ASP NEWS

Connect

Summer 2015 **vol. 44 (3)**

IN THIS ISSUE

Virtual Poster Symposium Recap

The very first Virtual Poster Symposium was recently held online, at http://photobiology.org/virtual2015.

A number of participants contributed not only posters, but videos as well. The judges had a particularly tough time with lots of favourites amongst the competitors.

The combined winner who contributed both a talk and a poster was Rachel Murkett with her poster: *Spectroscopic Studies into the Aggregation of a Photosynthetic Pigment, Lutein*, contributed by Rachel Murkett and Sophie Jackson from the Department of Chemistry, University of Cambridge.

The overall individual poster winner was Marvin Pollum, with his poster: *DNA- and RNA-Targeting Phototherapeutics Using Sulfur-Substituted Mimics of the Natural Nucleobases* by Marvin Pollum and Carlos E. Crespo-Hernández from Department of Chemistry and Center for Chemical Dynamics, Case Western Reserve University.

The best video was awarded to Emma Briars for the accompanying video to: *The Impact of Tumor-Endothelial Cell Crosstalk on Treatment Response in 3D Ovarian Cancer Models*, Emma Briars, et al., Wellman Center for Photomedicine, Massachusetts General Hospital, Harvard Medical School.

Finally all entrants were asked to participate in the judging themselves, and voted for their favourite poster and video amongst their peers. The People's Prize was resoundingly awarded to Joyce Liu for: Photodynamic Therapy Based Modulation of Molecular Targets for Enhanced Irinotecan Therapy in Pancreatic Cancer by Joyce Liu, Huang-Chiao Huang, Srivallesha Mallidi, Chun-Te Chiang, Zhiming Mai, Ruth Goldschmidt, Imran Rizvi and Tayyaba Hasan; Wellman Center for Photomedicine, Massachusetts General Hospital and Harvard Medical School.

Most posters and videos have now been made public to view online on at http://photobiology.org/virtual2015. Why not head over and see if you would have made the same decisions in voting? All of the entrants did a fabulous job, and are worth checking out!

A big thank you to all the entrants who entered the competition, and an even bigger thankyou to all the judges and organisers of the event. We hope to see you again in 2017, for the 2nd Virtual Poster Symposium.

-Joanna Turner, PhD

Sunlight and Pancreatic Cancer link

Pancreatic Cancer Risk Linked to Weak Sunlight
UC San Diego epidemiologists suggest harm may come from low Vitamin D

Writing in the April 30 online issue of the Journal of Steroid Biochemistry and Molecular Biology, researchers at University of California San Diego School of Medicine report pancreatic cancer rates are highest in countries with the least amount of sunlight. Low sunlight levels were due to a combination of heavy cloud cover and high latitude.
Image

Maps depict global incidence rates of pancreatic cancer (per 100,000) and ultraviolet B radiation (watts per square meter).

“If you’re living at a high latitude or in a place with a lot of heavy cloud cover, you can’t make vitamin D most of the year, which results in a higher-than-normal risk of getting pancreatic cancer,” said first author Cedric F. Garland, DrPH, adjunct professor in the Department of Family Medicine and Public Health and member of UC San Diego Moores Cancer Center.

“People who live in sunny countries near the equator have only one-sixth of the age-adjusted incidence rate of pancreatic cancer as those who live far from it. The importance of sunlight deficiency strongly suggests – but does not prove – that vitamin D deficiency may contribute to risk of pancreatic cancer.”

Limited foods naturally contain vitamin D. Fatty fish, such as salmon and tuna, are good sources; beef liver, cheese and egg yolks provide small amounts. Vitamin D is often added as a fortifying nutrient to milk, cereals and juices, but experts say most people also require additional vitamin D to be produce by the body when skin is directly exposed to sunlight. Specifically, ultraviolet B radiation. Skin exposed to sunshine indoors through a window will not produce vitamin D. Cloudy skies, shade and dark-colored skin also reduce vitamin D production.

The UC San Diego team, led by Garland and Edward D. Gorham, PhD, associate professor, had previously shown that sufficient levels of a metabolite of vitamin D in the serum, known as 25-hydroxyvitamin D was associated with substantially lower risk of breast and colorectal cancer. The current paper is the first to implicate vitamin D deficiency with pancreatic cancer.

Researchers studied data from 107 countries, taking into account international differences and possible confounders, such as alcohol consumption, obesity and smoking. “While these other factors also contribute to risk, the strong inverse association with cloud-cover adjusted sunlight persisted even after they were accounted for,” said Garland.

UC San Diego researchers had previously identified an association of high latitude with a higher risk of pancreatic cancer. Garland said the new study advances that finding by showing that an estimate of solar ultraviolet B that has been adjusted for heavy cloud cover produces an even stronger prediction of risk of pancreatic cancer.

Pancreatic cancer is the 12th most common cancer in the world, according to World Cancer Research Fund International, with 338,000 new cases diagnosed annually. Incidence rates are highest in North America and Europe; lowest in Africa and Asia. It is the seventh most common cause of death from cancer.

-source: UCSD

We need YOU!

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

Photosynthesis: Nano-enhancement

A new process has been developed for spontaneously incorporating and assembling carbon nanotubes (CNTs) and oxygen scavenging nanoparticles into chloroplasts, the part of plant cells that conduct photosynthesis -- converting light into energy. Incorporation of CNTs enhanced electron flow associated with photosynthesis by 49% in extracted chloroplasts and by 30% in leaves of living plants, and incorporation of cerium oxide nanoparticles (nanoceria) into extracted chloroplasts significantly reduced concentrations of superoxide, a compound that is toxic to plants.

Chloroplasts alone absorb light only from the visible portion of the solar spectrum, allowing access to only about 50% of the incident solar energy radiation, and less than 10% of full sunlight saturates the capacity of the photosynthetic apparatus. This nano-bio approach is believed to increase the breadth of the solar spectrum that is used to make energy and is expected to contribute to the development of biomimetic materials with enhanced photosynthetic activity and improved stability towards oxidative degradation.

A novel nanobionic approach has been developed that imparts higher photosynthetic activity to plant leaves and extracted plant chloroplasts, the biological organelles that convert captured carbon dioxide into solar energy. While chloroplasts host all of the biochemical machinery needed for photosynthesis, little is known about how to engineer chloroplasts extracted from plants for long-term, stable solar energy harnessing. Now, researchers at the Massachusetts Institute of Technology have discovered that highly charged single-walled carbon nanotubes (CNTs) coated with DNA and chitosan (a biomolecule derived from shrimp and other crustacean shells) are able to spontaneously penetrate into chloroplasts. The results were published in the journal Nature Materials (DOI: 10.1038/nmat3890). This new lipid exchange envelope penetration (LEEP) process for incorporating the nanostructures involves wrapping CNTs or nanoparticles with highly charged DNA or polymer molecules, enabling them to penetrate into the fatty, hydrophobic membranes that surround chloroplasts.

Incorporation of CNTs into chloroplasts extracted from plants enhanced choloroplast's photosynthetic activity by 49% compared to the control. When these nanocomposites were incorporated into leaf chloroplasts of living plants, the electron flow associated with photosynthesis was enhanced by 30%.

These results are consistent with the idea that semiconducting carbon nanotubes are able to expand the light capture by plant materials to other parts of the solar spectrum such as the green, near infrared and ultraviolet. Another major limitation in the use of extracted chloroplasts for solar energy applications is that they easily break down due to light- and oxygen-induced damage to the photosynthetic proteins. When potent oxygen radical scavengers such as cerium oxide nanoparticles (nanoceria) were combined with a highly charged polymer (polyacrylic acid) and incorporated into extracted chloroplasts using the LEEP process, damage to the chloroplasts from superoxides and other reactive oxygen species was dramatically reduced. This nanobionics approach is expected to contribute to the development of biomimetic materials for light-harvesting and solar energy conversion, as well as biochemical detection with regenerative properties and enhanced efficiency.

-source: Department of Energy

Photochemistry: Pick a color, any color

Scientists from China and Japan reported a breakthrough in understanding the molecular structures that enable plants to achieve photosynthesis.

Scientists have long understood how photosynthesis works – but only up to a point. The very fine details are hard to discern. Everything takes place at the molecular and even the atomic scale, involving proteins that are hard to see, and the coming and going of photons and electrons. Photosynthesis relies on processes that are governed by quantum physics – the laws of nature at its most granular.

But now scientists in China and Japan published a report in the journal Science that describes a more robust method of examining the microscopic light-harvesting structures in a plant.

Experts not associated with this research describe it as an incremental advance in understanding how plants, algae and cyanobacteria convert light to chemical energy. In theory this kind of research, with its close examination of natural photosynthesis, could have implications for engineers who work on solar energy and researchers who try to mimic nature with designs known as "artificial photosynthesis."

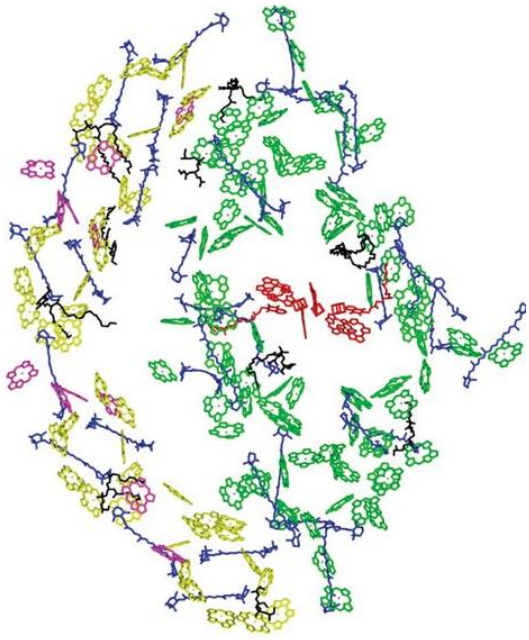
The scrutiny of the natural processes could also inspire new techniques of genetic engineering in plants themselves. Remarkable though it may be, photosynthesis -- which first appeared on Earth as early as 3.5 billion years ago -- is inefficient at exploiting the energy from the sun. Thus scientists would like to figure out how to make staple crops, such as corn, more efficient in their photosynthetic processes.

In the new paper, "Structural basis for energy transfer pathways in the plant PSI-LHCI supercomplex," Xiaochun Qin and colleagues report that they have succeeded in developing a better technique for sampling and crystallizing the proteins involved in one of the two main "photosystems" in a pea plant. They studied those proteins using X-ray crystallography.

Earlier efforts in studying this photosystem had already identified a network of molecules, including chlorophylls, carotenoids and phylloquinones, but the resolution of the imagery was insufficient to detect the precise structure of this molecular complex. The new technique essentially has brought the picture into sharper focus. What the scientists see is a system in which "antenna" proteins capture light and feed them into a kind of molecular reactor.

“The efficiency of the process is determined by the three-dimensional structures of the proteins and the cofactors (pigments, lipids etc.) that perform the process. A slight change in the three-dimensional structure of the proteins will significantly affect the efficiency,” said the study’s co-author, Jian-Ren Shen, Director of the Photosynthesis Research Center at Japan’s Okayama University, in an e-mail to The Post.

-source: Joel Achenbach, Washington Post



In memorandum: Giulio Jori, 1939-2014
Founder of the European Society of Photobiology

Dr. Jori passed away unexpectedly in December 2014.

The following excerpt is by Tom Dubbelman and is taken from Photochem. Photobiol. Sci., 2015, 14, 1223-1226, which commemorates his personality and achievements in photobiology.

Giulio was the driving force behind the start of the European Society for Photobiology. He talked about it with several European photobiologists and photochemists during several congresses, and together with Kurt Schaffner he invited a dozen scientists for a meeting in Mülheim in the Max Planck Institut für Kohlenforschung where Kurt was one of the directors. After ample discussion about a possible connection between the European Photochemistry Association and the European photobiologists, it was decided to establish a separate European Society for Photobiology.

Key discussion points at this first meeting of the ESP founding group in Mülheim were the necessity both for a Society Journal and a dedicated congress every two years and Giulio was a driving force in getting both going. The first congress was in Grenoble and this was the occasion when the first ESP executive committee was elected.

The next congress was the next year in Padova in order not to clash with other photobiology congresses. I have very fond memories of the very many contacts I had with Giulio during the meetings of the founding fathers of the ESP and those early years of the Society as I headed an election committee that asked members whether they would stand for election for the Executive Committee, and I was also a member of the editorial board of the journal. Our scientific connection through photodynamic therapy led to memorable visits to Padova.

Giulio will be remembered as a warm personality, a prominent photobiologist and the driving force and father of the European Society for Photobiology.

ASP NEWS
Published Quarterly by the American Society for Photobiology
www.photobiology.org

Contact
Jonathan F Lovell
E-mail: jflovell@buffalo.edu

Upcoming Photobiology Events

ASP 38: May 21-25, 2016, Tampa Bay

The time and place has been set! Mark your calendar and plan on joining ASP for the next conference.

31 August – 4 September, 2015
European Society for Photobiology 2015 Congress
Aveiro, Portugal
http://aveiro2015.photobiology.eu/

9th-11th September, 2015
Japanese Photochemistry Association Annual Meeting
Osaka, Japan
http://photochemistry.jp/2015/en/index.html

October 24-28, 2015
Photodynamic Therapy and Photodiagnosis
Nancy, France
http://www.pdt2016.com/

March 3, 2016
25th Annual Meeting of the Photomedicine Society
Washington, DC
http://www.photomedicine.org/currentmeeting.php

30 March – 3 April, 2016
American Society for Laser Medicine and Surgery Annual Conference
Boston, Massachusetts
http://www.aslms.org/annualconference/annualconference.shtml

Other Event Calendars
SPIE Events: http://spie.org/x1375.xml
Plant Biology Events: http://aspb.org/calendar
Chemistry Events: http://www.chemistry.org
Gordon Conferences: http://www.grc.org
Nature Events Directory:
www.nature.com/natureevents/science