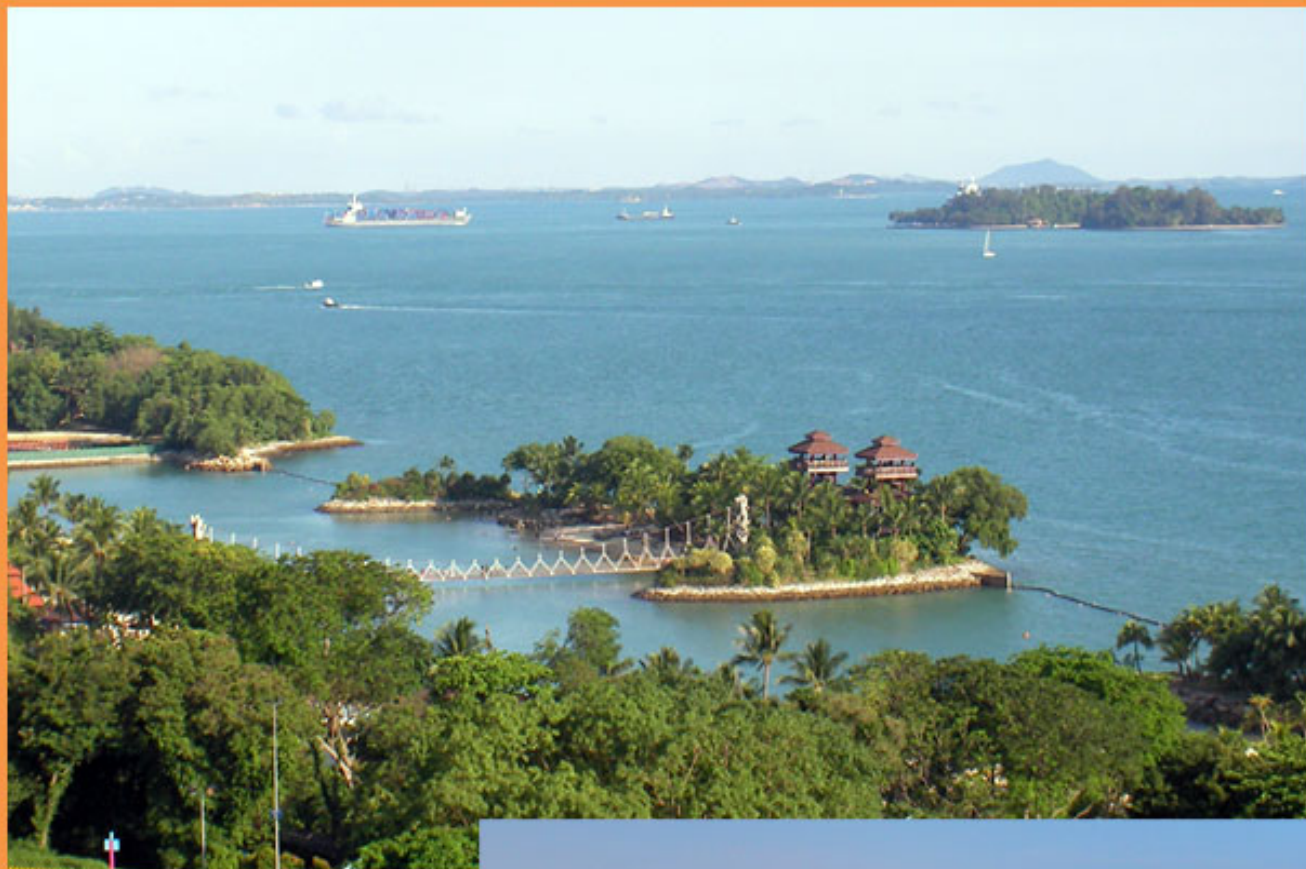


The Asian and Oceanian Photochemistry Association

Newsletter Number 1 April 2012



Special Issue: Introducing Singapore





The Asian and Oceanian Photochemistry Association

APA Newsletter Number 1 April 2012

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APA President's Preface

**Professor Minjoong Yoon,
President of the Asian and Oceanian Photochemistry Association**

It is my great privilege to write preface to the first issue of the APA Newsletter on behalf of the Asian and Oceanian Photochemistry Association (APA). First of all, with all of colleagues in the field of photochemistry and the related sciences in Asia and Oceania regions, I would like to congratulate on launching of the APA Newsletter which could be accomplished by Dr. Jonathan Hobley's great efforts. Launching of the newsletter in this year is particularly meaningful, because this year is 10th Anniversary of the APA which was officially founded in 2002 when the third Asian Photochemistry Conference was held at Mumbai, India. I think the APA newsletter must open a turning point to promote the APA one step further for the next more than 10 years in the future by providing all the photochemical societies and members in Asia and Oceania regions with opportunities to exchange scientific information as well as all kinds of activities.



In reality, the Asian and Oceanian Photochemistry Association (APA) was officially established more than 35 years behind the European Photochemistry Association (EPA) and Inter-American Photochemical Society (I-APS), even though the Japanese Photochemistry Association (JPA) was founded around the same time as the EPA and the I-APS. Nevertheless, the APA has achieved many scientific contributions very rapidly in promotion of the photochemical science in the world as well as encouragement of the international development of photochemistry and related subjects in Asian and Oceania countries by several scientific movements such as the biannual Asian Photochemistry Conference (APC), publication of journals including *J. Photochem. Photobiol. C-Photochem. Rev.* (official organ of the JPA), *Photochem. Photobiol. Sci.* (official organ of the Korean Society of Photoscience (KSP) as a part of coownership with EPA) and supporting the XXI International Conference on Photochemistry at Nara in 2003 and the XXV International Conference on Photochemistry at Beijing in 2011 and the annual Korea-Japan Symposium on Frontier Photoscience (KJFP). The APA also has been recognizing the APA-award, the award for the distinguished contribution to the APA and APA Prize for young scientists since 2005, being involved in the selection of the Porter Medal awardee with the I-APS and the EPA. From this year the APA will inaugurate Masuhara Lectureship Award at the 7th APC (Osaka, Japan November 2012) in honor of Professor Hiroshi Masuhara, the Founding President of the APA.

In spite of such scientific activities, we still need more frequent scientific communication to enhance collaboration between the APA members in universities, research institutions and industries through international contacts and exchange of scientists which is the core aim of the APA. In this point of view, I am sure that the biannual publication of the APA Newsletter will play very important roles in achieving the core aim of the APA, because the APA Newsletter will handle detail information of photochemical events and their highlights in each region, research grant calls that require international collaborators, job postings or opportunities requiring overseas applicants, publication highlights of great papers or theses from each regions, and any other relevant regional news, prestigious promotions, prestigious appointments, retirements of individual members.

Finally I would like to use this opportunity to express my gratitude to all the previous executive committee members of the APA and all the colleagues in the field of photochemistry and the related sciences in the Asia and Oceania region for their great contributions to the advancement of the APA up to the 10th Anniversary. The inauguration of the APA Newsletter seems to luster the celebration of the 10th Anniversary, and I would like to thank all the present APA executive committee members and councilors, particularly Dr. Jonathan Hobley and Professor Hiroshi Miyasaka for their great efforts of the successful edition of the 1st issue of the APA Newsletter. I hope all the colleagues continue to cooperate and support the sustainable publication of the high level Newsletter.

Forward

Jonathan Hobley

APA Council Representative for Singapore.

This is the first attempt at an APA newsletter and thanks to the help of many people it was not too time consuming to edit. Some of you may wonder why we need a newsletter. Well The Newsletter is designed to promote photochemistry and to disseminate information on the activities of the local societies. As mentioned in APA President Minjoong Yoon's preface, we are aiming to publish two APA Newsletters each year starting from this year. These are scheduled for publication in April and November of each year. In the Newsletter you will find important regional information that will help to keep the APA network of researchers connect via a knowledge of what we are all doing in our research activities and what events and initiatives we are undertaking. The APA Newsletter is also a platform of discussion about conferences that have been held as well as a medium for future conference details to be disseminated. I am sure that the Newsletter format will be flexible over time and we are very open to any suggestions for improvements or additional information that we may add to increase the benefits to APA members. The APA Newsletter is created for its members and we will have an open ear to the wishes of the members.

In this issue we will highlight some research activities, highlights and opportunities that exist in Singapore in our Regional focus section. Every issue we aim to highlight the activities of one of the APA regions, however since Singapore is now the newest member of APA it seems fitting that they (we) should kick-off this effort by introducing themselves to the rest of the APA community.

In this Newsletter we will also deliver important details on the upcoming APA meeting in Osaka this coming November as well as some other important conference events. In addition we announce the launch of a new journal by the Korean Society of Photochemistry, which is a welcome initiative to get photochemistry more prominent on the world stage. We also report on the recovery in Japan following last year's disaster.

Thanks to Minjoong Yoon for appreciating the small efforts that have gone into the making this first Newsletter, however I would like to point out that this is an honor for me to be given the opportunity to be at the heart of this mouthpiece to all of APA. I would also like to thank Professor Miyasaka, Professor Ghiggino and Professor Fukumura for their support of this initiative. Let's look forwards to a very active next 10 years of APA.

Upcoming Conferences

In this issue we have seven upcoming events to report in areas extending from Portugal in Europe and from Australia to Japan.

1) 7th Asian Photochemistry Conference (APC2012) 12-15 November 2012 Osaka, Japan

<http://photochemistry.jp/apc2012>



Icho Kaikan, Osaka University

Deadline for registration: June 30, 2012

Deadline for abstract: July 31, 2012

On behalf of the Asian and Oceanian Photochemistry Association (APA), we are happy to organize the 7th Asia and Oceania Conference on Photochemistry 2012 (APC2012). This international gathering of the scientists working in the fields of Photochemistry and related areas will be organized in Suita, Osaka, Japan, from November 12th to 15th, 2012.

APC was first held in Hong Kong in 1997, and has been held 5 times so far, Taejeon, Korea (1999), Mumbai, India (2002), Taipei (2005), Beijing, China (2008), and Wellington, New Zealand (2010).

APC2012 is an international conference for the experts working in the fields of Photochemistry and related areas all over the world. The scientific program of the APC2012 will cover all of the major disciplines of contemporary photochemistry-related science including physics, biology, medicine, materials science, engineering, and technology. The scientific committee represents a broad diversity of interests in photochemistry and, with their input, we are organizing an exciting array of scientific events composed by keynote lecture, invited talk, oral presentation, and poster session. To generate new research ideas, this conference will provide the unique opportunity for scientific interaction and exchange of ideas among the participants.

The Conference venue will be the Icho Kaikan, Osaka University. It is located in the Suita campus of Osaka University. The Hall has conference rooms, a reception hall, and a restaurant. Osaka is located at the center of Japan and easily accessed by limousine bus and/or train through Kansai airport from many cities in abroad. The Conference attendees will be able to enjoy not only the scientific program but also the culture of Japan.

We are welcoming you to Osaka and we hope all participants enjoy the exciting scientific and cultural program in November 2012 in Osaka.

Tetsuro Majima, Osaka Univ., Japan (JPA president 2010-2011)

Noboru Kitamura, Hokkaido Univ., Japan (JPA president 2012-2013)

2) The First International Conference on Photocatalysis and Solar Energy Conversion: Development of Materials and Nanomaterials - Daejeon Convention Center (DCC), Daejeon, Korea, May 29 - June 1, 2012

<http://www.redoxtech.com/pdf2012/Photocatalysis%20and%20Solar%20Energy%20Conversion%20-%20New.pdf>



Professor Professor Minjoong Yoon and Dr. Hussain Al-Ekabi at Redox Technologies Inc. in Canada are organizing a conference which will be held at Daejeon, Korea from May 29 to June 1. In this conference, four plenary speakers (Professors Akira Fujishima (Japan), Michael Graetzel (Swiss), Michael R. Hoffmann(USA), Jaesung Lee(Korea)) and 34 invited speakers will give talks. Additionally there will be 25 short talks and a poster session. You can refer to the conference website for more details. Although the deadline for submissions is officially closed, this event promises to be highly informative and the conference is held in a picturesque location as the

city is surrounded by mountains, and the the Gyeryongsan National Park reaches the city in the west.

Daejeon is South Korea's 5th largest city, and is located in the province of Chungnam in the center of the country. It is known as the science and technology capital of South Korea because it hosts many research institutes such as the Korea Advanced Institute of Science and Technology and it also hosts the Daedeok Science Town. You may wish to visit this conference as a non-participating person.

3) XXIV IUPAC Symposium on Photochemistry 15-20 July 2012 Coimbra, Portugal

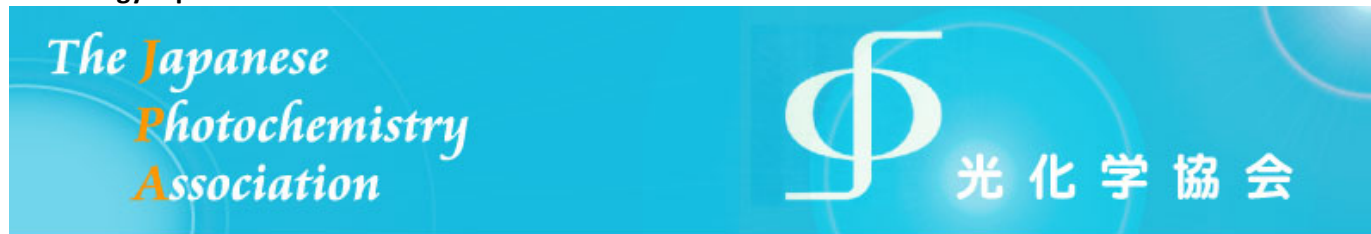
<http://www.photoiupac2012.com/>

The IUPAC Symposium on Photochemistry will be held in Coimbra, Portugal, this year. There will be plenary talks, invited talks as well as contributed talks and posters. The IUPAC conference series is held every two years and is an important photochemistry event.

The conference venue is the University of Coimbra which was founded, one century after the Portuguese nation, in 1290. Coimbra itself was one the capitol of Portugal. The city is very picturesque as it is located on a hill by the river Mondego.

The abstract submission deadline was extended until 24th April so please check to see if there will be further extensions on this. If not then you can always visit as a non-participating delegate to enjoy the talks and the historic town.

4) Japanese Photochemistry Association Annual Meeting 12th – 14th September 2012. Tokyo Institute of Technology Japan



Keep an eye on the JPA events website for more information

<http://photochemistry.jp/ENGLISH/events.htm>

The dead line of submission is May 29, 2012 (only short abstract is needed at that time, full abstract later).

International sessions are organized.

5) Photonics Global Singapore 13th – 16th December 2012

<http://www.photonicsglobal.org/index.php>

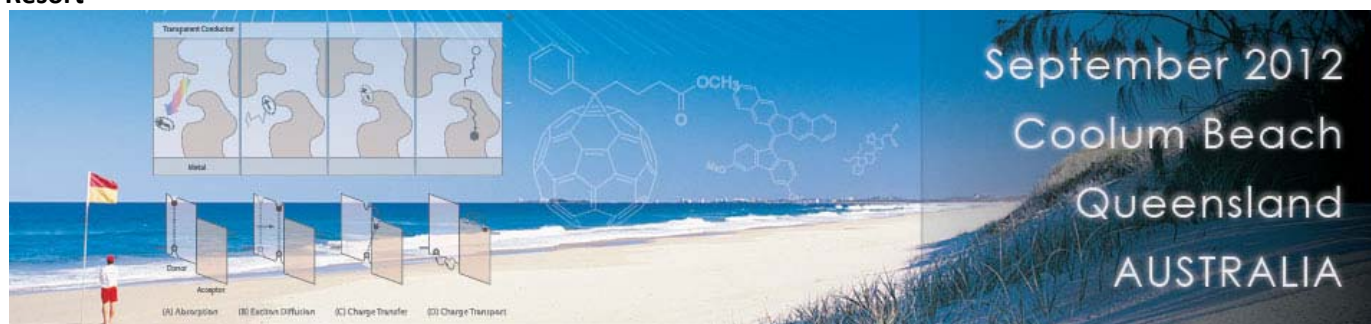
This is a biennial event held since 2008. Previous conference have attracted more than 300 delegates. Subjects include all areas of optics and light: Novel Photonic Materials and Devices, Photonic Nano-Structures and Applications, Optical Fibre Technology, Advanced Optical Communications, Biophotonics, Plasmonics and Metamaterials, Bioimaging and Sensing, Mid-Infrared and THz Photonics, Diffuse Optical Imaging and Spectroscopy, Silicon Photonics and It's Applications, Optical Fiber Grating-based Technologies and Their Applications, Green Energies in Photonics, Fibre Lasers and Their Applications, Photon-Induced Physical and Chemical Processes in Fluids, Microstructured and Special Optical Fibers, Microwave Photonics

6) Focus on Microscopy (FOM) conference, Maastricht, the Netherlands, March 24- 27, 2013

<http://www.focusonmicroscopy.org/>

See the next section for the write up of FOM2012. Further details will be released on the website.

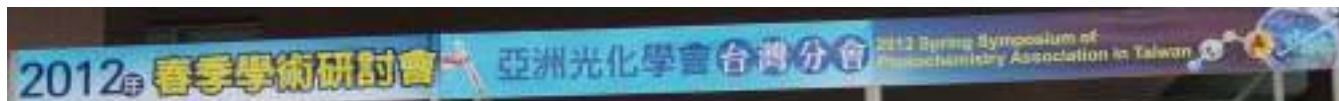
7) 3rd International Organic Excitonic Solar Cells Conference (IOESC:2012) 3rd-7th September Coolum Golf & Spa Resort



<http://www.opvaustralia.org/index.php>

The third international Organic Excitonic Solar Cell (OESC2012) conference will be held from the 3rd-7th September 2012. You are warmly invited to the Coolum Golf and Spa (formerly known as Hyatt Regency Coolum) on the beautiful Queensland Sunshine Coast, Australia. The conference will include both Dye Sensitised and Solid-State Thin Film Solar Cells. Coolum is off the Sunshine Motorway 100km North of Brisbane. Registration deadline 1st June 2012.

Conference Reports.



Conference Name: 2012 Spring Symposium of Photochemistry Association in Taiwan

Date: February 9-10, 2012

Venue: Kaohsiung Medical University

Organizer: Professor/Dean Jeh-Jeng Wang and colleague, College of Life Science, Kaohsiung Medical University

Number of Attendees (including students): 126



The main purpose of this meeting was to provide a forum for students, research assistants and post-doctoral researchers to report their research results. In addition, there were five keynote speeches given by professors (Ian Liao, Hung-Wen Li, Chih-Hung Lee, Ching-Shuang Wu, and Genin Gary Huang). The topics covered spectroscopy, dynamics, basic biomedical research and clinical medicine. The meeting also had a poster session. Students who gave excellent oral or poster presentations were awarded by the organizers. The meeting was conducted in English; students and young researchers can practice to communicate with international language.

Participation of Taiwan in APA was briefly discussed. The organizer and venue for the next regional (fall 2012) meeting were also announced.

To include a topic of applications of photochemical studies in the medical field was attempted for the first time in the Photochemistry meeting series. Future meetings may consider inviting researchers in various fields for the broadness of photochemistry researches.

Report by Dr. Jim Jr-Min Lin

Research Fellow, Institute of Atomic and Molecular Sciences Academia Sinica, Taipei, Taiwan 10617

Conference Name: Focus on Microscopy 2012 (FOM2012)

Date: 1st-4th April, 2012

Venue: Suntec City Singapore

Organizer: Colin Sheppard, Fred Brakenhoff and Thorsten Wohland

Number of Attendees: >300 presentations.

<http://www.focusonmicroscopy.org/>

This annual conference on optical techniques and imaging was held in Singapore in 2012. The conferences covered areas such as theory excitation microscopy, 3D and 4D live cell and tissue imaging Super-resolution imaging: (4pi, SIM, STED), fluorescent imaging, TIRF, Time-resolved fluorescence: FRET, FRAP, FLIM, FCS, Coherent non-linear microscopy (SHG, THG, SFG, CARS) Raman spectroscopy imaging, Correlative Light/Electron microscopy Laser

trapping and tracking, photo-activation, OCT, endoscopy , Data acquisition, High-throughput microscopy techniques, 3D image processing.

FOM 2012 also included the 25th International Conference on 3D Image Processing in Microscopy and the 24th International Conference on Confocal Microscopy.

Tutorials were held on Fundamentals of fluorescence imaging, Fluorescence correlation spectroscopy, Förster Resonance Energy Transfer (FRET) in cellular imaging and Time resolved multi-tag single molecule tracking.

Nearly 50 companies participated in the exhibition. There were well in excess of 300 contributions to the conference and many more attended as non-presenting participants. Well known photochemists were in attendance including Trevor Smith, Hiroshi Masuhara and Markus Sauer.

Singapore is a modern Asian City with easy to use infrastructure and many good quality hotels. It has, what some consider, the best food in the world. For example it is famous for chilli crab and black pepper crab dishes. Singapore was founded in 1819 by Sir Stamford Raffles.

Conference Name: Japanese Photochemistry Association (JPA) Annual Meeting

Date: September 6th – 8th 2011

Venue: Miyazaki Kyushu Japan

Organizer: JPA Masahide Yasuda, Miyazaki University (Organizing Committee Chair)

Number of Attendees: >460 presentations.



JPA annual meeting is always a bigger than average local conference with an attendance that rivals many international conferences. This year it was held in an Onsen (volcanic hot spring) resort, Miyazaki Kanko Hotel, in Miyazaki, Kyushu Island and the attendance was as usual very high with ~460 presentations scheduled.

Each day the conference ran three parallel sessions of 107 talks in total. Of these 21 of the talks were given at International Sessions (official language in English). In addition there were 348 poster allocations in the meeting. There were also 5 special addresses and award addresses as listed below.

The Japanese Photochemistry Association Lectureship Award (2011) Prof. Shunichi Fukuzumi (Osaka Univ., ALCA, JST) "Progress toward Artificial Photosynthesis"

The Japanese Photochemistry Association Lectureship Award (2011) Prof. Toshihiko NAGAMURA (Kitakyushu Natl. Col. Technol.) "Photochemistry and Photophysics for Molecular Photonics"

Lectureship Award for Asian and Oceanian Photochemist Sponsored by Eikosha (2011) Prof. Chien-Tien Chen (Department of Chemistry, National Tsing Hua University, Taiwan) "Doubly Ortho-linked Triarylethene, Diarylamine, and Spirofluorene Hybrids for Chirochromic Optical Switch and Optoelectronic Applications"

The 24th Japanese Photochemistry Association Award (2010) Prof. Hiroshi Ikeda (Osaka Pref. Univ.) “Elucidation of Mechanism for Organic Photoinduced Electron-transfer Reactions and Its Development into Luminescence Chemistry”

The 24th Japanese Photochemistry Association Award (2010) Prof. Takehiko Wada (IMRAM, Tohoku Univ.)
“Supramolecular Photochirogenesis with Bio- and Biorelated Molecules”

The 2011 JPA Awards were announced as follows

The JPA Award - Ryuzi Katoh (Nihon University)

The JPA Award for Young Photochemists - Yasuhiro Shiraishi (Osaka University) & Vasudevan Pillai Biju (AIST)

The JPA Achievement Award - Teijiro Ichimura (Prof. Emeritus, Tokyo Institute of Technology)

We are greatly looking forwards to the next chance to participate in the annual JPA event, which will this year be held in Tokyo Institute of Technology in September (see conference announcements).

Report by Evan Laurence Williams (Singapore)

Regional News

Introduction to Regional News

This section of the newsletter is for APA members from different regions to highlight particular events or launching of initiatives in your region. Any regional news can be proposed for this section, except for conferences, which will be covered in the conference reports and upcoming conference sections.

New Journal Launch by the KSP Korea.



Rapid Communication in Photoscience

Last month the Korean Society of Photochemistry (KSP) launched a new English language photochemistry journal entitled “**Rapid Communications in Photoscience**” (RCP)

The details for submission of communication papers can be accessed through the KSP website (<http://photos.or.kr/2010/>) or directly from the journal website:

http://www.rcp.or.kr/journal.do;jsessionid=1C4BB933660B17A38E6F2CF9AF8EB7F2.acoms40_node1?method=journalintro&journalSeq=J000038

RCP will be published quarterly

Japan one year after the disaster.

As you would all be aware, just over one year ago our Japanese members suffered an almost unimaginable disaster in the form of an enormous magnitude 9 earthquake, a massive Tsunami and a major nuclear incident. The enormity of the tragedy can only be imagined by many of us. However, just over one year later things are getting back to normal. We have two colleagues based in regions very much affected by the events in Nihon University in Fukushima and in Tohoku University in Sendai.

From Fukushima. Professor Ryuzi Katoh has just set up his lab in Nihon University since the nuclear incident which saw large areas around the Fukushima Daiichi (Number One) plant evacuated up to 80km. Although many fear radiation as a silent killer, in fact it is not so silent because unlike many chemicals it can be detected in tiny quantities. Professor Katoh has this to say.

“As you imagine, in our campus we recovered almost completely from last year disasters except for that radiation level is bit higher than usual value. We can do research work as usual. To confirm safety from radiation effect, our university purchased a radiation counter and check food and water in our campus routinely. Of course, no radiation can be detected. But this may provide students with peace of mind.”

From Sendai. Things in Sendai were immediately more serious as they were affected by all three aspects of the disaster. They had earthquake damage, infrastructure and more importantly people were highly affected by the tsunami and to top it all they also had elevated radiation levels and there were fears for neighboring nuclear plants in that area too. Thankfully those latter fears soon subsided and people could begin the long reconstruction work ahead of them. Although the earthquake was immense very few casualties occurred directly from it. Rather people suffered most from the subsequent tsunami. Professor Hiroshi Fukumura from Tohoku University in Japan had this to say just after the disaster.

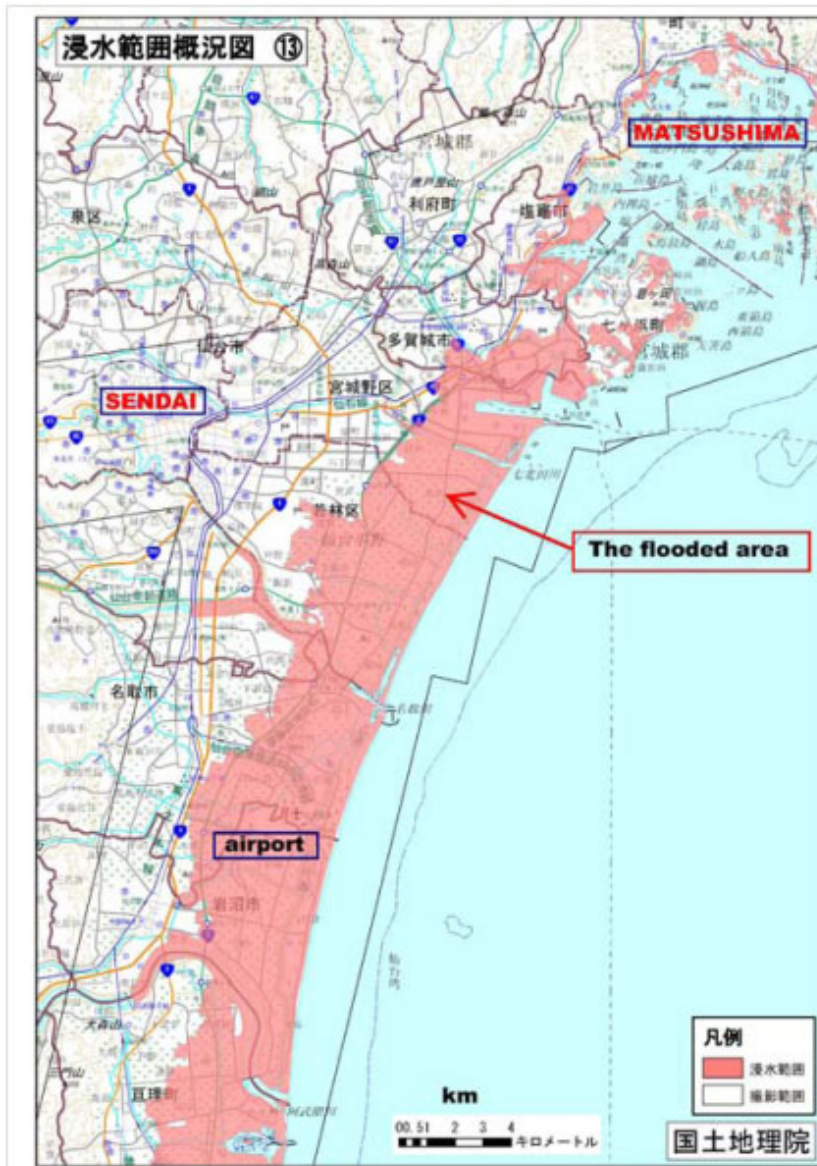


Image: the area flooded by the tsunami (in pink) did not reach to the University campus

"The tsunami was almost blocked by the highway running in parallel with the coastal line. The airport was destroyed seriously but now several flights a day are available between Tokyo and Sendai as well as Osaka and Sendai. Fortunately the famous Matsushima area seems to remain intact. I heard the main temple there was not destroyed. So you would understand that our university campus was not damaged by the tsunami. Then, how serious are the damages of our campus by the earthquake? As you may know the main building of Department of Chemistry was partly damaged. Debris fell and was piled up at the junction between the main part of the building and the elevator hall. The inside of all lab rooms at the main building looked horrible and I felt it like a miracle that nobody was injured and all students and staff members could safely escape from the mess. Fortunately nearly 3 years ago our lab has moved to the top floor of a three-story building and in this time the total damage by the quake was relatively small. You may see my office is a little untidy as usual"

Again just after the disaster Fukumura-sensei reported - *"Another concern is the situation of the nuclear power plant complex. Our lab has detectors for x-ray so that we can monitor radiation levels by ourselves. We measured the radiation levels in my apartment from the middle of March to the beginning of April. As you can see, the levels were sufficiently low and even gradually decaying. Recently Fukushima University reported the radiation levels from 372 points surrounding the plant complex. The results suggests that geographical*



Images: Top - The junction of the main building at an upper floor (from the main side).

Top right - the inside of a lab room,

Bottom right – Professor Fukumura’s office, in Tohoku University, just after the quake

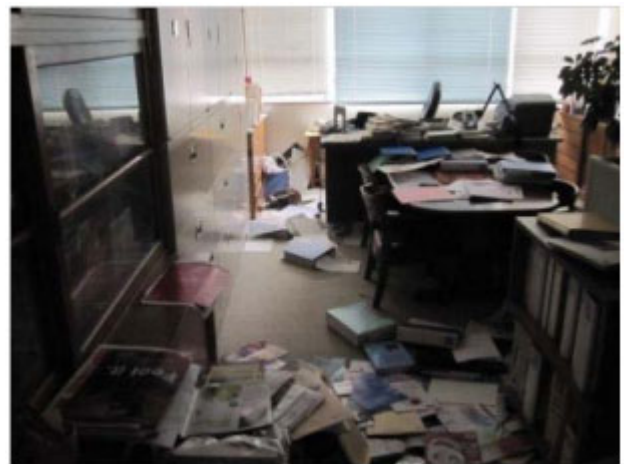


Image: Above - some dramatic tsunami damage to a gas stand in the area December 10th 2011.

features and local winds affect the pollution. The area showing values higher than 2.5 micro Sv/h seems to remain within 70 to 80 km from the plant complex even at the northwest direction. If you live one year at a place where the radiation level is 2.5 micro Sv/h in an area in Fukushima Prefecture, the total level you would receive is 22 mSv which is still less than a half of the maximum acceptable level for people who handle radioactive materials.”

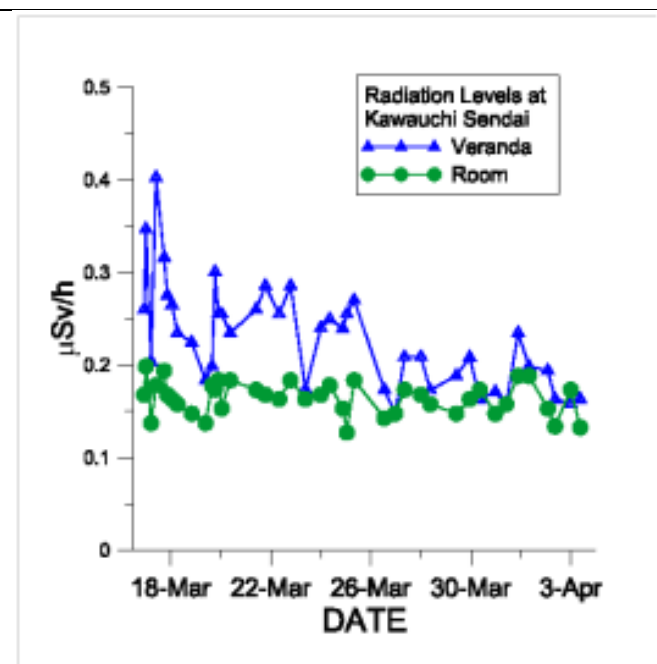
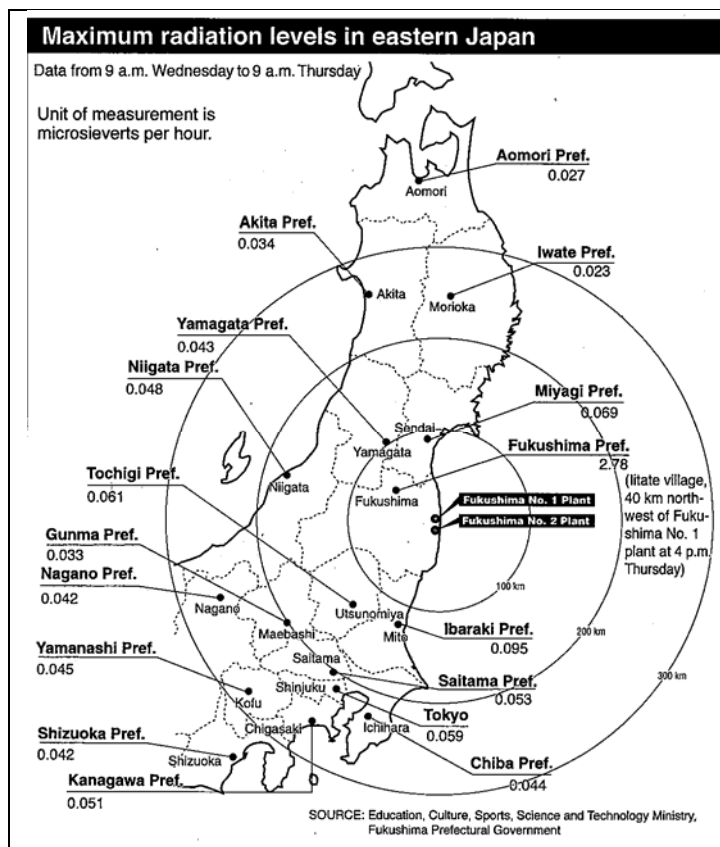


Image left - Radiation levels in Japan and Top - in Professor Fukumura's apartment from last year.

Still Standing. Despite the enormity of events the buildings in Tohoku University were still standing, although they had to be assessed for damage. This was largely due to forward planning for such an event.



Image: Main Chemistry building in Tohoku University just after the quake.

As you can see the exterior of the chemistry building shows no visible signs of damage. You will notice that it has structural strengthening with K-braces extending from the ground floor (1st) to the 5th Floor. These structural supports were installed just a few years before in preparation for just such an event. The usual Miyagi-Oki 7.4 magnitude earthquake had been expected at any time and there had been a magnitude 7.0 in 2003 and a magnitude 7.2 earthquake in 2005 emanating from a similar region of the fault line.

One year on from the quake Professor Fukumura has this to say: "Of course we got a serious damage by the quake and I have to admit that our lab's activity has all but stopped nearly one year to be honest. In a sense

nothing can compensate our scientific loss and more importantly our humanitarian loss as a country. But yet, assistance from the government has helped us to get back onto our feet. We will be back to strength and beyond soon enough.

On the last Friday (20th April 2012), our lab went to the Shiroishi castle for "Hanami" (Cherry Blossom Viewing Party). I carried a GM counter from our lab and measured the background level there. Shiroishi locates just about a half way to Fukushima and the level is reported to a little higher

than in Sendai. I wanted to check this by myself. The result is exactly more than double of the Sendai area while it still remains in a very safe level from the world standard.”



Image: Left - Ski photo 10 March 2012 Zao. Middle - Prof Fukumura measuring radiation levels and Right - Hanami photo both taken in 20 April 2012. Life gets back to normal.

So one year on we can report that it is not only safe to visit Japan, but we can expect that research output will continue from strength to strength. But as Professor Fukumura says *“The life in the lab is just as before, but we should not forget that the area nearby beaches have not been restored yet, remaining as just after the tsunami even now.”* This can be seen in the picture of the damaged gas stand taken on December 10th 2010. So let’s keep our thoughts to the people of Japan and wish them more strength in their recovery.

Material supplied By Professor Hiroshi Fukumura (Tohoku University) and Professor Ryuzi Kaotoh (Nihon University)

Regional Focus – APA Singapore.

Introduction to Regional Focus

The regional Focus section is intended to give information on the activities of the APA members in different areas of the Asian and Oceanian geographic location. This is an opportunity for people to disseminate and learn from the activities in other regions. Every issue of the newsletter we will be inviting a different region to highlight a few of their activities, big or small, so that APA as a whole can potentially interact better over the catchment area of APA members. It is really up to the different regions to decide on the length and format of the regional focus when it becomes their turn.

APA-Singapore



Singapore is often referred to as the red dot country, because when it is marked on a map as Singapore the City, the red dot actually covers the entire area of Singapore the Country. Another symbol of Singapore is the Merlion, which is a hybrid of a lion's head and a fishes tail. Rather like a Mermaid, but less attractive. Anyway this is what we incorporated into our chapters' APA membership card as symbols of our country. The red dot in a chemical flask with the notation for light energy and the red dot on the stopper of a cuvette for spectroscopy. The mm-Merlion was an obvious choice. Actually this mm-Merlion was created by the team of Masahiro Goto in NIMS Tsukuba Japan by laser implantation of coumarin molecules at a focus of a microscope objective, but as he is a friend of mine he allows us to use this as our symbol.

Singapore is a small and pragmatic country with a very great ambition to be prominent in the world. Maybe like a small child fighting for recognition from the bigger children. Well it has certainly got itself noticed. Singapore is bustling with scientists from all over the world, employed by the universities (National University of Singapore, NUS, & Nanyang Technological University, NTU) polytechnics and Research Institutes. Most of the research institutes come under the umbrella of A*STAR (The Agency for Science Technology and Research).

A*STAR is split into the BMRC (Biomedical Research Council) and SERC (the Science and Engineering Research Council) and each of these has over 7 component institutes with many acronyms. Yes acronyms are all over the place in Singapore. Everything is shortened to some combination of the component letters of its name.

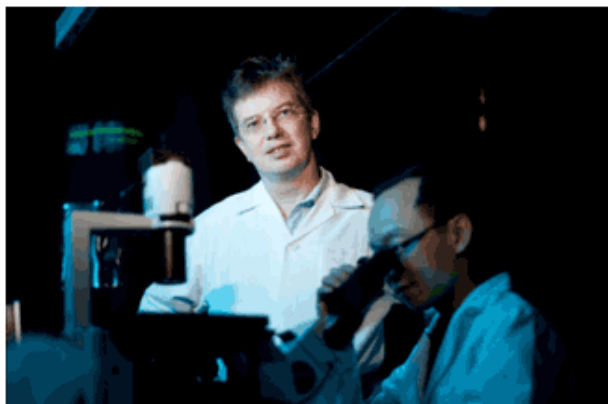
When I said that Singapore is pragmatic, in science this means that they are attracted very much by R&D with applications and commercial value. Well this is becoming the case more and more throughout the world. Despite this, fundamental subjects like photochemistry are still well represented in the R&D make up of Singapore. It can usually be found in pockets of other biomedical, biological, and renewable energy biased R&D. For example Singapore hosts SERIS – the Solar Energy Research Institute of Singapore, headed by Professor Joachim Luther. Professor Luther was once the head of the renowned Fraunhofer Institute for Solar Energy Systems in Freiburg, Germany. But upon retiring there in 2006, he became the head of SERIS. He heads a team that includes Prof Armin Aberle as the Deputy CEO of SERIS and Bram Hoex as their analysis and characterization expert.

As well as applied photochemistry in labs there are also labs carrying out pure photochemistry research for its own sake. For example, **Edwin Yeow**, who obtained his PhD in Chemistry in 2000 under the supervision of Prof. Ken

Ghigino at the University of Melbourne and did post-doctoral stints at different research laboratories including with Prof. Silvia Braslavsky (Max-Planck Institut für Strahlenchemie), Prof. Ron Steer (University of Saskatchewan), Prof. Frans De Schryver and Prof. Johan Hofkens (Katholieke Universiteit Leuven) is based at NTU as an Assistant Professor in the Division of Chemistry and Biological Chemistry. His current research interests involve utilizing both fluorescence and surface-enhance Raman spectroscopy and single-molecule detection techniques to study important processes occurring in materials chemistry, polymer physics and biological chemistry.

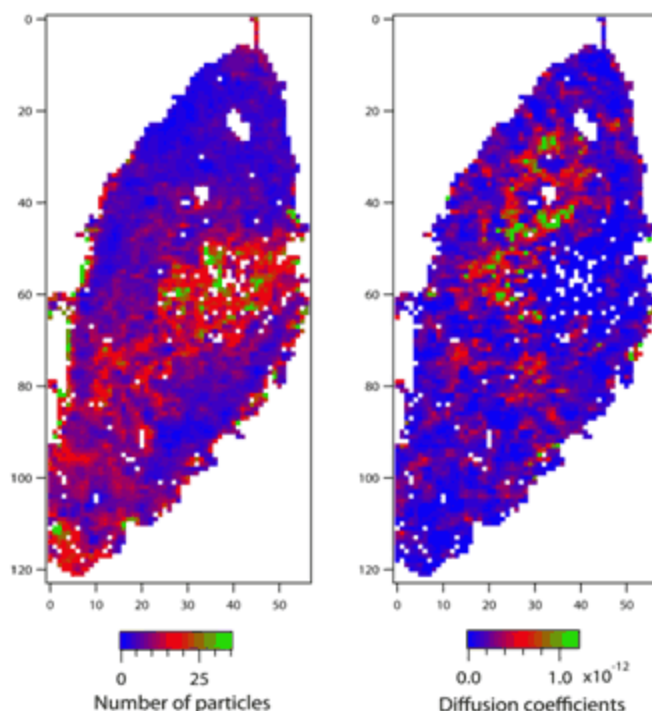
Singapore also houses **the Bio-optics lab in NUS Bioengineering** currently headed by Colin Sheppard (until the 27th April this year that is). Although Colin is departing the team there will continue their excellent research into advanced imaging techniques including SHG, CARS, two-photon microscopy, optical coherence tomography, confocal microscopy and Raman spectroscopy. Colin has been at the very forefront of optics research during his illustrious career and he will be continuing the good work in Italy. This is as sad time when we have to say goodbye to Colin and to wish him the very best in his new venture. Colin has been a catalyst for optics activity and has been key in attracting several topoptical conference series to try Singapore as the host nation. That includes this year's highly successful Focus On Microscopy conference FOM2012.

Also at NTU, **The BioFemtoLab** in the School of Physical and Mathematical Sciences, Division of Physics and Applied Physics, was founded in 2009 (M.-E. Michel-Beyerle, G.G. Gurzadyan). The present focus of their research is on structure-based excited state and electron transfer dynamics in proteins and DNA in solution and upon immobilization including interaction of biopolymers with small molecules and reaching out to light-induced repair of nucleosomes. In parallel to studies of biosystems, optimization principles for organic and hybrid solar cells are developed. Their investigations reach out to femtosecond dynamics of quasiparticles in graphene, to ultrafast exciton processes in organic crystals and nanostructures as well as to surface generation of phonons and heat transfer in thin metallic films. The laboratory is equipped with modern ultrafast spectroscopy instrumentation involving femtosecond pump-probe, fluorescence single photon counting and upconversion spectrometers, with a confocal microscope allowing for fluorescence lifetime imaging (FLIM), nanosecond flash-photolysis, as well as basic steady-state spectrophotometers and spectrofluorometers.



Thorsten Wohland (back) and his student Foo Yong Hwee (at the microscope).

The Biophysical Fluorescence Laboratory of Thorsten Wohland is interested in developing new fluorescence spectroscopy tools that can be applied in living systems for the quantitative measurement of biomolecular interactions and functions. The researchers focus on fluorescence correlation spectroscopy (FCS), a tool that measures fluorescence fluctuations from small observation volumes. Due to its single molecule sensitivity FCS can determine molecular concentrations, diffusion coefficients and biomolecular affinities even at very low concentrations. Recently the group extended the approach of FCS, which is typically performed at a single spot in a confocal system, to a camera based approach in which millions of points can be measured simultaneously in an imaging format (<http://cbis.nus.edu.sg/our-team/thorsten-wohland/>). [1-4]



This opens now the possibility to produce maps of diffusion coefficients, concentrations (in contrast to simple intensity images) and in the future biomolecular interaction maps.

Image: Whole cell maps of the number of particles detected at every pixel, N , and the diffusion coefficient, D . In contrast to simple intensity images these maps contain quantitative information about concentrations and molecular processes.

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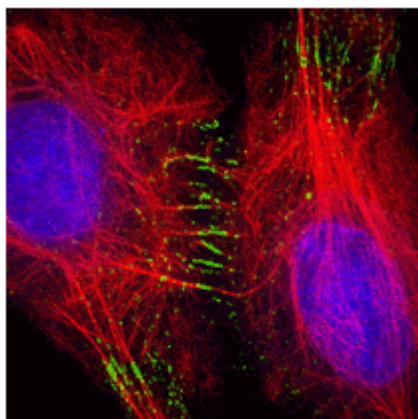
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The Institute of Medical Biology Microscopy Unit (IMU) is a core technology platform is largely run by Graham Wright. Their mission is to provide light and electron microscopy instrumentation along with image processing and analysis software and the expertise to facilitate research in molecular, cell and developmental biology. As well as standard widefield and confocal microscopy IMU focuses on seven areas of advanced imaging: 3D imaging, F-techniques, High content imaging, Live-cell imaging, Super-resolution microscopy, Electron microscopy, Image analysis & processing. More information about IMU can be found on our website:

<http://www.imb.a-star.edu.sg/imu/index.html>

The light microscope suite is located in the Immunus building and the electron microscopy suite is located in basement 2 of the building. Both reside in Singapore's Biopolis research campus. IMU runs regular training courses for basic microscopy, confocal, advanced confocal techniques, live-cell imaging and image analysis. Specific training on our microscope systems is organised for the researchers when they need to use a given technique.

In addition, IMU runs workshops and conferences bringing world experts to Biopolis to aid technology transfer and encourage collaboration. IMU has many links with microscopy facilities worldwide and collaborates with researchers locally and internationally through grant funded projects. Regular visitors are the Picoquant team and Markus Sauer.



The latest light microscope installed was the DeltaVision OMX superresolution microscope, from Applied Precision (now part of GE). This microscope can surpass Abbe's long-standing diffraction limit and achieve resolution down to 120 nm in multiple channels and 3D samples by 3D structured illumination microscopy (3D-SIM) and even down to 30 nm's by their localisation technique called Monet in TIRF mode. We are using this gain in resolution to shed new light on the keratin intermediate filaments, sensory and migratory structures within cells and the nuclear organisation.

Image: Graham Wright and John Common, IMB: A projected structured illumination image of human keratinocyte cells immuno-labelled with Keratin 5, desmoplakin and DAPI.

Photochemistry comes alive. The Zebrafish facility of Vladimir Korzh in IMCB.

Zebrafish is gaining popularity for analysis of photochemical effects in living animals

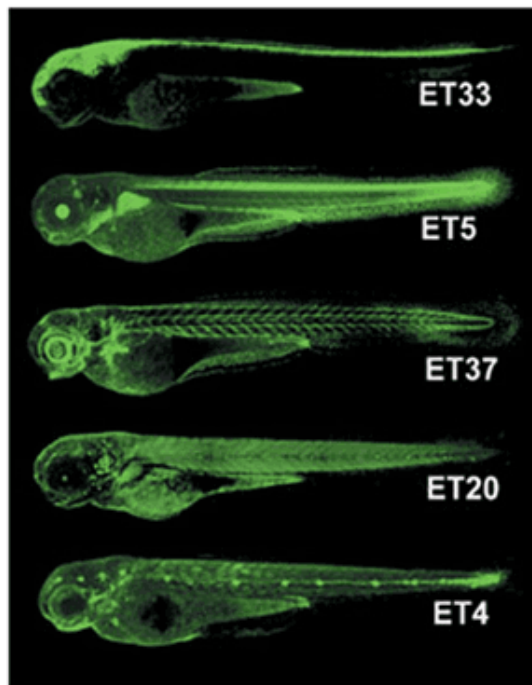


Fig. 2. Several enhancer trap (ET) 5-day-old transgenic larvae (from the ZETRAP database of living markers, see below) demonstrate distinct expression patterns of the green fluorescent protein (GFP) in vivo.

The discovery of green fluorescent protein (GFP) in jellyfish propels visualization and tracking capabilities in the life sciences to a new level. This promoted the research and development of other FPs in coral polyps, combjellies, copepods and lancelets (Matz et al., 1999). In recognition of their pioneering research in GFP, Osamu Shimomura, Martin Chalfie, and Roger Tsien (Chalfie et al., 1994; Shimomura et al., 1962) were awarded the Nobel Prize in 2008. In a parallel development, the increase in transgenesis efficiency by transposon-mediated genome integration eases the effort in generating zebrafish transgenics (Parinov et al., 2004). The optically translucent larvae easily allow the detection of transgene expression and establishment of transgenic lines expressing FPs. This makes generating a collection of such lines an achievable task for any laboratory. In result, FPs became efficient noninvasive tools for visualizing and monitoring processes taking place in living cells or whole organisms. And this can be done in different colors!

Recent development even uses some FPs as photochemically active agents. A key example is KillerRed (KR). It is a dimeric red fluorescent protein characterized by an excitation and emission maxima at 585 and 610 nm, respectively. KR was engineered from a non-fluorescent and non-phototoxic chromoprotein, anm2CP of jellyfish.

Upon irradiation by green light (520–590 nm) KR is photobleached resulting in efficient generation of the reactive oxygen species (ROS; Bulina et al., 2006). ROS is a by-product of cell metabolism implicated in human diseases (Halliwell and Gutteridge, 1986). It affects cells in a dose-dependent manner. Metabolically active tissues with little antioxidant capabilities such as the brain and heart are most sensitive to oxidative stress (Madamanchi et al., 2005). Several potential photochemical applications of KR include, chromophore-assisted light inactivation of target molecules, targeted cell killing, photodynamic therapy and study of signal transduction pathways. In Singapore the transposon-mediated transgenesis approach was used to generate a collection of zebrafish transgenics that expresses KR in various tissues. These transgenic lines were used to study the impact of oxidative stress on various organs (Teh et al., 2010). For example, green light illumination in two of these transgenics specifically induces heart failure and affects cell viability in the hindbrain of initially healthy larvae. The mode of action involves illumination triggered ROS production by KR, which in turn reduces the pumping efficiency of the heart (heart failure) and /or cell death in dose-dependent manner (Teh et al., 2010). In another set of behavioral experiments the transgenics expressing KR in specific part of the brain (habenula) was used to illustrate a role of this structure in stress avoidance behavior. This research suggested that some anxiety disorders in human patients could be due to disturbance of the habenula function. These studies illustrate recent progress in application of photochemistry for research in developmental biology, neurobiology and bioimaging (reviewed Korzh et al., 2011).

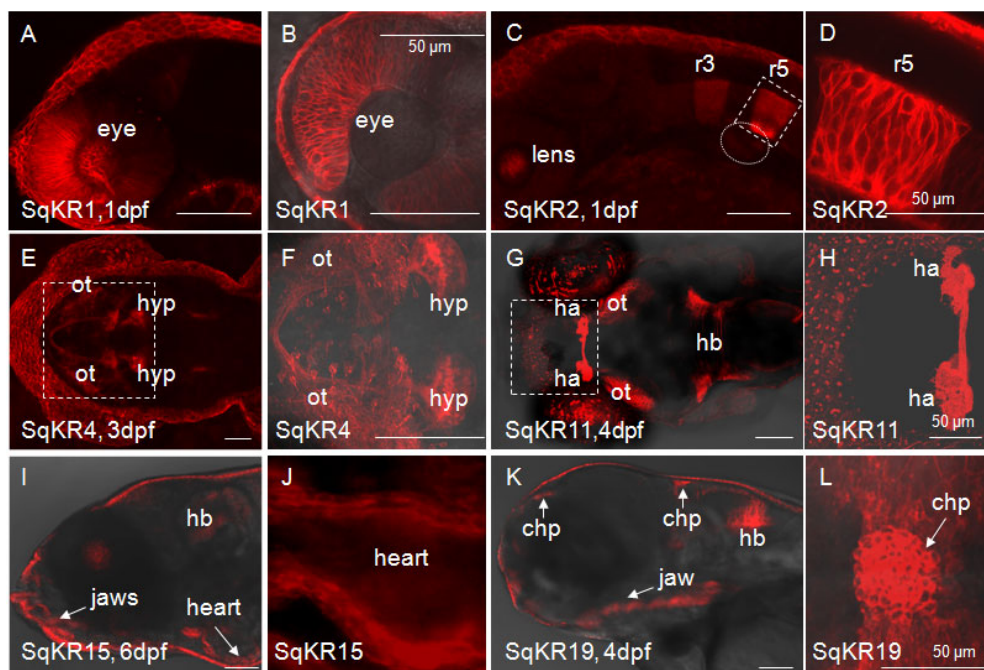


Image: Several embryos of transgenic lines of zebrafish expressing KR in tissue-specific manner (from Teh et al., 2010, BMC Dev Biol, 10:110). Abbreviations: chp – choroid plexus, ha – habenula, hb – hindbrain, hyp – hypothalamus, ot – optic tectum, r3 and r5 – rhombomeres (parts of hindbrain).

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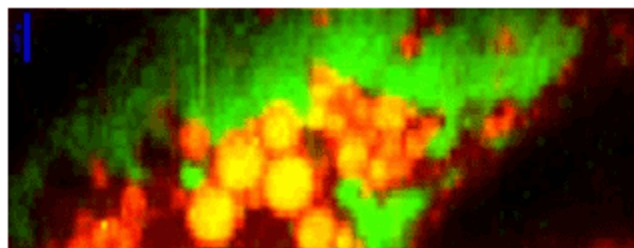
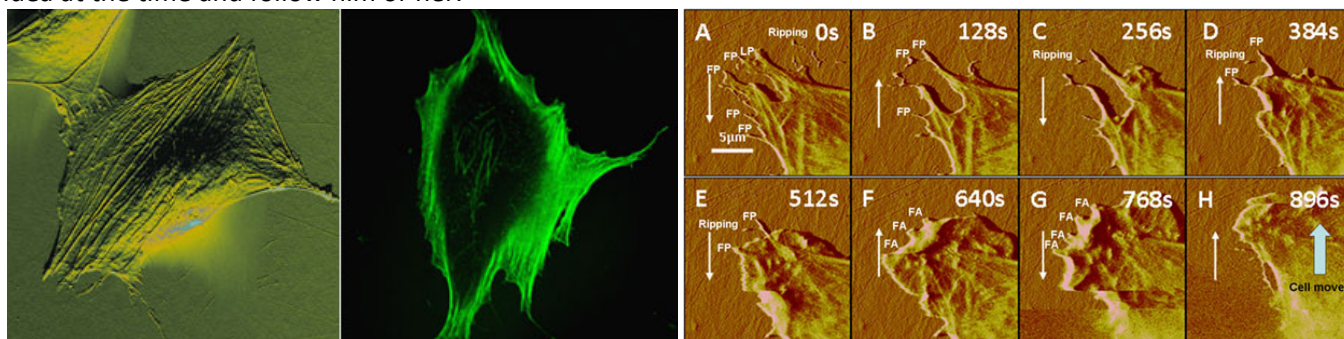


Image: Distribution of glucose metabolites during adipogenesis is imaged using Raman microscopy.

My team: Another team working on photochemistry in Singapore is the one to which I belong. The team includes Guo Hongchen (photothermal microscopy) Sergey Gorelik (Brewster angle spectroscopy and monolayers) Gomathy Sandhya Subramanian (OPV & Raman and FLIM bioimaging) Evan Laurence Williams (OPV) David Paramelle and Paul Free (nanoparticle probe preparations) Mehdi Rouhani (Student – inorganic photochromism) Bernhard Siebenhofer (student from Austrian Institute of Technology co-supervised with Dr Christoph Nowak AIT / CBSS NTU).

Ex-members (that we can always rely on) include Phang In Yee (AFM) Con Stylianou (stem cells) and Song Hongyan (organic chemistry). We are so diverse that I cannot really think of a good title for the team and we like to do whatever takes our interest and to remain scientifically free. Additionally, since we are so diverse, it is hard to tell

who actually runs what in the team, so we usually just defer to the person with the most knowledge or the best idea at the time and follow him or her.



Images: Live cell imaging – Left: Actin filaments visualized with liquid AFM and actin staining dyes. Right: Liquid AFM images Advancing and retracting lamellapodia in fibroblastic cells. (AFM by Dr Phang In Yee, Confocal image by Gomathy Sandhya Subramanian).

We have collaborations with local teams in NUS (Martin Lear) the BMRC (Bob Robinson, David Popp, Victor Nurcombe and Simon Cool) as well as internationally with Ryuzi Katoh (Nihon University Fukushima) and Akihiro Furube (Tsukuba University) in Japan, Professor David G. Fernig (University of Liverpool) and Trevor Smith (University of Melbourne) and Hiroshi Fukumura (Tohoku University). Some of these are funded by the A*STAR joint council office and the A*STAR-JST cooperative grants. At the end of this article I will highlight exchange and collaborative opportunities that allow for international cooperation.

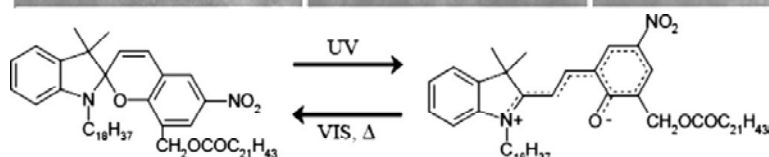
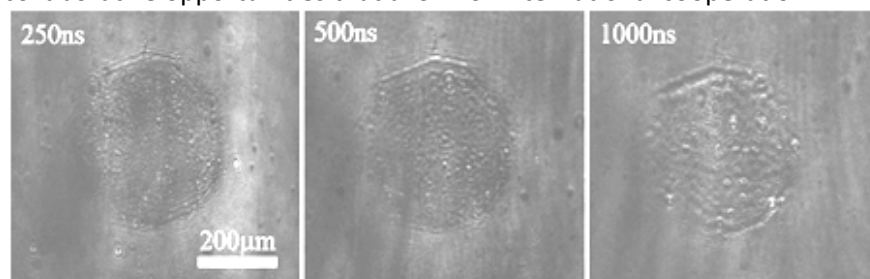


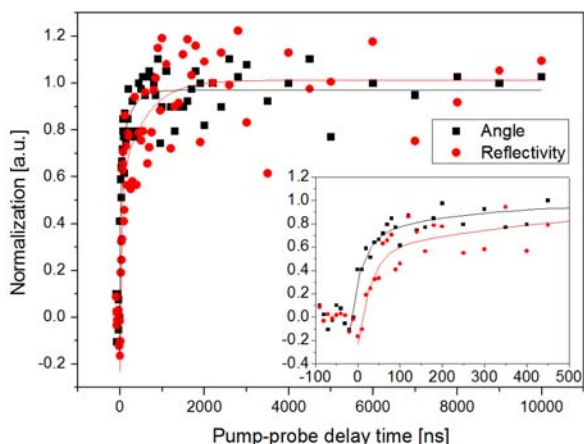
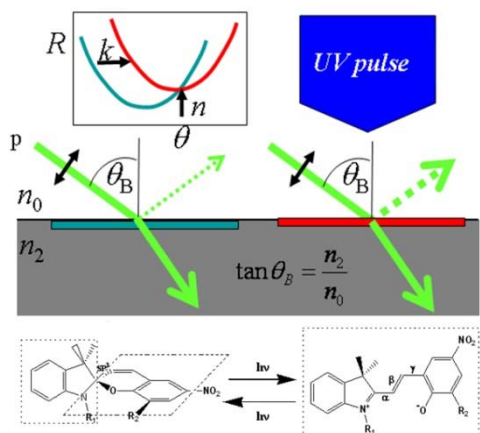
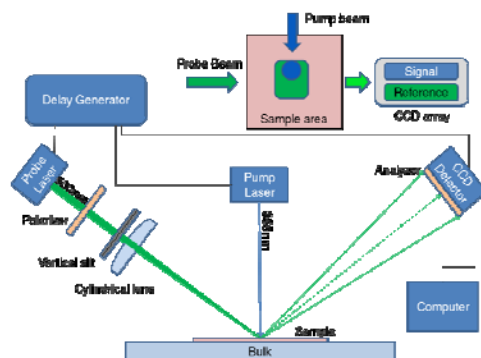
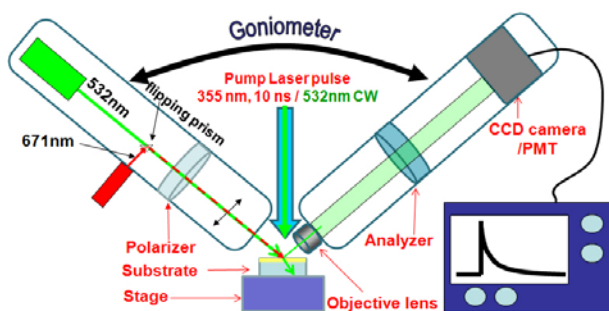
Image: 2-dimensional condensation in an irradiated spiropyran-octadecanol monolayer after conversion to merocyanine. (Collaboration with Professor Fukumura Tohoku University – images measured in Tohoku).

An important aspect of our work is developing new ways of measuring photochemical processes. For example photothermal microscopy and Transient Brewster angle microscopy and Reflectometry.

We have been developing both imaging and spectroscopic tools to make observations of monolayers.

Recently we have published two novel methods of making nanosecond pump-probe kinetic measurements in monolayers.

The methods rely on the minimization of reflectivity at Brewster's angle and the dependence of the minimum of the real and imaginary parts of refractive index.



Images: Methods for making Brewster angle reflectometry measurements in monolayers. The principle of the method and some time-resolved data for photoconversion in a spiropyran monolayer on water.

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Collaboration opportunities in Singapore

By far the easiest way to collaborate with us here in Singapore is to get involved via student exchange programs. Students can be funded to come to Singapore on short or long term visits under the following programs:

SIPGA: Singapore International Pre-Graduate Award. This is for final year undergraduates or Masters course students to spend a period of time of up to 6 months in Singapore to work with a research group here.
Benefits: Monthly stipend of \$1,500 (up to maximum of 6 months). Research attachment periods may vary from 2 to 6 months.

ARAP: A*STAR Research Attachment Program. This is for PhD candidates to spend up to two years working with an A*STAR co-supervisor. The supervision is shared. However the PhD is always awarded by the home University of the student.

PhD Students may participate in this program provided your home university supervisor has a collaboration with an A*STAR researcher or if the University has signed an agreement with A*STAR, which can be arranged.

Benefits: Monthly stipend of S\$2,500 for the period based at A*STAR, provided that student spends at least one year at A*STAR, up to a maximum of 2 years.

One-time settling-in allowance of S\$1,000.

One-time airfare grant of S\$1,500.

Research Calls: Several research calls come by for international collaborations. Historically these have already occurred between Japan (JST) and A*STAR, China and A*STAR and Australia and A*STAR. Additionally overseas partners can join research teams within Singapore funded by the various funding bodies.

Networking.

Every couple of years in June to July Singapore holds the ICMAT conference which hosts up to 30 symposia. The topics are variable, but they often contain areas relevant to photoscience. Keep a look out for this conference as an opportunity to visit us here in Singapore. The last one was held in 2011 and we had a symposium on optics and imaging. The next one will be in 2013. <http://www.mrs.org.sg/icmat2013/public.asp?page=home.asp>



By: Cathleen Teh and Vladimir Korzh (ZebraFish), Throsten Wohland, Graham Wright, Gagik G. Gurzadyan, Edwin Yeow.
Edited by Jonathan Hobley

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