# ASP NEWS

**Spring/Summer 2016** **vol. 45 (2)**

## IN THIS ISSUE



## Editor's note

ASP 2016 in Tampa has come and gone with enjoyment for all. The sunny weather, delectable conference food, intimate science and most importantly all the wonderful people made this a conference for all attendees to remember.

Many thanks to Beth Gaillard and all the supporting staff and volunteers for organizing this success.

ASP 2016 sent a message to attendees: "Our society, our journal". Overall, manuscript submission by ASP members to our society journal, Photochemistry and Photobiology has reached low levels. All ASP members are now highly encouraged to submit research and review articles, which will help our society greatly.

As a newsletter side note, we welcome Joe Huang to the team who will be co-editing the ASP newsletter.

-Jonathan Lovell

## Meet a Photobiologist


-Georg Wondrak, ASP president

**Q**: Where did you grow up?

**A**: I grew up in former West Berlin, surrounded by the wall. It came down when I was a young man. The day the wall came down, I was working for Janssen Pharmaceuticals after getting my undergrad degree at ETH, and transiting from West Germany via East Germany onto Berlin – it was incredible. Actually it is thanks to the reunification that I met my wife.

Q: How did you get involved in photobiology?

A: After working for Janssen for a few years, I was ready to go back to research. I did my PhD at the Technical University of Berlin and I focused on the chemistry of aging. We were working on lipid peroxidation and protein glycation chemistry. I then moved to the US to University of Kentucky to study light-induced skin aging. The question was whether histones are subject to glycation during photodamage.

Q: Is that still your main research interest?

A: My major interests involve studying and modulating mechanisms underlying photooxidative damage in skin relevant to aging and carcinogenesis, research that I am pursuing as an Associate Professor of Pharmacology and Toxicology at the University of Arizona, located in beautiful Tucson.

Q: How did you get involved with the ASP?

A: I first attended the 2004 Seattle meeting. The next year I started an assistant professor position and later co-chaired an ASP session with Mike Davis in Burlingame in 2008. Lisa Kelly encouraged me to get involved with the society and Al Girrotti asked me to run for council. In 2010 in Rhode Island, I became councilor and also took over as chair of the awards committee from Helene Hill. Beth Gaillard has been a great mentor too and gave me the confidence to run for president.

Q: As president of the ASP, what are your goals?

A: We need to be vibrant. Photochemically speaking, I want energy transfer with a high quantum yield. We don't want unproductive internal conversion. I want intersystem crossing - to break through to the other side. In 4 years from now, I want 1000 members. I will engage more and act as an integrator who pulls things together. For example, I want to use the wisdom of members who have served in the society for a long time and also tap into the energy of the young members.

-We caught up with Georg in Tampa

## Perspective: 2 ASP meetings, 10 years apart: From Doctoral student to Established Researcher

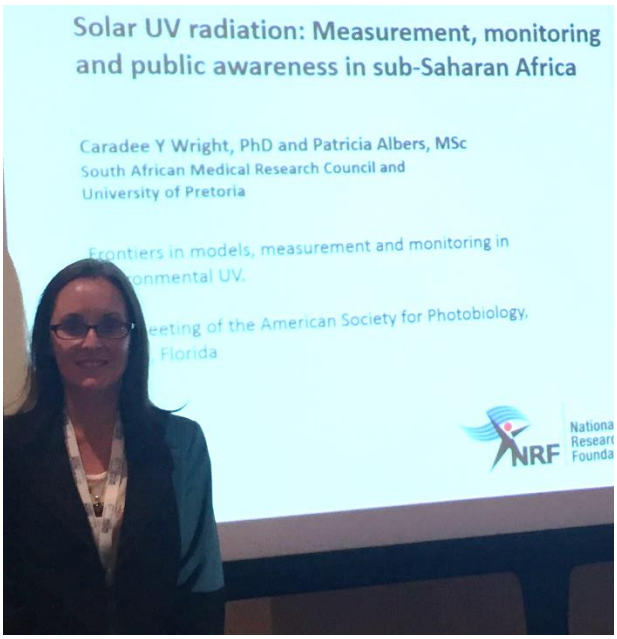

-Caradee Y. Wright at ASP 2006

In 2006, I first learnt of the American Society for Photobiology (ASP). I received a very friendly letter of invitation from Elisabeth Thieden inviting me to present on the personal solar UV radiation dosimetry work I had done as part of my masters and doctoral studies in South Africa and New Zealand, respectively. At the time, I was a doctoral student at the University of Otago and living in Dunedin, New Zealand. The 33rd annual meeting of the ASP was being held in Rio Grande, Puerto Rico – very far away from New Zealand and a relatively expensive journey for a student to afford. I applied for the Frederick Urbach Memorial Travel award. In a letter from Frances Noonan, I was told that I was fortunate enough to be awarded one of the awards to help support my attendance at the meeting. It was my first presentation at an international conference. I presented part of my talk on a review paper, co-written with my advisor Tony Reeder, and published in Photochemistry and Photobiology in 2005. Unbeknown to me, Photochemistry and Photobiology was the journal of

the ASP (I only realized that when I was at the meeting in Rio Grande).

My time at the meeting was valuable in that I learnt from others working in my field, heard about the excellent work that they were doing and get ideas on what to do next. I don't remember whether there were young researchers' events, and I don't remember meeting any other awardees of the Frederick Urbach Memorial Travel award. Two memories stand out for me. One was a lovely lunch with Elisabeth and her husband beside the hotel pool when we talked about the challenges of dosimetry studies, but also about our families and plans for the future. The second was probably one of the most adventurous things I have done in my life. It was one of the ASP organized afternoon-off activities. I went sea kayaking into an enclosed bay at night and saw tiny micro-organisms, or dinoflagellates, bioluminesce as we ran our paddles and hands through the water. It was beautiful, even if the trip up into the bay was harrowing as we fought against the outgoing tide. I shared the kayak with a wonderful ASP member, I wish I could remember her name, and if it hadn't been for her strength, I don't think I would have made it to the bay.

Ten years on, when Joanna Turner invited me to present at the 38th meeting of the ASP, I accepted almost immediately (and worried about the funding after). Even though I had discontinued my membership subscription (due to the relatively high cost) I still received the society's newsletter and kept up to date with my colleagues' research by regularly reading the journal's table of contents. Between 2003 and 2016, I had published six papers in Photochemistry and Photobiology. At the 2016 meeting in Tampa Bay, I presented on the known solar UV radiation-related health effects in Africa which Robyn Lucas, Mary Norval and I had recently published in a systematic review. During the 38th meeting, I felt a strong sense of nostalgia reflecting on the first ASP meeting that I attended, wishing I hadn't waited ten years to attend another meeting and thinking hard about a way to try and fund my membership subscription. I spent time with colleagues with whom I usually only exchange email, and I made new friends too. I was also so pleased to see the energy among the Associate Members. I commend the ASP for their support of and efforts to arrange side events for these researchers to spend time together. I attended the Mentoring lunch and was so impressed with the commitment shown by the Associate Members to the ASP. They are the future of the society; it will be their faces we see at the 50th meeting and the years beyond!




at ASP 2016

-Contributed by Caradee Wright, Pretoria, S. Africa

**ASP Election Results**

With the most recent ASP election, the current ASP leadership landscape is now as follows:

**President:**
Georg Wondrak (Div. 4, ’16-’18)
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**Past-President:**
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**Executive Secretariat:**
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## 2016 ASP Award Winners

ASP awards were given at the meeting in Tampa. We warmly congratulate the following scientists on their success

**Lifetime Achievement Award**
*This award recognizes the illustrious career of a senior researcher whose work has significantly advanced any of the research areas encompassed by the ASP.*

- Frances Noonan

Dr. Frances Noonan identified ultraviolet B light as the waveband active in initiating cutaneous malignant melanoma, the most aggressive and most lethal form of skin cancer. Additionally, she determined that UVB exposure at an early age was critical in initiating melanoma. These results were published in 2001 in Nature and in 2004 in Cancer Research. More recently, see *Melanoma induction by ultraviolet A but not ultraviolet B radiation requires melanin pigment.* Noonan FP, Zaidi MR, Wolnicka-Glubisz A, Anver MR, Bahn J, Wielgus A, Cadet J, Douki T, Mouret S, Tucker MA, Popratiloff A, Merlino G, De Fabo EC. Nat Commun. 2012 Jun 6;3:884.

**Research Award**

*This award recognizes individuals who have made significant contributions with major impact in the fields of photomedicine, photobiology, photochemistry, and/or photophysics.*

- **Antony Young**

Dr. Antony Yong is a Professor of Experimental Photobiology at the St John's Institute of Dermatology of King's College, London. Dr. Yong is interested in the acute and long-term adverse effects of solar ultraviolet radiation (UVR) on the skin, the most important of which is skin cancer. The Photobiology Unit he is leading is also interested in vitamin D photosynthesis which is the only established beneficial effect of solar UVR.

**L to R:** Antony Young, recipient of the ASP Research Award 2016 with Georg T. Wondrak, ASP President 2016-2018

**New Investigator Award**

*This award is intended to recognize research excellence in the fields of photomedicine, photobiology, photochemistry, and/or photophysics, typically carried out within the first ten years of obtaining the terminal academic degree.*

- Imran Rizvi
- Conor Evans

Dr. Imran Rizvi is an Assistant Professor at the Wellman Center for Photomedicine of Harvard Medical School at the Massachusetts General Hospital. Dr. Rizvi is interested in developing 3D models for human tumors, with an emphasis on ovarian cancer. He draws on concepts from tissue engineering, tumor biology and advanced optical imaging to create in vitro systems that can be used to design and evaluate photodynamic therapy-based combination regimens for cancer. Growth and characterization of these cultures is a collaborative effort in Dr. Rizvi's group. Dr. Conor Evans now serves as an Assistant Professor at the Wellman Center for Photomedicine of Harvard Medical School at the Massachusetts General Hospital. The Evans lab's research is focused on the development and clinical translation of optical microscopy and spectroscopy tools, with specific interests in

ultrasensitive detection of molecular markers, label-free imaging of tissues, and the imaging and quantification of tissue oxygenation. Dr. Evans has led the use of coherent Raman imaging technologies in biomedicine, and was the first to apply this imaging toolkit for the real-time visualization of lipids in skin in vivo. He has developed a number of imaging devices and methods, including coherent Raman imaging, time-lapse Optical Coherence Tomography, hyperspectral confocal microscopy, tissue clearing methods, and "smart" sensing bandages. He currently holds 9 patents and patent applications and has more than 30 peer-reviewed publications.

**L to R**; Imran Rizvi, recipient of the New Investigator Award, with Keith Cengel, ASP President 2014-2016.

**L to R:** Conor Evans, recipient of the New Investigator Award, with Theresa Busch, ASP treasurer.

**Photocite-A Award**

- Peter R. Ogilby

The ASP PhotoCite Awards A and B are given to the authors of "an original research article" and "a 'review article", respectively, in Photochemistry & Photobiology (P&P), published during the last four years that received the most hetero-citations (citations by others) during that period.

**Photocite-B Award**

- Jean Cadet & Thierry Douki

**Editors Student Research Award**

*This will honor an individual who has published outstanding research in P&P as the first author in 2013-2015, and must have been a graduate or undergraduate student at the time of submission.*

- Ashwini Ghogare

**Frederick Urbach Memorial Student Travel Award**

*These were established in memory of Fred Urbach, ASP past-President. The award is intended to assist ASP students and post-docs with travel expenses in order to present a poster or presentation of their work to the ASP meetings.*

- Sriram Anbil
- Roxanne Bérubé
- Shyamosree Bhattacharya
- Emma Briars
- Zinflou Corinne
- Richard Davis IV
- Marie-Catherine Drigeard Desgarnier
- Damioloa Gajuyigbe
- Ashwini A Ghogare
- Shipra Gupta
- Huang Chiao Huang

- Devi Kalyan Karumanchi
- Daniel Kraus
- Pratheeba Palasuberniam
- Anna Pilat
- Marvin Pollum
- Zachary Silber
- Stacey Sova
- Michael Vega
- Sally Yacout

**We need YOU!**

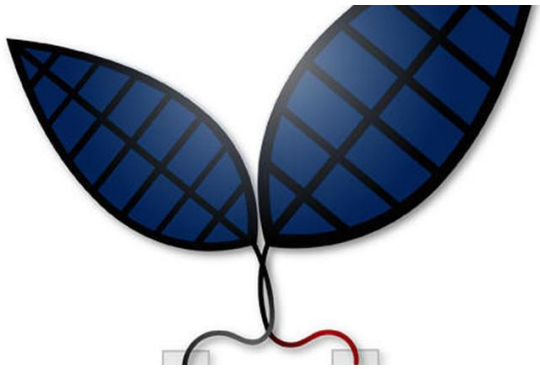
Please submit content (science highlights, suggested links, personal stories, etc) to ASP News. Email: jflovell@buffalo.edu or Huang.Huang-Chiao@mgh.harvard.edu

**Bionic leaf turns sunlight into liquid fuel**

The days of drilling into the ground in the search for fuel may be numbered, because if Daniel Nocera has his way, it'll just be a matter of looking for sunny skies.

Nocera, the Patterson Rockwood Professor of Energy at Harvard University, and Pamela Silver, the Elliott T. and Onie H. Adams Professor of Biochemistry and Systems Biology at Harvard Medical School, have co-created a system that uses solar energy to split water molecules and hydrogen-eating bacteria to produce liquid fuels.

The paper, whose lead authors include post-doctoral fellow Chong Liu and graduate student Brendan Colón, is described in a June 3 paper published in Science.



"This is a true artificial photosynthesis system," Nocera said. "Before, people were using artificial photosynthesis for water-splitting, but this is a true A-to-Z system, and we've gone well over the efficiency of photosynthesis in nature."

Dubbed "bionic leaf 2.0," the new system builds on previous work, which -- though it was capable of using solar energy to make isopropanol -- faced a number of challenges.

Chief among those challenges, Nocera said, was the fact that the catalyst used to produce hydrogen -- a nickel-molybdenum-zinc alloy -- also created reactive oxygen species, molecules that attacked and destroyed the bacteria's DNA. To avoid that problem, researchers were forced to run the system at abnormally high voltages, resulting in reduced efficiency.

"For this paper, we designed a new cobalt-phosphorus alloy catalyst, which we showed does not make reactive oxygen species," Nocera said. "That allowed us to lower the voltage, and that led to a dramatic increase in efficiency."

The system can now convert solar energy to biomass with 10 percent efficiency, Nocera said, far above the one percent seen in the fastest growing plants.

In addition to increasing the efficiency, Nocera and colleagues were able to expand the portfolio of the system to include isobutanol and isopentanol. Researchers also used the system to create PHB, a bio-plastic precursor, a process first demonstrated by MIT professor Anthony Sinskey.

The new catalyst also came with another advantage -- its chemical design allows it to "self-heal" -- meaning it wouldn't leech material into solution.

Though there may yet be room for additional increases in efficiency, Nocera said the system is already effective enough to consider possible commercial applications but within a different model for technology translation.

Working in conjunction with the First 100 Watts program at Harvard, which helped fund the research, Nocera hopes to continue developing the technology and its applications in nations like India with the help of their scientists.

In many ways, Nocera said, the new system marks the fulfillment of the promise of his "artificial leaf" -- which used solar power to split water and make hydrogen fuel.

-source: Harvard.edu

**A Slight Increase in Pediatric Cancer Risk Seen with Infant Phototherapy**

Phototherapy, increasingly used to treat jaundiced infants, could very slightly raise the risk of pediatric cancers, particularly myeloid leukemia, according to epidemiological research published online in May in Pediatrics.

At very high levels, bilirubin, a byproduct of the normal breakdown of old red blood cells, turns the skin and whites of the eyes yellow and can get into the brain, where it can cause cerebral palsy and hearing loss. Infants are susceptible to this condition, and in recent years, doctors have been treating it more aggressively with blue light therapy, which changes the shape of the bilirubin molecule and allows it to be excreted more easily.

But the association these new epidemiological studies found between phototherapy and cancer suggests the benefits should be balanced against the possible risk, especially for babies with Down syndrome, who are at elevated risk for cancer.

The slight increased risk of cancer was found in one study but only partly confirmed in the other. But the authors said it was enough to warrant at least a little more caution in using phototherapy. For babies born with Down syndrome, the potential risk due to phototherapy is greater, because they start out with a 10-fold higher risk of cancer, particularly leukemia, even if they do not get phototherapy.

"A lot of phototherapy is being given to babies whose bilirubin never reached the level recommended for treatment," said Thomas Newman, MD, MPH, an author of both studies and a professor of epidemiology and biostatistics and pediatrics at UC San Francisco. "Phototherapy is being given to babies just in case, to prevent readmission later. Although the risk of cancer is small – no more than one in 1,000 for most babies – and still must be regarded as uncertain, it is probably prudent to save phototherapy for the babies who most need it."

The blue light used in phototherapy, which is close to ultraviolet light on the spectrum, causes DNA damage and some scientists have long suspected it may be carcinogenic. Previous studies on phototherapy have had mixed results. The researchers said that could be because the cancer risk in babies is so low to begin with that the effects of phototherapy are only apparent when enough newborns are followed.

The two studies are among the largest to date. One examined about 500,000 babies born at Kaiser Permanente Northern California between 1995 and 2011, the other more than 5 million babies born in California between 1998 and 2007.

Both datasets showed an association between phototherapy and some cancers – myeloid leukemia in both cases, liver cancer in the Kaiser study and kidney cancer in the statewide dataset. The Kaiser study, which included data on more factors that might lead to both phototherapy and cancer, found that most associations were no longer statistically significant after the

researchers adjusted for these variables. However, there was an association with myeloid leukemia for babies who received higher doses of phototherapy, and this association persisted after the researchers adjusted for potentially confounding factors. The authors cautioned this result was based on only two babies who were treated twice or more with phototherapy.

"Health care providers should look at phototherapy the way they do other treatments, as having both benefits and potential risks," said Andrea Wickremasinghe, MD, of Kaiser Permanente Santa Clara, lead author of the California study. "We should probably be more cautious about giving phototherapy, particularly to babies with Down syndrome and babies with bilirubin levels that are below the thresholds recommended for treatment. On the other hand, we would not want excessive concern about this low and uncertain cancer risk to frighten people away from phototherapy when it is needed."

-source: ucsf.edu

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### Scientists Show Super Complex In Photosynthesis of Spinach in Structural Biology Breakthrough

Chinese researchers at the Institute of Biophysics of the Chinese Academy of Sciences make photosynthesis breakthrough.

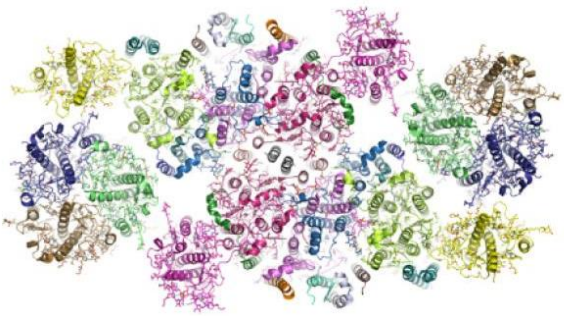
Chinese researchers make breakthrough in structural biology in photosynthesis. Understanding the inner workings of photosynthesis can have major impact on how we create energy in the future. Plants are still way ahead of humans in using the sun for energy.

During photosynthesis, the plant photosystem II core complex receives excitation energy from the peripheral light-harvesting complex II (LHCII). The pathways along which excitation energy is transferred between them, and their assembly mechanisms, remain to be deciphered through high-resolution structural studies.

The scientists around Liu Zhenfeng, Li Mei and Zhang Xinzheng show the structure of a 1.1-megadalton spinach photosystem II–LHCII supercomplex solved at 3.2 Ångström (0.1 nm) resolution through single-particle cryo-electron microscopy.

The structure reveals a homodimeric supramolecular system in which each monomer contains 25 protein subunits, 105 chlorophylls, 28 carotenoids and other cofactors. By analyzing the closely connected interfacial chlorophylls, the research team has obtained detailed insights into the energy-transfer pathways between the antenna and core complexes.

The study was published in Nature on May 18th.



## Upcoming Photobiology Events

September 1-4, 2016
**7th International Conference on Oxidative Stress in Skin Medicine and Biology**
Andros, Greece
http://oxstress.pharm.uoa.gr/

October 24-28, 2016
**Photodynamic Therapy and Photodiagnosis**
Nancy, France
http://www.pdt2016.com/

August 7-12, 2016
**17th International Congress on Photosynthesis**
Maastricht, Netherlands
http://www.ps2016.com

July 16-21, 2017
Gordon Research Conference on Photosynthesis
Sunday River, ME
https://www.grc.org/programs.aspx?id=11914