中央研究院週報

中央研究院　發行・73年11月1日創刊・105年7月14日出版・院內刊物／非賣品　第1574期

本院要聞

本院宣布第31屆新任院士名單

本院於2016年7月4日(星期一)起連續4天召開第32次院士會議，並於7月7日(星期四)選舉出第31屆中央研究院新任院士20位，及2016年名譽院士2位。第31屆中央研究院院士暨名譽院士名單如后:

數理科學組 (6人)

江台章　Tai Chang Chiang
1949年生
現職：美國伊利諾伊大學香檳分校物理系名譽教授及研究教授
專長：凝態物理、表面科學、同步輻射研究

葉永烜　Wing-Huen Ip
1947年生
現職：中央大學天文所及太空科學所教授
專長：行星科學、太空物理及天文物理

鍾孫霖　Sun-Lin Chung
1959年生
現職：中央研究院地球科學研究所特聘研究員
專長：地質學、岩石成因學、地球化學動力學

鄭清水　Ching-Shui Cheng
1950年生
現職：中央研究院統計科學研究所特聘研究員兼所長
專長：數理統計、實驗設計

牟中原　Chung-Yuan Mou
1950年生
現職：臺灣大學化學系教授
專長：非均相觸媒、孔洞材料、奈米生物醫學、統計力學

金芳蓉　Fan Chung(女)
1949年生
現職：加州大學聖地牙哥分校教授
專長：數學

工程科學組(6人)

楊威迦　Vigor Yang
1955年生
現職：美國喬治亞理工學院航空太空工程學系、William R. T. Oakes講座教授暨系主任
專長：航空太空推進與動力、燃燒、能量工程

劉立方　Philip Li-Fan Liu
1946年生
現職：Distinguished Professor and Vice President for Research and Technology, National University of Singapore; 1912 Professor of Engineering, Cornell University (on leave); Kuo-Ting Li Chair, National Central University
專長：海岸工程、海浪及海嘯力學

陳陽闓　Young-Kai Chen
1953年生
現職：美國諾基亞貝爾實驗室矽光電、數位交換及傳輸研究處資深處長
專長：高速半導體光電和無線集成電路及通訊技術

本期要目

1　本院要聞　3　學術活動
4　公佈欄　4　知識天地
7　學術演講

編輯委員：呂光烈　孟子青　譚婉玉　范毅軍　汪中和
排　　版：黃復君　冠順數位有限公司
http://newsletter.sinica.edu.tw/index.php, http://newsletter.sinica.edu.tw/en/index.php
E-mail: wknews@gate.sinica.edu.tw
地址：臺北市11529南港區研究院路2段128號
電話：2789-9488；傳真：2785-3847
《週報》為同仁溝通橋樑，如有意見或文章，歡迎惠賜中、英文稿。本報於每週四出刊，前一週的週三下午5:00為投稿截止時間，逾期稿件由本刊視版面彈性處理。投稿請儘可能使用E-mail，或送院本部秘書處公關科。

王康隆　Kang-Lung Wang
1941年生
現職：UCLA 電機工程系雷神講座教授
專長：自旋電子學、半導體電子學和奈米技術

李琳山　Lin-Shan Lee
1952年生
現職：國立臺灣大學電機工程學系及資訊工程學系教授、中央研究院資訊科學研究所合聘研究員
專長：語音訊號之電腦處理

戴聿昌　Yu-Chong Tai
1959年生
現職：加州理工學院醫學工程系系主任、電機, 機械及醫學工程系教授
專長：微機電系統、感應器、微型全功能分析系統、醫學元件及人體植入器

生命科學組 (5人)

張元豪　Howard Yuan-Hao Chang
1972年生
現職：史丹佛大學教授
專長：非編碼核糖核酸、基因體學、再生醫學

歐競雄　Jing-Hsiung James Ou
1954年生
現職：南加州大學醫學院分子微生物暨免疫學系教授
專長：病毒學、致癌病毒學、細胞自噬、細胞訊息傳導

吳子丑　T.-C. Wu
1957年生
現職：約翰霍普金斯醫學中心病理科、腫瘤科、婦產科暨分子微生物學和免疫學教授、婦科病理學研究執行長，約翰霍普金斯醫院病理科醫師
專長：分子病毒學、分子病理學、治療型子宮頸癌疫苗

楊秋忠　Chiu-Chung Young
1948年生
現職：教育部終身榮譽講座主持人(臺灣農林牧學界僅1位獲得)，國立中興大學土壤環境科學系中興講座教授(興大第一位，目前僅2位)，國際生物科學聯合會(IUBS)中華民國委員會委員，國際環境科學委員會(SCOPE)中華民國委員會委員
專長：土壤環境微生物及生化、土壤-微生物-植物關係

陳鈴津　Alice Lin-Tsing Yu(女)
1943年生
現職：中央研究院基因體中心特聘講座教授，林口長庚醫院暨長庚大學特聘講座教授兼幹細胞與轉譯癌症研究所副所長
專長：腫瘤免疫學與癌症免疫治療、腫瘤幹細胞生物學、轉譯醫學、臨床癌症學

人文及社會科學組 (3人)

孫康宜　Kang-I Sun Chang(女)
1944年出生
現職：耶魯大學東亞語文系the inaugural Malcolm G. Chace '56 講座教授
專長：中國古典文學、比較詩學、比較文化評論、文化理論、美國性別研究

黃正德　Cheng-Teh James Huang
1948年生
現職：美國哈佛大學語言學系語言學教授
專長：語言學（語法理論）

吳玉山　Yu-Shan Wu
1958年生
現職：中央研究院政治學研究所特聘研究員、臺灣大學政治系合聘教授
專長：政治學與國際關係

名譽院士名單

工程科學組 (2人)

克萊頓 丹尼爾 莫特　Clayton Daniel Mote, Jr.
1937年生
現職：美國國家工程學院院長
專長：旋轉及移動系統 (繩狀物、纜繩、盤狀物及網狀物等) 之動力學及穩定性及創傷生物力學

中村 修二　Shuji Nakamura
1954年生
現職：材料科學工程學系教授、 固態照明和能源電子中心主任、Cree 固態照明和顯示器講座教授、Soraa 公司創辦人之一
專長：中村教授研究領域包含MOCVD　HVPE、成長和製作以寬能隙半導體材料氮化鎵為主的發光二極體和雷射等元件

學術活動

105年7月份知識饗宴「奈米鑽石的前世今生」

主講人：張煥正特聘研究員(本院原子與分子科學研究所)
主持人：王　瑜副院長
時　間：2016年7月26日(星期二)晚上
地　點：本院學術活動中心
餐　會：2樓平面演講廳(18:00至19:00)
演　講：2樓第1會議室(19:00至21:00)
請於7月21日前報名：

1. 曾以網路報名本活動者，於接獲本院邀請函後，點選連結即可進入個人專屬網址報名；報名截止日前，個人資料如有異動，請至該網址更新。
2. 首次參加者，請至網址： http://www.sinica.edu.tw/sc.html 報名。
3. 報名參加餐會者，請於當日下午6時10分前完成報到並繳付新臺幣100元，逾時歉難保留用餐權利，敬請配合。
4. 如需免換證進入本院停車者，請主動告知大門警衛。

★凡參加本活動可獲得公務人員終身學習認證時數2小時。
★學生憑證至報到處可領《科學人》雜誌過刊，每人1本，送完為止。
洽詢專線：(02)2789-9875，院本部秘書處。

Workshop on Precision Cancer Medicine

時　　間：2016年9月2日（星期五）
地　　點：本院人文社會科學館第二會議室
主辦單位：中央研究院統計科學研究所
報名截止：2016年8月14日
活動網址：http://www3.stat.sinica.edu.tw/pcm2016/
聯 絡 人：統計所 林晏如小姐 (Tel: 02-6614-5621，Email: conference@stat.sinica.edu.tw)

《臺灣人類學刊》第14卷第1期已出版

本院民族所編印之《臺灣人類學刊》第14卷第1期已出版。本期共收錄專題「食物的『道地』與跨國／跨文化脈絡」論文3篇：

陳玉箴　「道地」的建構：「臺灣料理」在東京的生產、再現與變遷
張靜紅　流動、聚合與區隔：臺灣茶藝發展中的矛盾和動力
余舜德　The Authentic Taste of Puer Tea and Transnational Interests。

研究論文1篇：
Hao-Li Lin The Resilient Landscape: Fijian Village Gardens in the Age of Commercial Agriculture
另書評2篇。下載請至http://www.ioe.sinica.edu.tw/。

《中央研究院近代史研究所集刊》第92期已出版

本院近代史研究所編印之《中央研究院近代史研究所集刊》第92期已出版，本期共收錄論文3篇：

王正華　〈清代初中期作為產業的蘇州版畫與其商業面向〉
游博清　〈中國貿易與利潤分配：英國東印度公司廣州商館職員的薪資與福利（1786-1834）〉
劉素芬　〈抗戰時期的統制經濟與國營事業—以廣西紡織機械工廠為例〉。

另收錄書評2篇。

公布欄

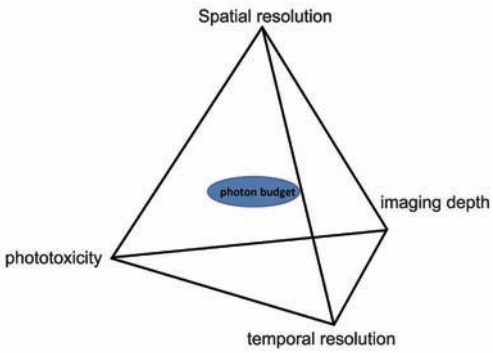
中央研究院2016年國際研究生學程錄取公告(The Announcement of 2016 TIGP Admissions)，請詳見中研院網站或TIGP網站 http://tigp.sinica.edu.tw。

知識天地

A Colorful World – fluorescent 3D live imaging

陳壁彰助研究員（應用科學研究中心）

Introduction



Since the 17th Centuries when Anton van Leeuwenhoek improved microscope and successfully observed single-celled organism, the revolution of optical microscopy has been continuously promoting the development of modern cell biology by building up the fundamentals of microbiology. Optical imaging techniques provide much important information in understanding life science especially cellular structure and morphology because "*seeing is believing*. However, the resolution of optical imaging is limited by the diffraction limit, which is discovered by Ernst Abbe, i.e. $\lambda/2(NA)$ (NA is the numerical aperture of the objective lens). For the last 100 years, biologists and optical scientists are unable to obtain a clear optical image of biological entities down to molecular level that are smaller than the diffraction limit (around 200-nm in lateral resolution). With the discovery of green fluorescent protein, the winners of Nobel Prize in Chemistry 2014, E. Betzig, W. E. Moerner and S. Hell, innovated super-resolution microscopic techniques. Such techniques enable biologists to visualize nano-sized fluorophores that are beyond the diffraction limit. These techniques do not physically violate the Abbe limit of resolution but exploit the photoluminescence properties and labelling specificity of fluorescence molecules to achieve super-resolution imaging. However, these super-resolution techniques limit most of their applications to fixed or dead samples due to the high laser power needed or slow speed for the localization process. Free from the suspected artifact caused by fixation process in sample preparation, live fluorescent imaging is more informative for biologists to elucidate the physiology of living specimens, especially for three three-dimensional (3D) imaging.

Challenges in the 3D Live Imaging

When it comes to live imaging, there are always tradeoffs between spatial resolution, temporal resolution, and phototoxicity based on the photon bank as shown to right. High imaging speeds are required to capture fast cellular process in order to avoid motion blurring in imaging. High spatial resolution is needed to resolve the structure details. High signal-to-noise ratios are crucial to have good quality imaging in order to perform computational image analysis. Long observation periods are needed to catch the biological process happening in the living specimens. Last but not least, low level of light dose is essential to reduce photobleaching of fluorescent probes and minimize phototoxicity to the samples. How to deal with the limited photon budget emitted from fluorophores to have the aforementioned tradeoffs inside live specimens efficiently is made even more difficult when the goal is to capture subcellular details. Established imaging technologies, such as widefield and confocal microscopy, have significant limitations for in vivo imaging of biological structure and function. Since they each illuminate the entire thickness of the specimen, even though high resolution information is obtained from only a single focal plane. This results in premature photobleaching and phototoxicity, limiting the duration of the imaging and altering the physiological state of the specimen. Thus, there is a great demand for technology which can uncover the complex biological phenomena that require 5D (x, y, z, t, λ) information in either a single- or multicellular context.

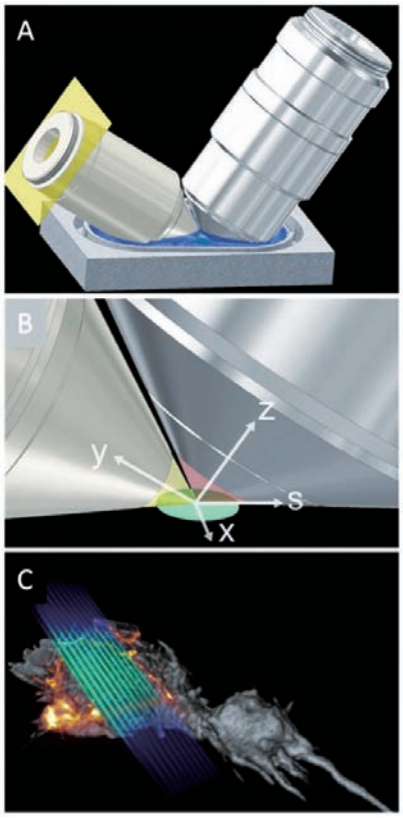
Novel Approach for bioimging in light microscopy

Widefield and confocal microscopes have been the main working platforms for biologists over the course of several decades. Widefield, or epi-fluorescence microscope provides fast imaging speed because of widefield detection, but it suffers from the "out-of-focus" light resulting in the reduced contrast and poor axial resolution. By use of physically small pinhole, confocal fluorescent microscope can reject out-of-focus background to have optical section capability. In this point-scanning based optical system, a beam of laser light is focused into the specimen to excite the fluorescent markers of interest. The generated fluorescent signal at the focus of the objective is collected sequentially by scanning the laser excitation focus across the sample to reconstruct the entire 3D image. Obviously, it is time consuming for large sample or too slow speed to catch fast dynamics process occurring in the live observing subject. The major disadvantage of these two techniques is very inefficient use of laser excitation light and fluorescent probes, as well as potentially high photodamage to the sample. Later on, the discovery of two-photon excitation microscopy uses a special and pricing laser light source, ultrafast laser, to generate the fluorescent signal exclusively at the focal volume by nonlinearity. In addition to the background free, the near-IR wavelength is used to excite the fluorescent molecules so that the deeper penetration depth is allowed. However, in the conventional implementation as a point-scanning technique, it suffers from the same limitation in speed and signal-to-noise ratio as confocal fluorescent microscopes. For live imaging scanning, it is true that line scanning improves upon point scanning and plane scanning, in turn, improves upon line scanning with respect to the detection objective. To address this issue, a new fluorescent imaging technique should be invented for this purpose. A notable example is light sheet based microscopy. Unlike conventional fluorescent imaging based on the epi-illumination configuration, light sheet based microscopy uses a separate excitation lens perpendicular to the widefield detection lens to confine the illumination to the neighborhood of the focal plane. By combining intrinsic optical sectioning with widefield detection, light sheet microscopy allows fast imaging speed to record multimegapixel imaging of selected plane in a single exposure of the camera. Instead of point-scanning in confocal or two photon microscopes, an entire excitation plane formed by the laser illuminates the sample from the side. Thus, the photons emitted from fluorescent probes at this selected excitation plane is collected with an objective lens, orthogonal to the excitation light sheet. Although this idea is derived from very ancient thought, along with the rapid development of instruments such as computer, camera or objectives, the stunning performance has been demonstrated only recently. By selective plane illumination, light sheet microscopy substantially improves acquisition speed and signal-to-noise ratio, while minimal photobleaching and phototoxicity. Especial for 3D live imaging, some light sheet microscopy has been operated to collect high-resolution images rapidly and minimizes damage to cells, meaning it can image the three-dimensional activity of molecules, cells, and embryos in fine detail over longer periods than was previously possible; imaging three-dimensional (3D) dynamics for hundreds of volumes, often at sub-second intervals, at the diffraction limit and beyond.

Light sheet based microscopy

In light sheet microscopy, the light sheet could be a real one, existing simultaneously across the illumination plane (such as generated by cylindrical lens), or a virtual one, created by a serial scanning long Gaussian beam formed by an imaging objective with a low numerical aperture (NA) excitation across the pupil plane. A real light sheet typically requires much lower power so that it takes less photo damage at the cost of spatial resolution in all dimensions, whereas a virtual light sheet gives more control over the spatial and temporal resolution. The 100-year-old idea of light sheet illumination, once termed "ultramicroscopy". In ultramicroscopy, optical sections are generated by stepping the specimen through the illumination plane created by cylindrical lens. This method has been proved to image the cellular resolution in optical-cleaning tissue such as fixed mouse brains, allowing the resolution in around micrometer range for small objects (less than 2 mm). A modified version of ultramicroscopy was presented as selective plane illumination microscopy (SPIM), instead of cylindrical lens, the imaging objective is used to generate a light sheet with scanned Gaussian beam having thinner thickness around 2~10 um (in ultramicroscopy the sheet thickness is ~ tenth of micrometer) to improve axial resolution and toward live imaging applications. SPIM has been demonstrated in a lot of applications, especially for understanding morphogenesis with live samples such as fruit fly, zebrafish or mouse with the acquisition rates on the order of 175 million voxels

per second. This performance mainly benefits from the advances in high-speed camera technology, such as the recent progress in scientific complementary metal oxide semiconductor (sCMOS) technology. This technique has been proven to be a good tool for imaging embryos noninvasively in 3D over time at single-cell resolution; however, this commercial Gaussian light sheet microscopy uses too thick light sheet over cellular dimensions to benefit sub-cellular imaging, which results in the drawbacks of substantial out-of-focus excitation and poor axial resolution. For example, when imaging a 50-μm-diameter cultured cell, an optimized Gaussian light sheet diverges to a full-width at half-maximum (FWHM) thickness of ~ 3 μm. Because this is threefold greater than the depth of focus of a high-numerical-aperture (NA) detection objective, substantial out-of-focus excitation remains, and hence the benefits of background reduction and photobleaching mitigation that are the hallmarks of plane illumination are not fully appreciated. In response, a ultrathin "non-diffracting" Bessel beam plane illumination was introduced to light sheet microscopy to have less background, less photobleaching, less photodamage and better axial resolution. A virtual light sheet plane of submicrometer thickness is created by sweeping such a beam, which is well suited to non-killing high-speed 4D live cell imaging.



Next, an improved version of Bessel light sheet, lattice light sheet microscopy is invented for the better spatiotemporal resolution, especially for temporal resolution, to watch the dynamics happening inside the cell. Ultrathin light sheets from two-dimensional optical lattices that allowed us to image 3D dynamics for hundreds of volumes, often at subsecond intervals, at the diffraction limit and beyond. The approach begins with a 2D optical lattice. Optical lattices are periodic interference patterns in two or three dimensions created by the coherent superposition of a finite number of plane waves travelling in certain well-defined directions. Like an ideal Bessel beam, an ideal 2D lattice is non-diffracting in the sense that it propagates indefinitely in a direction y without changing its cross-sectional profile, which extends infinitely in x and z. In either case, this is accomplished by confining the illumination at the rear pupil plane of the excitation objective to points on an infinitesimally thin ring. In practice, it is necessary to replace this ring with an annulus of finite thickness, and to control the thickness of the annulus to confine the pattern in z, thereby producing a sheet rather than a block of light. However, this also reduces the extent in y over which the pattern is uniform, so there is a tradeoff between the thinness of the light sheet and its effective field of view in y.

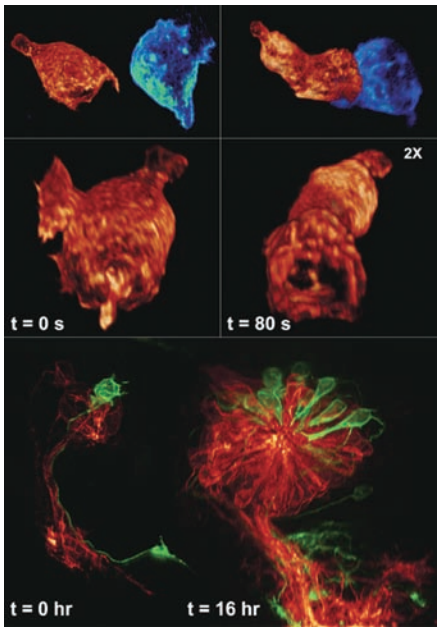
To create these lattices, a fast switching spatial light modulator (SLM) will be used, conjugated to the sample plane and placed before the annular mask. The xz cross-sectional electric field amplitude of the desired theoretical lattice light sheet as a binary phase pattern on the SLM will be displayed. Incident laser light is then diffracted by the SLM, filtered by the mask, and focused by the excitation objective to produce a light sheet.

To apply such light sheets to in vivo imaging, in Fig. A, the lattice pattern will be conjugated to the rear pupil plane (yellow) of excitation objective (left) and an orthogonal detection objective (right) will be suspended from above with their ends dipped in a shallow media-filled and temperature controlled bath. At an angle (Fig. B) in the yz plane such that their light cones of excitation (yellow) and detection (red) lie on one side of a horizontally mounted cover slip upon which the specimen rests. The lattice light sheet created in the xy plane at their common foci intersects the specimen obliquely (Fig. C). As the specimen is moved through the light sheet, the fluorescence thereby generated is recorded as series of 2D images on a camera. These are then assembled into a 3D image, and the process is repeated to build a 4D data set of cellular dynamics.

Applications of lattice light sheet microscopy

T cell motility and T cell/dendritic cell interactions (shown to the right) illustrates with high temporal resolution how a T cell (red) partially envelopes a target dendritic cell (blue) in a matter of seconds. A 2x zoom of the conjugated plane of the T cell is shown below, illustrating the opening that forms in 80 seconds. The rate of actin

flow in 4D is reported therein, something that could not be ascertained with spinning disk microscopes. At a larger scale, the unprecedented resolution in a live vertebrate embryo how stem cells migrate and differentiate into neurons to form a complex network in the olfactory system (shown to the right) in longer period of time. The technique can cover for different length scales at space and time, which make it more attractive for the biologist.



References

[1] E. Betzig, G. H. Patterson, R. Sougrat, O. W. Lindwasser, J. S. Bonifacino, M. W. Davidson, J. Lippincott-Schwartz, H. F. Hess, Science, **313**, 1642 (2006).

[2] G. Lukinavicius, L. Reymond, elisa D' Este, A. Masharina, F. Gottfert, H. Ta, A. Guther, M. Fournier, S. Rizzo, H. Waldmann, C. Blaukopf, c. Sommer, D. w. Gerlich, H-D Arndt, S. W. Hell, K. Johnsson, Nat. Methods, **11**, 731(2014).

[3] L. Gao, L. Shao, C. D. Higgins, J. S. Poulton, M. Peifer, M. W. Davidson, X. Wu, B. Goldstein, E. Betzig, Cell, **151**, 1370 (2012).

[4] R. Tomer, K. Khairy, F. Amat, P. J. Keller, Nat. Methods, **9**, 755 (2012).

[5] K. Wang, D. E. Milkie, A. Saxena, P. Engerer, T. Misgeld, M. E. Bronner, J. Mumm, E. Betzig, Nat. Methods, **11**, 625 (2014).

[6] T. A. Planchon, L. Gao, D. E. Milkie, M. W. Davidson, J. A. Galbraith, C. G. Galbraith, E. Betzig, Nat. Methods, **8**, 417 (2011).

[7] L. Gao, L. Shao, B.-C. Chen, E. Betzig, Nature Protocols , **9**, 1083 (2014).

[8] B.-C. Chen, W. Legant, K. Wang, L. Shao, D. E. Milkie, W. Davidson, C. Janetopoulos, X. S. Wu, J. A. Hammer III, Z. Liu, B. P. English, Y. Mimori-Kiyosue, A. Ritter, J. Lippincott-Schwartz, L. Fritz-Laylin, R. D. Mullins, D. Mitchell, J. M. Bembenek, A-C. Reyman, R. Bohme, S. W. Grill, J. Wang, G. Seydoux, U. S. Tulu, D. P. Kiehart, E. Betzig, Science, **346**, 1257998 (2014).

[9] P. J. Keller, Science, **340**, 1184 (2013).

學術演講

日期	時間	地點	講員	講題	主持人
			數理科學組		
7/19(二)	10:30	人文館11樓演講廳(環變中心)	Prof. Jin-Ho Yoon, (Gwangju Inst. of Science and Technology, South Korea)	Increasing Climate Extremes under Global Warming Depicted by CESM1	
7/21(四)	15:30	化學所A108會議室	閻明宇博士(鼎佳能源股份有限公司)	Hydrogen Production and Fuel Cell Application	鍾博文 助研究員
7/22(五)	15:30	化學所A108會議室	Dr. Shao Q. Yao (Nat'l Univ. of Singapore)	Recent Advances in Catalomics	李文山 副研究員
7/28(四)	15:30	化學所A108會議室	Dr. James G. Grote (The Air Force Research Laboratory, USA)	Nucleobases Bio Materials for Electronic & Photonic Applications	陶雨臺 特聘研究員
			生命科學組		
7/15(五)	11:00	農生中心A134演講廳	Keiko Torii 教授(美國華盛頓大學)	Communication and Decision Making during Plant Epidermal Development	中村友輝 副研究員
7/15(五)	15:00	生醫所B1B會議室	Prof. Garry Nolan (Stanford Univ. School of Medicine, USA)	A Single Cell Systems-Structured View of Immunity and Cancer	Dr. Ming-Zong Lai

7/19(二)	11:00	生醫所B1B會議室	Prof. Anne Calof (Univ. of California Irvine, USA)	Using the Mouse to Model the Origins of Birth Defects in Transcriptomopathies	薛一蘋 研究員
7/19(二)	11:00	生醫所B1B會議室	張定宗特聘教授 (國立成功大學)	Clinical Relevance of IgG Glycosylation in Hepatobiliary Disease	神奈木玲兒 特聘研究員
7/22(五)	11:00	跨領域大樓B106會議室	Dr. Wei-Dong Yao (SUNY-Upstate Medical Univ., Syracuse, NY, USA)	Tuning Synaptic Plasticity in Prefrontal Circuits: Role of Dopamine	黃怡萱 副研究員
7/25(一)	11:00	生醫所B1B會議室	林文昌研究員 (生醫所)	Bioinformatic Annotation of Human miRNAs from TCGA Dataset and Data Visualization with a Mobile APP	羅傅倫博士
7/26(二)	16:00	農生中心A134 演講廳	Nathalie Vrielynck教授 (法國巴黎第11大學)	A DNA Topoisomerase VI-like Complex Initiates Meotic Recombination	王中茹 助研究員
7/27(三)	15:00	農生中心A134 演講廳	Lars-Oliver Essen 教授 (德國馬爾堡大學)	Structural Changes upon Photoconversion in Plant and Cyanobacterial Phytochromes	涂世隆 副研究員
7/28(四)	11:00	生醫所B1B會議室	Dr. Cheemeng Tan (Univ. of California Davis)	Programmable Communication Between Artificial and Natural Cells	胡哲銘 助研究員
7/28(四)	11:00	生化所114會議室	Lars-Oliver Essen教授 (德國馬爾堡菲利普大學)	The Photolyase/cryptochrome Family: Common structures, Common Mechanisms?	蔡明道 特聘研究員
		人文及社會科學組			
7/15(五)	10:30	人社中心第1會議室	Prof. Kim-Sau Chung (Chinese Univ. of Hong Kong)	Leader Immunity and the Culture of Corruption	
7/19(二)	10:00	法律所第2會議室	陳維曾教授 (新加坡大學)	北京共識？尋找法律與經濟發展的中國模式	
7/19(二)	14:30	經濟所B110會議室	Prof. Tomoya Mori (Kyoto Univ., Japan)	Constant Churning and Persistent Regularity in the System of Cities: An Evidence from Japan in the Past 30 Years	彭信坤 特聘研究員
7/22(五)	14:00	人社中心第1會議室	朱建達助理教授 (臺灣大學)	Paul B. Ellickson, Stephanie Houghton & Christopher Timmins: Estimating Network Economies in Retail Chains: a Revealed Preference Approach	
7/22(五)	14:00	人社中心B202 會議室	顧彩璇博士 (Drexel Univ., USA)	When Traditional Chinese Acupuncture Meets Working Class American: Some Preliminary Observations of Knowledge, Body and Social Movement in the US	
7/25(一)	10:00	語言所519會議室	陳彥君女士 (語言所)	漢語鼻音韻尾變異類型研究	
7/25(一)	14:00	史語所研究大樓704 會議室	王新民研究員 (資訊所)	基於內容的音頻音樂檢索	林富士 研究員
7/26(二)	10:00	法律所第2會議室	劉淑範副研究員 (法律所)	淺談德國飛航安全及航空保安之民營化歷程	

最新演講訊息請逕於本院網頁：http：//www.sinica.edu.tw/「近期重要演講」項下瀏覽。