國立臺灣大學生醫電子與資訊學研究所

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國立臺灣大學生醫電子與資訊學研究所

BEBI Annual Report, No. 7 / 2013

國立臺灣大學
生醫電子與資訊學研究所

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2013年第7期年報

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序言 Preface

台大生醫電資所創所已有七年時間，一路以來我們戰戰兢兢，絲毫不敢懈怠；過去六年間，在前所長李百祺教授及賴飛羆教授的卓越領導下，為本所打下紮實的基礎。 接任所長職務一年以來，我致力於所內教學、研究質量的提升，並嘗試整合二組資源，持續推動師生的跨領域學習及交流，希望能創造具有特色的跨領域研究及學習環境，促使本所成為本校及全國培養跨領域人才的重鎮。雖不敢誇言已有重大成效，但願以下述結果，跟大家分享我們的嘗試與努力。

在前瞻研究成果部分，過去一年來，本所多位教師榮獲各研究機構頒贈之傑出研究獎，足以證明本所師資陣容之優異；還有經過多年所內老師們的努力爭取，今年八月起新進教師黃念祖教授加入本所，黃教授所專長之光微流道生醫系統技術，能夠與本所教師研究領域互補，相信對於本所各項教研工作均大有助益。此外，過去一年我們也加強與相關產業的溝通，積極推動產學合作，我們已安排師生定期進行企業參訪，其後並與數間企業進行合作洽談，期望能增加畢業生的就業機會、強化競爭力並落實學術研究成果、輔助產業快速發展。最後，創所至今我們已經產生五屆碩士畢業生、三屆博士畢業生，這些優秀人才的就業發展方向，是我們近年正積極調查統計的重點項目。學生是我們最寶貴的資產，也是生醫電資所教育是否成功的重要指標，我們希望能夠透過他們的成就及分享，為在學學生做出見證。

在所務及教學方面，我們嘗試了許多可能。首先，為落實跨領域師資、研究整合的目標，舉辦教師兩天一夜研習營，不僅對於生醫電資所的未來發展方向及努力目標達成初步共識，更加深了同仁情誼，創造雙贏。此外，為提高本所知名度、爭取優秀學生前來就讀。因此，首次舉辦跨校招生說明會，遠赴成功大學、交通大學舉辦碩士班甄試招生說明會，就成果來看，不僅報考學生的質量均佳為歷年罕見，更成功的將本所推向全國。於國際化方面，本所積極與國外知名大學交流，多次參與國外教學機構的雙向參訪行程，致力招收優秀外籍生、僑生及陸生，前三者今年度的報考生數量皆較往年多，顯見我們歷來的努力已初見成效。另外，我們也成立課程改善工作小組，對本所相關課程的整合及規劃做出努力。

強調結合生醫、電機及資訊的跨領域研究，是本所最大特色。如今，在穩固基礎上，我們需要做的其實更多。因此，許多不足之處，希望能夠經由大家協力來完成。新的年度開始，我們會秉持不懈的精神，持續建立順暢且有效的所務溝通管道，並延續各項重要工作，尤其在落實跨領域合作計畫、促進電資二組合作計畫、發展產學合作、爭取資源挹注、擴大國際化、推動並建立生醫核心實驗室、增加畢業生就業機會等方向，更是我們推動的重點。

衷心期許台大生醫電資所在所內師生同仁的努力下，能持續邁步向前，成為整合生醫/工程/資訊跨領域研究的典範。

2013年9月

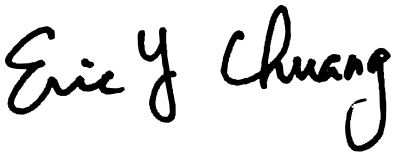
This is the seven year of Graduate Institute of Biomedical Electronics and Bioinformatics, all the way we been pursuing excellence in academic research. The past six year was led by former director Pro. Pai-Chi Li and Pro. Fei-Pei Lai, under outstanding leadership our institute has started in a solid foundation. After being the director for a year, I committed myself to teaching and academic research. The final goal was to integrate these two groups of resources, and continue to promote interdisciplinary learning and exchange of teachers and students. Our goal is to create a distinctive interdisciplinary research and learning environment, and to become a center for interdisciplinary talents. Hopefully we want to share with you our remarkable result.

Over the past year, our teacher's has won a number of Outstanding Research Awards awarded by various research institutions. In August, Professor Nien-Tsu Huang join our institute, Professor Huang specialty in biomedical optical microfluidic system technology, I believe our new teacher research brings great help to our institute. In the past year, we have also strengthened communication with related industries, and actively promote cooperation between our institute and industry, we have arranged for teachers and students regularly visit, corporate and subsequently with several companies to discuss cooperation. Hoping to increase employment opportunities for graduates strengthens the competitiveness and the implementation of academic research, and talents can be development rapidly to support industries. Finally, a record that so far we have produced five master's degree graduates, and three doctoral graduates, we are actively doing survey on recent years employment and development of these talented. Students are our most valuable asset, indicating whether if the education of BEBI is a success, we hope we can witness their achievements through sharing to us with talks.

We start re-organizing our teaching and recruiting. First, for the implementation of interdisciplinary teaching and research integration goals; the organization of training camp, not only give a preliminary agreement for BEBI on the future direction of development, colleagues friendship deepened, and create a win-win solution. Furthermore, we enhance the visibility of our institute, for the talented students to come to our institute. Therefore, the first held recruiting in NCKU campus and NCTU campus, organized by Master Audition admissions Council, the result show the quality of the students become rarely high. In the international recruiting strategy, our institute actively work on exchanging programs to well-known foreign universities, has participated in a two-way educational institutions abroad visits, and committed to recruit outstanding foreign students, overseas Chinese and terrestrial, and has been reported number of candidates this year are higher than previous years, showing that our efforts have been noticed. In addition, we have also set up a team to improve and integration and planning relevant courses.

Our institute emphasizing in integrating research in biomedical, electrical and information area, we have a solid foundation, but there are still much more things to do. The new year begins, we will uphold the spirit of unremitting, continue to build smooth and effective communication channels between school , especially in the implementation of interdisciplinary cooperation programs to promote electric and bioinformatics collaborative projects, industry cooperation projects, seek resources to invest also expand international, promote and build the core biomedical laboratories, such as the direction to increase employment opportunities for graduates, it is our main duty.

Sincerely hope all my colleagues and students from NTU BEBI, can continue to move forward as an integrated Biomedical / Engineering / Information interdisciplinary research model.



September, 2013

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壹 生醫電子與資訊學研究所簡介
Introduction of BEBI

國立臺灣大學生醫電子與資訊學研究所(簡稱生醫電資所)於2006年8月1日正式成立，本所的獨特性在於生物醫學、電機與資訊三大領域的結合，進行生物醫學之前瞻研究及跨領域教學。換言之，生醫電資所的主要使命在於提升跨領域的研究及教學，以因應生物醫學科技的快速發展，這些領域有：生醫電子、分子/細胞/組織影像、生醫訊號處理、生醫光電、感測器、微陣列分析、電腦輔助診斷、生物資訊學、系統生物學以及醫學資訊學等，為了在此專業領域中追求卓越，並謀求進一步的研究合作，整合來自不同領域的專業是相當必要的。

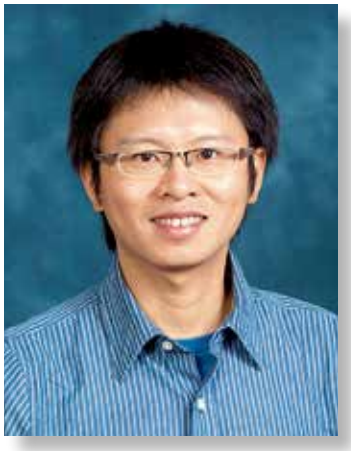
2006年8月，生醫電資所開始招收博士班，目前每年招收18名博士生加入生醫電資所的行列，碩士班也於2007年8月開始招生，每年有41名碩士新生加入。本所有38位教師，來自不同領域的背景，包含了電機工程、資訊科學、生物、藥學、生醫工程、醫學以及生命科學。本所的課程設計也提供學生有足夠的跨領域訓練，以迎合生物醫學科技此一領域的挑戰，目前，我們針對重要的生醫問題進行整合性的研究，同時也和生醫電子及生物資訊相關產業合作，及進行跨領域的訓練和教育，我們期待本所持續的成長茁壯，並對生物科技與健康照護領域做出貢獻。

The Graduate Institute of Biomedical Electronics and Bioinformatics (BEBI) at National Taiwan University was formally founded on August 1, 2006. In a way, it is a very unique institute among those in College of Electrical Engineering and Computer Science, National Taiwan University, in that the fields of expertise are diversified but our efforts remain extremely focused. The main mission of the institute is to promote multi disciplinary research and education in respond to the rapid advancement of biotechnology. In this regard, the following areas have been identified as our focus areas which we have been putting our major efforts in: biomedical electronics, molecular/cellular/tissue imaging, biomedical signal processing, biophotonics, sensors, microarrays, computer aided diagnosis, bioinformatics, systems biology and medical informatics. To excel in these areas and to bring up research synergy, integrative efforts from different disciplines are necessary.

The BEBI institute started the doctoral program in August, 2006 and now we admit 18 new Ph.D. students every year. Our master program started in August, 2007 with 41 new students entering the institute annually. There are 38 faculty members, among those 8 are with primary appointments. As our main mission mandates, our faculty members come from different trainings, including electrical engineering, computer science, biology, pharmacy, biomedical engineering, medicine and life sciences. Our curriculum is also designed to provide students with sufficient cross-disciplinary training to meet the challenges in biotechnology. Currently resources are used to promote integrated research projects aiming at important biomedical problems, collaboration with local industry in biomedical electronics and bioinformatics, as well as multidisciplinary training and education. As a result, research teams have been formed and several integrated program projects are underway. New courses have also been developed and a core lab is also being established to provide students with hands-on training. We look forward to continuing growth and contributions to this exciting field of biotechnology.

貳 新進教師介紹 New Faculty

一、黃念祖助理教授 Nien-Tsu Huang, Assistant Professor



黃念祖助理教授於2003年及2005年取得台灣大學機械工程系學士和應用力學所碩士學位，畢業後前往美國密西根大學(University of Michigan, Ann Arbor)取得機械工程學博士學位。黃教授於2013年8月返台，目前擔任台大電機系和生醫電資所合聘教師。黃教授取得博士學位後，於密西根大學及附屬墨茲兒童醫院擔任博士後研究員進行小兒敗血症和器官移植免疫系統的研究。他的研究成果包含設計微小化生醫晶片和搭配之光學系統以達到快速檢測和少量化樣本需求，上述成果獲得美國國衛院(National Institutes of Health)、國科會 (National Science Foundation) 等數項研究計畫補助。同時間他也多次參與知名國際微機電和生醫晶片會議並發表超過15篇生醫微奈米系統期刊和國際會議論文。他亦擔任專書“光微奈米致動器科技”(Optical Nano and Micro Actuator Technology)章節作者，並擁有數項微流體系統專利待核定中。

黃教授的主要研究方向可分為三個方向：(1)整合微機電致動器和微流道系統進行高速生醫樣本檢測 (2) 研發微流體晶片進行高通量單細胞分析 (3) 侷限型表面電漿共振(Localized Surface Plasmon Resonance)之免標定(Label-free)生醫檢測技術研發。

Nien-Tsu Huang received his B.S. in Mechanical Engineering and the M.S. in Applied Mechanics from National Taiwan University, Taipei, Taiwan, in 2003 and 2005. He received the Ph. D. degree in Mechanical Engineering at the University of Michigan, Ann Arbor, in 2012. Following a post-doctoral training in the Mechanical Engineering and C.S. Mott Children's Hospital at the University of Michigan, he joined the Graduated Institute of Biomedical Electronics and Bioinformatics and the Department of Electrical Engineering at National Taiwan University in 2013. During his post doctoral training, he developed integrated microfluidic devices and customized optical system for investigating immune system of pediatric sepsis patients. These research results had been published in severalprestigious journal and conference paper. Besides, he also got various research grants from National Institutes of Health (NIH) and National Science Foundation (NSF) for developing integrated optofluidic platforms projects.

His research focuses on integrating polymer-on-silicon MEMS devices into an optofluidic system for biophotonic detection, developing microfluidic devices for on-chip cellular manipulation, microarray for single cell analysis, and label-free based Localized Surface Plasmon Resonance (LSPR) and Surface Enhanced Ramon Scattering (SERS) biosensing for long-term and continuous cellular phenotyping monitoring.

National Taiwan University

參 研究領域 Research Fields

一、生醫電子組 Biomedical Electronics Group

本組研究主題涵蓋醫學影像、醫療儀器與生醫信號處理、生物晶片與生醫微感測器、生醫光電等數個領域。在醫學影像方面，研究重點係針對核磁共振與超音波造影技術，提升影像的品質、速度與功能性，並發展分子影像技術，應用於臨床醫學診斷、治療以及神經認知科學等方面。在醫療儀器與生醫信號處理方面，重點為開發或利用現有的醫療儀器，擷取各種生理訊號，並透過數位信號處理技術，提供醫療人員有效之疾病診斷及生理監測資訊。生物晶片的研究重點包DNA微陣列晶片之製程、感測技術與資料分析方法，以及以光電蝕刻技術控制生物分子、細胞及微組織之排列，並將其應用於生物醫學之研究。在生醫微感測器方面，主要為發展表面電漿共振光學檢測技術與利用標準半導體製程方式，進行生物分子的感測，並進一步將檢測元件微小化。在生醫光電領域，發展高解析度光學顯微影像以及各種光譜技術，提供生物分子、細胞與組織的分析、成像與操控工具，進而輔助疾病的診斷與生醫相關的研究。

Faculty members in this group have diverse research interests including “medical imaging”, “medical instrumentation and biomedical signal processing”, “biochips and biomedical sensors”, and “biomedical optics”. In the area of “medical imaging”, research efforts are focused on magnetic resonance imaging (MRI) and ultrasound imaging techniques. The goals are to improve the quality, acquisition speed and functionality of imaging, as well as to apply these techniques for diagnosis and treatment of disease. In the area of “medical instrumentation and biomedical signal processing”, digital signal processing techniques are used to extract information that is useful for diagnosis or monitoring of physiological status. Research efforts in the area of “biochips and biomedical sensors” are focused on improving the manufacture and detection of DNA and protein microarrays, arranging biomolecules and culture tissue using micro-patterning techniques, development of new data analysis methods for DNA microarrays, and development of miniature biosensors based on surface plasmon resonance (SPR) and nanowire biomolecular sensing devices based on standard CMOS fabrication. The emphasis of research in “biomedical optics” is to use optical microscopy and spectroscopy techniques to detect, image, analyze, and manipulate biological molecules, cells, and tissues. The ultimate goal is to provide information relevant to diagnosis and useful tools for the general biomedical research community.

二、生醫資訊組 Bioinformatics Group

本組研究主題為「生醫資料分析與探勘」、「計算系統生物學」、「計算藥物學及計算化學」以及「醫學資訊系統」。在生醫資料分析與探勘方面，研究重點包括生物晶片(微陣列)資料分析、DNA與蛋白質序列分析、基因及蛋白質結構與功能分析、生醫資料探勘等。在計算系統生物學方面，研究重點則是針對生物醫學及生命科學問題，建構數學分析及模擬計算的系統模型，以作為分析及模擬尖端生物醫學及生命科學現象的基礎。在計算藥物學及計算化學部分，則針對藥物及疫苗開發所涉及的量子化學計算及化學動力學計算建構新的計算模型以及設計更有效率的演算法。在醫學資訊系統方面，研究主題涵蓋層面極廣，舉凡醫學資訊應用所涉及的網路系統、多媒體系統、資料庫系統以及平行計算、分散式計算、即時計算之軟硬體設計與演算法分析均包含在內。

We dedicate our resources on the cutting-edge topics such as “biomedical data analysis and mining”, “computational system biology”, “computational pharmacology and chemistry”. In the area of biomedical data analysis and mining, our major research includes: biochip (Micro-array) data analysis, DNA and protein sequence analysis, gene and protein structure and function analysis, as well as biomedical data mining. In the area of computational system biology, we focused on advanced mathematical system models or simulations we developed to describe behaviors found in biomedicine and life science. In the area of computational pharmacology and chemistry, we are designing new computational models and efficient algorithms in quantum chemistry and molecular dynamics simulation for drugs and vaccine development. In medical informatics, we cover such as a wide range of topics in building the infrastructure for medical informatics, networking, multimedia, database, parallel processing, distributed computing, real-time computing, and algorithms as well as decision making and policy in current national health insurance database.

肆 學術活動 Academic Activities

一、第二屆獎勵研究創新獎 The 2nd Biomedical Electrical Engineering reward research and innovation

本所為鼓勵學生研究創新並提昇本所及本校之國際學術地位，於民國100年通過〈獎勵研究創新辦法〉並施行之。101年度為第二次舉辦，於八月開放所上同學申請，在本所招生及學術委員會上審議通過得獎名單後，並於101年12月17日(一)舉行第二屆頒獎典禮。本獎項特別邀請本所傑出校友-泰博科技陳董事長朝旺先生擔任頒獎人，同時邀請院長、本所老師、校友、學生共襄盛舉，參與老師有田維誠、郭柏齡、林致廷、阮雪芬、陳中平、曾宇鳳、林啓萬等諸位老師，及所上100多位同學熱烈參與。

在頒發獎項前，首先邀請泰博科技董事長-陳朝旺先生跟所上學生進行個人經驗分享，除了介紹他個人創業歷程外，也分享臺灣生醫產業界目前的狀況及未來的發展趨勢，這樣的經驗分享著實讓所上學生獲益良多，並對未來的創業之路有更進一步的了解。接著在演講結束後，便開始進行頒獎典禮，本獎項共分成兩大項，分別是學生傑出研究獎、年度最佳碩士、博士學位論文獎，此次特地有請陳朝旺董事長及郭院長來頒發獎項。

本次學生傑出研究獎獲獎學生分別為：蔡錦雄同學、杜羿樞同學、林振慶同學、曾意儒同學；年度最佳碩士學位論文獎的獲獎學生為田鈺申同學、陳宗銓同學；博士學位論文獎則由林振慶同學獲得。此三個獎項除了鼓勵所上學生勇於在國際的舞台上創新研究外，也欲藉此肯定本所學生在研究上的成就。

The Graduate Institute of Biomedical Electronics and Bioinformatics (BEBI) at National Taiwan University encourage students in research and innovation study to promote our university international academic status. The Biomedical Electrical Engineering research and innovation award was established at 2011, The 2nd Biomedical Electrical Engineering research and innovation award in 2012 is open for submission in August for students to apply. The BEBI Admissions and Academic Committee will evaluate the final awarding list and the 2nd Biomedical Electrical Engineering research and innovation awarding ceremony will be held on December 17, 2012. This award specifically invited the distinguished alumni - TaiDoc Technology Chairman of the board Mr. Zhao-Wang Chen to present this award. As well as invited the Dean of Electrical engineering and Computer Science, professors, alumni, and students from BEBI to participate in this honoring event. The participants professor are Wei-Cheng Tian, Po-Ling Kuo, Hsueh-Fen Juan, Chung-Ping Chen, Y. Jane Tseng, Chii-Wann Lin and approximately 100 students have attended this event.

The open ceremony started by inviting speaker TaiDoc Technology Chairman of the board Mr. Zhao-Wang Chen to give a talk about his life experience and career. Besides sharing his start-

up business, he also shared the current status and future of the Taiwan biomedical industry. This talk inspired a lot of students and gave a closer understanding on the road toward entrepreneurship. The awarding ceremony starts after the inspiring speech. Two types of awards were given: Graduate Student Outstanding Research Award and Best Master Thesis Award, Best Ph.D. Dissertation Award of the Year. The awards were hand out by Mr. Zhao-Wang Chen and Dr. Kuo the dean of Electrical Engineering and Computer Science.

The students awarded for Graduate Student Outstanding Research Award: Chin-Hsiung Tsai, Yi-Shu Tu, Chen-Ching Lin, Yi-Ju Tseng.

The students awarded for Best Master Thesis Award: Yu-Shen Tien, Tsung-Chuan Chen.

The student awarded for Best Ph.D. Dissertation Award: Chen-Ching Lin

These three awards encourage students to stand international arena innovative research, and also reward the contribution of the student's achievement in the biomedical study.

肆 學術活動
Academic Activities

二、博士班招生說明會
BEBI Introduction to prospective students: College of medicine (2013/03/30)

三、碩士班新生說明會 BEBI Introduction to new students: (2012/3/23)

四、演講　Lectures

1. 101.09.10
林金宏 專委，消防署
火災不會事先彩排，做對才能活著離開

2. 101.09.17
柯文哲 醫師，台大醫院創傷醫學部主任
IT ward at NTUH

3. 101.09.24
林智仁 教授，台大資訊工程學系
An Introduction to Machine Learning Research

4. 101.10.01
駱遠 教授，台大醫學院光電生物醫學研究中心
Spatial-Spectral Holographic Imaging System

5. 101.10.08
沈建忠 系主任，長庚大學中醫系
氣喘病的中醫思維原理

6. 101.10.15
蔡爾平 先生，生活藝術家
蔡爾平的土土土人生－鄉土、陶土、園土

7. 101.10.22
「愛的代價」電影觀賞會
（財團法人罕見疾病基金會）

8. 101.10.29
林世明 主任，台大醫學院光電生物醫學研究中心
病毒的奈米醫學影像 Medical images of virus at nanometer scale

9. 101.11.12
所長時間

10. 101.11.19
陳垣崇 院士，中央研究院生物醫學科學研究所所長
愛的代價－背後的故事

11. 101.11.26
陳文村 教授，清華大學資訊工程學系
智慧聯網之前瞻技術與應用

12. 101.12.03
鄭勝琦 董事長，JADEGIA(玉世家珠寶)
瑰麗東方－窺見翡翠的奇奧境域

13. 101.12.10
劉浩澧 主任，長庚大學電機工程學系
聚焦式超音波腦部藥物釋放

14. 101.12.17
泰博科技陳朝旺董事長演講暨獎勵研究創新頒獎典禮

15. 101.12.24
楊長豪 醫師，台大醫院眼科部主治醫師
人工電子眼的研發

16. 102.02.25
侯明鋒 院長，高雄市立大同醫院
乳癌臨床研究團隊的建立－從一個外科醫師的經驗

17. 102.03.04
李超煌 所長，國立陽明大學生醫光電研究所
Cellular responses to the physical stimulations in microenvironment

18. 102.03.11
彭明輝 教授，國立清華大學動力機械工程學系
留學、打工與網路時代的國際觀

19. 102.03.18
周綠蘋 教授，台大醫學院生物化學暨分子生物學研究所
蛋白體學於生物醫學及臨床之應用

20. 102.03.25
所長時間

21. 102.04.01
網路書院使用教學

22. 102.04.22
林聖忠 董事長，台灣中油股份有限公司
掌握全球能源新情勢，確保台灣能源供需安全

23. 102.04.29
企業參訪－泰博科技股份有限公司

24. 102.05.06
吳念真 導演，吳念真企劃製作有限公司
人生經歷分享

25. 102.05.13
吳漢章 總經理，華碩雲端股份有限公司
跨界整合資源，華碩雲端發展經驗分享

26. 102.05.20
張金堅 院長，台中澄清醫院中港分院
我的外科醫學之路

27. 102.05.27
林聰明 總經理，智晟電子股份有限公司
晉身CEO關鍵的－人事時地物(創業經驗的分享)

五、國立臺灣大學電機資訊學院101年度畢業典禮
2013Commencement of College of Electrical Engineering and Computer Science, NTU

六、2013/07/03~07/05 生醫電子資訊營
Biomedical Electronics and Bioinformatics Camp on July 3-5, 2013

2013臺大生醫電資營於7/3(三)~7/5(五)在臺大博理館舉辦，已是生醫所第七次舉行暑期營隊活動。今年活動主題為「癌症與生醫資訊」，透過系列課程介紹引領學員認識此領域並培養其興趣，作為進入相關領域之準備，並為國家培養生物科技與醫療電子資訊的學術與產業人才。

癌症是長久以來的重大醫療問題，癌症的治療及預防也越來越受到重視。本活動將透過一系列臨床醫師與學者的講解，介紹最新的科技在癌症診療上的應用、發現與發展，作為相關領域研究與應用發展基石，並安排實驗室參觀的活動，使學員了解生醫電資所教師們所研究的領域及背景，啓發學員對生醫電資的興趣。

另外在三天課程的尾聲舉辦創意競賽，將不同背景的學員混合編組，學員們利用小組討論時間，將課堂上所學習到的知識充分應用到報告中，並透過組員間相互溝通交流，培養團隊合作的能力，將團隊成果呈現於評審面前。而後，評審委員透過創新度、可執行性、流程規劃完整性及貢獻價值評估等因素考量，選出本次競賽前三名之優勝隊伍頒發獎狀及獎金。

本次活動總共有50位學員報名參加，成員有大學生、研究生及社會人士，顯示生醫電資營課程安排豐富多元，吸引不同背景的學員報名參加，另外在學員問卷調查中，全體學員皆表示滿意這次的營隊規劃，同時有93%的學員表達願意再次參加的意願。明年亦將秉持培養生物科技與醫療電子資訊之學術與產業人才，繼續舉辦相關研習課程。

The 7th Biomedical Electronics and Bioinformatics Summer Camp held on July 3 th to July 5th, 2013 at National Taiwan University Barry Lam Hall. This year main theme is “Cancer and Biomedical information”, introduced through series of courses to lead the students to understand and develop their interest in biomedical informatics. This summer camp provides them a chance to enter related fields and to develop professionals in biotechnology and medical electronics information professions for industry and academic.

Cancer is a major medical problem that is unsolved for a long time, cancer therapy and prevention has been more concerned by people than ever. This event invited clinicians and experts from this field and provide series of academic lecture, introducing them to the latest technology in cancer diagnosis and treatment, discovery and development of research and application of related field. Laboratory tours and arrange activities so that students understand each biomedical informatics study and background to inspire students interest in Biomedical Electronics and Bioinformatics field.

The three-day course is ended by a creative competition, students from different backgrounds mixed into groups, students use group discussion time to understand what they learned from the lectures and make full use of the knowledge to their final report. Communicate with each other through team cooperation, and in the end their final results will be presented to the jury. Then, the jury judge through the reports innovation, enforceability, process planning, integrity and contribution valuation considerations and other factors to elect the top three winning teams contest awarded with a certificate and prize.

There are 50 students participants in this camp, composed of undergraduates, graduates, and community members; this shows that Biomedical Electronics and Bioinformatics summer camp contains rich and diverse curriculum to attract students of different backgrounds. The student survey shows that all the students are satisfied with this camp, and 93% of participants expressed willingness to participate again. Next year the Biomedical Electronics and Bioinformatics summer Camp will keep the good tradition of opening biotechnology and medical electronic information programs train more academic and industry professionals.


2013 台大生醫電子資訊營

伍 國際交流 International Exchanges

一、2013輻射科學國際研討會：質子與重粒子射線的相關風險及癌症治療 ISRS 2013: International Symposium on Radiation Science 2013: Proton and heavy ion effects in relationship to risk and cancer treatment

「2013輻射科學國際研討會：質子與重粒子射線的相關風險及癌症治療」(以下簡稱ISRS 2013)乃The 24th Annual NASA Space Radiation Health Investigators' Workshop (SRHIW)的衛星會議，在美國太空總署(以下簡稱NASA) Space Radiation Program計畫主持人Frank Cucinotta的盛邀與莊曜宇所長積極爭取之下，擇定於2013/5/20-21緊接著日本主會之後，在本校霖澤館延續學術交流的熱潮。

ISRS 2013由國立臺灣大學永齡生醫工程中心與NASA Space Radiation Program共同主辦，並由國立臺灣大學生醫電資所與國家同步輻射研究中心協辦。會中邀集國內外知名學者32人，加上踴躍報名的與會來賓，總數多達百餘人。

本研討會的主旨有二：一、分享美國太空總署對太空輻射相關議題之研究，以輻射生物效應為主軸，討論其在放射及腫瘤醫學上的應用現況，並針對醫學物理、加速器專題之研究加以探討。二、針對目前放射治療在質子及重粒子領域的發展現況與趨勢，邀集學者進行經驗分享。

會議進行期間各場次發表內容精要，為國內相關學界帶來新穎且國際化的見解，互動時間討論熱絡，與會者佳評如潮，無不滿載而歸，可說是為本屆年會畫下了圓滿的句點。

International Symposium on Radiation Science 2013 conference: Proton and heavy ion effect in relationship to risk and cancer treatment conference is derived from The 24th Annual NASA Space Radiation Health Investigators' Workshop (SRHIW) Satellite Conference is supported by NASA Space Radiation Program Principle investigator Frank Cucinotta and our institute director Eric Y. Chuang. ISRS 2013 in Taiwan is held on May 20-21 at Taiwan University Tsai Lecture Hall after ISRS 2013 that is held in Japan.

ISRS 2013 is organized together by National Taiwan University YongLin Biomedical Engineering Center and Space Radiation Program; and co-organized by National Taiwan University Biomedical Electronics and Bioinformatics Institute and National Synchrotron Radiation Research Center (NSRRC). The conference invited 32 well-known scholars from all over the world and about a hundreds of people apply for this conference.

Two main issues were discussed in this conference: 1. The NASA for space radiation study that is related to the biological effects of radiation, further discuss application on radiology and oncology medical status; and for the medical physics area, accelerator topic of research to be explored. 2. Current proton radiotherapy and heavy particles in the field of development status and trends, also invited scholars to share their experience.

The domestic and international scholars bring new insights to each conference sessions, which brings delighted discussion time and rewarding knowledge. The participants have great reviews for this conference, the annual conference end in a perfect and delighting way.

二、2012輻射科學系列國際研討會：輻射誘導生物效應及修補
2012 International Workshop Series on Radiation Science: Radiation Induced Biological Effects and Repair

本所所長－莊曜宇教授兼任永齡生醫工程中心主任，於2012/11/13-14舉辦為期兩天的「2012輻射科學系列國際研討會：輻射誘導生物效應及修補」(以下簡稱IWRSS2012)，希望以此屆會議作為濫觴，進而開展出系列年會，提供輻射生物學界一指標性的討論平台。

IWSRR2012由永齡生醫工程中心主辦、本所協辦，會中邀集海內外12位專家學者，該領域與會學員更達百人之多，參與情況相當踴躍。本研討會之焦點除著重於輻射科學界的發展現況與全球化的趨勢外，更進一步討論放射線對於生物細胞等構造所造成的影響及其機轉，並針對輻射線影響之生物體修復、修補等應用議題進行深入探討與研究分享，積極推動輻射生物學界的互動，期以達成學術交流之目的。

對於國內相關學界而言，如此焦點明確且議題專精之研討會實為少見，為此會專程返台之長期旅美講者Prof. David Chen亦表示台灣輻射生物學界已十餘年未曾有過如此規模之會議，可見其對此會之高度肯定，相信IWSRR2012的學術餘波已為此系列會議在台灣輻射科學界奠下沉穩的基石。

Head of our department and YoungLin Biomedical Engineering Center Professor Eric Chuang hosted 2012 International Workshop Radiation Science: Radiation Induced Biological Effects and Repair(IWSRR2012) on 2012 November 13-14 to start a new series of annual meeting on Biological Radiation platform for young scientist in this area.

IWSRR2012 is organized by YoungLin Biomedical Engineering Center, and co-organized by our institute. The conference invited 12 experts and scholars from around the world and more than one hundred students participated in this conference. This workshop mainly focuses on current trend of Radiation biology. The conference further discussed about radiation on biological cell structure and its impact mechanisms, effects of the organism against radiation repair application and research. This seminar mainly promotes the student knowledge, interest and academic exchanges in radiation biology field.

This is a very rare topic for most domestic scholars.Radiation biologists from the State Prof. David Chen said that he has never seen Taiwan have never had such a large scale meeting on Radiation biology. He believe IWSRR2012 academic open up a new era for scientific community in Taiwan Radiation Biology.

三、外賓參訪 International Visits

有鑑於本所結合電子、資訊及醫學等領域之特色，並致力於跨領域整合的國際化學術趨勢，深受同學術範疇之中國東北大學中荷生物醫學與信息工程學院之肯定，亟欲來台與本所交流互動。根據中國中央教科所高教研究中心2009年《中國高等學校績效評價報告》以「投入產出力量」為評量標準，中國東北大學名列第三，僅次於清華大學與北京大學，相信其治學實力甚為可觀。

早在2010年秋季東北大學中荷生物醫學與信息工程學院即提出造訪之意願，卻礙於當年秋颱頻仍而未能成行，該院副院長趙越教授因此於今年暑假期間再次提出交流之請求，終於順利在2013年7月11日造訪本所。

本次參訪行程除安排本校國際事務處協助校園導覽之外，本所所長莊曜宇教授更邀請了電資學院副院長張耀文教授與多位所上教師共同接待，會中互動熱絡，雙方教師更談及交流學習之可能性，為日後兩校的師生及學術等互動奠下和諧的契機。

The National Taiwan University Graduate Institute of Biomedical Electronics and Bioinformatics integrates electronics, informatics, and medicine specialty and further committed to interdisciplinary international academic trends. It is well known to Sino-Dutch Biomedical and Information Engineering School of Northeastern University, which hope to set up exchange programmes with our institute.According to China Central UNESCO Higher Education Research Center in 2009, “China Higher Performance Evaluation Report” to “input-output power” as the evaluation criteria, Northeastern University, China ranked third, behind Tsinghua University and Peking University, from the report we can believes Northeastern University academic research is very impressive.

Back in the fall of 2010, Northeastern University, the Sino-Dutch Biomedical Engineering and Information has intention to visit our institute, but the typhoon last fall caused the visit cancelled. The Associate Dean Professor Zhao Yue therefore raised again this summer a request for them to visit, finally successful in July 11, 2013 Northeastern University visited our institute .

Besides arranging the Office of International Affairs to assist overview our campus our guests, the director of the Zhuang Yao Yu also invited Professor of Electrical Associate Dean Professor Zhang Yaowen with many of the teachers as receptions, during the pleasant interaction, both sides teacher talk more about the possibility of exchange and learning. Teachers and students of the two schools look forward to further academic and other interactive opportunities in the future.

(上圖由左至由)本所所長莊曜宇教授，中國東北大學中荷生物醫學與信息工程學院副院長趙越教授，本校電資學院副院長張耀文教授。

陸 實驗室及教師 Laboratories and Faculty

生醫電子組實驗室 Laboratory of Biomedical Electronic Group

實驗室名稱 Name	主持教授 Advising professor	地點 Room
超大型積體電路系統晶片電腦輔助設計實驗室 SOC VLSI-EDA Lab.	陳中平 Chung-Ping Chen	博理館405 Barry Lam Hall, Room 405
醫學影像實驗室/磁共振影像頻譜實驗室 Medical Imaging Lab./Magnetic Resonance Imaging Lab. 生醫分子影像核心實驗室 Biomedical Molecular Imaging Core Lab.	陳志宏 Jyh-Horng Chen	明達館706 MingDa Building, Room 706 醫學院基因體中心 NTU-CGM
智慧型與精密運動控制實驗室 IPMC Lab.	陳永耀 Yung-Yaw Chen	明達館604 MingDa Building, Room 604
放射物理生物實驗室 Radiation Physics and Biology Lab.	成佳憲 Chia-Hsien Cheng	臺大醫院 NTUH
生物資訊暨生物統計核心實驗室 Bioinformatics and Biostatistics Core Lab.	莊曜宇 Eric Y. Chuang	臺大基因體醫學中心7樓 NTU-CGM 7F
光微流道生醫系統實驗室 Bio-Optofluidic System Lab.	黃念祖 Nien-Tsu Huang	明達館702 MingDa Building, Room 702
醫用磁振造影研究室 Magnetic Resonance in Medicine Lab.	鍾孝文 Hsiao-Wen Chung	明達館704 MingDa Building, Room 704
紅外線暨生醫奈米元件實驗室 Infrared and Bio-Chemical Nano-Device Lab.	管傑雄 Chieh-Hsiung Kuan	電機二館426 EE 2, Room 426
細胞行為實驗室 Cell Behavior Lab.	郭柏齡 Po-Ling Kuo	明達館707 MingDa Building, Room 707
生物醫學信號實驗室 Biomedical Signal Lab.	郭德盛 Te-Son Kuo	明達館 705 MingDa Building, Room 705
統計信號處理實驗室 Statistical Signal Processing Lab.	李枝宏 Ju-Hong Lee	電機二館553 EE 2, Room 553
薄膜電晶體實驗室 TFT Lab.	李嗣涔 Si-Chen Lee	電機二館451 EE 2, Room 451

超音波影像實驗室 Ultrasonic Imaging Lab.	李百祺 Pai-Chi Li	明達館731 MingDa Building, Room 731
生醫晶片系統實驗室 Bio-Electronics-System Technology Lab.	林致廷 Chih-Ting Lin	電機二館450 EE 2, Room 450
醫用微感測器暨系統實驗室 Medical Micro Sensor and System Lab.	林啓萬 Chii-Wann Lin	展書樓605/608 Jan Shu Hall, Room 605/608
人腦實驗室 Brain Imaging and Modeling Lab.	林發暄 Fa-Hsuan Lin	展書樓703 Jan Shu Hall, Room 703
奈米生醫光電實驗室 Nano-Biophotonics Lab.	孫啓光 Chi-Kuang Sun	電機二館R406A EE 2, Room R406A
超快光電實驗室 Ultrafast Optics Lab.	孫啓光 Chi-Kuang Sun	電機二館R407B EE 2, Room R407B
生醫光譜與影像實驗室 Biomedical Optical Spectroscopy and Imaging Lab.	宋孔彬 Kung- Bin Sung	明達館703 MingDa Building, Room 703
微奈米分析技術及系統實驗室 Micro/Nano Analytical Technologies & Systems Lab.	田維誠 Wei-Cheng Tian	明達館509 MingDa Building, Room 509
數位信號處理實驗室 Digital Signal Processing Lab.	曹建和 Jen-Ho Tsao	電機二館552 EE 2, Room 552
心臟輔助器實驗室 Ventricular Assist Device Lab.	王水深 Shoei-Shen Wang	臺大醫院 NTUH
臨床磁振影像實驗室 Clinical Magnetic Resonance Imaging Lab.	吳文超 Wen-Chau Wu	明達館 704 MingDa Building, Room 704
中研院生醫所 IBMS RM511	楊泮池 Pan-Chyr Yang	臺大醫院 NTUH
台大醫院第七共同研究室 Laboratory	周迺寬 Nai-Kuan Chou	臺大醫院 NTUH

陸 實驗室及教師
Laboratories and Faculty

生醫資訊組實驗室 Laboratory of Bioinformatics Group

實驗室名稱 Name	主持教授 Advising professor	地點 Room
醫學影像處理實驗室 Medical Image Processing Lab.	張瑞峰 Ruey-Feng Chang	資訊館402 CSIE Building, Room 402
演算法與計算生物學實驗室 Algorithms and Computational Biology Lab.	趙坤茂 Kun-Mao Chao	資訊館432 CSIE Building, Room 432
數位相機與電腦視覺實驗室 Digital Camera and Computer Vision Lab.	傅楸善 Chiou-Shann Fuh	資訊館328 CSIE Building, Room 328
	黃俊升 Chiun-Sheng Huang	臺大醫院 NTUH
系統生物學研究室 Systems Biology Lab.	阮雪芬 Hsueh-Fen Juan	生命科學館1105 Life Science Building, Room 1105
生物資訊實驗室 Bioinformatics Lab.	高成炎 Cheng-Yan Kao	資訊館401 CSIE Building, Room 401
醫學資訊實驗室 Medical Informatics Lab.	賴飛羆 Fei-Pei Lai	資訊館346 CSIE Building, Room 346
演算法實驗室 Algorithmic Research Lab.	呂學一 Hsueh-I Lu	資訊館406 CSIE Building, Room 406
分子生醫資訊實驗室 Molecular Biomedical Informatics Lab.	歐陽彥正 Yen-Jen Oyang	資訊館410 CSIE Building, Room 410
臨床－生物醫學工程－產業融合實驗室 Merger Laboratory for Clinical Sciences, Biomedical Engineering and Industry	孫維仁 Wei-Zen Sun	臺大醫院 NTUH
生物資訊與化學資訊實驗室 Bioinformatics and Cheminformatics Lab.	曾宇鳳 Y. Jane Tseng	資訊館403 CSIE Building, Room 403

趙坤茂 教授 *Kun-Mao Chao* Professor

國立臺灣大學生醫電子與資訊學研究所 教授
國立臺灣大學資訊工程學系暨研究所 教授
國立臺灣大學資訊網路與多媒體研究所 合聘教授

Professor, Graduate Institute of Biomedical Electronics and Bioinformatics/ Department of Computer Science and Information Engineering, National Taiwan University
Adjunct Professor, Graduate Institute of Networking and Multimedia, National Taiwan University

演算法與計算生物學實驗室
Algorithms and Computational Biology Lab.

演算法與計算生物學實驗室創立於2002年8月。我們的研究主軸為「序列」與「樹狀結構」主題相關的演算法設計，以及利用這些演算法為基礎的生物資訊軟體工具開發，可說是「計算理論為體，生物資訊為用」。在過去幾年裡，我們的研究主軸是關於序列及樹狀結構上的有效演算法設計與分析。在序列方面，包括生物序列分析，如：單套體預測問題、標記SNP、複製數目變異問題、各種不同評分準則等，以及數列分析，如：最大總和區段問題、最大平均區段問題、不同條件的最佳化問題等。在樹狀結構方面，包括樹的建構問題，如：演化樹建構、最小繞線代價伸張樹問題等，以及樹的探索問題，如：樹邊分割問題、樹的查詢問題、樹邊置換問題等。這是非常有樂趣及成果的研究歷程，我們最終的目標是開發更多關於序列及樹狀結構的基本性質，並充分運用它們來設計解決這方面計算難題的實用演算法。

The Algorithms and Computational Biology Laboratory was established in August, 2002. We are interested in all aspects of the design and analysis of combinatorial algorithms. In particular, we solve algorithmic problems arising in computational molecular biology and networking. For the past few years, we have been mostly focused on the design and analysis of efficient algorithms for analyzing sequences and trees. For sequences, we mainly work on problems related to biological sequence analysis (haplotype vs. genotype; tag SNPs; copy number variations; variant scoring schemes), and numerical sequence analysis (maximum-sum segments; maximum-average segments; other maximization criteria). For trees, we mainly work on some tree construction problems (evolutionary trees; minimum routing cost spanning trees), and tree exploring problems (tree edge partition; tree querying; swap edges). This has been a joyful and fruitful journey to us. Our ultimate goal is to reveal more properties related to sequences and trees, and fully utilize them to design practical algorithms for solving hard problems in that line of investigation.

主要研究領域 Major Research Areas

計算生物學及生物資訊學、演算法、套裝軟體
Computational Biology and Bioinformatics, Algorithms, Software Tools

研究計畫 Research Projects

1. 單一核苷酸多型性資訊運用的演算法設計
   Efficient Algorithms for Utilizing SNP information
2. 線上拓撲排序問題之快速演算法
   Fast Algorithms for Online Topological Ordering
3. 多重基因複製問題的快速演算法
   Faster Algorithms for the Multiple Gene Duplication Problems

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莊曜宇 教授 *Eric Y. Chuang* Professor

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國立臺灣大學電機工程學系 教授
國立臺灣大學生命科學系 教授
國立臺灣大學流行病學所 教授
國立臺灣大學動物研究所 教授
國立臺灣大學永齡生醫工程中心 主任
國立臺灣大學基因體醫學研究中心生物統計暨生物資訊核心實驗室 主持人
國立臺灣大學生物技術中心資訊智財組 組長

Director & Professor, Graduate Institute of Biomedical Electronics and Bioinformatics/ Department of Electrical Engineering/ Department of Life Science/ Graduate Institute of Epidemiology/ Institute of Zoology, National Taiwan University
Director, YongLin Biomedical Engineering Center, National Taiwan University
Principal Investigator, Bioinfomatics and Biostatistics Core, NTU Research Center for Medical Excellence-Division of Genomic Medicine
Head, Group of Informational Intellectual Property, NTU Center of Biotechnology

生物資訊暨生物統計核心實驗室
Bioinformatics and Biostatistics Core Lab.

本實驗室研究是以基因體學探討癌症形成機制為主軸。近年來基因晶片(DNA microarray)已經被廣泛應用在同時觀察大量的基因表現，為研究特定基因調控極為方便、快速與可靠的方法。因此實驗室的研究方向乃致力於增進基因晶片技術在生物醫學領域上的研究，研究範疇涵蓋晶片製備技術、影像擷取與分析、生物資訊學、資料管理，以及利用基因晶片分析技術來解析致癌基因複雜的調控關係，探討基因表現或基因突變與細胞反應的關連。長遠的目標為藉由基因體研究找尋特定的癌症分子指標，將來作為癌症治療與診斷的標的。

The focus of our laboratory is using genomic approaches to investigate the mechanisms of carcinogenesis. DNA microarray has been applied widely in simultaneously monitoring a large quantity of gene expression patterns and served as a convenient, quick, and reliable method to investigate specific gene regulation. Therefore, our lab devotes to the application of microarray technology in the biomedical field. Interests in our laboratory include microarray fabrication, image capture and analysis, bioinformatics, database management, and analytic technique to understand the complicated regulatory mechanisms of cancer related genes as well as the correlation between gene expression or gene mutation and cellular response. Our long-term goals are via genomic study to identify specific cancer molecules as biomarkers for the targets of cancer therapy and diagnosis.

主要研究領域 Major Research Areas

生物晶片、生物資訊、癌症生物、輻射生物
Biochip, Bioinformatics, Cancer Biology, Radiation Biology

研究計畫 Research Projects

1. IGFBP5與幅射線誘發相關效應之研究
   Study the relationship between IGFBP5 and radiation-induced effects
2. 優勢重點領域拔尖計畫－醫學卓越研究中心－生物資訊暨生物統計核心實驗室
   Bioinformatics and Biostatistics Core Facility
3. 研究不同輻射敏感性之肺癌細胞受輻射誘導後之基因表現改變以及探討Notch pathway如何影響肺癌細胞CL1-0與CL1-5之輻射敏感性
   To study radiation-induced genomic instability and gene expression profiles in lung cancer cells with differential radiosensitivity and to investigate how HLJ1 modulates radiosensitivity in the lung cancer cell line CL1-0 and CL1-5
4. 微核醣核酸調控機制與其作用標的之預測
   Target prediction and regulation of microRNAs
5. 以基因體方式篩選台灣非吸菸女性肺癌病患甲基化變異
   Genome-wide Screening of Methylation Profiles in Non-smoking Female Lung Cancer in Taiwan

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國立臺灣大學電機工程學系 教授

Professor, Graduate Institute of Biomedical Electronics and Bioinformatics/
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醫用磁振造影研究室
Magnetic Resonance in Medicine Lab.

成立於2000年7月，指導教授為鍾孝文教授，目前計有博士班研究生8名，碩士班研究生4名。博士班畢業生25名，碩士班畢業生14名。目前進行中的研究主要有以下幾項：

1.螺旋槳式面迴訊磁振造影進階技術發展
本計畫重點在於針對螺旋槳式面迴訊磁振造影技術，發展一系列的進階影像擷取脈衝序列設計與Nyquist假影移除影像重建計算，從而獲取腦部以外組織的無扭曲擴散影像。

2.磁化率加權磁振造影之進階研發與臨床應用
本計畫重點在於針對磁化率加權磁振造影，做一系列的影像特性探討、數據擷取研發、與後處理變化，以加強腦部靜脈與出血之對比，並避免引入影像過度處理造成之假影。

Founded in July 2000. Supervisor: Prof. Hsiao-Wen Chung. This lab currently has 8 Ph.D. students and 4 M.S. student, plus 25 Ph.D. graduates and 14 M.S. graduates. Research topics include:

1.Advanced technical developments for Propeller echo-planar MR imaging
This project aims on a series of advanced technical developments related to the acquisition design and artifact-reduced reconstruction for Propeller echo-planar (EPI) magnetic resonance (MR) imaging, with the aims to enhance diffusion imaging in tissues outside of brain without geometric distortions.

2.Technical advancements and clinical applications of susceptibility-weighted MR imaging
This is a project on a series of technical developments related to image characteristics, acquisition design, and post-acquisition processing of susceptibility-weighted imaging (SWI) based on magnetic resonance (MR) imaging, with the aims to enhance venous and hemorrhagic contrast without introducing processing artifacts.

主要研究領域 Major Research Areas

醫用磁振造影

Biomedical magnetic resonance imaging

研究計畫 Research Projects

1. 螺旋槳式面迴訊磁振造影進階技術發展

   Advanced technical developments for Propeller echo-planar MR imaging

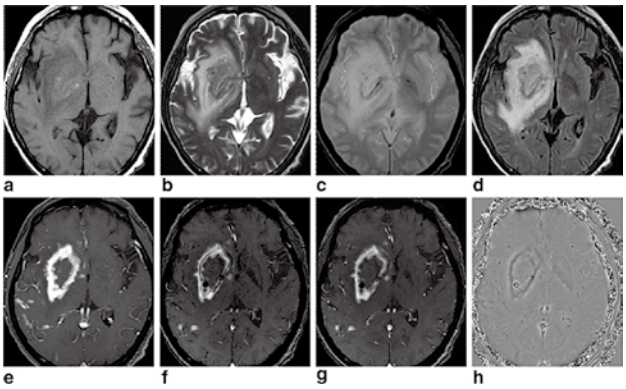
   補助單位：行政院國家科學委員會工程處　　計畫期間：2013/8/1 ~ 2016/7/30

2. 磁化率加權磁振造影之進階研發與臨床應用

   Technical advancements and clinical applications of susceptibility-weighted MR imaging

   補助單位：行政院國家科學委員會工程處　　計畫期間：2012/8/1 ~ 2015/7/30

■ 代表圖及中英文說明：



54歲女性右側基底核腦膿瘍病患。a：T1權重影像。b：T2權重影像。c：梯度迴訊T2*權重影像。d：FLAIR影像。e：顯影劑T1權重影像。f：顯影劑磁化率權重影像。g與h：原始絕對值與相位影像，用以產生f中之磁化率權重影像。腦膿瘍莢膜在顯影劑磁化率權重影像中顯現出亮暗相間之多層結構，在其他影像中皆未出現。

A 54-year-old female patient with pyogenic abscess in the right basal ganglion. a: T1-weighted image. b: T2-weighted image. c: Gradient-echo T2*-weighted image. d: T2-weighted fluid-attenuated inversion recovery image. e: Contrast-enhancedT1-weighted image. f: Contrast-enhanced susceptibility-weighted image. g,h: The original magnitude and correctedphase images used to generate the susceptibility-weighted image shown in f. The abscess capsule exhibiting hyperintensityon contrast-enhanced T1-weighted image shows a darkened ring within the central layer on contrast-enhanced susceptibility-weighted image, a phenomenon not visible in other types of MR images.

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國立臺灣大學資訊工程學系 教授

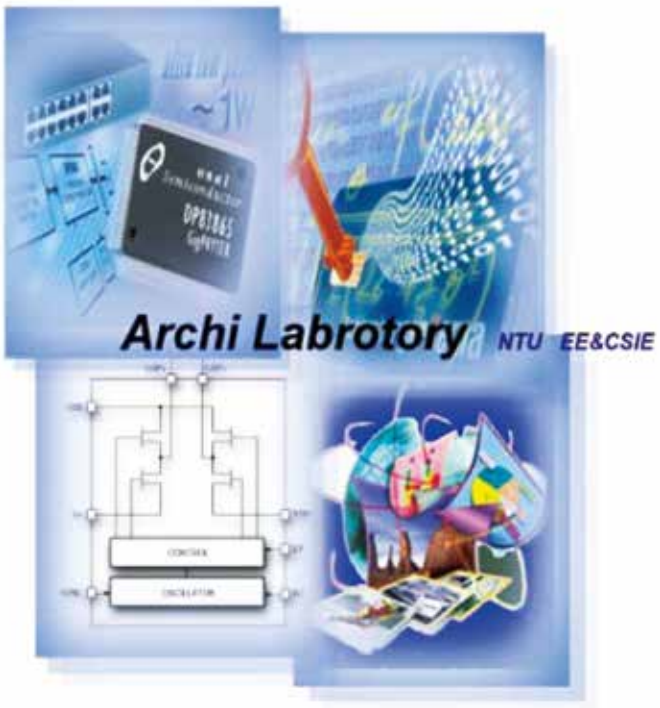
Professor, Graduate Institute of Biomedical Electronics and Bioinformatics, National Taiwan University
Professor, Department of Electrical Engineering/ Department of Computer Science & Information Engineering, National Taiwan University

醫學資訊實驗室
Medical Informatics Lab.

本實驗室成立於1987年，由賴飛羆教授所領導的研究群組成。實驗室成員包括博士班13人，碩士班10人。本實驗室研究領域廣泛，實驗室創立初期以研究「計算機結構」，「低功率系統晶片設計」為主，近年來改以醫學資訊為主要目標，本實驗室的研究方向包含：

1. 電腦與通訊網路安全機制研究
2. 醫學資訊

This Lab. was established in 1987 and Professor Fei-Pei Lai works together with 13 Ph.D. students and 10 master students. The major research areas include Information Security, and Medical Informatics. Our Lab. has cooperated with numerous IT companies and other overseas universities including Dortmund University in Germany, Calgary University in Canada and Mongolian University of Science and Technology in Mongolia as well as Tallinn University of Technology in Estonia.



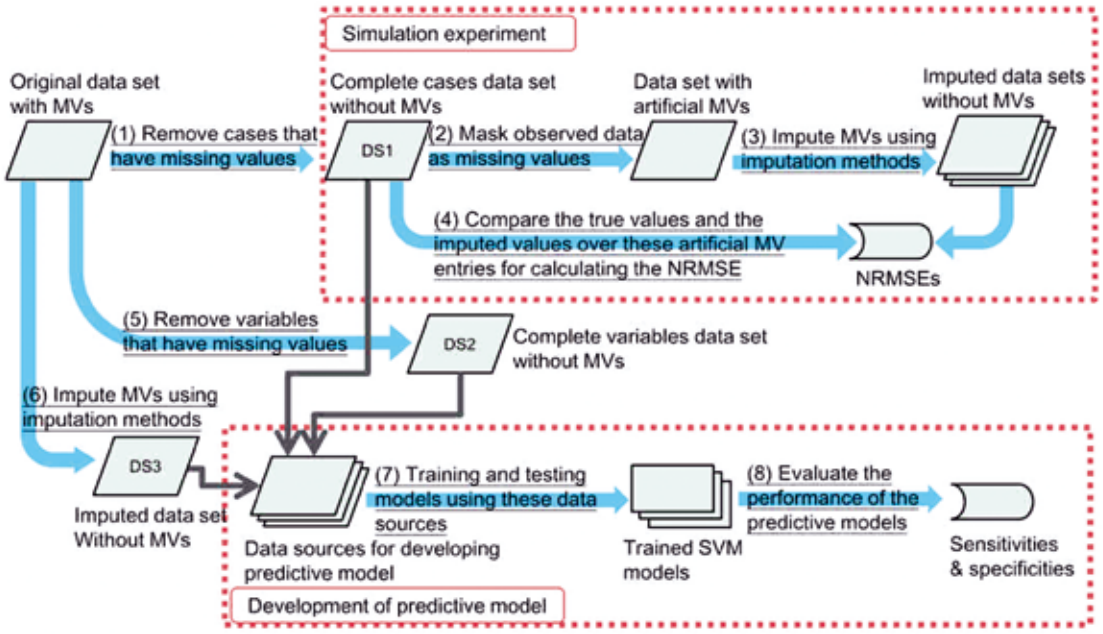
主要研究領域 Major Research Areas

資訊安全、醫學資訊
Information Security, Medical Informatics

研究計畫 Research Projects

1. 醫療資訊抽取與不完整醫療資料處理之平臺(2012/08/01-2015/07/31)
   Platform for medical information extraction from incomplete data

■ **研究計畫**－醫療資訊抽取與不完整醫療資料處理之平臺Platform for medical information extraction from incomplete data之代表圖及說明：



缺值模擬實驗與缺值處理方式實驗流程圖

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超音波影像實驗室
Ultrasonic Imaging Lab.

本實驗室由李百祺教授成立於1997年，主要從事醫學電子與影像物理相關研究，目前以生醫超音波技術與光聲影像等領域為研究重點。本實驗室在上述領域已產出許多具體貢獻並在全世界有很高之能見度。此外，本實驗室之成員來自電子、資訊、工程、生命科學及醫學等各領域，多年來亦積極與國內外單位進行合作，合作夥伴包括產、研、學各界，領域更涵蓋基礎科學、工程技術與臨床研究。跨界整合研究資源，致力前瞻生醫科技研究，提升健康與醫療品質，是本實驗室之成立宗旨與具體目標。

Ultrasonic Imaging Laboratory was founded by Professor Pai-Chi Li in 1997, with the main research focus in biomedical electronics and imaging physics. In the past few years, we have conducted a number of research projects in biomedical ultrasound and photoacoustic imaging. We have also made several critical contributions and are now one of the most visible research laboratories in this field in the world. Members of the lab come from various backgrounds, including electronics, informatics,engineering,life sciences and medicine. We have also been actively collaborating with research labs throughout the world, covering industry, research institutes and universities, from basic sciences,engineering to clinical research. Integrating multi-disciplinary research efforts, exploring advanced biomedical technologies, and improving healthcare quality is the mission of this lab.

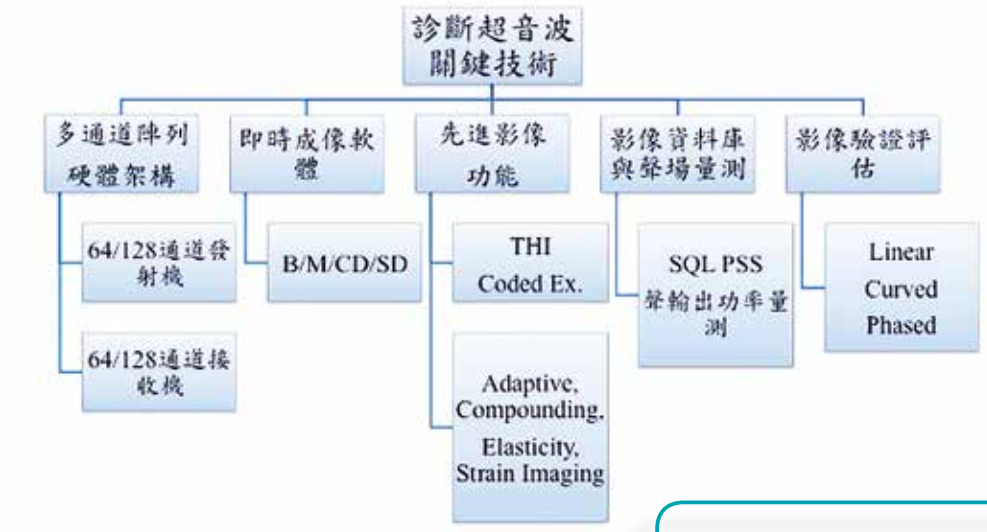
主要研究領域 Major Research Areas

生物醫學工程、超音波影像、生醫光聲影像
Biomedical Engineering, Ultrasound Imaging, Biomedical Photoacoustics

研究計畫 Research Projects

1. 診斷超音波系統關鍵技術開發3年計畫－影像核心平台基礎技術開發
   Three-Year Plan for Developing Key Technologies of Diagnostic Ultrasound
2. 明基友達集團臺大產學合作研究中心基金－超音波先進影像技術
3. 全光學式血管內超音波及光聲影像探頭與系統研究與開發
   All optical based intravascular ultrasound/photoacoustic imaging: scanhead and system design and Development
4. Wave imaging technologies for 3D cell culture systems
5. 超音波/光聲多模式分子探針之影像與治療應用
   Applications of multi-modality US/PA molecular probes in imaging and therapy

■研究計畫－診斷超音波系統關鍵技術開發3年計畫－影像核心平台基礎技術開發Three-Year Plan for Developing Key Technologies of Diagnostic之代表圖及說明：



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國立臺灣大學系統生物與生物資訊學研究中心 主任

Professor, Graduate Institute of Biomedical Electronics and Bioinformatics
Department of Computer Science and Information Engineering,
National Taiwan University
Director, Center for systems Biology and Bioinformatics,
National Taiwan University

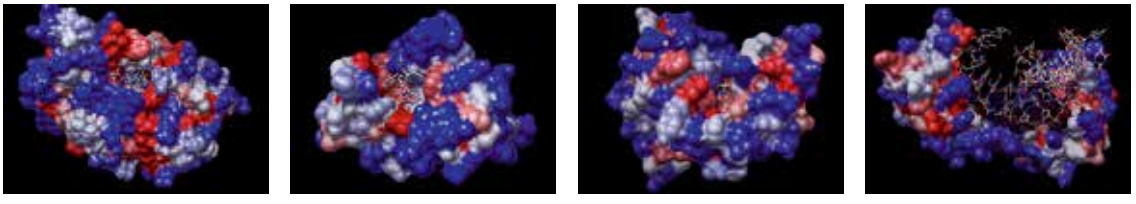
分子生醫資訊實驗室
Molecular Biomedical Informatics Lab.

分子生醫資訊實驗室專注於設計先進的機器學習演算法以應用於系統生物學的研究上。在過去幾年中，實驗室團隊提出三個創新的機器學習演算法並運用這些演算法以發展以下幾項生物資訊軟體工具：

1. HomoClust－以蛋白質序列比對為基礎建構蛋白質家族的階層架構
2. iPDA－蛋白質非穩定結構區段之預測
3. Proteminer and Protemot－以局部蛋白質結構比對為基礎預測蛋白質功能
4. MEDOCK－模擬蛋白質與配體嵌合
5. Prote2S－預測蛋白質二級結構
6. ProteDNA－預測轉錄因子上與DNA鍵結殘基

The Molecular Biomedical Informatics (MBI) laboratory focuses on design of advanced machine learning algorithms for systems biology research. During the past few years, the MBI team has proposed three innovative machine learning algorithms and has exploited these algorithms to develop various bioinformatics software tools including:

1. HomoClust — construction of protein family hierarchy based on sequence alignment;
2. iPDA — prediction of disorder regions in protein sequences;
3. Proteminer and Protemot — prediction of protein functional sites based on local structural alignment;
4. MEDOCK — emulation of protein-ligand docking;
5. Prote2S — prediction of protein secondary structures based on the polypeptide sequence;
6. ProteDNA — prediction of sequence specific DNA binding residues in transcription factors.



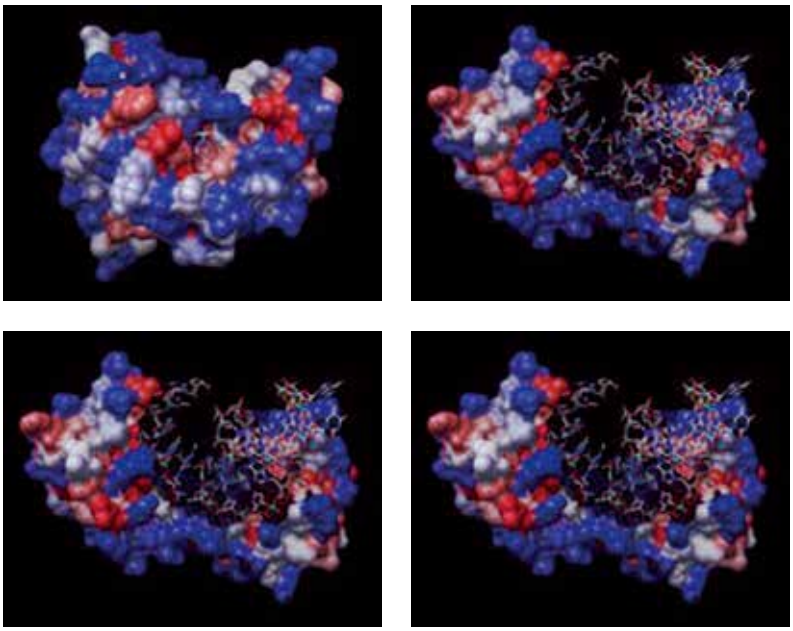
主要研究領域 Major Research Areas

生物資訊學、機器學習
Bioinformatics, Machine Learning

研究計畫 Research Projects

1. 以自動知識擷取為基礎之計算功能性蛋白質體學
   Computational functional proteomics based on automated knowledge extraction
2. 計算生物學先導型研究計畫
   Pilot Research Program of Computational Biolog

■研究計畫－以自動知識擷取為基礎之計算功能性蛋白質體學Computational functional proteomics based on automated knowledge extraction之代表圖：



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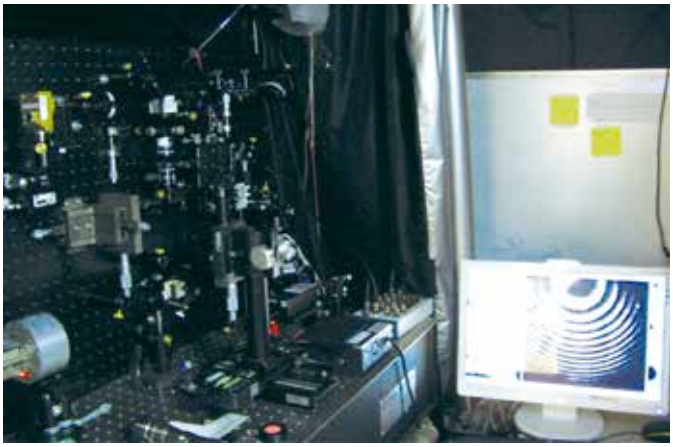
生醫光譜與影像實驗室

Biomedical Optical Spectroscopy and Imaging Lab.

我們實驗室目前的研究重點是以光學方法來觀察生物組織、細胞與分子，主要分為各種光譜的偵測分析以及光學影像系統的開發，以期對生物醫學領域的研究有所助益，並開發新的輔助醫學診斷的工具。長期的目標是發展低侵入性的儀器系統，協助癌症早期徵兆與癌前病變之診斷。

Current research in our laboratory is focused on pushing forward technologies of sensitive optical detectionand imaging systems and utilizing these systems to aid biomedical research and develop new diagnostic tools.The long-term objective is to develop minimally invasive diagnostic tools for the early detection and prevention of diseases such ascancer.



主要研究領域 Major Research Areas

生醫光電、生醫工程
Biomedical Optics, Biomedical engineering

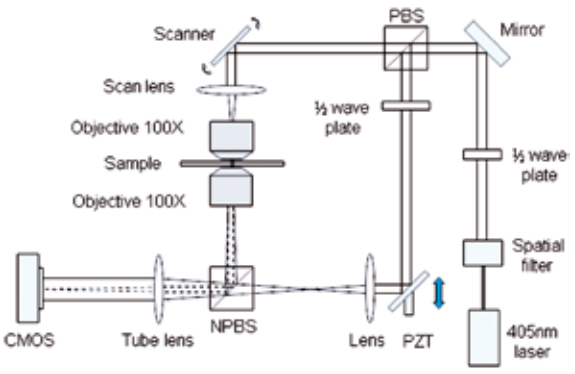
研究計畫 Research Projects

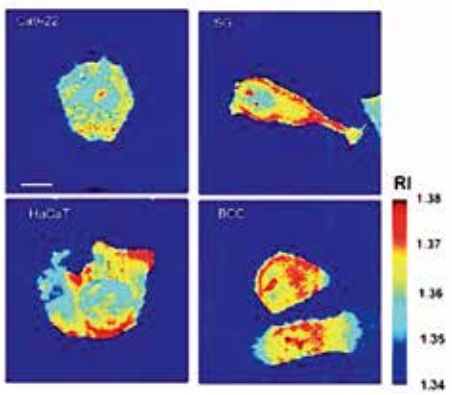
1. 以結合光纖之高光譜影像術進行非侵入性癌前病變與癌症早期診斷
   Noninvasive early diagnosis of precancer and cancer using fiber-optic-based hyperspectral imaging
2. 癌症與癌前病變細胞之結構與其散射光特性之關連性研究
   Studying the relation between structure and light scattering properties of cancer/precancerous cells
3. 三維折射率活細胞顯微術
   Three-dimensional refractive-index microscopy for live cell imaging

■研究計畫－三維折射率活細胞顯微術Three-dimensional refractive-index microscopy for live cell imagingSupported by: National Science Council之代表圖及中英文說明：

右圖為目前所建構的光學相位斷層掃描系統，利用此系統可以得到細胞的三維折射率的分布，下圖為四種不同細胞株(CA9-22, BCC, HaCaT及SG)於聚焦平面之折射率分布。圖中白色線代表10 μm。

The figure at the right shows a schematic diagram of an optical tomographic phase microscope we have developed. We have used this novel technique to acquire three-dimensional distributions of refractive index of living cells. The four figures at the bottom show refractive index (RI) images at the focal plane of four cell lines.





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Associate Professor, Graduate Institute of Biomedical Electronics and Bioinformatics/ Department of Computer Science and Information Engineering/ Department of pharmacy, National Taiwan University

生物資訊與化學資訊實驗室

Bioinformatics and Cheminformatics Lab.

本實驗室是一個跨領域的實驗室，研究的方向有兩個主軸，一是以分子結構為中心探討分子結構與活體、活性、毒性之關係，包括計算化學用在藥物設計、計算毒理學、化學資訊、生物資訊及代謝體學等，本實驗室應用物理化學、數值分析及資訊統計的技術來解決各種生物、化學及醫學方面的問題。目前主要的研究包括：1.發展新的計算化學方法做為臨床前藥物吸收、分佈、代謝及毒性之分析及新藥設計。2.以化合物三維結構分析用在化學資料庫做虛擬藥物篩選與化學結構資訊比對。3.應用代謝體之化學結構光譜找尋臨床上用來做為診斷、病程及預後生物指標之結構及新藥設計。

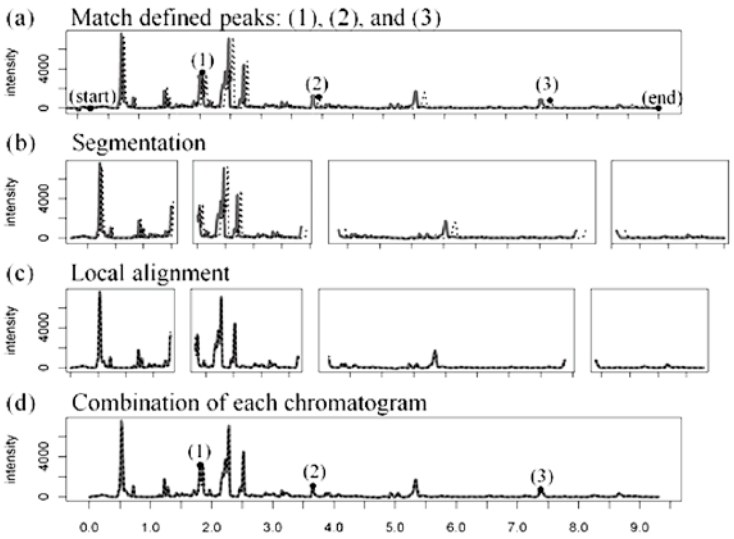
Bioinformatics and Cheminformatics Laboratory is a multidisciplinary lab. There are two main research themes in this lab. First and the major one is to analyze molecular structures such as drugs, endogenous molecules, proteins, and relate the structure for their pattern with biological activities, toxicities, and biological systems in the field of computational chemistry, computational toxicology, bioinformatics,cheminformatics, and metabonomics.

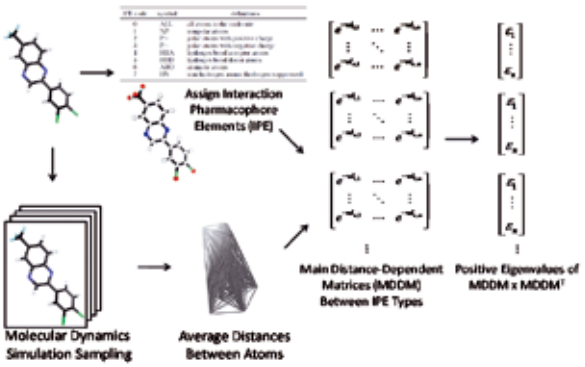
主要研究領域 Major Research Areas

計算化學及計算毒理學、生物資訊學、化學資訊學、代謝體學
Computational Chemistry and Computational Toxicology, Cheminformatics, Bioinformatics, and Metabolomics

研究計畫 Research Projects

1. 電腦輔助設計組蛋白甲基轉移酶G9a之抑制劑暨臨床前結構安全性篩選
   Computer-aided Drug Design and in silico Pre-Clinical PK/SafetyScreening of Histone Methyltransferase G9a Inhibitors as the Target Cancer Therapies
2. 運動處方對國人重大疾病的健康效益－臨床與代謝體指標的探討
   Exercise prescription for current major diseases recovery with special emphasis on clinicalindices and metabolomics biomarkers





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Professor, Graduate Institute of Networking and Multimedia, National Taiwan University

醫學影像處理實驗室
Medical Image Processing Lab.

乳癌是近年來已全球化的婦女死亡的主要原因，如果可以及早查出腫瘤的存在，乳癌治癒的機會將大增不少。在臨床上，電腦輔助診斷系統(CAD)可以幫助醫師分辨惡性和良性的乳房腫瘤，如果電腦輔助診斷系統可以提供更高的準確率，便可以大幅減少乳房切片檢查的需求。從1998年開始，我們致力於發展超音波電腦輔助診斷系統，也有了不錯的研究經驗與成果，成果計有2D/3D超音波、彩色超音波、PC-based超音波、彈性超音波及自動超音波的電腦診斷系統。合作研究單位有美國芝加哥大學，美國U-Systems超音波公司，並與韓國漢城大學醫院、日本獨協大學醫院、台大醫院、台北榮總醫師均有密切合作研究。

In recent years, the breast cancer is globally the main causes of death for women. If a cancer can be found out earlier, the curability of the breast cancer will increase greatly. Clinically, the computer-aided diagnosis (CAD) systems can help physicians to differentiate the benign and malignant tumors. If the computer-aided diagnosis systems have higher accuracy, the demand of the breast biopsy can be reduced.

Since 1998, we are devoted to develop the ultrasound (US) CAD systems including 2D/3D US, color Doppler US, color elastography, PC-based US, and automated US. The laboratory also collaborates with The University of Chicago and U-systems Inc., USA. We closely collaborate with physicians from Seoul National University Hospital, Dokkyo Medical University Hospital, National Taiwan University Hospital, and Taipei Veterans General Hospital.

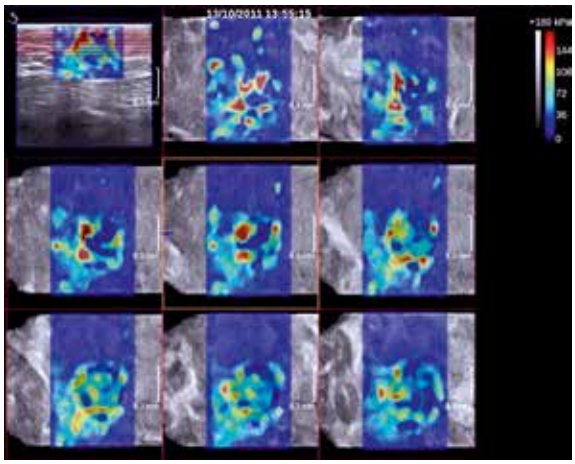
主要研究領域 Major Research Areas

醫學影像電腦輔助診斷、影像視訊處理、多媒體系統及通訊
Medical Image Computer Aided Diagnosis, Image Processing, Multimedia Systems and Communication

研究計畫 Research Projects

1. 多功能乳房超音波電腦輔助診斷系統3年計畫(學界科專)
   Multifunctional Breast Ultrasound Computer-aided Diagnosis
2. 新式乳房彈性超音波之電腦輔助診斷
   Computer-aided Diagnosis System for Advanced Breast Elastography
3. 乳房磁振造影之電腦輔助偵測與診斷
   Computer-aided Detection and Diagnosis System for Breast MRI

■研究計畫－新式乳房彈性超音波之電腦輔助診斷Computer-aided Diagnosis System for Advanced Breast Elastography之代表圖及中英文說明：



3-D剪力彈性超音波
3-D Shearwave elastography

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超大型積體電路系統晶片電腦輔助設計實驗室
SOC VLSI-EDA Lab.

自2003年成立至今，本實驗室一向是一個不斷追求創新及擴展知識的一個的國際化研究團隊,其研究領域包括了生醫電子，電腦輔助設計及數位IC設計實驗室，其研究重點在於針對電路實體設計及時序之最佳化以及線路模擬，及在針對製造時所產生之製程移之影響及解決方案。最近，我們又極力發展生醫MRI及PEI影像及血管模擬以及半導體光學製程之模擬之最佳化。在IC設計方面，我們主力在發展在高速低功率之微處理機所須之電路。本實驗室目前的研究方向主要可分為九大領域

- 生醫MRI、PET影像處理
- 生醫行動生理檢測系統
- 蛋白質摺疊分析
- 可製造性設計
- 數位電路之最佳化
- 統計型時序分析
- 高效能電路設計
- 半導體學製程影像之模擬與處理
- 電力線通訊系統

Established in 2003, BIO-EDA-VLSI Lab has been relentlessly pursuing new challenges and enrich knowledge in the field of EDA, VLSI circuit design, and BIO/Optical Microlithography Image Simulation and Processing. The focus of our research field include the following 9 major projects:

- Biomedical MRI, PET Imaging processing
- The transmission and analysis of Bio-signal
- Protein folding
- Digital Circuit Optimization
- Design for Manufacturabiliy
- Statistical Static Timing Analysis
- High Performance Circuit Design
- BIO and Optical Microlithography Imaging Simulation and Processing
- Power Line Communication system

主要研究領域 Major Research Areas

生醫及半導體光學製程影像處理、微處理機設計、VLSI電腦輔助設計、微波通訊線路設計、電力線通訊系統、生醫行動生理檢測系統

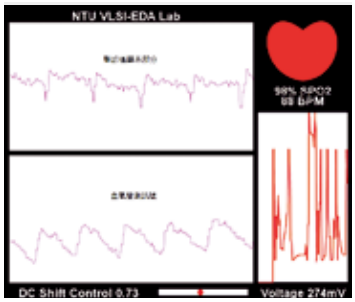
BIO/Optical Microlithography Image Processing, VLSI CAD, Microprocessor Design, RF Mix/Signal Circuit Design, Power Line Communication system, The transmission and analysis of Bio-signal

研究計畫 Research Projects

1. 次微米下之高速電路及低耗電最佳化
   Deep-Sub-Micron High-speed Low Power Optimization
2. 動態邏輯加法器設計及自動化
   Domino Adder Design and Automa
3. 次微米級干涉週期量測之診斷演算法
   Efficient and Accurate Optical Scatterometry Diagnosis of Grating Variation Based on Segmented Moment Matching and Singular Value Decomposition Method
4. 行動式無線癲癇症預測雲端系統
   Mobile Wireless Epilepsy Seizure Prediction System with Cloud Computation Method

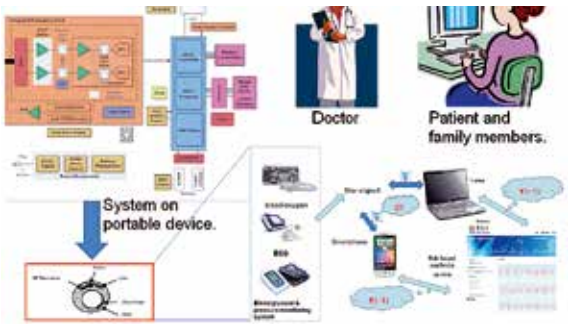
5. 連續性個人化健康照護整合平台子計畫三

6. Telecare platform with portable biomedical system applied in Smartphone



研究計畫-
Telecare platform with portable biomedical system applied in Smartphone：結合藍芽晶片傳送至智慧型手機，做圖形化的顯示。

研究計畫-
連續性個人化健康照護整合平台子計畫三之代表圖：



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醫學影像實驗室
Medical Imaging Lab.

醫學影像實驗室目前位於臺灣大學明達館七樓(room706)。負責人為陳志宏(Jyh-Horng Chen)教授，助理1人，研究生6人，博士班學生1人。主要研究方向為核磁共振造影(MRI)、殘障者人機介面與噪音抑制(Noise cancelation)等研究主題。在電機一館一樓設有MRI/MRS實驗室，設有一台Bruker 3.0 Tesla MR，平時提供校園內學術單位做研究，以及本實驗室研究造影技術之用。

核磁共振影像頻譜實驗室
Magnetic Resonance Imaging Lab.

本實驗室於1999年成立，以提供有效、可靠的成像技術及訓練課程予各研究領域之研究學者，心理學家、生理學家、動物學家，可藉由磁振光譜影像之重建方式，為未來之基因蛋白體研究、動物病變模型之評估，提供微細且精確的訊息，以成為臺灣的MRI研究及人才培訓資源中心。另一方面，本實驗室亦從事新技術之研發，期能突破現有磁振造影(MRI)之成像速度限制，提升磁共振影幅系統成像能力及臺灣在磁共振領域之國際知名度，並藉由國內現有MR研究資源合作，以跨學科之研究，使人文、科學、醫學、工程等不同學科得以匯整激盪，並創造21世紀之新學門科學，建立一個世界級之核磁共振卓越中心。主要研究方向包括：大腦功能性磁振造影、擴散磁振造影、MR線圈設計、MRI成像最佳化技術、超快速平行擷取MRI系統、小動物生理病理研究、分子影像。

The laboratory will apply the existing MRI / MRS techniques to interdisplinary research, including school of humanity, psychology, medicine, engineering, agriculture and food science. Its object is to combine experts in different areas to generate, hopefully, some new academic areas in 21 century. This laboratory is supported by National Taiwan University (NTU) as well as Instrumentation Center of National Science Council (NSC) in Taiwan.

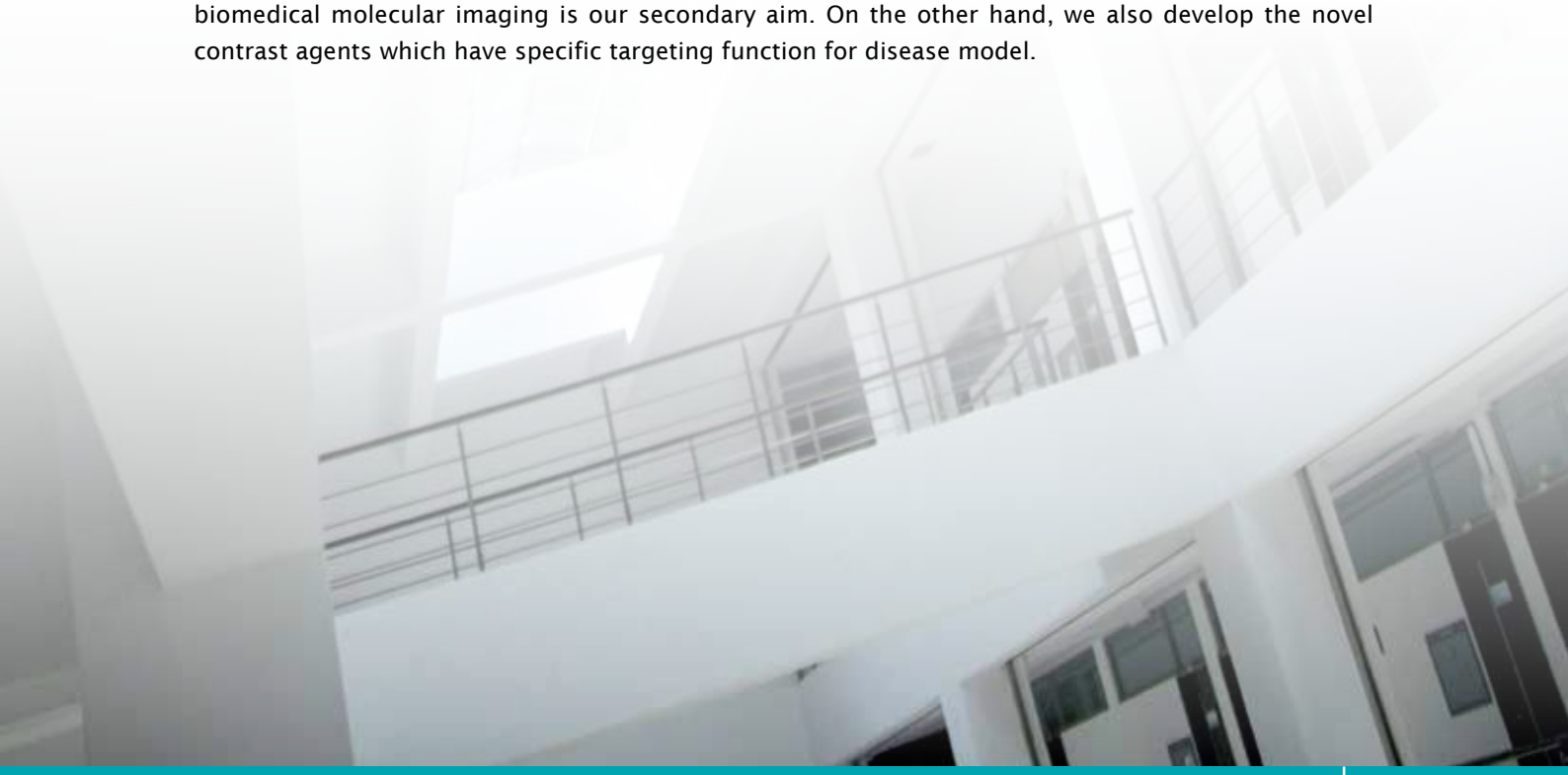
生醫分子影像核心實驗室
Biomedical Molecular Imaging Core Lab.

此核心實驗室結合磁共振(MR)分子影像、光學分子影像(Optical molecular imaging)及超音波分子影像(Ultarsonic molecular imaging)，此外，為使活體中特定的分子成像，除了要有上述高分辨率、敏感、快速的成像技術，還具備合成具有高親和力的分子探針及具有特異標定之顯影劑。

本核心實驗室主要目標之一為提供分子醫學影像之量測與生物體之醫學成像技術研究服務予臺灣大學醫學院區內從事生物醫學、基礎醫學與臨床醫學研究人員，此外，本實驗室致力發展新型醫學影像之顯影劑開發，並結合分子生物之技術，開發新式具特異標定功能之奈米粒子。

This core combined MR molecular imaging, optical molecular imaging and ultrasonic molecular imaging, thence,besides above mentioned properties, high spatial resolution, sensitivity and fast imaging technology, it has the ability to synthesize high affinity molecular probe and specific-targeting contrast agent, and then in vivo specific molecular imaging will be obtained.

Our primary aim for this Biomedical molecular imaging Core is to provide research services to all the investigators within NTU medical campus, and conducting methodological research related to biomedical molecular imaging is our secondary aim. On the other hand, we also develop the novel contrast agents which have specific targeting function for disease model.



主要研究領域 Major Research Areas

核磁共振影像、醫學工程

Magnetic Resonance Image, Functional MRI, Molecular imaging, Man Machine interface, Medical Engineering

研究計畫 Research Projects

1. 新世代磁振造影之研發：以多截面激發接收為基礎之多通道高溫超導收發陣列線圈
   Next Generation MRI: MRI with Multi-slice Acquisition and High Temperature Superconducting Multi-channel Transceiver Array.
2. 人文與社會科學MRI與MEG研究人才培育計畫－影像運作原則、神經系統及認知神經科學入門講習
   Training course for humanities and social science researchers for MRI and MEG: Fundamentaleducation on the imaging acquisition and processing, nervous system and cognitive neuroscience
3. 高溫超導陣列線圈於動物磁振造影之生醫應用
   Novel Applications of High Temperature Superconducting Phased Array Coils for MR AnimalImaging
4. 心智科學大型研究設備建置及共同使用服務計畫－大腦與心智文化整合性研究
   Installation and Operation of Core Facility in Mind Science: An Initiative for Integrated Research on Brain, Mind and Culture
5. 發展動態磁振造影及具標定之生醫分子影像：評估肺癌與轉移肺癌小鼠模式之治療反應－發展動態磁振造影及具標定之生醫分子影像：評估肺癌與轉移肺癌小鼠模式之治療反應
   Evaluating Therapeutic Response of Lung Cancer and Metastatic Lung Cancer in Mouse Models with DCE MRI and Targeted Molecular Imaging
6. 供癌細胞/幹細胞血統追蹤之基因改造鼠：研發及應用－具標定功能奈米顯影劑及複合式生醫分子影像技術平台之研究：以雙螢光基因及白喉毒素受體基因替換小鼠為模型(子計畫二)
   Genetically-Engineered Mice for Cancer Cell / Stem Cell Lineage Tracing : Research and Application
7. 大腦如何調節自發性節律平靜狀態下腦功能性連結之探討與應用
   How Does Brain Coordinate Spontaneous Fluctuation?

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智慧型及精密運動控制實驗室
IPMC Lab.

本實驗室「智慧型精密運動控制實驗室」由陳永耀教授領導，位於明達館604室，其研究的主要方向為智慧型控制與超音波熱療。實驗室的近期研究領域分成反向光學微影技術、電子束微影系統、姿態辨識聲音的分析與處理、仿生機械人、及超音波熱療等五大主題。

反向光學微影技術的研究是針對在IC製程上小尺度的光罩所產生的繞射現象，在光罩設計時將繞射現象考慮進去，設計出最佳的光罩形狀。電子束微影系統的研究是在IC製程中的電子束蝕刻時，對電子束做位置的訊號回授控制以修正電子移動時所產生的漂移現象。姿態辨識的研究是利用人工智慧的方式來處理影像中的資訊，本實驗室建立影像的監視系統應用在老人看護上。另外在聲音處理的方面是利用訊號處理的方式將聲音中的雜訊濾除，進而研究聲音本質與語者分析。仿生機械人的研究是模仿生物的運動模式，將生物的優點轉換成電機領域的應用，近期的研究是將蛇的運動設計成新型的載具。超音波熱療的研究是發展新的預測方式，來追蹤人體中因呼吸而上下運動的腫瘤細胞，使得聚焦的超音波能夠正確的加熱在腫瘤細胞上，殺死腫瘤細胞。

本實驗室致力於將智慧型控制嘗試應用在各方領域，將機械自動化，改良儀器控制法，改善人類生活。

Intelligent Precision Motion Control Laboratory isled by Prof. Yung-Yaw Chan and located in room 604, Minda building. Researches included inverse optical micro-lithography, electron beam lithography, motion identification, sound Analysis, biomimetics, and high intensity focus ultrasound.

Inverse optical micro-lithography is to design the optimal from of the mask, due to the diffraction of light changes. Electron Beam Lithography is to write on wafers by electron beam directly. We use sensors to feedback control the system to reduce beam broadening and proximity effect. In motion identify, we analyze the human activities for the home care systems. Biomimetics is to study the biological structure and the locomotion of real snakes,and to develop and design advanced platform actuation systems.Our laboratory applies Intelligent Control to automate machine and to improve the system performance.

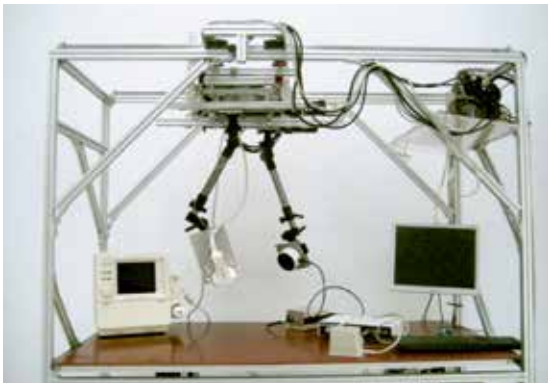
主要研究領域 Major Research Areas

智慧型控制、居家看護、精密伺服控制、超音波加熱治療

Intelligent control, Home care, Precision servo control, Hyperthermia treatment planning

研究計畫 Research Projects

1. 智慧型微創手術擴增實境系統研發(總計劃)
   Development on Intelligent Augmented Reality Mini-invasive Surgical System
2. 結合影像深度資訊之智慧型人體動作辨識與多目標追蹤
   Application of Image Depth Information on Intelligent Human Action Recognition and Multi-targets Tracking
3. 由呼吸導致週期性位移肝腫瘤之超音波熱劑量控制方法研發(總計畫)
   Development on High Intensity Focused Ultrasound Thermal Therapy Tracking Control on Liver Tumor with Respiration-induced Periodic Motion
4. 肝腫瘤位置追蹤及高強度聚焦超音波熱療控制系統研發(子計畫一)
   Development on Liver Tumor Tracking and High Intensity Focused Ultrasound Thermal Therapy Control System



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國立臺灣大學醫學院臨床醫學研究所 合聘教授
國立臺灣大學醫學院附設醫院腫瘤醫學部放射腫瘤科 主治醫師

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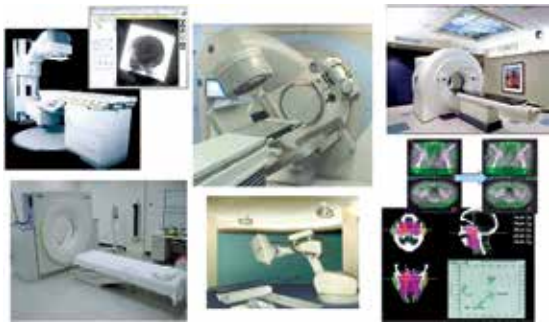
Professor ,Graduate Institute of Oncology, National Taiwan University College of Medicine
Adjunct Professor, Graduate Institute of Clinical Medicine, National Taiwan University College of Medicine
Attending Physician, Division of Radiation Oncology, Department of Oncology, National Taiwan University Hospital

放射物理生物實驗室
Radiation Physics and Biology Lab.

本實驗室由成佳憲教授於2002年起隨同整建臺大醫院腫瘤醫學部放射腫瘤科時設立，主要從事放射治療物理學與放射生物學相關研究，目前以設備技術物理與腫瘤放射治療轉譯醫學等領域為研究重點。本實驗室在影像導引放射治療領域與肝癌放射治療領域已產出許多具體貢獻。本實驗室之成員來自臺大醫院腫瘤醫學部放射腫瘤科醫學物理師、放射師及放射生物醫學領域研究人員，多年來亦積極與國內外單位進行合作。

The laboratory for radiation physics and biology was established by Jason Chia-Hsien Cheng, M.D., M.S., Ph.D., with the reconstruction of Division of Radiation Oncology, Department of Oncology, National Taiwan University Hospital. The main research directions are radiation physics related to equipment and technique, as well as translational medicine of radiation oncology. Our research team has been contributing significantly the progress in image-guided radiation therapy and radiotherapy to hepatocellular carcinoma. The team members of our laboratory include the radiation physicists, radiation technologists, and radiation biologists from Division of Radiation Oncology. The laboratory also has the collaboration with the other research teams in Taiwan and in the other countries.



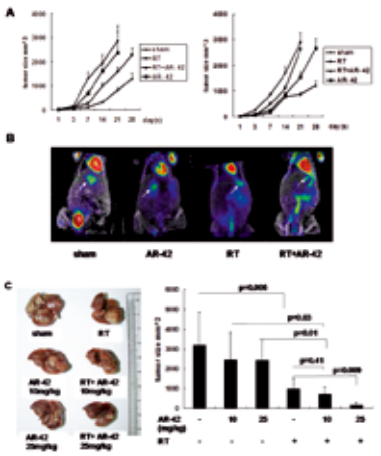
主要研究領域 Major Research Areas

放射腫瘤學、放射物理學、放射生物學、癌症轉譯醫學
Radiation Oncology, Radiation Physics, Radiation Biology, Cancer Translational Medicine

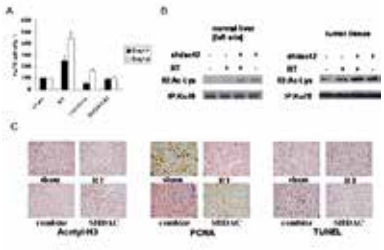
研究計畫 Research Projects

1. 探討組織蛋白去乙醯基酵素在肝癌放射治療的角色
   Investigation on Therapeutic Role of Histone Deacetylase in Radiotherapy to Hepatocellular Carcinoma
2. 探討磷脂醯肌醇3－激酶/蛋白質激酶B/哺乳動物雷帕黴素靶蛋白傳遞路徑及相關拮抗劑對於肝癌細胞放射抵抗性之作用機轉
   Investigation on the mechanisms of PI-3K/Akt/mTOR dependent radioresistance of epatocellular carcinoma and the related inhibitors

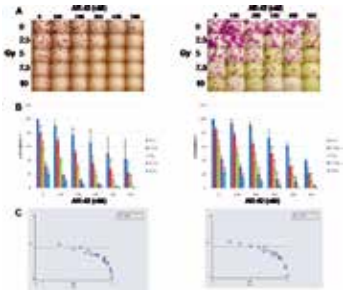
■研究計畫－探討組織蛋白去乙醯基酵素在肝癌放射治療的角色
Investigation on Therapeutic Role of Histone Deacetylase in Radiotherapy to Hepatocellular Carcinoma之代表圖及中英文說明：



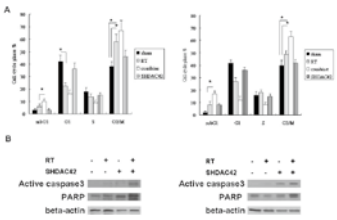
Synergistic effect of an HDAC inhibitor as a radiosensitizer in HCC ectopic and orthotopic xenograft models. With our established HCC ectopic and orthotopic xenograft models, we have been able to evaluate the in vivo synergistic effect of combined radiation and HDAC inhibitor as a potential radiosensitizer.



AR-42 down-regulates Ku70 activity and enhanced Ku70 acetylation on orthotopic hepatocellular carcinoma (HCC) tumor models.



Radiosensitization of HCC cells by an HDAC inhibitor AR-42.



AR-42 enhances the radiation induced cell cycle changes and apoptosis of HCC cells.

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Nai-Kuan Chou Clinical Associate Professor

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Clinical Associate professor of surgery, National Taiwan University, College of Medicine
Director of Intensive Care Unit of Department of Surgery, National Taiwan University Hospital
Convener m of Organ Procurement Organization, National Taiwan University Hospital

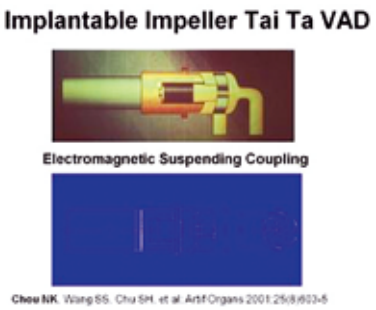
臺大醫院第七共同研究室

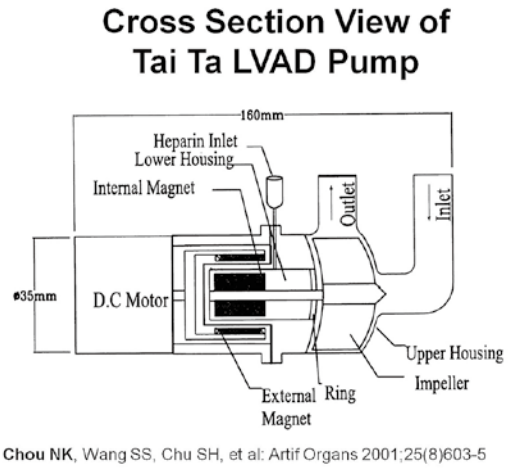
Laboratory.

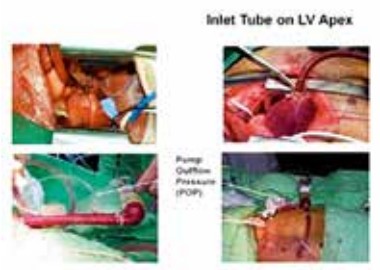
實驗室結合研究團隊的各實驗室，成員如下：應力所邵耀華教授、電機系汪重光教授、獸醫系徐久忠教授、高分子所謝國煌教授、包舜華博士、戴浩志醫師、王碩盟醫師、劉亮廷醫師。

1. 小動物實驗模型
2. 醫療儀器、訊號分析處理
3. 超音波影像處理
4. 實驗室儀器：雙向心臟血管用X光射影系統、多頻道生理記錄分析系統(Polygraphy)、Injector、Autoinjector、多頻道心理生理電腦化記錄分析儀(EP recording)、CARTO、電氣生理刺激器、血管內導線壓力儀器(PressureWire)、OCT、電燒機、血管內超音波(i-LAB)、血液凝固測試儀(ACT)、波士頓科技羅塔培特控制台系統、IABP、電擊器、血中含氧測定儀、非侵入式自動血壓計、微量點滴控制器(Syringe pump)、人工心律調整器、血氧飽合濃度監視器、血壓血氧ECG監視器、電刀機、點滴幫浦、耳溫槍、血糖機、JJ電燒機等等。

Laboratory animals, animal models of heart failure and artherosclerosis, establishes computerized database for laboratory animal science and assists in various experiments, disease diagnosis, and health monitoring.







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Professor, Graduate Institute of Biomedical Electronics and Bioinformatics/ Department of Computer Science and Information Engineering/ Graduate Institute of Networking and Multimedia, National Taiwan University

數位相機與電腦視覺實驗室
Digital Camera and Computer Vision Lab.

本實驗室由傅楸善教授成立於2003年，主要從事數位相機與電腦視覺相關研究。歷年來已執行多項研究計畫，目前以生醫數位相機、影像處理與自動光學檢測等領域為研究重點。本實驗室在上述領域已產出許多具體貢獻並在全世界有很高之能見度。此外，本實驗室之成員來自電子、資訊及醫學等各領域，多年來亦積極與國內外單位進行合作，合作夥伴包括產、研、學各界，例如：光寶科技、源浩科技、德律科技等。提升數位相機與自動光學檢測技術及其生醫應用，是本實驗室之成立宗旨與具體目標。

Digital Camera and Computer Vision Laboratory was founded by Professor Chiou-Shann Fuh in 2003, with the main research focus in digital camera and computer vision. In the past few years, we have conducted a number of research projects in digital image processing and automatic optical inspection. We have also made several critical contributions and are now one of the most visible research laboratories in this field in the world. Members of the laboratory come from various backgrounds, including electronics, informatics, and medicine. We have also been actively collaborating with research laboratories throughout the world, covering industry, research institutes, and universities, from basic sciences, engineering to clinical research, such as Liteon, Winstar Technology, and TRI. Integrating multi-disciplinary research efforts, exploring advanced digital camera with biomedical applications, and automatic optical inspection are the mission of this laboratory.

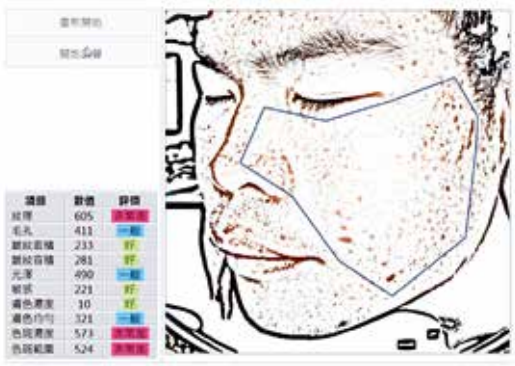
主要研究領域 Major Research Areas

數位相機、電腦視覺、自動光學檢測、數位影像處理
Digital Camera, Computer Vision, Automatic Optical Inspection, Digital Image Processing

研究計畫 Research Projects

1. 數位相機之影像處理：高動態範圍影像、行人偵測、性別與年齡估計
   Image Processing for Digital Cameras: High Dynamic Range Image, Pedestrian Detection, Gender and Age Estimation
2. 數位相機之影像處理：降低雜訊、光線補償、臉色改善
   Image Processing for Digital Cameras: Noise Reduction, Light Compensation, Facial Color Enhancement
3. 數位相機之影像處理：色彩內插、色彩校正、色彩管理
   Digital Image Processing for Camera: Color Interpolation, Color Calibration, Color Management
4. 行動視訊高畫質顯示調適技術
   High Quality Display Adaptation Technique for Mobile Video Device

■研究計畫－數位相機之影像處理：高動態範圍影像、行人偵測、性別與年齡估計Image Processing for Digital Cameras: High Dynamic Range Image, Pedestrian Detection, Gender and Age Estimation之代表圖及中英文說明：



人臉特徵偵測與分析
Human Face Feature Detection and Analysis

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Professor, Department of Surgery, National Taiwan University
Attending Physician, Department of Surgery, National Taiwan University Hospital
Director, Comprehensive Breast Care Center, National Taiwan University Hospital

主要研究領域 Major Research Areas

乳房外科、乳房超音波、腫瘤外科、分子流行病學、臨床試驗
Breast Surgery, Breast Ultrasound, Surgical Oncology, Molecular Epidemiology, Clinical trial

研究計畫 Research Projects

一、轉譯醫學研究
Translational Medicine Research

1. 針對亞洲年輕婦女急速增加luminal type乳癌發展新穎治療標的與生物標記－(總計畫與子計畫一)以多平臺全基因微陣列方法去分析及發現不同臨床生物表現之同Luminal A型態乳癌的特別基因特徵。
   (Novel therapeutic targets and biomarkers for emerging luminal type breast cancer in young women in Asia-Main Project and Subproject 1) To Discover Genomic Signatures of Differential Clinical Behaviors of Lumina A-type Breast Cancer through Multi-Platform Whole Genome Microarray Analyses.
2. 全基因體關聯研究找到的單一核甘酸基因多形性變異與乳癌危險性，分子類型與預後的關係
   The association between single nucleotide polymorphisms discovered by genome-wide association study and the susceptibility, progression, molecular subtype and prognosis of breast cancer.
3. 代謝體研究應用於乳癌早期偵測及療效預測
   Application of metabolomics to breast cancer early detection and prognosis estimation
4. 微核醣核酸調控腫瘤進展的微環境因子與分子機制－微核醣核酸在乳癌轉移的角色探討。
   Microfluidic Devices for the Studies of Drug Selection and Chemotherapeutic Efficacy
5. 微流體平台進行藥物篩選與化療療效監測
   Microfluidic Devices for the Studies of Drug Selection and Chemotherapeutic Efficacy

二、乳房超音波及其他影像檢查研究
Breast Ultrasound and Other Imaging Screening Research

1. 衛生署癌症卓越研究計畫第一期：探討台灣地區年輕女性乳癌病人激增的原因；尋求對年輕女性更具實效的篩檢方法；建立台灣人之乳癌基因圖譜
   To establish centers of excellence for cancer research in Taiwan from 2010-2013: Investigating the reason of the rapid increase of young woman breast cancer patient in Taiwan, searching for a more effective screening method for young woman, establishing a breast cancer gene map for Taiwanese.

   子計畫：以自動掃描全乳房超音波併傳統徒手超音波或乳房X光攝影術交替篩檢45-50歲婦女試驗
   Theme: Using automated breast ultrasound screening plus traditional free-hand ultrasound or mammography to screen woman from 45 to 50 years old.

2. 衛生署癌症卓越研究計畫第二期：針對具有發生率上升及早發性特色的臺灣女性乳癌發展具有成本效益的篩檢方法和避免過度治療的策略
   To establish centers of excellence for cancer research in Taiwan from 2014-2017: Developing cost-effective strategies for breast cancer screening and Avoiding over-treatment in Taiwan, an area of increasing incidence and early onset.

   子計畫：乳房超音波篩檢的標準化及品質控制
   Theme: Breast ultrasound screening standardization and quality control

三、臨床試驗
Clinical Trial

1. NK105：一項針對轉移性或復發性乳癌患者比較NK105與Paclitaxel的多國第III期臨床試驗
   A multi-national phase III clinical study comparing NK105 versus paclitaxel in patients with metastatic or recurrent breast cancer.

2. Safeher：第三期前瞻性、二組非隨機分配、多國多中心、開放藥品標示研究，評估可手術切除之HER 2陽性早期乳癌患者接受協助與自行皮下注射Trastuzumab術後輔助治療之安全性
   A phase III prospective, two-cohort non-randomized, multi-centre, multinational, open label study to assess the safety of assisted-and self-administered subcutaneous trastuzumab as adjuvant therapy in patients with operable HER2-positive early breast cancer.

3. TKI258：一項針對先前接受內分泌治療期間或之後發生疾病惡化之HER2-與HR+的停經後乳癌患者，評估 TKI258 併用 fulvestrant 的安全性及療效之多中心、隨機分配、雙盲、安慰劑對照的第 II 期試驗
   A multicenter, randomized, double blind, placebo controlled, phase II trial evaluating the safety and efficacy of TKI258 combined with fulvestrant, in postmenopausal patients with HER2- and HR+ breast cancer that have evidence of disease progression on or after prior endocrine therapy.

4. D-care：一項隨機、雙盲、安慰劑控制、多中心之第三期試驗，目的在探討以Denosumab作為治療罹患初期乳癌且具高復發風險女性之輔助治療
   A randomized, double-blinded, Multi-center phase 3 study of denosumab as adjuvant treatment for women with early-stage breast cancer at high risk of recurrence.

5. Novartis：一項第IIIb期、多中心、開放性的擴大性試驗，針對雌激素受體陽性、第二型人類表皮生長因子受體陰性且局部惡化或轉移的更年期後乳癌女性，研究everolimus (RAD001)併用exemestane之治療
   A phase IIIb, multi-center, open-label, expanded access study of EVERolimus (RAD001) in combination with exemestane in post-menopausal women with EStrogen receptor positive, human epidermal growth factor receptor 2 negative locally advanced or metastatic breast cancer.

6. LCL (161)：一項針對三重陰性乳癌患者，評估使用每週一次paclitaxel併用或不併用LCL161之差異的第二期、多中心、開放性、術前輔助治療之隨機分配試驗
   A Phase II, multi-center, open-label, neoadjuvant, randomized study of weekly paclitaxel with or without LCL161 in patients with triple negative breast cancer

7. LUX-breast cancer 2：開放標示、第二期試驗，使用BIBW 2992(afatinib)於術前輔助性或輔助性HER2標靶治療無效且HER2過度表現之轉移性乳癌患者
   An open label, phase II trial of BIBW 2992(afatinib) in patients with metastatic HER2-overexpressing breast cancer failing HER2-targeted treatment in the neoadjuvant treatment setting.

8. Aphinity：隨機、多中心、雙盲、安慰劑對照試驗，比較可藉由手術切除之HER2陽性原發性乳癌病患，使用trastuzumab、化療藥物與安慰劑，以及trastuzumab、化療藥物與pertuzumab，做為輔助療法之療效與安全性
   A randomized multicenter, double-blind, place-controlled comparison of chemotherapy plus trastuzumab plus placebo versus chemotherapy plus trastuzumab plus pertuzumab as adjuvant therapy in patients with operable HER2-positive primary breast cancer.

9. Katherine：隨機分配、多中心、開放藥品標示的第三期臨床試驗，針對病理上具有腫瘤殘餘在乳房或腋下淋巴結的HER2陽性原發性乳癌，比較TRASTUZUMAB EMTANSINE和TRASTUZUMAB用於術後輔助療法的療效與安全性
   A randomized, multicenter, open-label phase III study to evaluate the efficacy and safety of trastuzumab emtansine versus trastuzumab as adjuvant therapy for patients with HER2-positive primary breast cancer who have resudual tumor present pathologically in the breast or axillary lymph nodes following preoperative therapy.

10. OPT：隨機分配、雙盲、第二期/第三期臨床試驗，以Globo H-KLH免疫療法治療轉移性之乳癌患者
    A double-blind, randomized trial of active immunotherapy with Globo H-KLH (OPT-822) in

subjects with metastatic breast cancer

四、台灣乳癌臨床試驗合作聯盟
Taiwan Breast Cancer Consortium

1. 設立台灣乳癌臨床試驗合作聯盟，以轉譯醫學資源中心之臨床試驗合作聯盟－乳癌，進行乳癌相關之臨床試驗
   Set up the “Taiwan Breast Cancer Consortium” as an excellent consortium of breast cancer clinical trial in Asia. Conduct the protocol: TR09 - Clinical Trials’ Consortium, Resource Center of Translational Medicine: Breast Cancer, for breast cancer related clinical trials.
2. 幫助國際及台灣藥廠執行乳癌臨床試驗之藥品開發
   Help international and domestic pharmaceutical companies conduct their breast cancer trials in Taiwan
3. 以研究聯盟團隊執行醫師發起之臨床試驗
   Help investigators of the consortium conduct investigator-initiated trials for breast cancer
4. 建立臨床資料收集系統資訊平台
   Establish an information platform of clinical database of Taiwan breast cancer

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國立灣大學基因體與系統生物學 學位學程

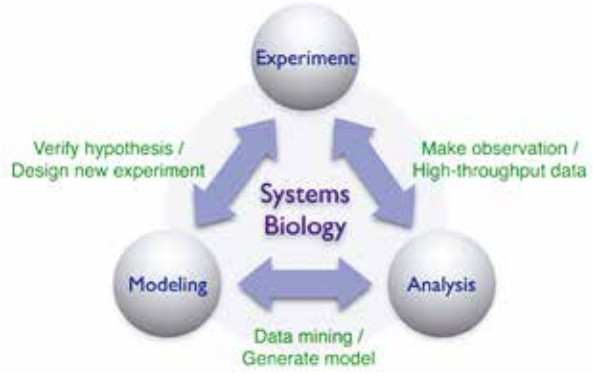
Professor, Graduate Institute of Biomedical Electronics and Bioinformatics/ Department of Life Science/ Institute of Molecular and Cellular Biology/ Genome and Systems Biology Degree Program, National Taiwan University

系統生物學研究室
Systems Biology Lab.

本研究室主要以系統生物學探討藥物在癌細胞的作用機制，內容包括各蛋白質間交互作用的預測和建構、基因網絡的模擬和建構，及微型RNA於其調控的蛋白質間交互作用及網路關係，期望進一步達到開發新藥的目地。主要的目標是利用系統生物學研究法來研究在ATP合成　抑制劑誘導下乳癌及肺癌細胞進行細胞凋亡的作用機制；同時，利用系統生物學研究法來開發新的藥物。

The main research in our lab is to apply systems biology for drug-discovery. We discover novel drugs for cancer therapy and investigate the molecular mechanism of apoptosis in drugs-induced cancer cells using systems biology approach.

MicroRNAs are short single-stranded non-coding RNA molecules which play a key role in post-transcriptional regulation of mRNAs. A miRNA can affect many downstream targets which in turn form a complicated network. Our lab has characterized the roles of miRNAs in the regulation of cellular networks and revealed that miRNA-regulated network could be used as a novel therapeutic target for cancer as well as other diseases such as neurological and cardiovascular diseases.



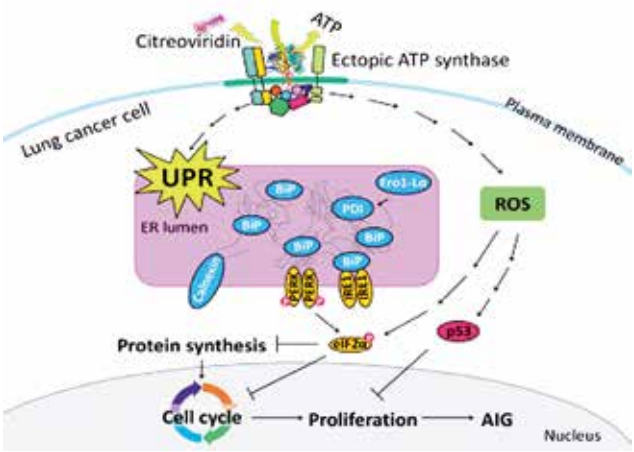
主要研究領域 Major Research Areas

系統生物學、蛋白質體學、生物資訊
Systems Biology, Proteomics, Bioinformatics

研究計畫 Research Projects

1. 結合蛋白質體學和網路生物學研究細胞膜異位表達ATP合成酶的反應路徑
   Elucidating the response pathways of ectopic ATP synthase by combining proteomics and network biology
2. 調控ATP合成酶基因之微RNA功能及演化
   Evolution and functions of microRNAs that regulate ATP synthase subunit genes
3. 整合體學探討微型核醣核酸於癌症轉移之調控網路
   Integrative omics and network study of miRNA regulation in cancer progression

■研究計畫－結合蛋白質體學和網路生物學研究細胞膜異位表達ATP合成酶的反應路徑Elucidating the response pathways of ectopic ATP synthase by combining proteomics and network biology之代表圖及中英文說明：



本圖顯示ATP合成酶抑制劑誘導肺癌細胞死亡的可能機制
Summary of the plausible mechanisms in lung cancer cell death induced by ATP synthase inhibitor citreoviridin.

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生物資訊實驗室
Bioinformatics Lab.

本研究室的研究方向為生物資訊與基因演算法。現有醫學、分子生物學、植物學、植物病理、資訊科學、電子電機工程、等，多種背景的學生、研究人員及國內外學者，進行常態性的跨領域合作。目前正進行的研究題目包括-蛋白質交互作用網絡的架構、預測與分析，基因交互作用網絡的架構、預測與分析，第二代定序技術之序列重組、註記與量化分析等。

透過基因變異的比對、蛋白質與基因交互作用的定性資料、基因晶片的定量資料、以及目前日益普及的第二代定序技術所生產的大量序列片段，我們期望了解遺傳疾病、癌症、精神疾病等的致病機制，協助疾病的診斷、預防和治療。同樣的研究方法也應用在其它物種的研究工作上，藉此探究植物的抗(生物與非生物)壓力機制，以及植物與病菌間的蛋白質交互作用，協助開發抗壓抗病高產量高品質的農產品。除此之外，我們也分析大腸桿菌與酵母菌等重要模式物種的基因功能與生化路徑，辨識基因間或蛋白質間的交互作用，進一步推論其它物種的運作模式。許多植物與藻類均為重要的能源作物，可用於生產生質酒精或柴油等，目前的第二代定序技術除可用於模式物種外，針對於非模式物種也進行大量的解序與基因表現分析，龐大且複雜的序列資料讓這個高通量的技術無法徹底發揮潛能，特別是目前可用的資料處理工具甚為匱乏，本研究室除了分析此類資料外，亦開發相關工具和創新的演算法，提升此類資料處理的效率和準確度。

The research focuses of this laboratory are bioinformatics and Taiwanese research. In bioinformatics, our lab apply genetic algorithm and combinatorial optimization to biological problems, solving problems from microarray analysis, protein structure prediction, protein-protein interaction prediction, drug discovery and design, and virtual screening of drug leads. These diverse topics can also be combined into systems biology, study biological problems from a global view. We also tried to translate our researches into applications in clinical medicine and drug developments. In Taiwanese research, we have devoted to the computational linguistics of Taiwanese, including input (optical character recognition) and output (Taiwanese voice synthesis). In the future, we would like to incorporate other elements, and construct a more integrative Taiwanese-computer environment, and facilitate the education of mother tone and archival research.

主要研究領域 Major Research Areas

生物資訊、計算分子生物學、基因演算法
Bioinformatics, Computational Molecular Biology, Genetic Algorithm

研究計畫 Research Projects

1. 植物，真菌與微生物系統生物學分析工具與資料庫整合分析平台開發
   Developing bioinformatics tools and on-line platforms for analyzing systems biology databases of plants, fungi, and microbes

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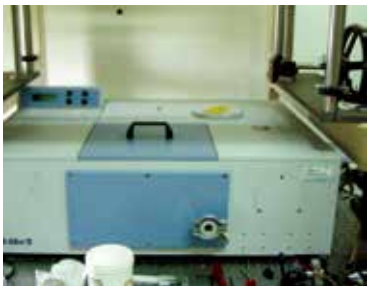
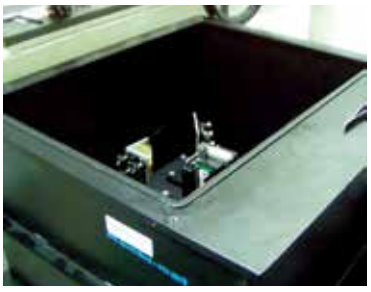
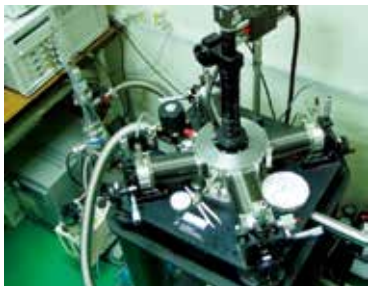
電子束暨奈米元件實驗室
E-beam and Nano Device Lab.

- 電子束直寫顯影實驗室、電子束掃瞄及顯影實驗室
  Direct-Writing Electron Beam Lithography System Lab., Scanning Electron Microscope Lab.
- 微拉曼/光激發光 光譜實驗室
  Micro-Raman/PL Spectral Lab.
- 紅外線光譜實驗室
  Infrared Spectral Lab.



Bruker FTIR紅外線光譜儀及變角度反射模組





電晶體特性曲線實驗器

FTIR 紅外線光譜儀

T 64000微光譜量測系統
（今年新增XY平面定位掃瞄功能）

電子束微顯影系統

主要研究領域 Major Research Areas

紅外線光偵測器、電子束微影技術、生醫元件、量子點元件、電子元件雜訊分析、光學模擬、聚焦離子束系統
Optoelectronic Device, E-beam Lithography, Noise Measurement, Bio-medical Chip, Quantum-dot Device, Optics simulation, Focused-ion-beam System

研究計畫 Research Projects

1. 發展奈米結構增強光偵測與光發射
   Development of nano-tructures to enhance light detection and emission
2. 矽鍺量子點奈米級記憶元件及陣列之製作與研究
   Nano-scale SiGe quantum-dot memory and array
3. 可低偏高溫操作且正向頂面入射的超晶格紅外線偵測器及陣列的研發
   Development of the Superlattice Infrared Photodetector and Array for Low-Bias High-Temperature Operation and Top Normal Incidence of Light
4. 光譜與電性量測於基因篩選之應用
   Application of spectrum and electrical signal measurements on gene screening
5. 窄頻紅外線光源與偵測器及其在植物與神經細胞上的應用
6. 離子的高敏感度交流電性量測並以紅外線頻譜作輔助分析(2/3)
   High-sensitivity AC electrical signal measurement and infrared spectrum assistant analysis originated from ions
7. 整合雙能障超晶格及量子井紅外線偵測器以達到高偵測率高響應及高溫操作
   Integration of double-barrier superlattice and quantum well infrared photodetectors for advantages of high detectivity, high responsivity,and high-temperature operation

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細胞行為實驗室
Cell Behavior Lab.

本實驗室主要研究課題在於瞭解細胞間如何使用物理性因子互相調節功能，以及改變環境物理性質。我們特別對細胞間以及與環境間的機械力傳遞感到興趣。因為相對僅能靠擴散方式作用的化學物質而言，力學訊號的作用範圍更遠，傳遞速度也較快，而且絕大多數的細胞均能產生。因此在大範圍組織整合的初始過程，包括組織發育、修補、以及退化，力學訊號可能扮演了具有相當決定性的角色。目前我們研究重點是同質細胞間的自我聚合及功能整合，以及異質細胞間的空間協調，以及各種機械性刺激對細胞移動的影響。我們的短期目標是發展出能精確測量、並調控細胞間力學通訊的實驗平台。遠程目標則是促進吾人對異質細胞間在各種生理、病理狀態下的交互作用，並對組織老化及再生的治療方針上有所啓益。

The primary interest of our lab is to investigate cell-cell communication via various biophysical factors. Specifically, we examine how cells regulate each other using mechanical and optical signals. Compared with biochemical agents that are primarily transmitted through diffusion, mechanical and optical signals are relatively long-ranged and transmitted at a faster time scale. Hence these signals may play a deterministic role in the initiation of tissue organization at a large spatial scale such as tissue development, regeneration, and degeneration. Currently we are studying the self-aggregation and integration of homogenous cells, as well as the spatial coordination of a complicated cellular network composed of heterogeneous cells, specifically the stratification between mesenchymal and epidermal cells. Current cell model involves muscle, dermal, and endothelial cells. Our short term goal is to develop a novel platform that can detect and modulate the mechanical and optical cues communicated between cells. The long term goal is to improve our understanding in cellular interactions of heterogeneous cells in various physiological and pathological conditions, and shed light on the therapeutic strategy in tissue regeneration and degeneration.

主要研究領域 Major Research Areas

組織工程、醫用生物物理、超音波彈性影像
Tissue engineering, Medical biophysics, Ultrasonic elasticity imaging

研究計畫 Research Projects

1. 適用多波影像之三維細胞培養支架開發
2. 經濟部政策型科專計畫：診斷超音波系統關鍵技術開發3年計畫－影像核心平台基礎技術開發
3. 智慧型非侵入陣列式血流監控系統晶片－子計畫六：以非侵入陣列式系統晶片監控頸動脈血流動力－力學模型及臨床評估

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統計信號處理實驗室
Statistical Signal Processing Lab.

本實驗室由李枝宏教授負責成立於1986年，主要研究領域為數位信號處理之理論與技術研發，近年來也積極進行應用數位信號處理之理論與技術於生醫領域之相關研究，包含：

1. 由國立臺灣大學醫學院骨科部提供人體膝關節病變與運動傷害所產生之振動訊號，應用相關信號處理理論研發建立此振動訊號之數學模型的技術，以協助臨床上分析診斷人體膝關節病變與運動傷害之型態與種類，以期提供醫生進行正確且必要醫療措施所需之資訊。

2. 由國立臺灣大學獸醫學系提供馬匹膝關節病變與老化所產生之振動訊號，應用相關信號處理理論研發建立此振動訊號之數學模型的技術，以協助臨床上分析診斷馬匹膝關節病變與老化之型態與種類，以期提供獸醫生進行正確且必要醫療措施所需之資訊。

3. 由國立臺灣大學醫學院牙科部提供人體顳顎關節病變所產生之振動訊號，應用相關信號處理理論研發建立此振動訊號之數學模型的技術，以協助臨床上分析診斷人體顳顎關節病變之型態與種類，以期提供醫生進行正確且必要醫療措施所需之資訊。目前進行的研究希望利用此特性進而更精確的找出膝關節振動訊號的特徵，進而發展實用簡單方便的非侵襲性關節診斷系統。

I. BASIC DIGITAL SIGNAL PROCESSING:
   (1) Techniques for the Design and Implementation of 1-D and 2-D FIR and IIR Digital Filters.
   (2) Techniques for Design and Implementation of 1-D and 2-D FIR and IIR Digital Filter Banks (Multi-rate Digital Signal Processing)

II. STATISTICAL DIGITAL SIGNAL PROCESSING:
   (1) Adaptive Signal Processing for Array Signals
   (2) Adaptive Array Beamforming Under Random Mismatches

(3) Adaptive Array Bearing Estimation Under Random Mismatches
(4) Adaptive Beamforming Using 2-D Circular Array for Wireless CDMA Systems
(5) Adaptive Minimum Bit Error Rate Beamforming Assisted Receiver for Wireless Communications
(6) Adaptive Signal Processing Techniques for Smart Antennas with Applications in Wireless and Mobile Communications

III. PROCESSING AND ANALYSIS OF BIOMEDICAL SIGNALS:
Analysis and Processing of Joint Vibration Signals for the Diagnosis of Cartilage Pathology
(1) Signal Processing Techniques for Vibration Signals of Human Knee Joints
(2) Signal Processing Techniques for Vibration Signals of Equine Knee Joints
(3) Signal Processing Techniques for Vibration Signals of Human emporomandibular joints

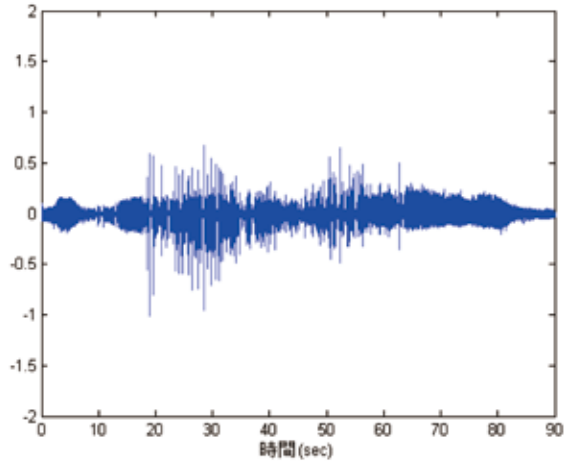
Goal of this research: To conduct research on Vibration Arthrometry (VAM) and provide the public a noninvasive, accurate tool (Expert Systems) for the diagnosis of joint disorders in clinical medicine.

主要研究領域 Major Research Areas

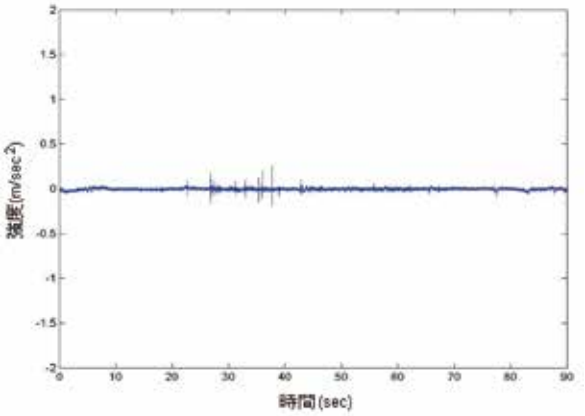
數位信號處理、智慧型天線與無線通訊信號處理、生醫信號處理、數位影像處理
Digital Signal Processing, Signal Processing for Smart Antennas and Wireless Communications, Biomedical Signal Processing, Digital Image Processing

研究計畫 Research Projects

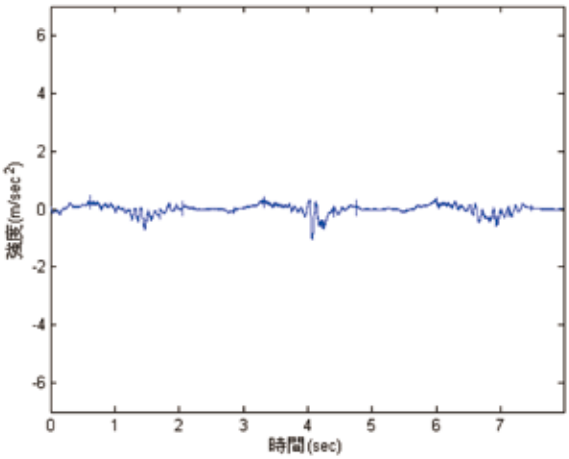
(1) 應用於視訊信號處理之二維副頻帶濾波器組之設計(Design of Two-Dimensional Subband Filter Banks with Applications to Video Signal Processing)，行政院國家科學委員會，NSC 97-2221-E-002-116-MY3，NT$650000.00，2008/8~2011/7。
(2) 應用於通訊環境下可適性陣列信號處理理論與技術之研究(Theory and Techniques for Adaptive Array Signal Processing Under Communication Environments)，行政院國家科學委員會，NSC 97-2221-E-002-174-MY3，NT$890000.00，2008/8 ~ 2011/7。Array Signal Processing Under Communication Environments)，行政院國家科學委員會，NSC 97-2221-E-002-174-MY3，NT$890000.00，2008/8 ~ 2011/7。



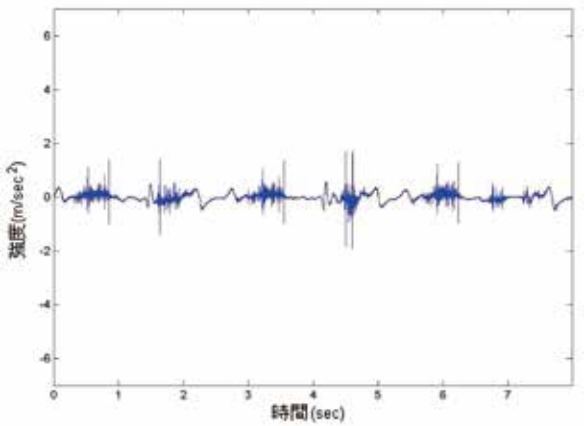
(A) 正常著膝關節在慢速擺動下所產生的振動訊號
(Physiological Patellofemoral Crepitus; PPC)



(B) 非正常著膝關節在慢速擺動下所產生的振動訊號
(Physiological Patellofemoral Crepitus; PPC)



(C) 正常著膝關節在快速擺動下所產生的振動訊號
(Vibration Arthrometry; VAM)



(D) 非正常著膝關節在快速擺動下所產生的振動訊號
(Vibration Arthrometry; VAM)

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李嗣涔 教授 *Si-Chen Lee* Professor

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國立臺灣大學電機工程學系 教授

Professor, Graduate Institute of Biomedical Electronics and Bioinformatics/ Department of Electrical Engineering, National Taiwan UniversityPresident, National Taiwan University

薄膜電晶體實驗室
TFT Lab.

薄膜電晶體實驗室(TFT Laboratory)由李嗣涔教授領導，是台灣大學電子工程學研究所奈米電子組(Nano Electronics Group)的實驗室，實驗室的主要研究領域為：接近室溫量子點紅外線偵測器；兆赫等級之量子環偵測器；非晶矽、多晶矽、氧化物薄膜電晶體的創新製程研究等。本實驗室利用表面電漿效應，開發出室溫、窄頻且可調變波長之多波長表面電漿熱輻射發射器和波導熱輻射發射器。利用電漿子或波導型熱輻射紅外光源之窄頻寬 (半高寬可達0.5μm)特性，可應用於窄頻紅外線影響植物生長及癌細胞治療。

近年本實驗室研究發現，以4~5μm紅外光照射大腸桿菌24小時，可刺激大腸桿菌外膜蛋白(OmpA，OmpF)表現量，增強生長代謝，結果如同Fig.1所示。阿拉伯芥經過3~5μm 窄頻紅外光照射72小時後，其GASA4、CHS、RbcS、NPQ4和PSAK等基因數量有所變化，換言之，不同波段窄頻紅外光可影響阿拉伯芥生長型態和基因表現。

另外，3,4,5μm窄頻紅外光照射子宮頸癌細胞HeLa 48小時，可破壞細胞內粒線體膜電位，加強Paclitaxel對子宮頸癌細胞HeLa的療效，結果如同Fig.2所示。此外，3,4,5μm窄頻紅外光照射肺腺癌細胞A549 48小時，可抑制癌細胞的生長，使其細胞膨大和停滯於細胞週期G_2與M。

The Thin Film Transistor lab is led by Professor Si-Chen Lee. It belongs to the Nano Electronics Group of the Graduate Institute of Electronics Engineering of National Taiwan University. The research directions of this lab are:Near room temperature operated quantum dot infrared photodetector, THz quantum ring infrared photodetector a-Si:H, poly-Si and oxide thin film transistors.Our lab has developed the narrow bandwidth, multiple wavelength and room temperature-operated infrared plasmonic thermal emitter and waveguide thermal emitter utilizing the surface plasmon polariton.The plasmonic thermal emitters or waveguide thermal emittersemits infrared radiation with very narrow bandwidth. The full width at half maximum (FWHM) is about 0.5 μm. It has been applied successfully to observe the plant growth and cancer cell treatment with narrow band infrared radiation.

Recently, we found that E. coli treated with 4~5μmIR radiation for 24 hours increase dexpression of membrane proteins(OmpA,OmpF) and growth rates of E. coli as shown in Fig.1. In addition, it is found that Arabidopsistreated with3~5μmIR radiationon for 72 hours regulated morphology and genes expression, such as the GASA4, CHS, RbcS, NPQ4 and PSAK genes.

Moreover, it is also found that the narrow band infrared radiation with peak wavelengths of 3, 4, and 5μm can damage mitochondrial membrane potential of cervical cancer HeLa cells to enhance the effectiveness of paclitaxel treatment as shown in Fig.2. Additionallly, 3, 4, and 5μm IR radiation for 48 hoursinduced cell dilation and G_2/M cell cycle arrest in lung cancer A549 cells.

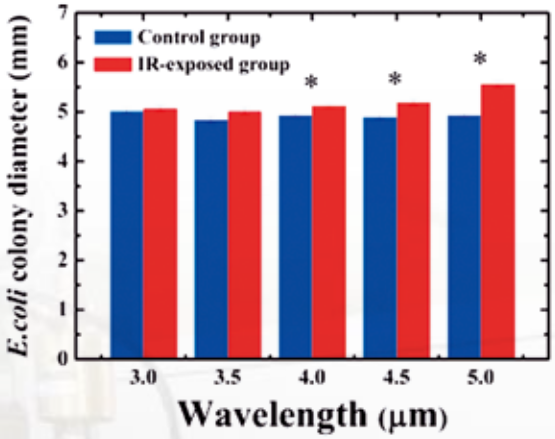

Fig.1 Measurement of E.coli colony diameter under narrow bandinfrared radiationfor 24 hours.

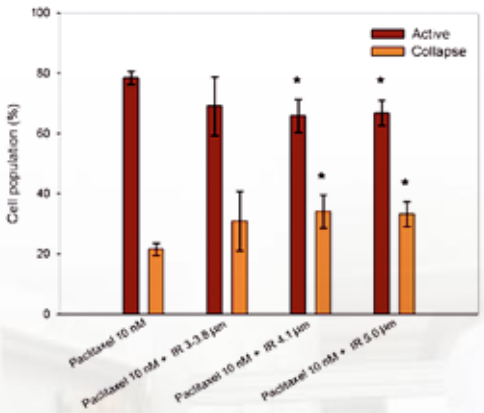

Fig.2 Mitochondrial membrane potentials under different treatments for 48 hours.

主要研究領域 Major Research Areas

量子點及量子環偵測器、非晶及多晶矽薄膜電晶體、電漿子熱發射器及其在癌細胞、植物生長之應用、太陽電池

Quantum Dot and Quantum Ring Photodetector, Amorphous and Poly-Si Thin Film Transistor, Plasmonic Thermal Emitter and Its Application to Biotechnology and Cancer Cell, Solar Cell

研究計畫 Research Projects

1. 1~10μm窄頻高功率紅外線光源研發及其在矽光子學，生物技術及癌症治療上的應用
   Development of 1~10μm Narrow-band High Power Infrared Light Source with Applications in Si-photonics, biotechnology and cancer therapy (1/3)
2. 能源國家型科技計畫-計畫辦公室設置與運作計畫
   National Science and Technology Program：Energy Office Administrative Project (2011)
3. 100年度奈米國家型科技計畫：1~10μm窄頻高功率紅外線光源研發及其在矽光子學，生物技術及癌症治療上的應用
   2011 National Science and Technology Program for Nanoscience and Nanotechnology：Development of 1~10μm Narrow-band High Power Infrared Light Source with Applications in Si-photonics, biotechnology and cancer therapy (2011)
4. 利用奈米微結構的高效率可撓式薄膜太陽能電池與異質接面矽晶太陽能電池
   High Efficiency Flexible Thin Film Solar Cells and Heterojunction Solar Cells by utilizing Nano-structure
5. 製成條件對銦鎵鋅氧化物(IGZO)薄膜之影響與分析

■研究計畫－1~10μm窄頻高功率紅外線光源研發及其在矽光子學，生物技術及癌症治療上的應用 Development of 1~10μm Narrow-band High Power Infrared Light Source with Applications in Si-photonics, biotechnology and cancer therapy (1/3)之代表圖及說明：

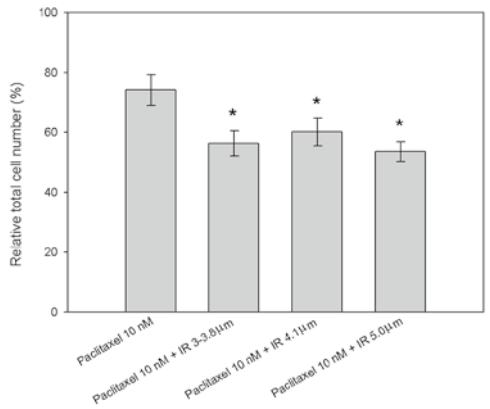

Fig. Relative HeLa cervical carcinoma cell numbers under the combination of IR and Paclitaxel for 48 hours.

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Chih-Ting Lin Associate Professor

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國立臺灣大學電機工程學系 副教授
國家臺灣大學電子工程學研究所 副教授

Associate Professor, Graduate Institute of Biomedical Electronics and Bioinformatics/ Department of Electrical Engineering/ Graduate Institute of Electronics Engineering, National Taiwan University

生醫晶片技術實驗

Bio-Electronics-System Technology Lab.

本實驗室成立於2006年，主要研究方向為電子生醫晶片技術相關研究，目前以生物分子檢測技術、微細胞監測晶片技術、軟性電子材料與無線感測器網路系統等領域為研究重點。進一步的說明，整合現今蓬勃發展的奈微米製程科技與傳統生物科學知識，可以發展出極具應用及發展潛力之關鍵性跨領域技術，因此，本實驗室致力於開發不同之生醫電子應用晶片與系統，期能在相關領域獲得良好之成果與能見度。本實驗室之成員來自電機系、機械系及醫工等工程相關領域，以此為基礎，積極與生醫相關領域學者進行合作，合作領域及研究範疇涵蓋基礎科學、工程技術與臨床研究等。

The bio-related research activity is one of the major focuses in world wide research institutes. However, the advancement of bio-research is limited by costly instruments and time consuming analysis. To overcome this obstacle, in our research group, the nano-electronics and micro-mechanism are integrated to be a powerful tool for this emerging research field.

More specific, a series of bio-chemical molecular sensors can be developed by utilizing nano-scale electrical devices. Based on the superior fabrication facilities and skills in Complementary Metal-Oxide- Semiconductor (CMOS) and Nano/Micro Electro-Mechanical System (N/MEMS), moreover, micro protein sensor arrays technologies and living cell monitoring systems are also envisioned to be an exciting research direction. In summary, our research is aiming at developing innovative and integrated systems for nano/bio research fields.

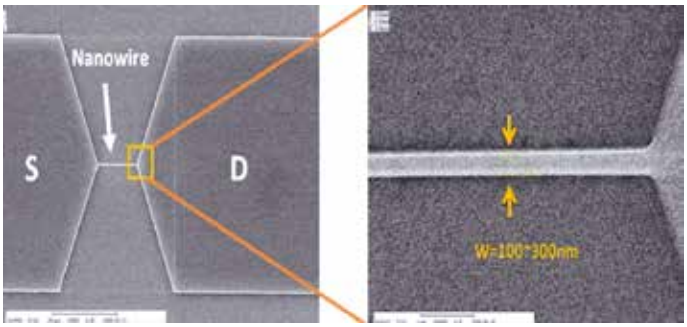
主要研究領域 Major Research Areas

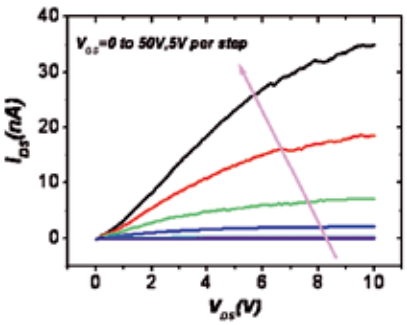
奈微米生物機電系統、生物晶片、生物分子量測技術、奈米製程技術、生物微感測器、軟性噴墨電子技術
Bio-NEMS, Bio-Chip, Nano fabrication, Biomolecular Detection Technology, Inkjet Printing Organic Electronics

研究計畫 Research Projects

1. 以病人為中心的無線醫療環境－腦與心的對話－子計畫三：智慧型奈米多晶矽心血管疾病生物標誌診斷系統晶片之研發(3/3) (NSC 102-2220-E-002-009)
2. 有機電子噴墨技術與標準半導體電子製程技術整合之異質三維系統晶片架構之研發 (NSC 101-2628-E-002-022-MY3)
3. 整合阻抗分析、光學檢測和光流體晶片的定點照護系統之開發與系統驗證 (NSC 102-2627-E-002-004)
4. 以細胞治療進行毛囊再生：發展大量生產可控制知可注入式誘導性微組織的方法及特化其毛囊誘導特性 (NSC 99-2320-B-002-004-MY3)
5. 智慧型奈米多晶矽心血管疾病生物標誌診斷系統晶片之研發

■研究計畫－智慧型奈米多晶矽心血管疾病生物標誌診斷系統晶片之研發The development of poly-silicon nanowire sensor-system-on-chip for biomarkers in heart failure diagnosis之代表圖及中英文說明：





掃描式電子顯微鏡(SEM)拍攝多晶矽電晶體元件及通道。右圖為奈米線通道的多晶矽電晶體Ids-Vgs電性圖(L/W=10um/300nm，熱氧化二氧化矽=1um)，右圖為奈米線通道的多晶矽電晶體Ids-Vds電性圖(L/W=10um/300nm，熱氧化二氧化矽=1um)。

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國立臺灣大學醫學工程研究所 教授
國立臺灣大學電機工程學系 教授

Professor, Graduate Institute of Biomedical Electronics and Bioinformatics/
Graduate Institute of Biomedical Engineering/
Department of Electrical Engineering, National Taiwan University

醫用微感測器暨系統實驗室
Medical Micro Sensor and System Lab.

本實驗室致力於配合醫療儀器認證與驗證法規之推動與精神體現，以微機電技術與光學感測方式進行生醫奈微米微感測器元件與系統整合之研究與應用-包括表面電漿共振(surface plasmon resonance)原理，表面電漿子感測器設計、微型系統整合、軟硬體介面溝通，主旨在於發展快速、便利、正確、與人性化醫用感測儀器，以促進個人化醫學(personalized medicine)與電子化醫療(e-health)之研究與產業發展。

We have devoted to apply microfabrication technologies and optical sensing mechanisms to develop nano/micro sensors and integrated system for the medical applications with compliance of medical device regulations and standards. Our research currently focus on the theoretical development for novel Surface Plasmon Resonance (SPR) devices, design of SPR nano/micro sensor, bioplamonics, and the heterogeneous integration of micro-system from hardware to software. The aim is to develop the fast diagnosis, easy to use, and user-friendly medical devices toward the success of personalized medicine and e-health.

林啓萬教授擔任第九屆亞洲化學感測器研討會之大會主席，成功於2011/11/14~17於劍潭青年活動中心落幕，ACCS2013將於泰國清邁舉辦。

本實驗室研究團隊參加「2011台灣生醫暨生農產業選秀大賽」獲得“潛力新秀獎”殊榮

主要研究領域 Major Research Areas

生物微感測器與系統、生醫晶片、生醫光電、類神經網路、醫材法規
Bioelectronics, Biomedical Micro sensors and System, Biochip, Biomedical Optics, Artificial Neural Networks, Regulatory Affairs

研究計畫 Research Projects

1. 結核菌標準化血清抗體及丙型干擾素快速檢測系統之開發及應用(3/3)
   Development of standardized rapid Mycobacterium diagnosis platforms: serum antibody and interferon-γ detection
2. 新型超解析度電漿子成像平臺於量測單分子奈米陣列交互作用之研究(2/3)
   Novel Super-resolution Plasmonic Imaging Platform for Measurement of Single Molecular Interactions on Nano Array
3. 植入式射頻脈衝電刺激無線系統晶片於疼痛控制之應用
   Implantable Wireless Pulsed Radio-Frequency Stimulation CMOS SoC for Pain Control (2/2)
4. Toward Prevention of Sudden Cardiac Death on Smart ECG Patches (101-S-C07)

■研究計畫－植入式射頻脈衝電刺激無線系統晶片於疼痛控制之應用Implantable Wireless Pulsed Radio-Frequency StimulationCMOS SoC for Pain Control之代表圖及說明：

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Fa-Hsuan Lin Associate Professor

國立臺灣大學醫學工程研究所 副教授
國立臺灣大學生醫電子與資訊學研究所 副教授
國立臺灣大學腦與心智科學研究所 副教授
國立臺灣大學醫學院醫學系放射線科 副教授

Associate Professor, Institute of Biomedical Engineering, National Taiwan University
Associate Professor, Graduate Institute of Biomedical Electronics and Bioinformatics, National Taiwan University
Associate Professor, Graduate Institute of Brain and Mind Sciences, National Taiwan University
Associate Professor, Department of Radiology, School of Medicine, National Taiwan University

人腦實驗室
Brain Imaging and Modeling Lab.

近年來，科學界逐漸了解複雜的人類行為與認知功能是藉由腦中不同階層的神經系統交互作用所表現出來，而非由單一的結構所掌控，有鑑於此，欲進一步了解人腦功能，則需要在結構與功能層面上研究以下三個問題：(1)什麼地方發生活動(2)這些活動是何時發生以及其發生順序為何(3)是如何藉由在大規模的神經網路中的訊息傳遞完成這些認知行為。現代非侵入性的醫學影像技術可幫助我們獲得高空間與時間解析度的神經活動資料，而定量的系統模擬將有助於解譯隱含於這些神經影像資料中協同完成感官、認知與行為歷程的動態神經活動.

本實驗室的研究方向為整合硬體研發、資料分析與數值模擬等工程技術來幫助我們了解複雜的人腦功能。進行中的研究計畫集中於結合結構與功能性核磁共振影像，腦磁圖與腦電圖之高時間空間解析度的神經影像技術，以及系統階層的神經信號模擬，以了解神經活動與行為間的關係。

Complex behavior and cognitive functions of the human brain are suggested to be "mapped at the level of multi-focal neural systems rather than specific anatomical sites, giving rise to brain-behavior relationships that are both localized and distributed". Further understanding of these brain mechanisms requires both structural and functional knowledge to answer (i) where are the foci of activity, (ii) when are these areas activated and what is the temporal sequence of activations, and (iii) how does the information flow in the large-scale neural network during the execution of cognitive and/or behavioral tasks. Advanced noninvasive medical imaging/recording modalities are able to localize brain activities at high spatial and temporal resolution. Quantitative modeling to interpret these data is needed to understand how large-scale distributed neuronal interactions underlying perceptual / cognitive / behavioral functions emerge and change over time.

Our research interests include the integration of hardware development, data analysis, and mathematical modeling to facilitate our understanding of brain cognition. Current research projects try to explore challenges of spatiotemporal brain imaging and modeling by using a combination of hardware and analytical approaches to enhance the spatiotemporal resolution of single (MRI) or combined (MRI/fMRI and MEG/EEG) modalities. In addition, mathematical approaches for identifying large-scale neural networks and their correlation to behavioral measurements are investigated.

主要研究領域 Major Research Areas

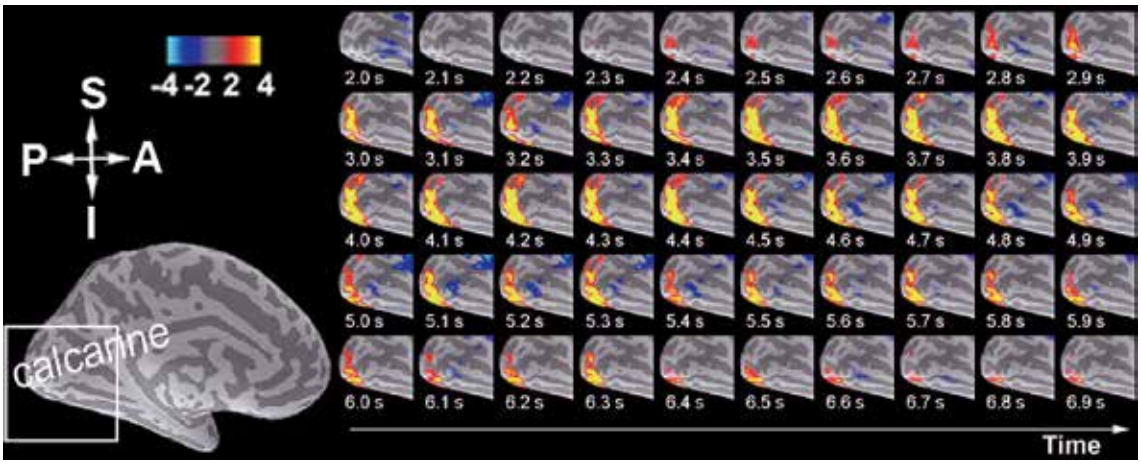
神經影像、核磁共振影像、腦磁圖、腦電圖、神經系統模擬

Neural imaging, Magnetic resonance imaging, Magnetoencephalography (MEG), Electroencephalography (EEG), Neuronal modeling

研究計畫 Research Projects

1. 國科會計畫－【平行化腦部磁振造影診斷系統】
   Parallel magnetic resonance neuro-imaging diagnosis system
2. 國科會計畫－【高度平行化之人腦核磁共振影像】
   Highly parallel magnetic resonance imaging of the human brain
3. 經濟部計畫－【腦連結體磁振造影系統】
   Brain Connectome MRI System
4. 國衛院計畫－【整合核磁共振逆影像與腦磁圖之高時間空間解析度人腦映像方法】
   High spatiotemporal resolution mapping of human brain function using MR inverse imaging and MEG
5. 教育部深耕型研究計畫－【使用腦磁圖進行高時空解析度之人腦活動映像與網路分析】
6. 教育部學術研究生涯發展計畫－桂冠型研究計畫【高度平行化之人腦核磁共振影像】
7. 用多種神經影像進行人腦視覺系統之時空映像與系統模擬
   Multimodal spatiotemporal brain mapping and modeling of human visual system

■**研究計畫**－用多種神經影像進　人腦視覺系統之時空映像與系統模擬Multimodal spatiotemporal brain mapping and modeling of human visual system之代表圖及中英文說明：



單一受試者對於視覺刺激以100毫秒解析度INI重建之功能性核磁共振影像(fMRI)時間序列(TR/TE = 100/30毫秒，Flip angle = 20度，視野 = 200微米)。本實驗使用32通道頭部線圈陣列，資料從128次隨機呈現的刺激中取得，每此測試包含了6秒的baseline，跟接下來的0.5秒8Hz閃爍棋盤格刺激，以及接下來的23.5秒後刺激期 (每次總共30秒)。圖上的時間標記指的是閃爍棋盤格刺激開始後的時間。

A single-subject 100-ms resolution INI fMRI time series of activations to visual stimulation (TR/TE=100/30 ms, flip angle 20º, FOV=200 mm), co-registered to a flattened region of the left occipital cortex. The data were obtained using a 32-channel head coil array in 128 randomized trials, each of which consisted of 6 seconds pre-stimulus baseline, followed by 8-Hz flashing checkerboard flashing for 0.5 sec and subsequently 23.5 s post-stimulus (30 sec in total for each trial). The time stamps labeled in the figure indicate time after onset of the flashing checkerboard.

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呂學一 教授 *Hsueh-I Lu* Professor

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國立臺灣大學資訊工程學系暨研究所 教授
國立臺灣大學網路多媒體研究所 教授

Professor, Graduate Institute of Biomedical Electronics and Bioinformatics/ Department of Computer Science and Information Engineering/ Graduate Institute of Networking and Multimedia, National Taiwan University

演算法實驗室
Algorithmic Research Lab.

演算法實驗室於2005年成立，目前我們有8位博士班學生與19位碩士班學生。本實驗室的研究專注於基礎演算法的設計、分析以及應用。

The Lab of Algorithmic Research was established in 2005. We currently have 8 Ph.D. students and 19 master students. Our research focuses on fundamental algorithms and their applications.

主要研究領域 Major Research Areas

演算法、圖論、生物資訊
Algorithms, Graph Theory, Bioinformatics

研究計畫 Research Projects

1. 平面圖之「簡潔編碼」與「簡潔呈現」演算法
   Algorithms for succinct encodings and compact drawings of planar graphs
2. 動態簡潔資料結構
   Succinct dynamic data structures

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孫啓光 教授 *Chi-Kuang Sun* Professor

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國立臺灣大學生醫電子與資訊學研究所 特聘教授
國立臺灣大學光電工程學研究所 特聘教授
國立臺灣大學電機工程學系 特聘教授
國立臺灣大學光電生物醫學研究中心 教授
中央研究院應用科學研究中心 合聘研究員
中央研究院物理研究所 合聘研究員

Chief Director, Molecular Imaging Center, National Taiwan University
Distinguished Professor, Graduate Institute of Biomedical Electronics and Bioinformatics, National Taiwan University.
Distinguished Professor, Graduate Institute of Photonics and Optoelectronics, National Taiwan University.
Distinguished Professor, Department of Electrical Engineering, National Taiwan University.
Professor, Center for Optoelectronic Medicine, National Taiwan University
Adjunct Research Fellow, Research Center for Applied Sciences, Academia Sinica.
Adjunct Research Fellow, Institute of Physics, Academia Sinica.

奈米生醫光電實驗室
Bio-nanophotonics Lab.

主要研究領域 Major Research Areas

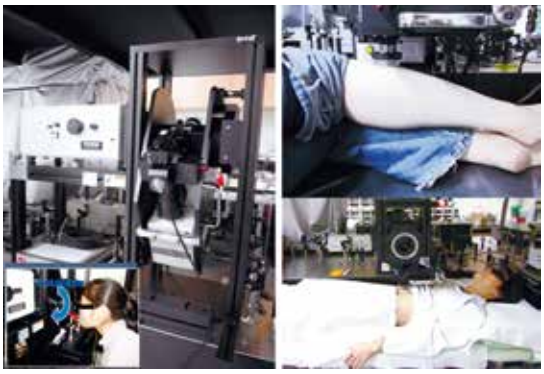
非侵入式光學奈米影像與操控、兆赫波與微波生醫應用、奈米超音波
Non-invasive optical microscopy and manipulations, THz and Microwaves for biomedicine, nano-ultrasonics.

研究計畫 Research Projects

1. 奈米聲學與奈米超音波(1/3)
   Nano-acoustics & Nano-ultrasonics(1/3)
2. 奈米聲學與奈米超音波(2/3)
   Nano-acoustics & Nano-ultrasonics(2/3)
3. 奈米聲學與奈米超音波(3/3)
   Nano-acoustics & Nano-ultrasonics(3/3)
4. 光纖化兆赫波影像系統(1/3)
   Fiber-based THz imaging and sensing systems (1/3)
5. 光纖化兆赫波影像系統(2/3)
   Fiber-based THz imaging and sensing systems (2/3)

6. 台俄國合計畫-飛秒光纖CARS顯微光譜生物影像(1/3)
   Fiber format femtosecond CARS microspectroscopy techniques of biological tissues
7. 台俄國合計畫-飛秒光纖CARS顯微光譜生物影像(2/3)
   Fiber format femtosecond CARS microspectroscopy techniques of biological Tissues (2/3)
8. 倍頻式光學虛擬活體切片術(第三年)
   Harmonics-Based Invio Optical Virtual Biopsy
9. 倍頻式光學虛擬活體切片術(第四年)
   Harmonics-Based Invio Optical Virtual Biopsy
10. 國立台灣大學邁向頂尖大學核心實驗室－分子生醫影像研究中心核心實驗室計畫
    Molecular Imaging Center Core Facility
11. 拔尖計畫－子計畫一：以光學虛擬切片分子影像從事早期疾病診斷
    Advanced Optical Virtual Biopsy for Early Disease Diagnosis

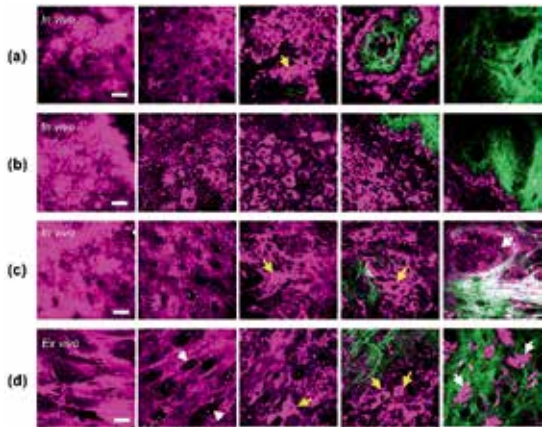
■研究計畫－倍頻式光學虛擬活體切片術
Harmonics-based in vivo optical virtual biopsy
之代表圖及中英文說明-1：



Version 1　　Version 2

頻式光學虛擬活體切片系統架構圖
Version 1 and 2 are the implementation of the HGM system for in vivo imaging. The rotatable system is adapted from a commercial scanning system (FV300).

■研究計畫－倍頻式光學虛擬活體切片術
Harmonics-based in vivo optical virtual biopsy
之代表圖及中英文說明-2：



圖A：色素性病灶在不同量測深度之倍頻影像，包括(a)痣(b)脂溢性角化症(c)基底細胞癌以及(d)黑色素細胞癌。

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孫維仁 教授 *Wei-Zen Sun* Professor

國立臺灣大學醫學院麻醉科 教授
國立臺灣大學醫學院緊急醫療研究中心 主任
國立臺灣大學神經科學及認知中心 副主任
國立臺灣大學腦與心智科學研究所 合聘教授
國立臺灣大學生醫電子與資訊學研究所 合聘教授

Professor, Department of Anesthesiology, National Taiwan University
Chair, Center for Emergency Medical Service, National Taiwan University
Vice Chair, Neurobiology and Cognitive Science Center, National Taiwan University
Professor, Graduate Institute of Biomedical Electronics and Bioinformatics, National Taiwan University

臨床-生物醫學工程-產業融合實驗室
Merger Laboratory for Clinical Sciences, Biomedical Engineering and Industry

本融合實驗室由孫維仁教授成立於1992年，主要工作是從臨床服務的病患需求觀點，來提供醫療儀器與資訊處理之相關整合研究和產品研發。九〇年代開始，是以病患自控式鎮痛儀(Patient-Controlled Analgesia, PCA)導入數位化和無線化技術為主軸的急性疼痛服務提升，開發出 i-Pain®整合平台，並已和領先全球品牌進行緊密的結合。〇三年經歷SARS氣管插管爆發群聚感染的致命性災難時，本融合實驗室針對非感染性醫材的迫切市場需求，研發出可拋式內視鏡Sunscope®，獲得經濟部學界科專和產業的贊助，朝向全球商業市場邁進。三位一體的融合實驗室成立的宗旨就是要：敞開各專業的藩籬，主動並積極的邀集跨領域人才進行多元腦力激盪，讓一切研發終極目標導向臨床應用，通過醫師嚴格的臨床驗證，確保病患實際需求獲得超值滿足，以吸引產業關注和早期資本投入。

In 1992, Professor Wei-Zen Sun founded the merger laboratory in National Taiwan University Hospital. Based on the unmet demand from patient's perspective, we have successfully provided innovative development of medical devices and informatics through synergistic interaction among clinician, and biomedical engineer, and entrepreneur. We started by integrating the digital and wireless technology with conventional PCA pump (patient-controlled analgesia) to transform into an update web-based platform, i-Pain®. This product is currently adopted by a global leader brand and served as the major service module in Asia. In 2003, as SARS outbreak through non-protected endotracheal intubation, we developed the most advanced intubation device with disposable visual tube. This design totally eliminates the risk of air-borne lethal infection by avoiding close contact with patient's airway. This innovative product, Sunscope®, has won a first prized award and is currently supported by government grant and industry investment. Collectively, we establish this merger laboratory to trigger brainstorming among multidisciplinary specialties and to make sure that the cross-reaction of respective domain knowledge is taken place under the goal: to put forth any helpful effort and technology in synergy, to assess the product under critical assessment of clinicians, to bring in industry investment and commercial distribution for patient welfare.

主要研究領域 Major Research Areas

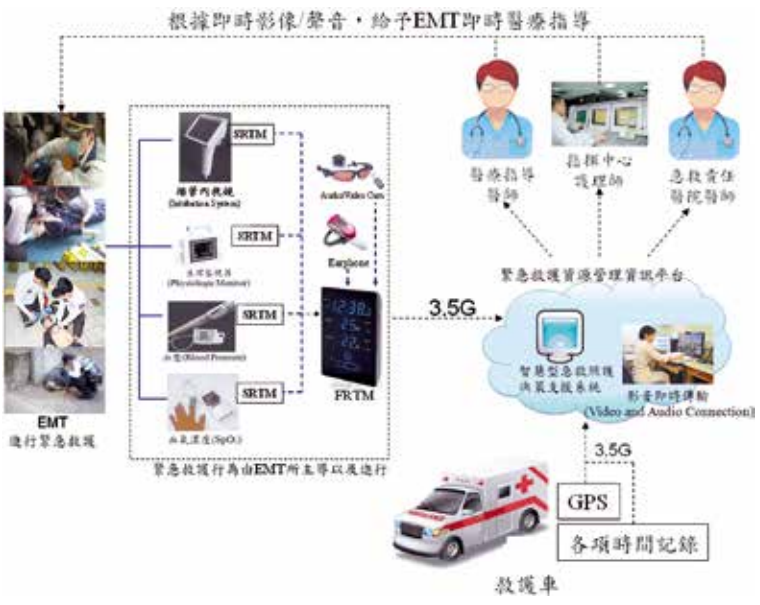
臨床與生物醫學工程與產業整合、疼痛醫學、麻醉醫學、緊急醫療
Integration of Clinical Science, Biomedical Engineering and Industry; Pain Medicine; Anesthesiology; Emergent Medical Service

研究計畫 Research Projects

1. i-Pain®(美商赫士睿公司技術轉移，Hospira，USA)
2. Sunscope®(經濟部學界科專委託計畫)
3. Lidopat® / Lidocap®(美時製藥合作)
4. 健保資料庫分析(歐陽彥正教授合作)
5. 遠距緊急救護監測－同步互聯醫療網：開發以緊急救護技術員為中心的移動式整合播放站(新北市消防局中長程計畫，送審中)

■研究計畫－遠距緊急救護監測－同步互聯醫療網：開發以緊急救護技術員為中心的移動式整合播放站
Project title: Interactive Telemedicine in Emergent Medical System: Emergent Medical Technician-Based Mobile Broadcasting Station之代表圖及中英文說明：

本系統以ARM架構的處理器為中心，使用3.5G行動通訊網路連結相關醫療設備，如帽沿攝影機、隱藏式麥克風、藍牙耳機、氣管插管內視鏡、血氧濃度器、攜帶型生理監視器等急救器材，即時將病患的生命徵象數值(vital sign)傳遞至緊急救護資源整合平台，使得相關醫療專業人員，如救護指揮中心的護理師以及地方急救責任醫院的醫師均可即時得知病患的狀況，並及對EMT給予即時的醫療指導，有效的促進EMT、救護指揮中心之派遣員、護理師及醫療指導醫師、地方急救責任醫院的溝通與資源整合，即時的經由EMT進行最恰當的處置，給予病患必要且適當的照護，提高救護的品質與病患的存活率，以EMT為資訊中心的資訊連結架構圖如圖所示。



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Wei-Cheng Tian Associate Professor

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國立臺灣大學電子工程學學研究所 副教授
國立臺灣大學電機工程學系 副教授

Associate Professor, Graduate Institute of Biomedical Electronics and Bioinformatics, National Taiwan University
Associate Professor, Graduate Institute of Electronics Engineering, National Taiwan University
Associate Professor, Department of Electrical Engineering, National Taiwan University

微奈米分析技術及系統實驗室
Micro/Nano Analytical Technologies & Systems Lab.

本實驗室由田維誠教授成立於2009年。本實驗室的研究方向為微奈米分析技術及系統在生醫檢測，醫療技術，及生物化學應用之研究。本實驗室的研究重心在微奈米機電、微奈米流體力學及有關元件系統整合、封裝及可靠性之研究，並希望與CMOS製程相結合。未來將以微奈米分析技術及系統儀器出發，希望能大幅改進臨床前、臨床及體外診斷之準確性、速度、成本及使用方便性。

My research interests are on biological, chemical, and medical applications of micro & nano technologies with the focus on the CMOS compatible integration, packaging, and reliability of the micro/nano devices and systems. The future goal is to improve the accuracy, speed, cost, and ease-of-use of pre-clinical, clinical, and in vitro diagnostics by using micro/nano-enabled systems or instrumentations.

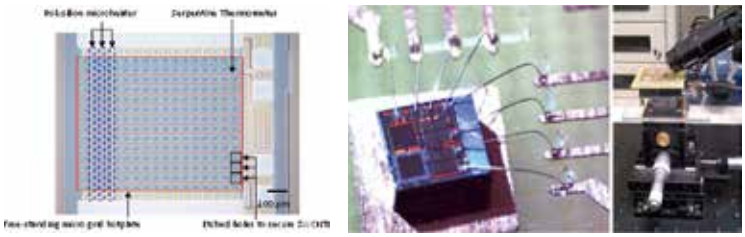
主要研究領域 Major Research Areas

微奈米分析及流體集成技術、微奈米機電系統儀器在生化醫療之應用
Micro and nano analytical & fluidic integrated technologies, MEMS/NEMS enabled instrumentation for biological, chemical, and medical applications

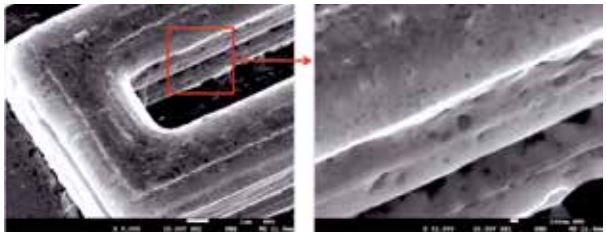
研究計畫 Research Projects

1. 人體呼吸氣體分析儀關鍵元件之研製與開發
   Research and Development of Key Components for Human Breath Analyzer
2. 混合式CMOS相容壓力微感測器陣列在非侵入血流監控之應用
   Mixed Mode CMOS-based Pressure Microsensor Arrays for Non-Invasive Hemodynamic Monitoring

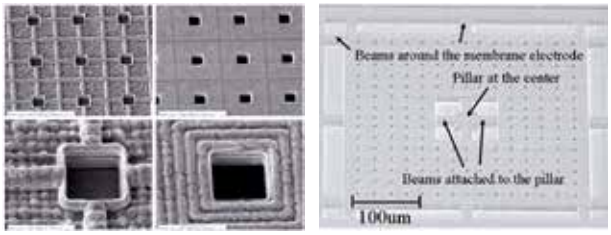
■**研究計畫**－混合式CMOS相容壓力微感測器陣列在非侵入血流監控之應用Mixed Mode CMOS-based Pressure Microsensor Arrays for Non-Invasive HemodynamicMonitoring之代表圖說明：



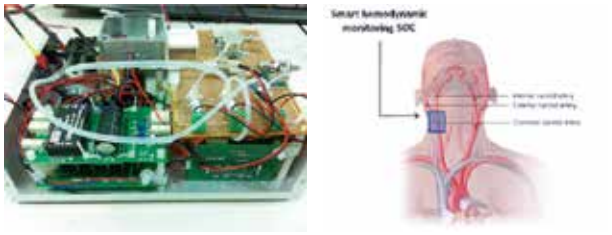
Left: CMOS MEMS sensing platform; Right: Packaged CMOS-based sensors



Left: Microstructures for sensor; Right: Nano-Au material coated on the sidewall



Left: MEMS membrane structures; Right: CMOS MEMS tactile sensors



Left: Assembled system of micro gas analyzer for breath analysis; Right: Concept of CMOS MEMS tactile sensors for blood monitoring

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本實驗室的研究領域包括醫用超音波成像及通訊信號處理。醫用超音波成像研究包括3D立體成像、血流流速估測、超音波斷層掃描、超音波信號誤差校正、二維陣列波束成形架構設計、對比劑成像與非線性成像等。

Medical Ultrasound Imaging
Bio-signal Analysis
Underwater Acoustic Communication

主要研究領域 Major Research Areas

一、生醫訊號處理

1. 超音波：對比劑的研究和利用，計算經由對比劑回波訊號中的諧波成分來估測理論中組織的衰減係數，其中必須利用周期譜的方式求得訊號的功率頻譜密度。設計一個可用在體內實驗的適應性演算法，用以估測體內組織的衰減係數。並且，對此法做誤差分析以得知應用此方法估測衰減係數與理論值的差距。利用動物實驗，將不同程度的肝臟疾病應用超音波對比劑在肝組織的分佈情形藉以判斷肝病。

2. 胎兒心電圖：胎兒心電圖的觀察有實際上的困難，因為胎兒位於母體之內，皮膚上的電極所紀錄的信號中，同時存在兩個本質上相同的來源，為母親和胎兒的心臟。尤其母親心電圖的信號強度遠大於胎兒心電圖，更增加了處理上的困難。另外，因為胎兒心電圖十分微弱，其他生理現象所產生的干擾或是量測上造成的雜訊，相對於胎兒心電圖的影響也會十分顯著。本研究著力於胎兒心電圖的信號取得。

3. 腦波

二、水下通訊

水聲通訊和無線電通訊主要有二個最大的差異點，一是水聲通道有非常長的多重路徑延遲，範圍可涵蓋十到一百多個符號(symbols)，另一個是通道時變的速度。對於基於通道估測的等化器來說，通道估測是決定其效能的表現的最重要因素。

- Diagnostic Medical Ultrasound: Ultrasound Contrast Imaging, Ultrasonic Liver Imaging
- Bio-signal Processing : Fetal ECG extraction, EEG Signal Analysis
- Underwater Acoustic Communication: UWA Channel Estimation, Tracking and Equalization

研究計畫 Research Projects

1. 超音波對比劑於組織參數估測之應用(1)國科會計畫2007~2008
2. 超音波對比劑於組織參數估測之應用(2)國科會計畫2008~2009
3. 一個用於二次諧波脈衝壓縮成像之多頻合成技術國科會計畫2010~2011

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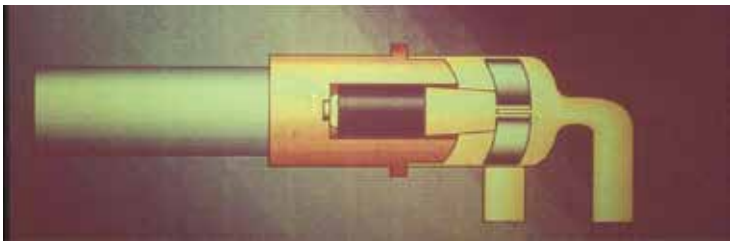
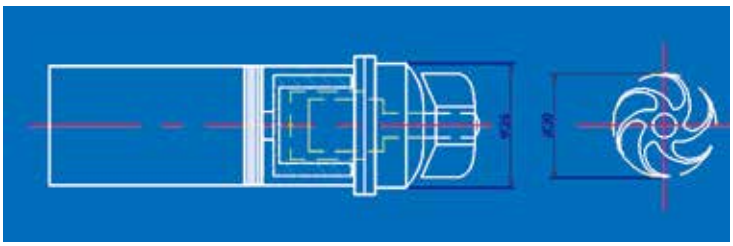
心臟輔助器實驗室
Ventricular Assist Device Lab.

自1993年我們就積極研究流線型離心幫浦做為心臟衰竭的輔助循環，可在100mmHg阻力下提供8 L/min的輔助。而利用電壓的改變而改變葉輪的轉速造成博動流。包含馬達的總重量只有110 g，總長度只有7 cm，溶血系數只有0.020。此心臟輔助器擁有經濟部智慧財產局新型第一五四一O五號及新型第M 323290號專利。目前我們持續研究小而美的心臟輔助器以供幼兒使用。

We started to develop our own centrifugal pump with streamlined design in impeller type in 1993. It can produce 8L/min output at a resistance of 100 mmHg. It can provide pulsatile flow by changing the rotating speed of the impeller periodically via introducing a square wave form voltage into the driving motor coil of the pump. Together with the generator, it weighs only 110 gm with a total length of 7 cm, and index of hemolysis of only 0.020. Now we keep on developing a smaller pump to treat the intractable heart failure for infants.





臺大一號心室輔助器

主要研究領域 Major Research Areas

心臟外科包括冠狀動脈繞道手術、瓣膜手術、主動脈手術、心律不整手術、心臟衰竭手術等
血管外科包括胸主動脈瘤支架或手術、腹主動脈瘤支架或手術、周邊動脈阻塞重建手術、靜脈曲張手術、尿毒症血液透析之廔管手術等
心臟輔助循環包括葉克膜體外維生系統、心室輔助器等
移植手術包括心臟移植、心肺移植
Cardiac Surgery：Coronary Artery Disease Surgery, Valvular Heart Disease Surgery, AorticSurgery, Arrhythmia Surgery, Surgery for Heart Failure
Vascular Surgery：EndoVascular Stent-grafting for Thoracic Aortic Aneurysm or Abdominal Aortic Aneurysm, Revascularization for Peripheral Arterial Occlusive Disease, Varicose Vein Surgery, Arteriovenous Fistula Creation
Mechanical Circulatory Assist：Extracorporeal Membrane Oxygenation, Ventricular Assist Device
Transplantation：Heart Transplantation, Heart-Lung Transplantation

研究計畫 Research Projects

1. 人體心肺移植(台大醫院計畫, 2006 ~ 2010)
   Heart-lung transplantation.(NTUH, 2006 ~ 2010)
2. 一項為期24個月、多中心隨機分配、開放性、非劣性的研究，比較在兩個濃度控制的Certican併用降低劑量的Neoral對照3克的MMF併用標準劑量的Neoral於新接受心臟移植病患者的療效與安全性(台大醫院計畫, 2006 ~ 2011)
   A 24-month, multicenter, randomized, open-label non-inferiority study of efficacy and safety comparing two exposures of concertration-controlled Certican with reduced Neoral versus 3.0g MMF with standard dose Neoral in de novo heart transplant recipients.(NTUH, 2006 ~ 2011)
3. 骨髓間葉幹細胞於心肌再生的研究：評估不同製備方式評估蠶絲移植物對骨髓間葉幹細胞分化影響與動物實驗(1,2,3)(國科會計畫NSC97-2314-B-002-045-MY3, 2008/08/01 ~ 2011/07/31)
   Regenerating myocardial cells by using mesenchymal stem cell(MSC)- effect of different fabrication techniques of silk fibrion-based scaffolds on differentiation of MSC into myocardiocytes in vitro, and aminal study(1,2,3).(NSC97-2314-B-002-045-MY3, 2008/08/01 ~ 2011/07/31)
4. 運動處方對國人重大疾病的健康效益－臨床與代謝體指標的探討－「運動處方對於冠狀動脈繞道手術病患的健康效益：臨床與代謝體指標的探討(整合型計畫-子計畫四) (1/3,2/3,3/3)
   Discussion of the health benefits on exercise prescription of major disease – the benefits of exercise prescription for coronary bypass patient-discussion of clinical andmetabonomics (NSC100-2627-B-002-018, 2010/08/01~ 2013/07/31)
5. 評估接枝紅血球生成素(EPO)於具方向性蠶絲蛋白摻和玻尿酸薄膜釋放不同濃度之血管內皮細胞生長因子對人類羊水幹細胞(hAES)分化影響與心肌再生之動物實驗

Effect of Erythropoietin (EPO) grafted in isotropic silk-fibroin/hyaluronic acid patch releasing vascular endothelial growth factor on differentiation of human amniotic epithelial stem cells (hAES) into cardiomyocytes and regeneration myocardium.
(NSC100-2314-B-002-047, 2011/08/01~ 2012/07/31)

6. 新型玻尿酸水膠在心臟幹細胞治療的轉譯研究(整合型計畫-子計畫三) (1/2,2/2)
   Development of novel hyaluronan hydrogel for cardiac stem cell therapy — A translational approach.
   (DOH100-TD-PB-111-TM019, 2011/05/01~ 2012/04/30)
   (DOH101-TD-PB-111-TM029, 2012/05/01~ 2013/04/30)
7. 行冠狀動脈繞道術後病患症狀經驗與生活品質之縱向研究
   Symptom experience and QoL in CABG patients-A longitudinal study.
   (台大醫院研究倫理委員會計畫 201104062RC, 2011/05/01-2012/04/30)
8. 一個前瞻性、隨機、活性對照藥、開放性試驗，於第三及第四期週邊動脈阻塞性疾病患者比較乳化液劑型前列腺素E1與環糊精劑型前列腺素E1之療效及安全性
   A prospective, randomized, active controlled, open-label study to compare the efficacy and safety of PGE1 emulsion and PGE1-CD in patients with stages III-IV of peripheral arterial occlusive disease (PAOD).
   (台大醫院研究倫理委員會計畫QCR10018, 2012/03/06-2013/09/30)

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臨床磁振影像實驗室
Clinical Magnetic Resonance Imaging Lab.

本實驗室由吳文超教授成立於2010年，主要從事磁共振影像技術開發與臨床應用之相關研究，目前以微灌流影像與功能性影像為研究重點，並與台大醫院影像醫學部、核子醫學部合作，建立多模技術平台，提高於臨床診斷及預後的準確性。

Professor Wen-Chau Wu founded the Laboratory of Clinical Magnetic Resonance Imaging in the summer of 2010. The main research focus has been placed on the technical development and clinical applications of magnetic resonance imaging (MRI). Currently, we are conducting three NSC funded projects using advanced MRI techniques, including multi-modal functional MRI, perfusion MRI (arterial spin labeling, dynamic susceptibility contrast enhanced imaging, and dynamic contrast enhanced imaging), and diffusion-weighted MRI. We closely collaborate with the Departments of Medical Imaging and Nuclear Medicine in National Taiwan University Hospital to build up a multi-modal framework to improve the accuracy of diagnosis and prognosis in various diseases.

主要研究領域 Major Research Areas

微灌流磁共振影像、功能性磁共振影像、醫學影像處理、生醫信號分析

Perfusion Magnetic Resonance Imaging (Arterial Spin Labeling and Bolus Tracking), Functional Magnetic Resonance Imaging, Medical Image Processing, Biomedical Signal Analysis

研究計畫 Research Projects

1. 速度選擇動脈氫質子標記法微灌流磁振造影
   Velocity-selective arterial spin labeling perfusion magnetic resonance imaging
2. 四肢肌肉之功能性磁振造影
   Functional magnetic resonance imaging in extremity muscles
3. 使用動態對比劑增強及動脈標定磁振造影技術定量腎臟血流灌注並評估臨床應用之可行性
   Clinical feasibility of dynamic contrast enhanced MRI and arterial spin labeling MRI in quantitative assessment of renal perfusion

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IBMS RM511

我們主要研究工作有下列四方面(1)找尋國人肺癌之危險基因。(2)建立體外癌轉移模式，全基因體搜尋癌轉移相關基因。(3)發現新的癌轉移基因及機轉做為診斷及治療標的。(4)研究癌細胞與周邊微環境之交互作用，特別是發炎細胞與癌細胞的互動。我們以cDNA基因微陣列研究基因之調控，訊息傳遞及功能。在基因流行病學研究我們已找到數個國人肺癌之危險基因，我們更以自己建立之肺腺癌之細胞株，利用侵襲篩選之細胞培養方式，篩選出高侵襲能力之子細胞株，並在老鼠實驗動物模式證明高侵襲肺癌細胞株也同時具有高轉移能力，利用以一體外模式及cDNA微陣列，我們可以全基因體找尋癌轉移之相關基因，在含9600基因之微陣列中我們找到近600個基因與肺癌轉移有關，我們將利用這些基因製成癌轉移檢測晶片推廣至臨床使用。同時在這些癌轉移相關基因中，我們發現新的抑癌轉移基因及促癌轉移基因如Collapsin Response Mediator Protein-1 (CRMP-1)，LCRMP-1，HLJ1及Slug等。這些基因在癌轉移之分子調控機制為目前主要研究之重點，且此類新的癌轉移相關蛋白也成為治療主要標誌分子，我們也用基因微陣列之研究模式，剖析這些基因之下游基因。最近，我們正著重於研究這些新的癌轉移相關蛋白之訊息傳遞途徑及功能和蛋白交互作用機制。

Our research teams are interested in studying the molecular pathogenesis of lung cancer in Taiwan and mechanisms of cancer metastasis. We focus on four aspects: (1) identification of novel risk genes for lung cancer in Taiwan, (2) molecular signature for prognostic prediction and personalized therapy of lung cancer, (3) identify novel genes and mechanisms involved in cancer metastasis for potential diagnosis and treatment targets, and (4) interaction of cancer cells and microenvironments, especially the cross talks between cancer cells and microenvironment inflammatory cells. Our team has identified several candidate risk genes for lung cancer. Cancer metastasis is a complicated process that may involve numerous genetic changes. To identify invasion/metastasis associated

genes, we used DNA microarray and invasion/metastasis lung cancer cell line model and identified a panel of genes associated with lung cancer metastasis. We also developed gene expression signature and microRNA signature that can predict survival and metastasis of lung cancer patients. These molecular signatures may be helpful for personalized therapy of lung cancer patients. We have also identified novel invasion/metastasis suppressor genes such as collapsin response mediator protein-1 (CRMP-1), long form CRMP, HLJ-1 and invasion promoting gene slug. Currently, we are investigating the molecular mechanisms and signaling pathways and protein interaction maps of these novel metastasis related genes.

主要研究領域 Major Research Areas

基因體醫學、細胞生物學、轉譯醫學

Genomic medicine, Cell Biology, Translational Medicine

研究計畫 Research Projects

1. 探討HIPK2與Slug在致癌性及癌轉移的角色
   HIPK2 regulates slug-mediated tumorigenesis and metastasis
2. 研究促癌轉移基因 Slug 在細胞週期扮演的角色
   The invasion promoter Slug is a novel cell cycle regulator
3. 整合性功能基因體學核心實驗室II
   Integrated Core Facility for Functional Genomics (II)
4. 多功能轉錄因子YY1和肺癌生成關係之探討
   Multifunctional Transcription Factor YY1 and Lung Cancer Progression
5. 整合性功能基因體學核心實驗室I
   Integrated Core Facility for Functional Genomics (I)
6. 癌轉移之外基因調控
   Epigenetic Control of Cancer Metastasis

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柒 發表論文 Publications

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※學術期刊論文 Journal articles & book chapters

1. Yang, W.-L. R.,Lee, Y.-E., Chen, M.-H., Chao, K.-M., and Huang, C.-Y. F., "In-silico Drug Screening and Potential Target Identification for Hepatocellular Carcinoma Using Support Vector Machine Based on Drug Screening Result", Gene, accepted, 2013.
2. Lee, C.-H., Lee, M.-C., Shu, C.-C., Lim, C.-S., Wang, J.-Y., Lee, L.-N., and Chao, K.-M., "Risk Factors for Pulmonary Tuberculosis in Patients with Chronic Obstructive Airway Disease in Taiwan: A Nationwide Cohort Study", BMC Infectious Diseases, accepted, 2013.
3. Chen, K.-Y., Hsu, P.-H., and Chao, K.-M., "Efficient Retrieval of Approximate Palindromes in a Run-Length Encoded String", Theoretical Computer Science, accepted, 2012.
4. Lee, C.-H., Lee, M.-C., Lin, H.-H., Shu, C.-C., Wang, J.-Y., Lee, L.-N., and Chao, K.-M., "Pulmonary Tuberculosis and Delay in Anti-tuberculous Treatment are Important Risk Factors for Chronic Obstructive Pulmonary Disease" PLoS ONE, accepted, 2012.
5. Chen, K.-Y. and Chao, K.-M., "A Fully Compressed Algorithm for Computing the Edit Distance of Run-Length Encoded Strings", Algorithmica, accepted, 2012.
6. Hsu, P.-H., Chen, K.-Y., and Chao, K.-M., "Finding All Approximate Gapped Palindromes", International Journal of Foundations of Computer Science, accepted, 2012 (An invited paper for the special issue of IJFCS for ISAAC 2009).
7. Chu, A.-C., Wu, B.Y., and Chao, K.-M., 2012, "A Linear-time Algorithm for Finding an Edge-partition with Max-min Ratio at Most Two", Discrete Applied Mathematics, accepted.
8. Chang, C.-J. and Chao, K.-M., "Efficient Algorithms for Local Ranking", Information Processing Letters, 112(13): 517-522, 2012.
9. Chen, K.-Y., Hsu, P.-H., and Chao, K.-M., "Efficient Retrieval of Approximate Palindromes in a Run-Length Encoded String," Theoretical Computer Science, accepted, 2012.
10. Hsu, P.-H., Chen, K.-Y., and Chao, K.-M., "Finding All Approximate Gapped Palindromes", International Journal of Foundations of Computer Science, accepted. (An invited paper for the special issue of IJFCS for ISAAC 2009), 2012.

※研討會論文 Conference & proceeding papers

1. Lin, R.-R., Chang, Y.-H. and Chao, K.-M., 2013, "A Compact and Efficient Labeling Scheme for XML Documents", The 18th International Conference on Database Systems for Advanced Applications (DASFAA 2013), Lecture Notes in Computer Science, China.
2. Wu, Y.-W., Lin, W.-Y., Wang, H.-L., and Chao, K.-M., 2013, "An Optimal Algorithm for the Popular Condensation Problem", International Workshop on Combinatorial Algorithms (IWOCA 2013), Lecture Notes in Computer Science, France.
3. Bernt, M.,Chao, K.-M., Kao, J.-W., Middendorf, M., and Tannier, E., 2012, "Preserving Inversion Phylogeny Reconstruction", The 12th Workshop on Algorithms in Bioinformatics (WABI 2012), Lecture Notes in Bioinformatics, Ljubljana, Slovenia.

4. Yang, W.-L. R.,Lee, Y.-E., Chen, M.-H., Chao, K.-M., and Huang, C.-Y. F., "In-silico Drug Screening and Potential Target Identification for Hepatocellular Carcinoma Using Support Vector Machine Based on Prior Screening Result", The 23rd International Conference on Genome Informatics (GIW 2012), Taiwan.
5. Chao, K.-M., Chu, A.-C., Jansson, J., Lemence, R., and Mancheron, A., 2012, "Asymptotic Limits of a New Type of Maximization Recurrence with an Application to Bioinformatics", The 9th Annual Conference on Theory and Applications of Models of Computation (TAMC 2012), Lecture Notes in Computer Science, Beijing, China.

※專書 Books

1. Chao, K.-M., Hsu, T.-s., and Lee, D.-T. (Eds.) (2012) "Algorithms and Computation", Lecture Notes in Computer Science 7676, Springer. (702 pages; ISBN 978-3-642-35260-7)

莊曜宇教授 Eric Y. Chuang, Professor

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李百祺特聘教授 Pai-Chi Li, Distinquished Professor

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歐陽彥正教授 Yen-Jen Oyang, Professor

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曾宇鳳副教授 Y. Jane Tseng, Associate Professor

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張瑞峰教授 Ruey-Feng Chang, Professor

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陳中平教授 Chung-Ping Chen, Professor

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陳志宏教授 Jyh-Horng Chen, Professor

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陳永耀教授 Yung-Yaw Chen, Professor

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成佳憲教授 Chia-Hsien Cheng, Professor

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邱銘章副教授 Ming-Jang Chiu, Associate Professor

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周迺寬副教授 Nai-Kuan Chou, Clinical Associate Professor

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傅楸善教授 Chiou-Shann Fuh, Professor

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阮雪芬教授 Hsueh-Fen Juan, Professor

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3. C.-K. Sun, "THz dielectric fiber based imaging: in vivo molecular imaging of water", 38th International Conference on Infrared, Millimeter, and Terahertz Waves, Mainz, Germany (2013). Plenary Speaker
4. C.-K. Sun, "Dielectric THz fibers and fiber-based directional couplers", 2013 International Symposium on Microwave/Terahertz Science and Application (MTSA 2013), Shanghai, China (2013). Keynote Speaker
5. S.-C. Yang, P.-K. Wei, T.-W. Liao, M.-L. Tsai, P.-A. Mante, Y.-R. Huang, I-J. Chen, H.-Y. Chen, and C.-K. Sun, "Strong suppression of angle and period dependency of surface-plasmon-polaritons in gold nanodisks by combining a nanorod substrate", in Technical Digest of Conference on Lasers and Electro-Optics (CLEO2013:Laser Science to Photonic Applications), paper JTu4A.63, San Jose, CA (2013).
6. C.-K. Sun, "Guided coherent acoustic phonon propagation in nanorods", Abstract Book of the 3rd International Symposium on Laser Ultrasonics and Advanced Sensing (LU2013), paper In12, pp. 162, Yokohama, Japan (2013). Invited Speaker
7. C.-K. Sun, "Nanoultrasonic imaging by using THz sound waves", in Program and Abstracts of 32nd International Acoustical Imaging Symposium (AI 32), pp. 29, Singapore (2013). Keynote Speaker
8. C.-K. Sun, "Nanoultrasonics based on piezoelectric superlattices", in Program and Abstracts of 2013 International Congress on Ultrasonics (ICU 2013), pp. Info-9, Singapore (2013). Keynote Speaker
9. C.-K. Sun, "Optical harmonic generation biopsy of human skin", Optics & Photonics International Congress 2013, Yokohama, Japan (2013). Invited Speaker
10. C.-K. Sun, "THz Dielectric Fibers and Fiber-based THz Bio-Imaging", International Workshop on

Terahertz Science and Technology 2013 (OTST2013), Kyoto, Japan (2013). Invited Speaker

11. T.-F. Tseng, J.-M. Wun, W. Chen, S.-W. Peng, J.-W. Shi, and C.-K. Sun, "High-Resolution 3-Dimensional Radar Imaging Based on a Few-Cycle W-band Photonic Millimeter-Wave Pulse Generator", in Technical Digest of The 2013 Optical Fiber Communication Conference and Exposition and the National Fiber Optic Engineers Conference (OFCNFOEC2013), paper OTu2H.5, Anaheim, CA (2013).

12. H.-Y. Chung and C.-K. Sun, "Using a Mini Aspheric Lens as the Objective of a Miniaturized Video-rate Nonlinear Optical Microscope", Design and Quality for Biomedical Technologies V, Photonics West, paper 8573-10, San Francisco, CA (2013).

13. C.-Y. Lin, C.-F. Lin, and C.-K. Sun, "Characterization of oral precancerous lesions based on higher-harmonic generation microscopy", Optical Imaging, Therapeutics, and Advanced Technology in Head and Neck Surgery and Otolaryngology, Photonics West, paper 8565-77, San Francisco, CA (2013).

14. Y.-H. Cheng, C.-F. Lin, and C.-K. Sun, "A Novel Intravital Multi-Harmonic Generation Microscope for Early Diagnosis of Oral Cancer", Optical Biopsy X, Photonics West, paper 8577-25, San Francisco, CA (2013).

15. M.-R. Tsai, Y.-H. Liao, and C.-K. Sun, "Differential diagnosis of pigmented skin lesions based on harmonic generation microscopy", Photonics in Dermatology and Plastic Surgery, Photonics West, paper 8565-6, San Francisco, CA (2013).

16. M.-R. Tsai, Y.-H. Liao, and C.-K. Sun, "Applying tattoo dye as third-harmonic generation contrast agent for in vivo optical biopsy of human skin", Multiphoton Microscopy in the Biomedical Sciences XIII, Photonics West, paper 8588-109, San Francisco, CA (2013).

17. P.-A. Mante, M.-H. Lin, H.-Y. Chen, S. Gwo, and C.-K. Sun, "Ultrafast phonon dynamic in plasmonic supracrystal", Ultrafast Phenomena and Nanophotonics XVII, Photonics West, paper 8623-33, San Francisco, CA (2013). Invited Paper

18. Y.-F. Tsai, T.-F. Tseng, H. Chen, J.-T. Lu, W.-J. Lee, T.-D. Wang, and C.-K. Sun, "In Vivo T-Ray Imaging of Blood Glucose Level in Diabetic Mice", International Symposium on Frontiers in THz Technology, paper WeA1.2, Nara, Japan (2012). Invited Speaker

19. C.-K. Sun, "In Vivo Noninvasive THz Imaging of Blood Glucose Level", Asia Communications and Photonics Conference, paper ATH4H.8, Guangzhou, China (2012). Invited Speaker

20. C.-K. Sun, "Phonon Nanoscopy", Son et Lumière: Phononics and Photonics at the Nanoscale, Les Houches, France (2012). Tutorial Lecturer

21. C.-K. Sun, "In vivo multi-harmonic generation biopsy", Proceeding of Nanophotonics in Asia 2012, pp. 34-35, Kanazawa, Japan (2012). Invited Speaker

22. C.-K. Sun, "In vivo Multi-Harmonic Generation Light Microscopy for Clinical Virtual Biopsy", IVF-Taiwan ICT Workshop, Taipei, Taiwan (2012). Invited Speaker

23. I-J. Chen, P.-A. Mante, C.-K. Chang, C.-C. Kuo, K.-H. Chen, V. Goussev, and C.-K. Sun, "THz-Bandwidth Coherent Phonon Emission by Supported Monolayer Graphene in the Out-of-Plane Direction", in Abstract Book of the 14th International Conference on Phonon Scattering in Condensed Matter (PHONONS 2012), pp. 58, Ann Arbor, MI, USA (2012); AIP Conference Proceedings 1506, pp. 68-72 (2012).

24. S.-C. Yang, H.-H. Hsiao, H.-P. Chen, H.-C. Chang, P.-K. Wei, and C.-K. Sun, "Observation of Near-Field Interaction between Surface Plasmon Polaritons and Nanoacoustic Pulses", in Abstract Book of the 14th International Conference on Phonon Scattering in Condensed Matter (PHONONS 2012), pp. 219-220, Ann Arbor, MI, USA (2012).

25. P.-A. Mante, M.-H. Lin, H.-Y. Chen, S. Gwo, and C.-K. Sun, "Probing interparticle bonding in plasmonic supracrystal", in Abstract Book of the 14th International Conference on Phonon Scattering in Condensed Matter (PHONONS 2012), pp. 248, Ann Arbor, MI, USA (2012).

26. P.-A. Mante, H.-P. Chen, Y.-C. Wu, C.-Y. Ho, L.-W. Tu, J.-K. Sheu, and C.-K. Sun, "Confined acoustic vibrations in piezoelectric GaN nanorods", in Abstract Book of the 14th International Conference on Phonon Scattering in

Condensed Matter (PHONONS 2012), pp. 39, Ann Arbor, MI, USA (2012).

27. C.-K. Sun, C.-C. Chen, Y.-C. Wen, P.-A. Mante, V. Gusev, and J.-K. Sheu, “Probing Interfacial Water Molecules by Using Sub-Nanometre Ultrasonic Pulses”, in Abstract Book of the 14th International Conference on Phonon Scattering in Condensed Matter (PHONONS 2012), pp. 44, Ann Arbor, MI, USA (2012). Invited Speaker

28. C.-K. Sun, M.-R. Tsai, Y.-H. Liao, A. A. Ivanov, A. B. Fedotov, A. M. Zheltikov, “In vivo higher-harmonic generation biopsy based on a femtosecond Cr:forsterite laser”, in Summaries of 15th International Conference on Laser Optics (LO2012), paper WeR6-12, St. Petersburg, Russia (2012). Invited Speaker.

29. H.-H. Lin, M.-R. Tsai, C.-F. Chen, S.-Y. Chen, Y.-H. Liao, G. G. Lee, and C.-K. Sun, “Cell Segmentation and NC Ratio Analysis of Third Harmonic Generation Virtual Biopsy Images Based on Marker-Controlled Gradient Watershed Algorithm”, in Proceedings of 2012 IEEE International Symposium on Circuits and Systems (ISCAS 2012), Seoul, Korea (2012); Best Paper Award.

30. S.-C. Yang, H.-H. Hsiao, H.-P. Chen, H.-C. Chang, P.-K. Wei, and C.-K. Sun, “Intense Near-Field Interaction between Surface Plasmon Polaritons and Nanoacoustic Pulses”, in Technical Digest of Conference on Lasers and Electro-Optics (CLEO2012:Laser Science and Photonic Applications), paper QTh3F.8, San Jose, CA (2012).

31. T.-F. Tseng, C.-H. Lai, J.-T. Lu, Y.-F. Tsai, Y.-J. Hwang, and C.-K. Sun, “Strong-coupling behavior of THz sub-wavelength directional couplers”, in Technical Digest of Conference on Lasers and Electro-Optics (CLEO2012:Laser Science and Photonic Applications), paper JW2A.42, San Jose, CA (2012).

32. C.-K. Sun, “In vivo multi-harmonic generation biopsy of human skin and mucosa”, in Technical Digest of Conference on Lasers and Electro-Optics (CLEO2012:Laser Science and Photonic Applications), paper JW3G.3, San Jose, CA (2012), Invited Speaker.

33. C.-K. Sun, “Confined acoustic vibrations and acoustic waveguiding in semiconductor nanorods”, Proceeding of the 9th Cross-Strait Workshop on Nano Science and Technology, pp. 46, Tainan, Taiwan (2012). Plenary Speaker

34. C.-K. Chen, C.-K. Sun, and T.-M. Liu, “In vivo Imaging Human Micro-circulation with Video-rate Third Harmonic Generation Microscopy”, in Proceeding of Biomedical Optics and Three-Dimensional Imaging 2012, Miami, Florida, USA (2012).

35. M.-R. Tsai, Y.-H. Liao, and C.-K. Sun, “Applying tattoo dye as third-harmonic-generation contrast agent for in vivo optical biopsy of human skin”, in Program and Abstract Book of Focus on Microscopy, pp. 214, Singapore (2012).

36. Y.-H. Cheng and C.-K. Sun, “High speed real-time long-term image acquisition and storage system for 2D Lissajous scanning laser microscopy”, in Program and Abstract Book of Focus on Microscopy, pp. 287, Singapore (2012).

37. H.-Y. Chung, C.-H. Yu, C.-Y. Lin, H.-J. Tsai, and C.-K. Sun, “Hand-held miniaturized video-rate nonlinear optical microscope”, in Program and Abstract Book of Focus on Microscopy, pp. 275, Singapore (2012).

38. M.-R. Tsai, Y.-H. Liao, and C.-K. Sun, “Differential diagnosis of pigmented skin lesions based on in vivo higher-harmonic generation biopsy”, in Program and Abstract Book of Focus on Microscopy, pp. 277, Singapore (2012).

39. S.-Y. Chou, H.-C. Hsu, S.-Y. Chen, Y.-H. Liao, P.-H. Wang, and C.-K. Sun, "In vivo harmonic generation biopsy for quantitative evaluation in chronological aged skin keratinocytes”, 7th Asian Conference on Ultrafast Phenomena, paper p-15, Busan, Korea (2012).

40. C.-K. Sun, “Probe interfacial water molecules by using THz EM and acoustic waves”, 7th Asian Conference on Ultrafast Phenomena, Busan, Korea (2012), Invited Speaker.

41. C.-K. Sun, “MMW resonant absorption of viruses through dipolar coupling with confined acoustic vibrations”, in Proceeding of 3rd International THz-Bio Workshop, paper O-23, Seoul, Korea (2012), Invited Speaker.

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1. S.-Y. Chen and C.-K. Sun, “Combined SHG/THG Imaging, in Second Harmonic Generation Imaging”, F. S. Pavone and P. J. Campagnola Ed., CRC Press (2013).
2. C.-H. Laiand C.-K. Sun, “Terahertz-Wave Plastic Fibers and Their Applications, in Handbook of Terahertz Technologies: Devices and Applications, T. Nagatsuma and Ho-Jin Song Ed.”, Pan Stanford Publishing (2013).

孫維仁教授 We-Zen Sun, Professor

※學術期刊論文 Journal articles & book chapters

1. Yu-Chang Yeh, Ming-Jiuh Wang, Anne Chao, Wen-Je Ko, Wing-Sum Chan, Shou-Zen Fan, Jui-Chang Tsai, Wei-Zen Sun*”, Correlation between early sublingual small vessel density and late blood lactate level in critical ill surgical patients. J Surg Res, May 21, 2012.
2. Wei-Zen Sun*”, Comprehensive enough? Role of multidimentional inventories in managing migraine. Acta Anaesthesiol Taiwan, April 4, 2012.
3. Yu-Chang Yeh, Wei-Zen Sun, Wen-Je Ko, Wing-Sum Chan, Shou-Zen Fan, Jui-Chang Tsai, Tzu-Yu Lin*”, Dexmedetomidine prevents alterations of intestinal microcirculation that are induced by surgical stress and pain in a novel rat model. Anesth Analg, April 13, 2012.
4. Feng-Sheng Lin, Wen-Ying Lin, Chien-Yu Chen, Chih-Peng Lin, Tzu-Fu Lin, Wei-Zen Sun*”, Differential analgesic synergism between tramadol and propoxyphene with acetaminophen for mild postoperative wound pain. Acta Anaesthesiol Taiwan, April 4, 2012.
5. Yu-Chang Yeh, Wen-Je Ko, Chih-Peng Lin, Shou-Zen Fan, Jui-Chang Tsai, Wei-Zen Sun*”, Enoxaparin sodium prevents intestinal microcirculatory dysfunction in endotoxemic rats. Critical Care, 16(2), R59, 2012.
6. Man-Ling Wang, Chun-Yi Dai, Matthew Huei-Ming Ma, Kuan-Wu Chang, Chih-Peng Lin*, Wei-Zen Sun*”, Direct endotracheal intubation through a novel detachable optic probe (Sunscope®) among emergency medical technicians with variable training backgrounds. Acta Anaesthesiol Taiwan, 50(1):7-11, 2012.
7. Meng-Han Yang, Peng-Hui Wang, Shuu-Jiun Wang, Wei-Zen Sun, Yen-Jen Oyang, Jong-Ling Fuh*”, Women with endometriosis are more likely to suffer from migraines: a population-based study. PLoS ONE, 7(3):e33941, March 19, 2012.
8. Chih-Peng Lin, Wen-Ying Lin, Feng-Sheng Lin, Wei-Zen Sun*”, Efficacy of intrathecal drug delivery system for refractory cancer pain patients: a single tertiary medical center experience. J Formos Med Assoc, 111(3): March 17, 2012.
9. Yu-Chang Yeh, Wen-Je Ko, Kuang-Cheng Chan, Shou-Zen Fan, Jui-Chang Tsai, Ya-Jung Cheng*, Wei-Zen Sun*”, Investigating the effect of Toll-like receptor 4 antagonist, Eritoran tetrasodium, on intestinal microcirculation in endotoxemia with a novel rat model. Shock, 37(5):556-61, 2012.
10. Yeong-Ray Wen, Chih-Peng Lin, Ming-Dar Tsai, Jui-Yuan Chen, Chih-Chun Ma, Wei-Zen Sun*, Chia-Chuan Wang*”, Combination of nerve blockade and intravenous alfentanil is better than single treatment in postoperative pain. J Formos Med Assoc, 111(2):101-8, 2012.
11. Ming-Cheng Chang, Chien-Nan Lee, Yu-Li Chen, Ying-Cheng Chiang, Wei-Zen Sun, Wen-Fang Cheng, Chi-An Chen”,Cord blood stem cell-derived DCs generate potent antigen-specific immune responses and anti-tumor effects. Clin Sci, Jan 23, 2012. [Epub ahead of print].

※研討會論文 Conference & proceeding papers

1. Wei-Zen Sun", The competitive role between interventional and conventional pain management in hospice care in Taiwan. (Plenary Lecture) The 46th Annual Meeting of the Japan Society of Pain Clinicians, Shimane, Japan, 2012.
2. 孫維仁, 以夷制夷的中西醫學互補整合方略: 嚴謹西方觀點(大會演講). 台北國際中醫藥學數論壇, Taipei Traditional Chinese Medicine International Forum, Taiwan, s53-4, 2012.
3. Feng-Sheng Lin, Wen-Ying Lin, Chih-Peng Lin, Wei-Zen Sun*", Novel implication of Near-infrared spectroscopy in treating complex regional pain syndrome: a useful monitor for sympathetic block. Chinese J Pain, 2(1S): s114-5, 2012.
4. Wen-Ying Lin, Feng-Sheng Lin, Chih-Peng Lin, Wei-Zen Sun*", Percutaneous spinal cord stimulation as a useful alternative to intractable cancer pain associated with profound opioid tolerance. Chinese J Pain, 2(1S): s112-3, 2012.
5. Wen-Ying Lin, Feng-Sheng Lin, Chih-Peng Lin, Wei-Zen Sun*", Percutaneous spinal cord stimulation relieves intractable cancer pain- a clinical case report. Chinese J Pain, 2(1S): s117-8, 2012.
6. Chih-Peng Lin, Wen-Ying Lin, Feng-Sheng Lin, Wei-Zen Sun*", PPAR gamma agonist Pioglitazone neither delays nor decrease morphine tolerance and morphine-induced glial activation. Chinese J Pain, 2(1S): s90-1, 2012.

※專書Books

1. 孫維仁, 癌症及其末期疾病所致之疼痛. IN: 黃安年: 末期疾病疼痛治療學 (Pain Management for Terminal Diseases, ISBN 9789861506197), 台灣安寧緩和醫學學會, 2nd ed, pp1-23, 2012.

田維誠副教授 Wei-Cheng Tian, Associate Professor

※學術期刊論文 Journal articles & book chapters

1. Wei-Cheng Tian*, Yu-Hsuan Ho, Chao-Hao Chen and Chun-Yen Kuo, "Sensing Performance of Precisely Ordered TiO2 Nanowire Gas Sensors Fabricated by Electron-Beam Lithography", Sensors, 13; doi:10.3390/s130100865, 865-874, Jan. 2013
2. Wei-Cheng Tian*, Yu-Hsuan Ho, and Chao-Hung Chou, "A Photoactivated TiO2 Gas Chromatograph Detector for Diverse Chemical Compounds Sensing at Room Temperature", IEEE Sensors Journal, 2013
3. Ming-Yee Wong, Wei-Rui Cheng, Mao-Huang Liu, Wei-Cheng Tain, Chia-Jung Lu, "A preconcentrator chip employing micro-SPME array coated with in-situ-synthesized carbon adsorbent film for VOCs analysis", Talanta, 101, 307-313, Nov. 2012
4. Yu-Hsuan Ho, Yung-Ting Chang, Shun-Wei Liu, Hsiao-Han Lai, Chih-Wei Chu, Chih-I Wu, Wei-Cheng Tian, and Pei-Kuen Wei, "Optimization of Polymer Light Emitting Devices Using TiOx Electron Transport Layers and Prism Sheets", Organic Electronics, 13, 2667-2670, Nov. 2012
5. Kung-Bin Sung, Ke-Pan Liao, Yen-Lin Liu, Wei-Cheng Tian*, "Development of a nanofluidic preconcentrator with precise sample positioning and multi-channel preconcentration", Microfluidics and Nanofluidics, DOI 10.1007/s10404-012-1084-6, Publish Online, Oct. 2012
6. W. -C. Tian*, T.H. Wu, C.J. Lu W. R. Chen and H.J. Sheen, "A novel micropreconcentrator employing a laminar flow patterned heater for micro gas chromatography", J. Micromech. Microeng., 22 065014, May 2012
7. Yu-Hsuan Ho, Ding-Wei Huang, Yung-Ting Chang, Ya-Han Ye, Chih-Wei Chu, Wei-Cheng Tian, Chin-Ti Chen, and Pei-Kuen Wei, "Improve efficiency of white organic light-emitting diodes by using nanosphere arrays in color conversion layers", Opt. Express, 20, pp. 3005-3014, Jan. 2012

8. Wei-Cheng Tian*, T.H. Wu, C.J. Lu W. R. Chen and H.J. Sheen, "Development of a Novel Micropreconcentrator for Micro Gas Chromatography", J. Micromech. Microeng., under press, 2012

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1. Y. C. Lin, C. J. Hsieh, L. B. Hunag, J. C. Liou, and W.-C. Tian*, "CMOS MEMS Metal-based Tactile Sensors Development", AVS 59th International Symposium & Exhibition, Tampa, FL, USA, Oct. 2012
2. Y. C. Chen, C. Y. Chang, H. L. Lu, C. J. Lu, and W.-C. Tian*, "A CMOS MEMS Gas Sensor Using Monolayer Protected Gold Nano-Clusters Coating on Three-Dimensional Interdigitated Electrodes", AVS 59th International Symposium & Exhibition, Tampa, FL, USA, Oct. 2012
3. Y.-S. Tien, P.-C. Ku, F.-Y. Lin, P.-C. Li, L.-H. Lu, and P.-L. Kuo, W.-C. Tian*, "A Low Voltage CMOS-based Capacitive Micromachined Ultrasonic Sensors Development", IEEE Sensors 2012, 1810-1813, Taipei, Taiwan, Oct. 2012
4. C.-T. Sun, Y.-C. Lin, C.-J. Hsieh, J.-C. Liou, L.-B. Wang, W.-C. Tian*, "A Linear-Response CMOS-MEMS Capacitive Tactile Sensor", IEEE Sensors 2012, 2082-2085, Taipei, Taiwan, Oct. 2012
5. Yu-Hsuan Ho, Shun-Wei Liu, Hsun Liang, Kuan-Han Ting, Wei-Cheng Tian and Pei-Kuen Wei, "Luminous and Conversion Efficiency Improvement in OLED/OPV Tandem Device with Omnidirectional Antireflection Nanopillars", SID2012, 2516-2519, Boston, MA, USA, Jun. 2012
6. Yu-Hsuan Ho, Hsun Liang, Yung-Ting Chang, Wei-Cheng Tian, Chih-Wei Chu, Chin-Ti Chen, and Pei-Kuen Wei, "High Efficient Color Conversion Layers for White Organic Light-Emitting Diodes using Polystyrene Nanosphere Monolayers", SID2012, 1499-1502, Boston, MA, USA, Jun. 2012
7. Y. -L. Liu, K. -P. Liao, K. -B. Sung, and W. -C. Tian*, "Design of nanofluidic preconcentrators using electrical resistive circuit network", International SEMBA & BioPro, Taichung, Taiwan, Feb. 2012
8. Yu-Hsuan Ho, Kuan-Han Ting, Yung-Ting Chang, Wei-Cheng Tian, Chih-Wei Chu, Chin-Ti Chen and Pei-Kuen Wei, "Improve Efficiency of White Organic Light-Emitting Diodes by Using Nanosphere Arrays in Color Conversion Layers", SID2012, Boston, MA, USA, Jun. 2012
9. Yu-Hsuan Ho, Shun-Wei Liu, Hsun Liang, Kuan-Han Ting, Wei-Cheng Tian and Pei-Kuen Wei, "Luminous and Conversion Efficiency Improvement in OLED/OPV Tandem Device with Omnidirectional Antireflection Nanopillars", SID2012, Boston, MA, USA, Jun. 2012

王水深教授 Shoei-Shen Wang, Professor

※學術期刊論文 Journal articles & book chapters

1. Chi NH, Yang MC, Chung TW, Chou NK, Wang SS(correspondence author), "Cardiac repair using chitosan-hyaluronan/silk fibroin patches in a rat heart model with myocardial infarction." Carbohyd Polym 2013;92(1):591-7.
2. Chen CH, Wang SS, Wei EI, Chu TY, Hsieh PCh, "Hyaluronan enhances bone marrow cell therapy for myocardial repair after infarction". Molecular Therapy 2013;21(3):670-9.
3. Wu CY, Chan CY, Huang SC, Chi NS, Wang SS, Wu IH, "Outcomes following endovascular or open repair for ruptured abdominal aortic aneurysm in a Chinese population." Heart Vessels 2013(Accepted).
4. Kobashigawa JA, Pauly DF, Starling RC, Eisen HJ, Ross H, Wang SS, Cantin B, Hill JA, Lopez P, Dong G, Nichols S, "Cardiac allograft vasculopathy by intravascular ultrasound in heart transplant patients: substudy from the everolimus or mycophenolate mofetil randomized, multicenter trial." JACC Heart Failure 2013(Accepted).
5. Wang SS, Chou NK, Chi NH, Huang SC, Wu IH, Wang CH, Yu HY, Chen YS, Tsao CI, Ko WJ, Shun CT, "Clinical experience of tacrolimus with everolimus in heart transplantation." Transplant Proc 2012;44:907-9.
6. Chi NH, Yang MC, Chung TW, Chen JY, Chou NK, Wang SS(correspondence author), "Cardiac repair achieved by bone marrow mesenchymal stem cells/silk fibroin/hyaluronic acid patches in a rat of myocardial infarction model."

Biomaterials 2012;33(22):5541-51.

7. Shih FJ, Fan YW, Chiu CM, Shih FJi, Wang SS(correspondence author),"The Dilemma of "To be or not to be": developing electronically e-health & cloud computing documents foroverseas transplant patients from Taiwan organ transplant health professionals' perspective." Transplant Proc 2012;44:835-8.
8. Chou NK, Luo JM, Chi NH, Wu IH, Huang SC, Chen YS, Yu HY, Tsao CI, Ko WJ, Chu SH, Wang SS(correspondence author), "Extracorporeal membrane oxygenation and thoratec pneumatic ventricular assist devices as double bridge to heart transplantation." Transplant Proc 2012;44:878-80.
9. Tsao CI, Chou NK, Chi NH, Chen SC, Ko WJ, Yu HY, Chen YS, Wang SS(correspondence author), "The influence of the organ allocation policy on a patient's chancesof undergoing heart transplantation and the posttransplantation survival rate." Transplant Proc 2012;44:881-2.
10. Hsu KH, Huang SC, Chou NK, Chi NH, Tsao CI, Ko WJ, Chen YS, Chang CI, Chiu IS, Wang SS(correspondence author), "Ventricular assist device application as a bridge to pediatric heart transplantation: a single center's experience." Transplant Proc 2012;44:883-5.
11. Lin MH, NK Chou, Chi NH, Chen YS, Yu HY, Huang SC, Ko WJ, Chou HW, Wang SS(correspondence author), "The outcome of heart transplantation in hepatitis c-positive recipients." Transplant Proc 2012;44:890-3.
12. Chi NH, Chou NK, Tsao CI, Huang SC, Wu IH, Yu HY, Chen YS, Wang SS(correspondence author), "Endomyocardial biopsy in heart transplantation: schedule or event?" Transplant Proc 2012;44:894-6.
13. Chou NK, Jan CF, Chi NH, Lee CM, Wu IH, Huang SC, Chen YS, Yu HY, Tsao CI, Ko WJ, Chu SH, Wang SS(correspondence author), "Cardiac allograft vasculopathy compared by intravascular ultrasound sonography: everolimus to mycophenolate mofetil-one single-center experience." Transplant Proc 2012;44:897-9.
14. Chou HW, Chi NH, Lin MH, Chou NK, Tsao CI, Yu HY, Chen YS, Wang SS(correspondence author),"Steroid pulse therapy combined with plasmapheresis for clinically compromised patients after heart transplantation." Transplant Proc 2012;44:900-2.
15. Chang TI, Chi NH, Chou NK, Tsao CI, Yu HY, Chen YS, Wang SS(correspondence author), "Isolated cardiac sarcoidosis in heart transplantation." Transplant Proc 2012;44:903-6.
16. Chen YC, Chuang MK, Chou NK, Chi NH, Wu IH, Chen YS, Yu HY, Huang SC, Wang CH, Tsao CI, Ko WJ, Wang SS(correspondence author), "Twenty-four year single-center experience of hepatitis B virus infection in heart transplantation." Transplant Proc 2012;44:910-2.
17. Luo JM, Chou NK, Chen YS, Huang SC, Chi NH, Yu HY, Ko WJ, Wang SS(correspondence author) , "Heart retransplantation for pediatric primary allograft failure." Transplant Proc 2012;44:913-4.
18. Tseng PH, Wang SS(correspondence author), Shih FJ, "Changes inhealth-related quality of life across three post-hearttransplantation stages: preoperative extracorporeal membraneversus non-extracorporeal membrane group/clinical trial plan group versus non-clinical trial plan group in Taiwan." Transplant Proc 2012;44:915-8.
19. Huang SC, Wu ET, Wang CC, Chen YS, Chang CI, Chiu IS, Ko WJ, Wang SS(correspondence author), " Eleven years of experience with extracorporeal cardiopulmonary resuscitation for paediatric patients with in-hospital cardiac arrest." Resuscitation 2012;83(6):710-4.
20. Chien CY, Wang SS(correspondence author), "Coronary artery bypass in octogenarians. International Journal of Gerontology 2012;6:155-9.
21. Wu IH, Wu MH, Chen SJ, Wang SS, Chang CI, "Successful deployment of an iliac limb graft to repair

acute aortic rupture after balloon aortoplasty of recoarctation in a child with Turner syndrome aortoplasty of recoarctation in a child with Turner syndrome." Heart Vessels 2012;27(2):227-30.

22. Chiu HH, Wu MH, Wang SS, Lan C, Chou NK, Chen SY, Lai JS, "Cardiorespiratory function of pediatric heart transplant recipients in the early postoperative period." Am J Phys Med Rehabil 2012;91(2):156-61.

23. Chen YH, Wu YW, Yang WS, Wang SS, Lee CM, Chou NK, Hsu RB, Lin YH, Lin MS, Ho YL, Chen MF, "Relationship between bone mineral density and serum osteoprotegerin in patients with chronic heart failure." PLoS One 2012;7(8):e44242.

24. Wu VC, Huang TM, Wu PC, Wang WJ, Chao CT, Yang SY, Shiao CC, Hu FC, Lai CF, Lin YF, Han YY, Chen YS, Hsu RB, Young GH, Wang SS, Tsai PR, Chen YM, Chao TT, Ko WJ, Wu KD, The NSARF Group, "Preoperative proteinuria is associated with long-term progression to chronic dialysis and mortality after coronary artery bypass grafting surgery." PLoS One 2012;7(1):e27687.

25. Wu XM, Lin YH, Chen A, Hsu TP, Wu YW, Lin HJ, Hsu RB, Lee CM, Wang SS, Lo MT, Ho YL, Chen MF, "Prognostic significance of adipocytokines in systolic heart failure patients." Eur J Clin Invest 2012;42(10):1079-86.

26. Huang SC, Wu ET, Wang CC, Chen SJ, Chen YS, Chang CI, Chiu IS, Wang SS, "Surgical management of pulmonary artery sling: trachea diameter and outcomes with or without tracheoplasty." Pediatr Pulmonol 2012;47(9):903-8.

27. Wu YT, Wu YW, Hwang CL, Wang SS, "Changes in diastolic function after exercise training in patients with and without diabetes mellitus after coronary artery bypass surgery. A randomized controlled trial." Eur J Phys Rehabil Med 2012;48(3):351-60.

※研討會論文 Conference & proceeding papers

1. Wang SS, "Heart Transplantation in Taiwan", 2013 The Asian Society for Cardiovascular and Thoracic Surgery (ASCVTS 2013), Kobe, Japan, April 4-7, 2013
2. Wang SS, "Current Role of Hybrid Surgery in Aortic Surgery", The 4th Catholic VESSEL Update 2012, Korea, Seoul, December 1, 2012
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吳文超副教授 Wen-Chau Wu, Associate Professor

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2. Wen-Chau Wu*, Shu-Fen Jiang, Shun-Chung Yang, Shu-Hua Lien. “Pseudocontinuous arterial spin labeling perfusion magnetic resonance imaging – A normative study of reproducibility in the human brain”, Neuroimage 2011;56:1244-1250.
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楊泮池教授 Pan-Chyr Yang, Professor

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2. Lin JC, Wu YY, Wu JY, Lin TC, Wu CT, Chang YL, Jou YS, Hong TM, Yang PC, "TROP2 is Epigenetically Inactivated and Modulates IGF-1R Signaling in Lung Adenocarcinoma", EMBO Molecular Medicine 2012
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捌 教師得獎、專利及技術轉移
Award、Patents and Technology Transfer

一、教師得獎 Award

※2013

1. 傅楸善, NTU team got 4th and gold medal among 120 World Final teams among 10,000 regional teams in ACM ICPC (International Collegiate Programming Contest), Saint Petersburg, Russia, July 3, 2013
2. 孫啓光，潘文淵文教基金會研究傑出獎，2013
3. 成佳憲，台灣大學102學年度學術研究績效獎勵(傑出期刊3)，2013

※2012

1. 李百祺，AIUM Fellow, 2012. (American Institute of Ultrasound in Medicine)
2. 李百祺，國科會101年度傑出研究獎，國科會，2012
3. 孫啓光，國科會101年度傑出研究獎，國科會，2012
4. 成佳憲，台灣大學101學年度學術研究績效獎勵(傑出期刊2)，2012
5. 阮雪芬，中華民國資訊學會最佳博士論文指導教授獎
6. 阮雪芬，中華民國資訊學會李國鼎穿石獎
7. 阮雪芬，101學年度國科會補助大專校院獎勵特殊優秀人才措施(獎勵人員傑出研究表現)
8. 阮雪芬，台灣大學101學年度學術研究績效獎勵(傑出期刊3、優良期刊3)

二、專利 Patents

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2. 高密度微電極陣列及其序列式控制方法，林啓萬、陳志宏、楊豐旗，097147521(2013/05/23核准)。
3. “Method for k-space reconstruction in magnetic resonance inverse imaging”, Fa-Hsuan Lin, issued on March 19, 2013 (United States Patent 8,400,152)
4. 用於生物分子鑑定之雙頻帶微平面倒F型天線及其鑑定方法，林啓萬、邱南福、李世光、吳光鐘，中華民國I359269號，有效日2027/10/29。
5. 以導電金屬氧化物為中介層改善表面電漿共振特性之方法，林啓萬、邱南福、馮偉意、張家禎、何國川、李世光、吳光鐘，中華民國I364533號，有效日2027/12/24。
6. 利用脈衝雷射光源產生的聲學信號之造影系統，孫啓光、賴昱宏、張界逢、李思宇，申請中華民國專利，申請號102113270，申請日2012/4/15。
7. “An ultrasound imaging system”, P.-C. Li and Y.-F. Li (filed for U.S. Patent, 13/746548, 2013/01/22).
8. “An image generation system”, P.-C. Li and B.-Y. Hsieh (filed for U.S. Patent, 13/803657, 2013/03/14).
9. “Ultrasonic diagnostic system and portable ultrasonic diagnostic apparatus thereof”, P.-C. Li and Y.-F.

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10.“超音波探針”，李百祺、劉建宏，中華民國專利I384252號。(2013/2/1公告)

11.“影像探頭”，李百祺、謝寶育，中華民國專利I402054號。(2013/7/21公告)

12.“影像生成系統”，李百祺、謝寶育，中華民國專利申請號102101627。(申請日2013/01/16)

13.“低複雜度位移補償波束成像系統及其方法”，何寬育、吳安宇、李百祺、詹承洲、陳郁豪，中華民國專利申請號102106388。(申請日2013/02/23)

14.“應用於侵入式裝置之階梯結構”，李百祺、吳宜瑾，中華民國專利申請號102115021。(申請日2013/04/26)

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3. 耐受醇類之大腸桿菌之製備方法，阮雪芬、森浩禎、張心儀、黃宣誠、黃翠琴、廖俊智，中華民國專利第I 37990號。(2012.12.21~2028.10.28)
4. 預測食道癌病患對於化學暨放射線療法之反應的方法及套組，陳佩君、程蘊菁、賴亮全、蔡孟勳、陳星光、楊珮雯、李章銘、莊曜宇、蕭朱杏，中華民國 I 380018號。(有效日2012/12/21)
5. “Contrast improvement method and system for photoacoustic imaging”, P.-C. Li and C.-W. Wei (filed for US patent, 13/557202, 2012/7/24; publication date 2012/11/22, US 2012/0294518).
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8. Device and Method for Obtaining Clear Image, Y. C. Lin, C. W. Chen, C. S. Fuh, and M. H. Shih (USA patent granted, 8,306,360, 2012/11/06-).
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15. 孫啓光、蔡沅甫、陳華，“用電磁波偵測血糖含量的方法與裝置/Method and device for detecting a blood glucose level using an electromagnetic wave”，申請中華民國專利，申請號101114805，申請日2012/4/25。
16. Noninvasive measuring device and noninvasive measuring method for probing an interface, C.-K. Sun, C.-C. Chen, and Y.-C. Wen, USA patent pending. Application date: 2012/07/31. Application number: 13/563,467

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21. 用於增進導電元件導電特性之奈米孔洞陣列上開發明，管傑雄，黎中立，美國台灣 97電661 US 8,232,475 B2 I375984, Jul. 2012
22. HIGH-DENSITY MICRO ELECTRODE ARRAY AND SERIAL CONTROL METHOD THEREOF，US 8,195,268 B2，Chii-Wann Lin，Jyh-Horng Chen，Feng-Chi Yang，Pub.：Jul. 5,2012
23. 健康監控裝置及人體電訊處理方式，顏家鈺、顏凡哲、李世光、林啓萬、吳光鐘、曾慶恩，中華民國專利I365062號(2012/06/01核准到2029/06/14止)
24. Method and Apparatus for Simultaneously acquiring multiple slices/slabs in magnetic resonance system，J.-H. Chen and T.-D. Chiueh，中華民國專利(有效日2012/05/21-)。
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28. Tseng YJ, Lin FY, US-61603501 "Structure-Based Fragment Hopping For Lead Optimization And Improvement In Synthetic Accessibility", (申請日2012/02/27)
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三、技術轉移 Technology Transfer

1. 張瑞峰，自動化乳房超音波影像診斷電腦輔助系統，愛樺企業股份有限公司，$180,000，2013/06/01-2017/05/31。
2. 李百祺，高頻超音波小動物影像系統之處理系統，思銳生醫科技股份有限公司，NT$1,000,000，2012/11/1-2015/10/31。
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5. 孫維仁，結腸灌流內視鏡技術及其相關專利，昇航科技有限公司，$3,000,000，2012/02/01-2016/01/31。