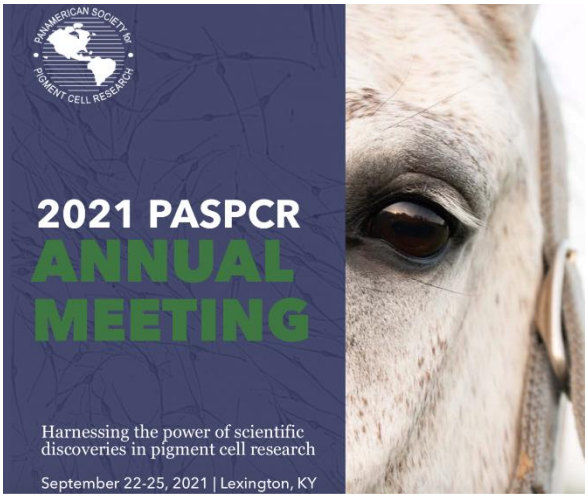
Our 2021 meeting will be a symposium in celebration of *Theresa Busch's 20th anniversary at the University of Pennsylvania* at 11-1 & 2-5 pm on June 8, 2021 (https://photobiology.org/asp-2021-symposium/). Speakers include:

- Keith Cengel (University of Pennsylvania)
- Jonathan Celli (University of Massachusetts, Boston)
- Bin Chen (University of the Sciences)
- Gwendolyn Cramer (University of Pennsylvania)
- Sandra Gollnick (Roswell Park)
- Tayyaba Hasan (MGH and Harvard University)
- Huang-Chiao Huang (University of Maryland)
- Srivalleesha Mallidi (Tufts University)
- Sherri McFarland (University of Texas at Arlington)
- Yi Hong Ong (University of Pennsylvania)
- Imran Rizvi (University of North Carolina)
- Bryan Q. Spring (Northeastern University)
- Gal Shafirstein (Roswell Park)
- Timothy Zhu (University of Pennsylvania)



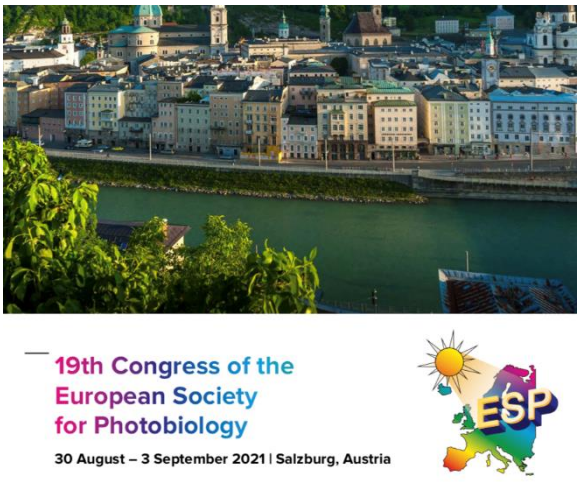
PanAmerican Society of Pigment Cell Research (PASPCR) meeting

This meeting is scheduled for Sept. 22–25, 2021 in Lexington, Kentucky and may be online, in-person, or hybrid. Organizers of the meeting include John D'Orazio, Phoebe Glazer, and Shioban Gadameedhi.



ESP 2021

The European Society for Photobiology (ESP) 2021 congress will be held from August 30 to September 3, 2021. Check out their website at http://salzburg2021.photobiology.eu). We have been working with Franz Trautinger, ESP President, and there will be a joint ASP-ESP symposium co-chaired by Jean Krutman and Thierry Douki.



ASP 2022

We are excited about the upcoming Albuquerque 2022 meeting. This meeting will include Frank Gasparro's Past Presidents' Bridges-to-the-Future symposium.