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. 9 / 2015

國立臺灣大學
生醫電子與資訊學研究所

Graduate Institute of
Biomedical Electronics and Bioinformatics,
National Taiwan University

2015年第9期年報

BEBI Annual Report, No. 9 / 2015

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序言 Preface

過去一年以來，臺大生醫電資所積極爭取新的教師員額，希望為所上增添更多不同領域的教學資源以及研究方向，並持續推動師生的跨領域學習研究及交流，擴展與國內外研究機構及企業的合作關係，協助學生接觸最新生醫工程及資訊技術，使之能與全球生醫科技接軌。

在培育跨領域人才方面，自102年由電資學院代表與美國農業部國家農業圖書館（USDA National Agricultural Library, NAL）簽訂的實習計畫以來，本所積極鼓勵學生申請，103年再度推薦了1名優異博班學生前往美國農業部國家農業圖書館進行研究實習。本所與臺大醫院合作，薦送優秀研究生至臺大醫院醫工部、資訊室、病歷資訊室實習，運作至今，互動相當順暢；為獎勵表現優良之實習生，本所於實習結束後，選擇表現優良者頒予獎學金以茲獎勵。另外，我們也持續加強與相關產業的溝通，積極推動產學互動。我們定期安排師生進行企業參訪，去年拜訪的是台達電子股份有限公司，藉由實地參訪，讓學生實際體會研究機構及企業內部之運作與開發研究進程。除此之外，本所積極為學生爭取資源，並與產業界密集接觸。在103年春季更與泰博科技股份有限公司簽訂合作備忘錄，爭取獎學金計畫並邀請該公司至本所之永齡生醫工程館七樓空間設立產學合作辦公室，除了期望能增加在學學生的學習資源，更希望能拓展畢業生的就業機會，藉以強化競爭力並落實密切的產學交流、人才流動機會，讓學生們學以致用。除此之外，我們目前也與另外幾家公司洽談獎學金實習計畫與可能的產學合作。

在所務及研究教學方面，我們致力於在既有的基礎上持續發展及改進。首先，我們在四月份完成了本所成立以來第二次的教學評鑑，這次的評鑑提供了我們自我檢視的機會，也邀請了陳仲瑄院士與陳良博院士擔任本所評鑑委員，為我們提供寶貴的意見及建議。其次，為落實跨領域研究整合的目標，本所精心規劃了BSL2等級的生醫核心實驗室，即將於104年開學前竣工，並將在完成後開放本所師生共同使用，以進行前瞻性跨領域整合研究。而每年暑假例行舉辦的生醫電資營，今年的活動新加入了黑客松、業師及企業出題等元素，使活動更加豐富，給予學員多元的學習與思考機會。除此活動之外，我們與本校醫工所成功申請到「2015生物醫學工程研討會」主辦權。生物醫學工程研討會簡稱醫工年會，將於2015年11月13、14日假本校館舍舉辦，此會乃生醫工程領域的年度大事，距離上次由本校主辦，已睽違九年之久，這次由本所及醫工所接下此重擔，我們將認真籌辦、全力以赴，務必將此盛會辦理得盡善盡美。

強調結合生醫、電機及資訊的跨領域研究整合，是本所最大之特色，也是我們持續不斷努力的目標。本所成立至今，即將邁向第10個年頭，上述豐碩的成果皆歸功於全體師生及同仁的努力。面對新的年度，我們將配合國際潮流、政府經建所需來提升現有基礎與核心課程，此外也將增加跨領域產學研究計畫之合作，爭取資源挹注來加強推動整合性研究。

最後，衷心期許臺大生醫電資所在所內師生同仁的共同努力下，能持續邁步向前，本所能更加茁壯，成為整合生醫/工程/資訊跨領域研究的典範。

莊曜宇

2015年8月

Over the past year, the department of NTU Biomedical Electronics and Bioinformatics (NTUBEBI) actively recruited top professors from diverse of research areas to continue promoting interdisciplinary research, expanding domestic and foreign research institutions coordination, and to assist in cooperating with enterprises in order to offer students access to the latest biomedical engineering and bioinformatics technology. Finally, we hope to integrate with the global biomedical technology.

Regarding to fostering of interdisciplinary talents, the NTUBEBI and USDA National Agricultural Library (NAL) has contracted an internship program since 2013, and recommending students to apply. In 2014, NTUBEBI has recommended one excellent PhD students for the NAL research internship. NTUBEBI has collaborated with the National Taiwan University Hospital (NTUH) and has recommended and sent outstanding graduate students to the department of Biomedical Engineering, the Information Technology Office (IT Office) and the Medical Information Management Office (MIM Office) to the National Taiwan University Hospital Medical for internships. Upon completing these internship programs, interns with good performance were awarded with scholarships. In addition, we continue to strengthen communication and related industries , and actively promote industry-academia collaboration. On our regulary scheduled field visit, our teachers and students visited Delta Electronics Co., Ltd. last year ,giving students insight into the practical experience of working within research institutions, enterprise internal operations, and research & development process. Furthermore , the Institute actively seek more resources for students. In the spring of 2014, NTUBEBI signed a cooperation contract with TaiDoc Technology, for providing scholarship program for the institute and invited the TaiDoc Technology to set up office space at 7 floor NTU YongLin Biomedical Engineering Center to establish industry-university cooperation to increasing student learning resources, and employment opportunities for graduates.We are aiming to increase the employment opportunities for graduates and strengthen the competitiveness by implementing industry to university exchanges and also give talent mobility opportunities for students to apply their knowledge. Furthermore, we approached other companies totalk about intern scholarships plans and possibility of industry-university cooperative research plans.

Regarding institute teaching and research affairs, NTUBEBI is committed to develop andimprove on the existing basis. First, we have completed in 2th instructional evaluation since the establishment of NTUBEBI institute this April. This evaluation provides us the opportunity to self-review, alsoinvited Chen Chung-Hsuan as evaluation committee, which provided us valuable comments and suggestions. Secondly, for the implementation of integrated interdisciplinaryresearch, the BSL2 level Biomedical Core Laboratory will be open before next semester; BSL2 Biomedical Core Laboratory will be providingteachers and students the ability to conduct their prospective interdisciplinaryintegration research. In the up coming BiomedicalElectronics and Bioinformatics camp event, we continue to collaborate with theInstitute of Biomedical Engineering. We also included Hackathon, industryteachers, and enterprise themes; these new elements to enriched the Biomedical Electronics and Bioinformatics camp, giving students diverse opportunities for learning and thinking. In addition to this activity, we successfully obtained the rights from Biomedical Engineering Institute to host “2015 Biomedical Engineering Symposium”. The 2015 Biomedical Engineering Symposium (BE annual meeting) is held on November 13-14, 2015 in our institute. This is a huge event for the Biomedical Engineering field in Taiwan, the Biomedical Engineering Institute and our institute will put full efforts in preparing for this annual event, making sure it is well organized.

NTUBEBI's most prominent feature is not only emphasizing the combination of biomedical, electrical, and information integration interdisciplinary research but also putting ongoing effort to reach this aforementioned goal. Ever since the establishment of our Institute ten years ago, the many great achievements are attributed to the efforts of all our colleagues and students. Facing the coming year, we will cooperate with the international trend and government funding policy to upgrade the existing foundation and core courses. In addition, NTUBEBI will also increase interdisciplinary studies and research cooperation programs, seeking for more resources to strengthen the promotion of integrated research.

Finally, thanks to the joint efforts of the NTUBEBI colleagues and students, we continue to move forward and rapidly becoming a role model for the integrated Biomedical / Engineering / Information interdisciplinary research institute.

Eric Y Chuang

August 2015

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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 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)和次世代定序資料分析、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，研究重點則是針對複雜的生物系統，建構數學分析及模擬計算的模型，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、即時計算等均包含在內。

We dedicate our resources to cutting-edge topics such as "biomedical data analysis and mining", "computational systems biology", "computational pharmacology and chemistry", and "medical information systems". Our major research interests in biomedical data analysis and mining include biochip (microarray) and next generation sequencing 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 systems biology, we focus on developing advanced mathematical models and simulation methods to describe the operations and behaviors of complex biological systems. Our research on computational pharmacology and chemistry aims to design novel computational models and efficient simulation algorithms for quantum chemistry and molecular dynamics to facilitate drugs and vaccine development. In medical information systems, we cover a wide range of topics on developing information technologies for medical applications, including networking, multimedia, database, parallel processing, distributed computing, and real-time systems.

一、第四屆獎勵研究創新獎
The 4th 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。103年度為第四次舉辦，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103年12月8日(一)舉行第四屆頒獎典禮。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，參與老師有賴飛羆、宋孔彬、陳中平、周迺寬、高成炎等諸位老師，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─陳朝旺先生跟所上師生分享他的人生經驗，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。

本次學生傑出論文獎獲獎學生為：蘇璟瑋同學、許瑋貞同學及陳俐瑾同學；年度最佳碩士論文獎的獲獎學生為楊克鈞同學；年度最佳博士論文獎則由陳俐瑾同學獲得。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。

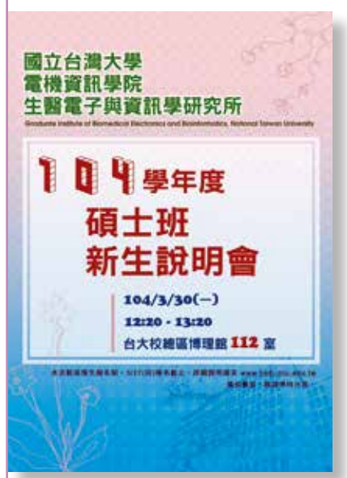
The Graduate Institute of Biomedical Electronics and Bioinformatics (BEBI) at National Taiwan University encourage students in research and innovation study to promote our university international academic status. The Biomedical Electrical Engineering research and innovation award was established at 2011. The 4th Biomedical Electrical Engineering research and innovation award in 2014 opened for submission in August for students to apply. The BEBI Admissions and Academic Committee will evaluate the final awarding list and the 4th Biomedical Electrical Engineering research and innovation awarding ceremony was held on December 8th, 2014. 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 professors are Feipei Lai, Kung-Bin Sung, Chung-Ping Chen, Nai-Kuan Chou, and Cheng-Yan Kao approximately 100 students 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 experience of commercial litigation and Patent Litigation. The awarding ceremony started 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 Paper Award: Jing-Wei Su, Wei-Chen Hsu, and Li-Chin Chen. The students awarded for Best Master Thesis Award: Ko-Chun Yang. The student awarded for Best Ph.D. Dissertation Award: Li-Chin Chen. 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.

二、博士班招生說明會
BEBI Introduction to prospective students: PH.D Program (2015/03/27)

三、碩士班新生說明會BEBI Introduction to new students: (2015/3/30)



四、演講　Lectures

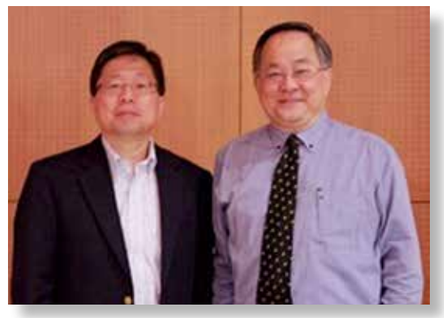
2014.09.22	臺北市消防局金華分隊 朱春成小隊長	火災預防搶救
2014.09.29	大瓏企業股份有限公司 劉惠珍董事長	大瓏企業─經驗分享
2014.10.06	中央研究院 董奕鍾研究員	Control Gaseous and Mechanical Microenvironments in vitro: Microfluidic Cell Culture
2014.10.13	國立臺灣科技大學醫學工程研究所 廖愛禾副教授	The application of theranostic microbubble ultrasound system for the minimally invasive surgery
2014.10.20	臺大中文系 簡媜	誰在銀閃閃的地方 , 等你 --- 以文學思考「生老病死課題」與 臺灣的「老化海嘯」
2014.10.27	萌拓學堂 陳嫦芬教授	認識 『職場素養』
2014.11.17	國立臺北藝術大學音樂系 蘇顯達主任	你的態度決定音樂的高度
2014.11.24	臺灣高等法院 郭豫珍法官	現身說「法」
2014.12.22	中國醫藥大學中醫暨針灸研究中心 張恒鴻主任	中醫診斷實證研究
2014.12.29	癌症關懷基金會 黃翠華董事	您吃對了嗎？營養師教您輕鬆簡單成為健康養生達人
2015.01.05	TFT 劉安婷理事長	擁抱世代，從教育開始
2015.03.02	臺中榮總醫研部計算生物實驗室 蕭自宏副研究員	Utilizing Gene Set Approaches to Identify Functional Regulations and Modulations in Cancer
2015.03.09	臺大醫院內科部 余忠仁醫師	肺癌多專科診療
2015.03.16	陽明大學生物醫學暨工程學院 張正院長	生技醫材產業之國際趨勢與臺灣因應之策略與契機
2015.03.23	陽明大學醫資所 黃宣誠所長	肺癌多專科診療
2015.03.30	交通大學資訊工程學系 曾新穆教授	Health Risk Prediction via Mining Big Health Data
2015.04.27	臺大醫院　蔡甫昌醫師	從基因檢測到大數據 ~ Angelina Jolie 與 Captain American 的生命倫理挑戰
2015.05.04	臺北醫學大學 閻雲校長	Nanoparticle in Cancer Medicine
2015.05.11	成功大學生物醫學工程學系 蘇芳慶特聘教授	MEDICAL DEVICE INNOVATION AT NCKU: from Unmet Clinical Needs to Value Creation"
2015.05.18	南畫廊　林復南董事長	「臺灣畫」成長記錄
2015.05.25	資誠會計師事務所　張明輝所長	從國際趨勢看菁英人才的未來世界
2015.06.01	中央研究院資訊科學所　許聞廉所長	Bioinformatics for the Biosignature Initiative
2015.06.08	大學眼科　林丕容院長	連鎖醫療機構經營策略發展

1. 2014.09.29
大瓏企業股份有限公司 劉惠珍董事長
「大瓏企業經驗分享」

2. 2014.10.27
萌拓學堂 陳嫦芬教授
「認識『職場素養』」

3. 2014.11.17
國立臺北藝術大學音樂系 蘇顯達主任
「你的態度決定音樂的高度」

4. 2015.03.16
陽明大學生物醫學暨工程學院 張正院長
「生技醫材產業之國際趨勢與臺灣因應之策略與契機」



5. 2015.04.27
臺大醫院 蔡甫昌醫師
「從基因檢測到大數據~
Angelina Jolie 與 Captain American 的生命倫理挑戰」

6. 2015.05.04
臺北醫學大學 閻雲校長
「Nanoparticle in Cancer Medicine」

7. 2015.05.11
成功大學生物醫學工程學系 蘇芳慶特聘教授
「MEDICAL DEVICE INNOVATION AT NCKU:
from Unmet Clinical Needs to Value Creation"」

8. 2015.06.08
大學眼科 林丕容院長
「連鎖醫療機構經營策略發展」

五、國立臺灣大學電機資訊學院103年度畢業典禮
2015 Commencement of College of Electrical Engineering and Computer Science, NTU

六、2015/07/05~07/09生醫電子資訊營
Biomedical Electronics and Bioinformatics Camp on July,5-9, 2015

2015臺大生醫電資營於7月5日至7月9日假臺大博理館及電機二館教室舉辦，邁入第九屆的電資營，這次結合了黑客松的概念擴大舉辦。今年活動主題為「物聯網於醫療健康之應用」，透過一場場結合實務的講座、Hackathon以及創意競賽，促使學員在密集的腦力激盪之下，針對企業出題發揮創意提案。

黑客松（Hackathon）是黑客（Hack）與馬拉松（Marathon）的複合字，用來表示一個「馬拉松式的科技創作活動」。本屆生醫電資營結合黑客松的概念，與H.I.T團隊共同舉辦全臺第一個生醫黑客松營隊。（H.I.T Taiwan是一個致力於推廣生醫創新實作的組織，由臺大學生創立，並由醫學、工程、商管等背景的學生組成。旨在促進臺灣與國內外生醫產學界的交流，並透過與波士頓、加州等生醫創業興盛之校園、企業合作，讓在校學生能自MIT、Stanford等校汲取生醫創新實作與業界經驗。）

在物聯網時代，科技智慧產品無所不在，在醫療方面的應用更是有著無限可能，我們期望藉由擴張至五天的營期，邀請學員與我們一同挑戰腦力激盪的極限，不只了解生醫物聯網的應用與趨勢（包含遠距照護、智慧醫院或雲端醫療.....等），更首度嘗試加入企業出題、業師指導等元素，透過團隊合作創意發想，進行實作呈現。

課程的尾聲，我們將兩組企業主題分別舉辦創意競賽，在這五天的密集相處與頻繁討論之下，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，選出本次競賽兩組各前二名之優勝隊伍頒發獎狀及獎金。

本次活動總共有107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。在學員問卷調查中，全體學員皆對於這次的營隊規劃感到相當滿意，尤其是Design Thinking、Idea Pitch與Round Table規劃，都讓學員有很大的學習與發揮空間。明年我們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。

2015 National Taiwan University Biomedical Electronic camp was held on July,5-9,2015 in NTU Barry Lam Hall and EE Bldg. No.2.. Being the ninth year of the event, for the first time the concept of Hackathon was added. The theme event of this year is "The Application of Internet of Things in Medicine and Health". Through practical courses, Hackathon and creativity competition, the event enables participants to come up with creative ideas for enterprise topics through intensive brainstorming.

The word "Hackathon" is a portmanteau of the words "Hack" and "Marathon", used to express a "marathon session of technology creativity event". This year's Biomedical Electronics

camp combines the concept of Hackathon, hosted together with H.I.T team. (H.I.T Taiwan is an organization dedicated in promoting biomedical innovation and implementation, founded by NTU students from different backgrounds, including medical, engineering, business administration etc. H.I.T aims on promoting communication between Taiwan and biomedical industries throughout the world, through enterprise collaboration with states with prosperous biomedical industry development such as Boston, California, etc., which allows students to exchange experiences and creative practices with schools such as MIT,Stanford, etc.)

In the Internet of Things era, technology smart products are everywhere. There are also infinite possibilities of medical application, we invite participants to join us and challenge the limits through brainstorming in the five day camp, not only do we acquire knowledge of Biomedical application and trends (including telecare, smart hospital ,medical cloud system, etc.), we also added enterprise topics and professional specialist lecturers for the first time. Through teamwork and creative thinking participants can present their outcome practices.

At the end of the class, we held creativity competition respectively for two enterprise topics, after five day intensive discussion, not only will participants be able to apply knowledge acquired in courses to the report, but also will cultivate teamwork ability. The results of the creativity competition will be sent to judges. Judges will select the winners by 1.level of innovation 2. enforceability 3.progress integrity 4.contributed value evaluation, 2 winners will be selected from each of the enterprise topics, and will receive a certificate and money reward.

A total of 107 participants joined the event, including college students, graduate students and society members, which clearly shows that the rich and diverse courses of biomedical electronics and bioinformatics camp attracts people from different backgrounds. According to our after camp questionnaires, all participants were quite satisfied with the camp program, especially the Design Thinking,Idea Pitch and Round Table programs, which allows the participants to gain knowledge and give full play of what they learned. Next year we will also strive to foster biology technology and medical electronic information both academic and industry talents by continue holding related seminar courses.

肆 國際交流
International Exchanges

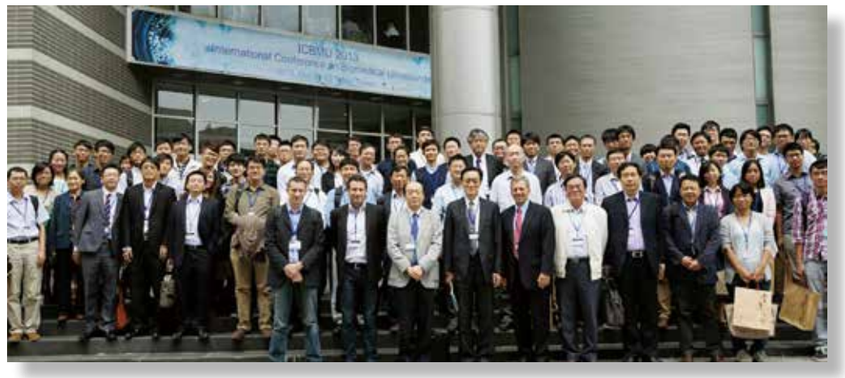
一、 放射醫學國際研討會：藉由科技改善未來放射治療之技術
International Symposium on Radiation Medicine: Improving Radiation Therapy through Techology

本所所長─莊曜宇教授兼任永齡生醫工程中心主任，於2014/10/4-5舉辦為期兩天的「2014 放射醫學國際研討會：藉由科技改善未來放射治療之技術」(以下簡稱ISRM2014)，提供放射腫瘤醫師、醫學物理師與放射治療師等專業人員一個適合的交流平台與國際接軌，期能提升臺灣的放射治療之能量。

此外，亦希望藉由此次研討會，能提供多面向的議題與各界先進討論切磋，並汲取國外知名質子治療中心之營運與運作經驗，讓未來臺大癌症醫院在設置籌劃質子治療中心時能有充分的準備與了解。

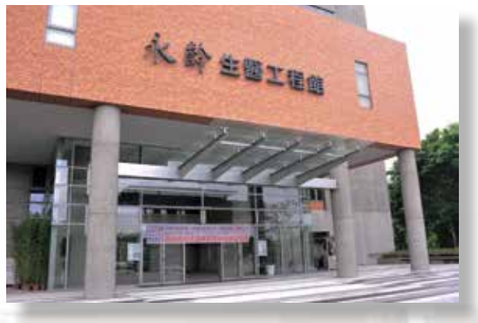
ISRM2014由永齡生醫工程中心主辦，本所與財團法人永齡健康基金會、中華民國癌症醫學會、中華民國醫事放射學會、中華民國醫學物理學會協辦，會中邀集10位海內外專家學者，此次研討會發表文章議題豐富，內容充實，且與會者均為相關研究領域成就卓越之學者專家，在會期中互動討論熱絡，對國內學者助益甚多，而會議圓滿落幕，亦有助於推動後續之國際合作。

"The International Symposium on Radiation Medicine: Improving Radiation Therapy through Technology" (ISRM2014) held on October 4-5,2014 by Eric Y. Chuang the Director of YongLin Biomedical Engineering Center and Institute of Biomedical Engineering. ISRM2014 provides a platform for radiation oncologists, medical physicists, radiation therapists and other professionals to exchanges globalize knowledge, enhancing the research energy of the radiation treatment in Taiwan.



In addition, through the seminar, we hope to provide more issue-oriented discussions with all sectors of advanced radiation ideas, absorbing expertise and operational experience from well-known foreign proton therapy center, getting better understanding and preparing for planning the new proton therapy center at National Taiwan University Hospital cancer treatment center.

ISRM2014 sponsored by YongLin Biomedical Engineering Center,co-organized by YongLin Healthcare Foundation, the Chinese Oncology Society, Taiwan Society of Radiological Technologists, Chinese Society of Medical Physics brought together 10 experts and scholars at home and abroad.Rich and informative articles are published in the seminar; participants are mostly outstanding scholars from this field, which held lots of deep interactive discussions, bringing useful thoughts for many domestic scholars. ISRM2014 conference ended successfully and will continue promoting international cooperation.



伍 實驗室及教師
Laboratories and Faculty

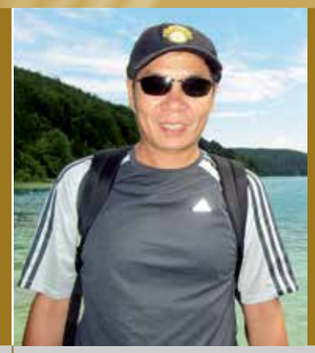
生醫電子組實驗室 Laboratory of Biomedical Electronic Group

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 Room 405, Barry Lam Hall
醫學影像實驗室/ 核磁共振影像頻譜實驗室/ 生醫分子影像核心實驗室 Medical Imaging Lab. Magnetic Resonance Imaging Lab. Biomedical Molecular Imaging Core Lab.	陳志宏 Jyh-Horng Chen	明達館706 Room 706, MingDa Building
智慧型及精密運動控制實驗室 IPMC Lab.	陳永耀 Yung-Yaw Chen	明達館604 Room 604, MingDa Building
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
生物晶片實驗室 Microarray Lab.	莊曜宇 Eric Y. Chuang	明達館701 Room 701, MingDa Building
光流體生醫系統實驗室 Bio-Optofluidic Systems Lab.	黃念祖 Nien-Tsu Huang	明達館702 Room 702, MingDa Building
醫用磁振造影研究室 Magnetic Resonance in Medicine Lab.	鍾孝文 Hsiao-Wen Chung	明達館704 Room 704, MingDa Building
電子束暨奈米元件實驗室 E-beam and Nano Device Lab.	管傑雄 Chieh-Hsiung Kuan	電機二館426 Room 426, EE 2
細胞行為實驗室 Cell Behavior Lab.	郭柏齡 Po-Ling Kuo	明達館707 Room 707, MingDa Building
統計信號處理實驗室 Statistical Signal Processing Lab.	李枝宏 Ju-Hong Lee	電機二館553 Room 553, EE 2
紅外線元件實驗室 IR Device Lab.	李嗣涔 Si-Chen Lee	電機二館451 Room 451, EE 2
超音波影像實驗室 Ultrasonic Imaging Lab.	李百祺 Pai-Chi Li	明達館731 Room 731, MingDa Building
內皮細胞分子生物學實驗室 Laboratory of Endothelial Cell Molecular Biology	李心予 Hsinyu Lee	生命科學館 504 室 Room 504, Life Science Building
生醫晶片技術實驗室 CMOS Biotechnology Lab.	林致廷 Chih-Ting Lin	電機二館450 Room 450, EE 2
醫用微感測器暨系統實驗室 Medical Micro Sensor and System Lab.	林啟萬 Chii-Wann Lin	展書樓605/608 Room 605/608, Jan Su Hall
人腦實驗室 Brain Imaging and Modeling Lab.	林發暄 Fa-Hsuan Lin	展書樓703 Room 703, Jan Su Hall
奈米生醫光電實驗室 Bio-nanophotonics Lab.	孫啟光 Chi-Kuang Sun	電機二館R406A Room R406A, EE 2
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 Room 703, MingDa Building
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 Room 509, MingDa Building
數位信號處理實驗室 Digital Signal Processing Lab.	曹建和 Jen-Ho Tsao	電機二館552 Room 552, EE 2
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 Room 704, MingDa Building
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

伍 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 Room 402, CSIE Building
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 Room 432, CSIE Building
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 Room 328, CSIE Building
	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 Room 1105 Life Science Building
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 Room 346, CSIE Building
演算法實驗室 Algorithmic Research Lab.	呂學一 Hsueh-I Lu	資訊館406 Room 406, CSIE Building
分子生醫資訊實驗室 Molecular Biomedical Informatics Lab.	歐陽彥正 Yen-Jen Oyang	資訊館410 Room 410, CSIE Building
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 Room 403, CSIE Building



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

■ **計畫名稱**：多重基因複製問題的快速演算法
補助單位：行政院國家科學委員會
計畫期間：2009/08/01 ~ 2012/07/31

在演化分子生物學裡，種系發展分析可協助理解不同生物間的演化關係。一棵種族樹可以用來代表一個種族集合之親緣關係；一棵基因樹則描繪出一群種族就某個基因家族所建立之親緣關係。由於複雜的演化過程，如：基因複製、水平基因轉移、染色體重組等，基因樹和種族樹之間可能產生不一致的地方，演化生物學家必須能進一步解釋這些不一致的地方。

前人以對應基因樹與種族樹的調和模式，來解釋這些不一致產生的原因。這方面有個重要的問題稱為「多重基因複製問題」，它將基因複製事件，從基因樹對應到種族樹。本計劃將探討多重基因複製問題上的兩個主題：一個主題稱為「事件叢集問題」，該問題要在種族樹上找出最少的地方，來放置所有應該產生的複製事件；另一個主題稱為「最少事件問題」，該問題要在種族樹上決定發生複製事件的樹點，使得複製事件的總數為最少。

我們將設計解決「事件叢集問題」的更快速解法，這問題已被證明是「樹區間覆蓋問題」的特例，透過調整整個樹的拜訪順序，我們希望能設計出這兩個問題的最佳解法。我們也將設計解決「最少事件問題」的更快速解法，主要是要加速下面四個步驟：(1) 計算最低共同祖先對應關係；(2) 找出所有帶頭的樹點；(3) 檢查帶頭樹點是否自由；(4) 修訂對應關係。我們進一步檢驗基因叢集裡的資料，從而建立一套更合適的模組，希望能有統一的理論可處理各式各樣的演化事件，如此得到的重建過程將更貼近實務需求。

Project title: Faster Algorithms for the Multiple Gene Duplication Problemsn
Supported by: National Science Council
Project period: 2009/08/01 ~ 2012/07/31

In the evolutionary molecular biology, phylogenetic analyses help to realize the evolutionary relationship among various organisms. A species tree represents the phylogeny of a set of species, and a gene tree depicts the phylogeny among a gene family for a set of species. Due to complicated evolutionary processes such as gene duplication, horizontal gene transfer, recombination, etc., gene trees and species trees may be inconsistent. It is important for evolutionary biologists to explain the inconsistency between gene trees and species trees.

The reconciled tree provides the mapping between genes trees and a species tree that explains the inconsistency in the evolutionary history. The Multiple Gene Duplication (MGD) problem is to map gene duplications from the gene trees into the species tree and to cluster such mapped duplications into a few genome duplications. In this project, we study two variants of the MGD problems with different cost function measurements. Given are a set of gene trees and a species tree. The first problem, called the Episode-Clustering problem, is to find a minimum number of locations in the species tree for placing all duplications in the gene trees. The other problem, called the Minimum Episodes problem, is to assign duplication events to nodes in a species tree such that the total number of episodes is minimized.

We will design faster algorithms for the Episode-Clustering problem, which has been shown to be a special case of the Tree Interval Cover problem. By traversing the tree in an appropriate order, we wish to design an optimal algorithm for both problems. We will also design faster algorithms for the Minimum Episodes problem. We need to speed up the following four steps: (1) computing the LCA-mapping, (2) finding all leading nodes, (3) checking if these leading nodes are free, and (4) updating the mapping. We will examine the data in the gene clusters more closely and establish a more robust model for them. We will set up a unified theory for handling all evolutionary operations in order to make the reconstruction work in practice.

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Director, Yong Lin Biomedical Engineering Center, National Taiwan University
Deputy Director, Research and Development Center for Medical Devices, National Taiwan University
Principal Investigator, Bioinformatics and Biostatistics Core Lab, NTU Center of Genomic Medicine

生物晶片實驗室
Microarray Lab.

本研究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)與次世代定序(Next-Generation Sequencing)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。因此研究室的研究方向乃致力於增進基因晶片與次世代定序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、基因序列資料分析、生物資訊學、資料管理，以及利用基因晶片分析與次世代定序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.

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Professor, Graduate Institute of Biomedical Electronics and Bioinformatics, National Taiwan University
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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9名，碩士班研究生3名。博士班畢業生26名，碩士班畢業生17名。

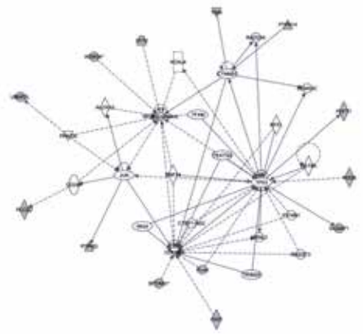
Founded in July 2000. Supervisor: Prof. Hsiao-Wen Chung. This lab currently has 9 Ph.D. students and 3 M.S. student, plus 26 Ph.D. graduates and 17 M.S. graduates.

主要研究領域 Major Research Areas

生物晶片、次世代定序、生物資訊、癌症生物、輻射生物
Biochip, Next-Generation Sequencing, Bioinformatics, Cancer Biology, Radiation Biology

研究計畫 Research Projects

1. 華人乳癌基因資料庫及個人化雲端諮詢平台(財團法人永齡健康基金會)
   Chinese breast cancer genome database and personalized online consulting system
2. 環境基因體醫療研究(財團法人資訊工業策進會)
   Medical Metagenome Study
3. 臺灣特有雉科-帝雉基因體定序計畫(臺北市立動物園)
   Taiwan endemic species-Syrmaticus mikado sequencing project
4. 利用整合性基因群分析與舊藥新用策略尋找各乳癌亞型之最佳治療藥物(財團法人國家衛生研究院)
   Utilize Gene Set Analysis to Reposition Putative Drugs for Breast Cancer with Modulated Responses
5. 探索長Q-T間期症候群之突變點及其功能與開發臨床基因檢測晶片(臺大醫院)
   Identification and functional exploration of mutation sites in long QT syndrome and development of a genetic screening chip for clinical applications
6. 優勢重點領域拔尖計畫 - 基因體醫學研究中心 - 生物資訊暨生物統計核心實驗室 (邁向頂尖大學計畫)
   Bioinformatics and Biostatistics Core Facility
7. 研究 SEMA6A 在肺癌所扮演的角色及探討其基因多型性在台灣地區非吸菸女性肺癌的重要性(科技部)
   To investigate the roles of SEMA6A in lung tumorigenesis and susceptibility-associated SNPs of SEMA6A in non-smoking female lung cancer
8. 覆氧時NDRG1受非編碼核糖核酸調控之機轉研究(科技部)
   Investigation of regulatory mechanism of NDRG1 by non-coding RNA upon reoxygenation
9. 建構可應用平行運算技術之雲端次世代定序分析系統(財團法人資訊工業策進會)
   Building a Cloud NGS Analysis Platform Parallel Computing Application



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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

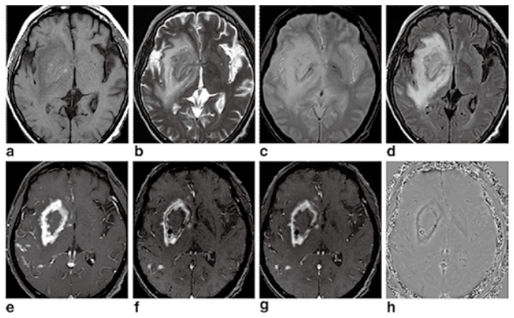
2. 磁化率加權磁振造影之進階研發與臨床應用

   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。

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.

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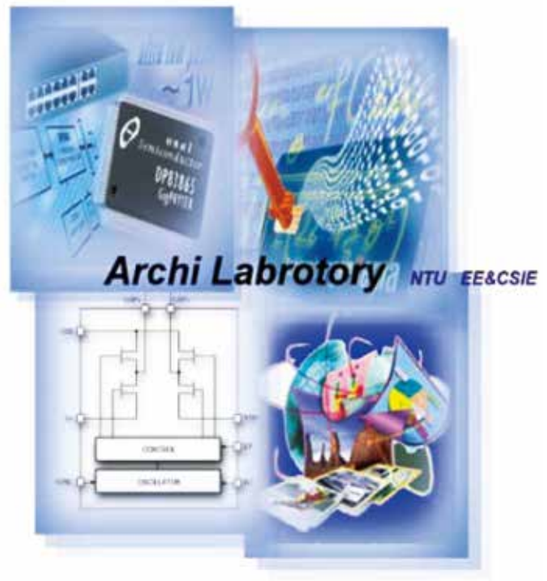
醫學資訊實驗室

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10人，碩士班10人。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：

醫學資訊

This Lab. was established in 1987 and Professor Feipei Lai works together with 10 Ph.D. students and 10 master students. The major research areas include 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

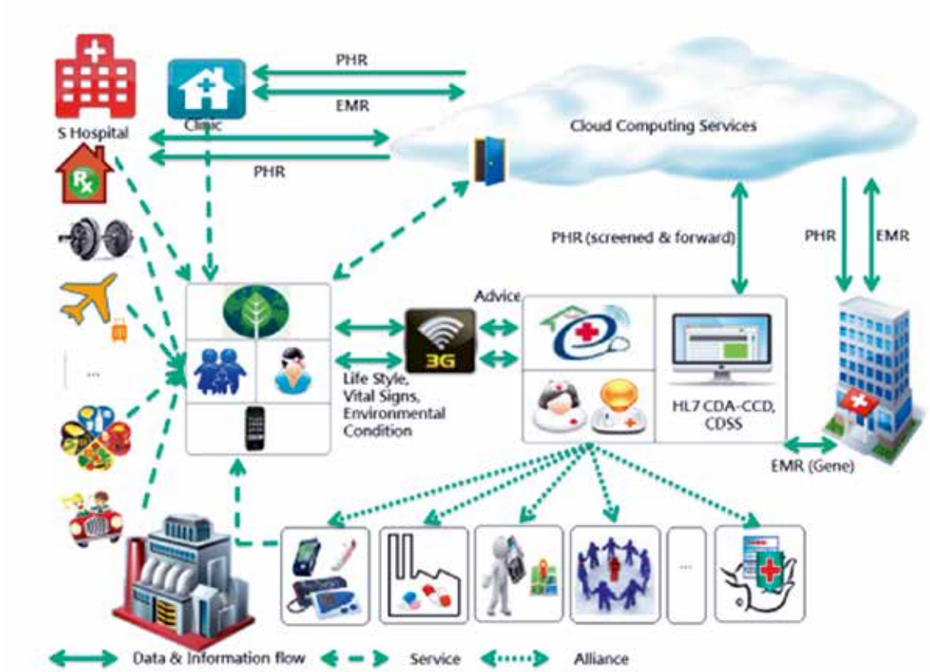
醫學資訊

Medical Informatics

研究計畫 Research Projects

1. 遠距醫療資訊技術平臺

   IT Platform for Telehealthcare



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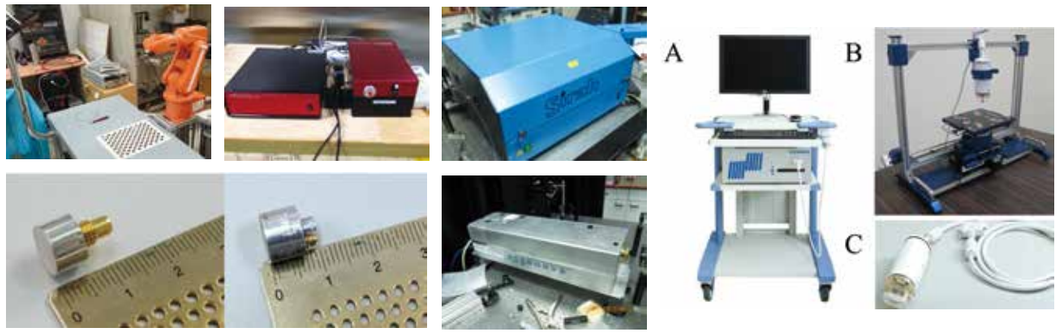
超音波影像實驗室

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.



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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生物醫學的研究上。近幾年，本實驗室與臨床醫師合作，將創新的機器學習演算法運用於臨床資料庫的分析上。主要的成果包括:

(1) 發現手術中麻醉藥的使用與罹患失智症的相關性；

(2) 發現長期服用安眠藥與罹患失智症的相關性；

(3) 發現婦女罹患子宮內膜異位與偏頭痛的相關性；

(4) 發現4個與精神分裂症相關的基因。

The Molecular Biomedical Informatics (MBI) laboratory focuses on design of advanced machine learning algorithms for biomedical applications. During the past few years, the MBI team has been collaborating with clinical physicians to conduct analyses on large medical databases. The main results include:

1. identified the risk of suffering dementia for patients who received anesthesia in surgery;
2. identified the risk of suffering dementia for insomnia patients who were long-term users of hypnotics;
3. identified the risk of suffering migraines for women with Endometriosis;
4. identified 4 genes that are associated with schizophrenia.

主要研究領域 Major Research Areas

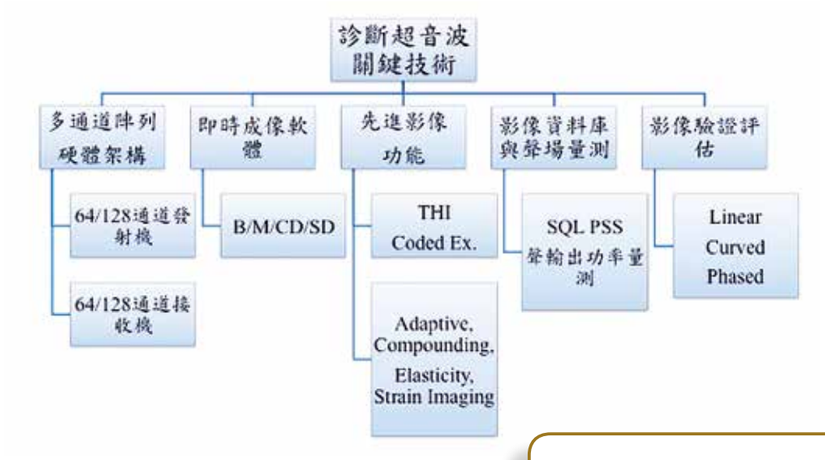
生物醫學工程、超音波影像、生醫光聲影像

Biomedical Engineering, Ultrasound Imaging, Biomedical Photoacoustics

研究計畫 Research Projects

1. 自動化三維超音波乳房影像檢查
   Automatic 3D ultrasound breast screening
2. 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
3. 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
4. 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
5. 用於三維細胞培養系統之多波影像技術
   Multiwave imaging technologies for 3D cell culture systems
6. 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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主要研究領域 Major Research Areas

生醫資訊學、機器學習

Biomedical informatics, Machine Learning

研究計畫 Research Projects

1. 應用巨量資料探勘與地理空間資訊分析技術針對緊急救護服務之醫療資源管理、配置與未來規劃進行整體研究計畫--應用巨量資料探勘方法分析緊急救護時間、空間、與醫療資訊之研究。
   An integrated study on applying massive data mining and geographic information technologies to analyze the resource management, allocation, and future planning of Emergency Medical Service

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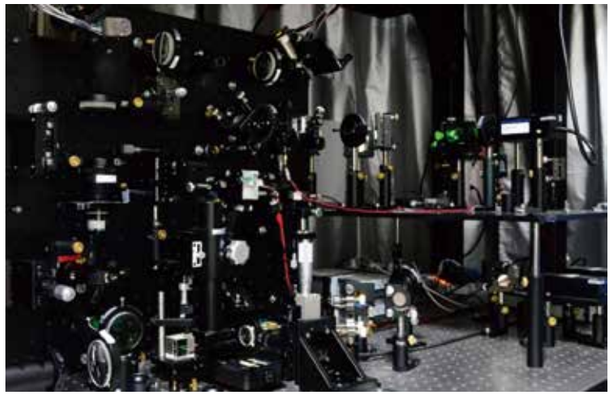
生醫光譜與影像實驗室

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。長期的目標是發展可應用於活體的工具，協助疾病如上皮癌前病變之診斷，以及生理狀況的長期監測。

Current research in our laboratory is focused on pushing forward optical spectroscopy and microscopy technologies and utilizing these methods to aid biomedical research and develop new diagnostic tools. The long-term objectives are to develop in-vivo tools for diagnosing disease such as epithelial precancers and monitoring physiological status.



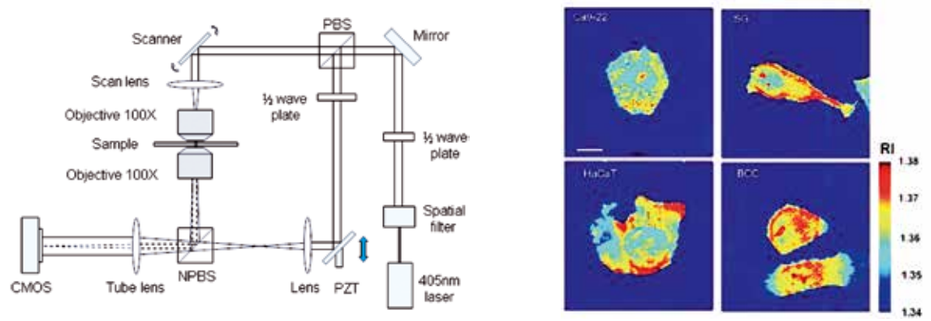
主要研究領域 Major Research Areas

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(主持人)
   Noninvasive early diagnosis of precancer and cancer using fiber-optic-based hyperspectral imaging (PI)
2. 三維折射率活細胞顯微術(主持人)
   Three-dimensional refractive-index microscopy for live cell imaging (PI)
3. 非侵入性高光譜顯微影像系統進行食道癌域理論之光學定量分析(共同主持人)
   Optical quantification of field carcinogenesis in the esophagus with a non-invasive hyperspectral imaging system (co-PI)
4. 針對大腸腫瘤及淋巴結轉移的早期發現和清除的光電醫學診斷與治療關鍵問題研究(共同主持人)
   Integrated optoelectronic approaches for early diagnosis and precision treatment of metastasis colorectal cancer and lymph node (co-PI)

■ **研究計畫** - 三維折射率活細胞顯微術 Three-dimensional refractive-index microscopy for live cell imaging, Supported by: Ministry of Science and Technology之代表圖及中英文說明：



左圖為本計畫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，右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 on the left side shows a schematic diagram of an optical tomographic phase microscope developed in this project. We have used this novel technique to acquire three-dimensional distributions of refractive index of living cells. The four figures on the right side show refractive index images of four cell lines at the focal plane.

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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、病程及癒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.

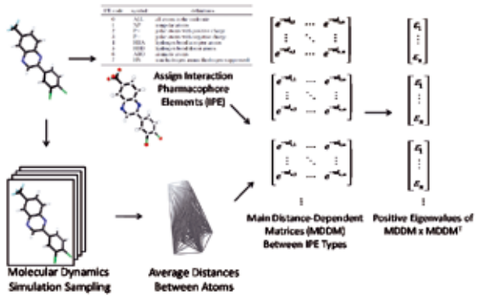
主要研究領域 Major Research Areas

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

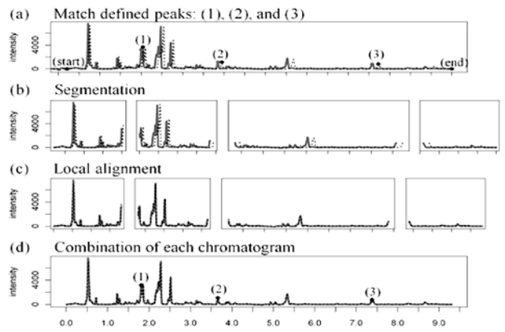


■ **計畫名稱**：電腦輔助設計組蛋白甲基轉移酶9a之抑制劑暨臨床前結構安全性篩選
補助單位：行政院國家科學委員會(生物處)

G9a是哺乳動物內與異常染色質有關的甲基轉移酶，可經由促進H3K9的甲基化抑制腫瘤抑制基因的表現，我們的整合研究團隊已顯示G9a的生物活性在腫瘤進展的過程中，涉及多種重要的細胞功能，包括癌細胞的增殖，黏附，遷移，侵襲，失巢凋亡以及癌症幹細胞維持。此外，抑制G9a的活性後，亦可有效降CD133+的結腸癌幹細胞自我更新的能力，而結腸癌幹細胞是在結腸癌治療過程中，導致癌症復發與抗藥性的主要原因之一。這些證據有力地支持，未來在台灣本土癌症患者的治療上，G9a是一個很好的標靶分子，同時目前只有一選擇性G9a抑製劑，發展有效的G9a抑制劑似乎可做為未來癌症藥物市場發展的策略。

本計劃目標在於透過電腦模擬和演算能力的方法研發新型G9a抑製劑，以結構優化分子結構使其具有更佳的生物活性，使其成為新型藥物應用於臨床治療。

我們將分析G9a與配體間的相互作用關係，根據目前篩選到的化合物以及現有的抑制劑合理地篩選共多可能之分子成引導型抑制劑。此方法中根據已知結構進行結構置換，同時保留原有相似的化學性質，以合成出新型有潛力的抑制劑。此外，在團隊合成資料庫中，篩選有潛力的抑制劑提供合作研究團隊進行細胞實驗，根據實驗值進一步分析以達到結構優化。



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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、臺大醫院、臺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.

代表圖及中英文說明：
Automated Breast Ultrasound / 全自動乳房超音波

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. 新式乳房彈性超音波之電腦輔助診斷 / Computer-aided Diagnosis System for Advanced Breast Elastography
2. 自動乳房超音波之電腦輔助腫瘤偵測 / Computer-aided Tumor Detection System for Automated Breast Ultrasound

■ **研究計畫** - 自動乳房超音波之電腦輔助腫瘤偵測
補助單位：行政院科技部
計畫期間：2014/08/01 ~ 2017/07/31

自動乳房超音波是繼彩色Doppler 超音波及彈性超音波之後最重要的超音波新技術，自動超音波是利用自動掃瞄機構來移動探頭以取得全乳房超音波影像並儲存成電腦檔案，可如其他醫學影像將掃瞄及診斷工作分開，醫師並可隨時查詢任何部位的影像，其主要可避免徒手式超音波易有人為失誤及可進行大量快速篩檢。但自動超音波一個病例會掃出大量的影像，醫師仍需花費許多時間來診斷，因此利用電腦輔助腫瘤偵測是有其必用性。目前技術已可以找出腫瘤但主要問題在於降低偽陽數，如果偽陽數過多對於醫師的診斷助益並不高。而乳房腺體回音紋理類型分類是目前相當熱門的新主題，回音紋理類型主要可分成同質性或異質性，異質性回音紋理類型較同質性的女性有更高的罹患乳癌風險。本計畫將以西門子的ABVS影像及新式的iVu俯臥式旋轉ABTS影像為研究對象，發展電腦輔助偵測、診斷、密度分析、紋理類型分類系統，第一年將利用分水嶺偵測將腫瘤從大量的自動乳房超音波影像中找出，以提供診斷參考。第二年針對iVu旋轉式ABTS自動超音波腫瘤偵測及密度分析。第三年將發展偵測效能自動評估工具並利用乳房組織結構及整合多次掃瞄結果降低腫瘤偽陽率，同時研究自動超音波回音紋理類型，紋理類型在乳癌風險預測具有極大意義。

■ Project title: Computer-aided Tumor Detection System for Automated Breast Ultrasound
Supported by: Ministry of Science and Technology
Project period: 2014/08/01 ~ 2017/07/31

The automated breast ultrasound (ABUS) is the most important development in ultrasound technology since the advent of Doppler imaging and elastography. In the ABUS, there is a mechanism to automatically move a longer probe to obtain the whole breast ultrasound images. The images will be saved into a computer file and the physician could review the images at any locations of scanned breast. For the ABUS, the scanning and diagnosis could be separated as other modalities such as Mammography and MRI. It could avoid the disadvantages of conventional freehand ultrasound and be used in the fast breast mass screening. However, there are a lot images in an ABUS case and the physician still needs a lot of time to review the images. Hence, a computer-aided detection system is needed to reduce the diagnosis time and avoid the misdiagnosis. Although the current technology could detect the tumors easily, the main issue is how to reduce the number of false positives. A computer-aided detection system with high number of false positives still cannot help the doctors to reduce the diagnosis time. This project will focus on the Siemens ABVS images and the newest prone rotational iVu ABTS images to develop the computer-aided detection, diagnosis, density analysis, and echo texture type classification systems. In the first year, the watershed technique will be applied for finding the breast tumor in the ABUS images. In the second year, the computer-aided diagnosis and density analysis systems for the iVu rotational ABTS images will be developed. In the third year, an automatic detection evaluation tool will be developed to reduce the evaluation time and the breast structure and multi-pass detection results will be used to further to reduce the number of false positives. Also, the echo texture classification will be developed for the breast cancer risk factor.

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Professor, Graduate Institute of Biomedical Electronics and Bioinformatics,
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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
- 半導體光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

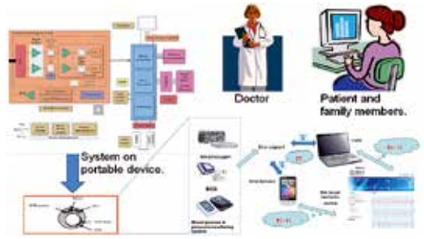
生醫及半導體光學製程影像處理、微處理機設計、VLSI電腦輔助設計、微波通訊線路設計、電力線通訊系統、生醫行動生理檢測系統

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

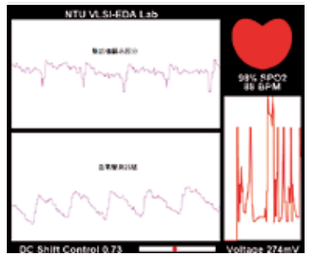
研究計畫 Research Projects

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
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** -
連續性個人化健康照護整合平台子計畫三之代表圖：



■ **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。



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

National Taiwan University

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，助理一人，研究生六人，博士班學生一人。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(Noisecancelation)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. 磁化率定量影像於磁振造影之生醫應用：動態定量之磁共振影像
   Novel Biomedical Applications of Quantitative Susceptibility Mapping: Dynamic and Quantitative MRI
3. 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
4. 構建中樞與週邊神經系統聯結之磁共振影像技術: 定量化中風偵測與評估研究
   Quantitative Brain-Peripheral MR Imaging and Classification Techniques for Stroke Detection and Assessment

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Department of Electrical Engineering, National Taiwan University

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 is led 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.

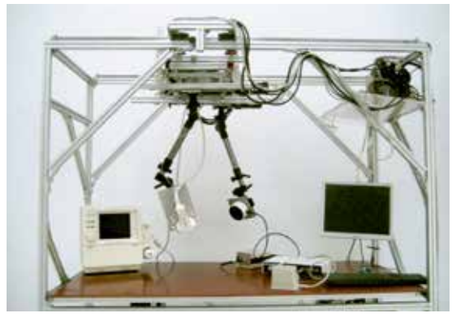
主要研究領域 Major Research Areas

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



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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

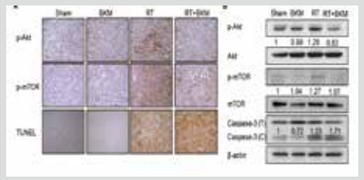
放射腫瘤學、放射物理學、放射生物學、癌症轉譯醫學
Radiation Oncology, Radiation Physics, Radiation Biology, Cancer Translational Medicine

研究計畫 Research Projects

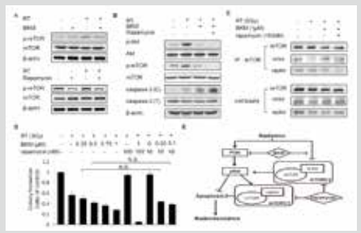
1. 探討磷脂醯肌醇3-激酶/蛋白質激酶B/哺乳動物雷帕黴素靶蛋白傳遞路徑及相關拮抗劑對於肝癌細胞放射抵抗性之作用機轉
   Investigation on the mechanisms of PI-3K/Akt/mTOR dependent radioresistance of epatocellularcarcinoma and the related inhibitors.
2. 表皮生長因子受體訊息傳遞路徑對表現基質金屬蛋白酶9之小鼠肺癌放射治療模式於腫瘤生長及轉移之機轉研究
   Mechanism investigation of EGFR/HER2 signaling pathway on tumor growth and metastasis by radiotherapy for MMP-9 expressed Lewis lung carcinoma.

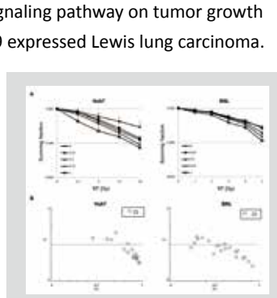
■ **研究計畫** - 探討磷脂醯肌醇3-激酶/蛋白質激酶B/哺乳動物雷帕黴素靶蛋白傳遞路徑及相關拮抗劑對於肝癌細胞放射抵抗性之作用機轉 Investigation on the mechanisms of PI-3K/Akt/mTOR dependent radioresistance of hepatocellular carcinoma and the related inhibitors之代表圖及中英文說明：

Combined radiotherapy (RT) and BKM120 inhibits RT-activated PI3K/Akt signaling and enhances BNL cell apoptosis in vivo.

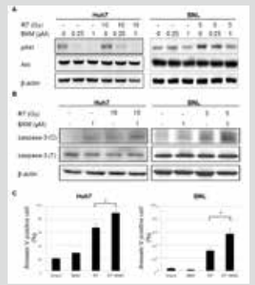


The addition of rapamycin to BKM120 enhances the inhibition of mTOR and Akt phosphorylation and increases caspase-3 activation in irradiated BNL cells.



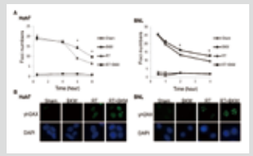


A PI3K inhibitor, BKM120, enhances the radiosensitization of hepatocellular carcinoma cell lines (Huh7 and BNL).

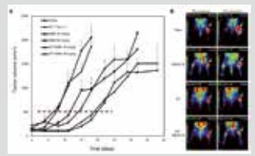


BKM120 inhibits radiation-activated PI3K/Akt signaling and enhances radiation-induced apoptosis in Huh7 and BNL cells.

Inhibition of PI3K signaling by BKM120 leads to the persistence of DNA damage.



Combined BKM120 and radiotherapy (RT) enhances tumor suppressive activity in two BNL xenograft models.



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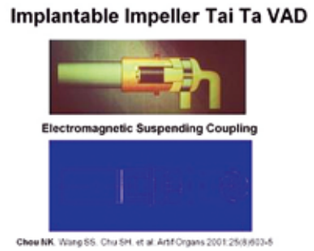
Director of Intensive Care Unit of Department of Surgery, National Taiwan University Hospital
Convener of Organ Procurement Organization, National Taiwan University Hospital

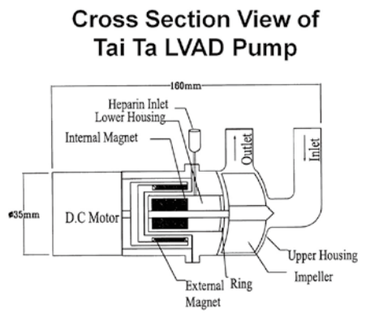
臺大醫院第七共同研究室
Laboratory

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

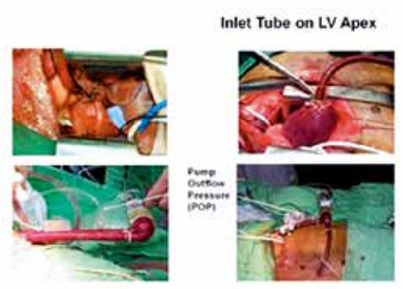
1. 小動物實驗模型
2. 醫療儀器、訊號分析處理
3. 超音波影像處理
4. 實驗室儀器： 雙向心臟血管用X光射影系統、多頻道生理記錄分析系統(Polygraphy)、Injector、Autoinjector、多頻道心理生理電腦化記錄分析儀(EP recording)、CARTO、電氣生理刺激器、血管內導線壓力儀器(PressureWire)、OCT、電燒機、血管內超音波(i-LAB)、血液凝固測試儀(ACT)、波士頓科技羅塔培特控制台系統、IABP、電擊器、血中含氧測定儀、非侵入式自動血壓計、微量點滴控制器(Syringe pump)、人工心律調整器、血氧飽合濃度監視器、血壓血氧ECG監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





Chou NK, Wang SS, Chu SH, et al: Artif Organs 2001;25(8)603-5



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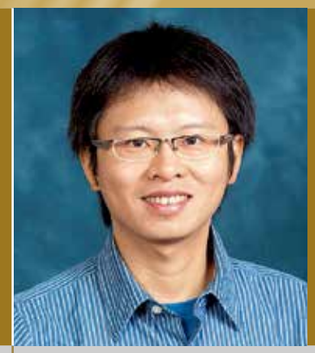

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Assistant Professor, Department of Electrical Engineering, National Taiwan University

光流體生醫系統實驗室
Bio-Optofluidic Systems Lab.

光流體生醫系統實驗室為黃念祖博士成立於2013年，隸屬於國立台灣大學電機工程學系和生醫電子與資訊學研究所。本實驗室主要研究為發展整合型微流體生物晶片(Lab-on-Chip)，其晶片將微型化電子、光學、機械及流體等元件進行生醫領域相關應用，如細胞生物學、藥物篩選、快速疾病檢測，並期許將來能使用醫療資源較為匱乏環境之定點照護功能(Point-of-care)。

Bio-Optofluidic System Lab is in the department of Electrical Engineering and the graduate institute of Biomedical Electronic and Bioinformatics at National Taiwan University, Taipei, Taiwan. Our lab is focusing on developing integrated electrical, optical and mechanical miniaturized fluidics and sensors for biological applications, such as cellular biology, drug screening, and disease diagnosis.

主要研究領域 Major Research Areas

光微流道系統, 微系統細胞操控, 集中型表面電漿共振, 奈微米製造技術

Bio-MEMS, Optical-MEMS, Microfluidics, Bio-sensing, Cell Manipulation in Microenvironment, Micro/Nano Fabrication Techniques.

研究計畫 Research Projects

1. 細胞表型分析之整合式光流體平台研發
   Developing integrated optofluidic platform for cellular phenotyping
2. 免標定侷限表面電漿共振感測系統應用於肺結核病患免疫系統檢測
   A Microfluidic Platform Integrating Localized Surface Plasma Resonance (LSPR) Sensing for Immunodiagnostics of Patients with Tuberculosis

■ **研究計畫** -
細胞表型分析之整合式光流體平台研發
Developing integrated optofluidic platform for cellular phenotyping
之代表圖說明：

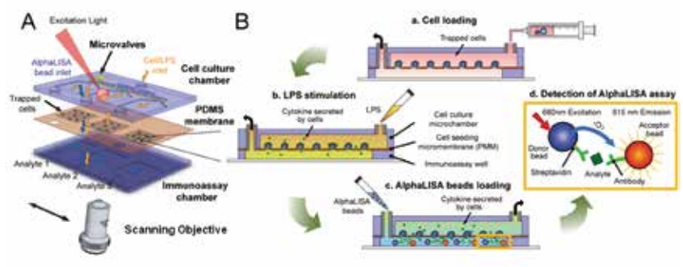

Figure 1 (A) Schematic of integrated optofluidic platform for cellular immunophenotyping
(B) Schematic showing the immunophenotyping assay protocol used in this study.

■ **研究計畫** - 免標定侷限表面電漿共振感測系統應用於肺結核病患免疫系統檢測
A Microfluidic Platform Integrating Localized Surface Plasma Resonance (LSPR) Sensing for Immunodiagnostics of Patients with Tuberculosis之代表圖說明：

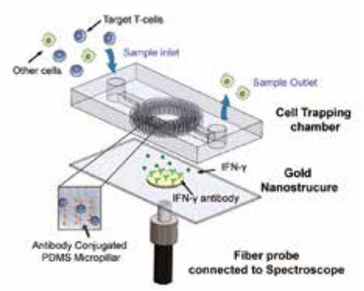

Figure 2 Schematic of microfluidic platform integrating LSPR sensing

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Chiou-Shann Fuh, Professor

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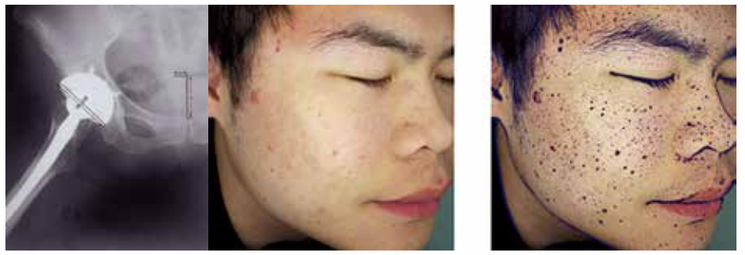
國立臺灣大學資訊工程學系教授
資訊網路與多媒體研究所教授

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

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, Lumens Digital Optics, 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

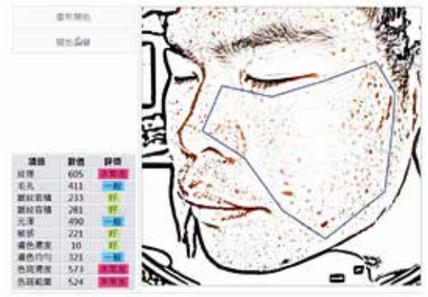
研究計畫 Research Projects

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

■ Project title: Image Processing for Digital Cameras: High Dynamic Range Image, Pedestrian Detection, Gender and Age Estimation
Supported by: Ministry of Science and Techology
Project period: 2012/08/01 ~ 2015/07/31

This is a three-year project to use computer vision and digital image processing methods for high dynamic range image, pedestrian detection, gender and age estimation of digital cameras. We will study the best camera, light source, environment, scene, and color interaction. In the first year, we will develop various high dynamic range image methods for different sensors and image and signal processors (ISPs) to achieve optimum high dynamic range image. In the second year, after being able to process direct sunshine, backlight, and shadow, we will use such high dynamic range image techniques to research the best pedestrian detection algorithm to estimate distance and improve traffic safety even under too bright or dark scenes. After pedestrian detection, we would like to analyze behavior difference caused by gender and age to improve traffic safety. In the third year, we will research various gender and age estimation methods to develop programs and algorithms which can accommodate different races and frontal or side faces to improve traffic safety and better offer customers personalized services. We would like to break the patent and technology barriers of Japanese and American companies and to enhance competitiveness of Taiwan companies in international markets.

代表圖及中英文說明：



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

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Adjunct Professor, Graduate Institute of Biomedical Electronics and Bioinformatics, National Taiwan University
Professor, Department of Surgery, National Taiwan University
Attending Physician, Department of Surgery, National Taiwan University Hospital

主要研究領域 Major Research Areas

乳房外科、乳房超音波檢查、腫瘤外科、分子流行病學
Breast Surgery, Breast Ultrasound, Surgical Oncology, Molecular Epidemiology

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
2. 微流體平台進行藥物篩選與化療療效監測。

二、乳房超音波及其他影像檢查研究Breast Ultrasound and Other Imaging Screening Research
1. 自動乳房超音波之電腦輔助診斷
2. 以乳房超音波及乳房攝影術進行台灣40-49歲婦女乳癌篩檢隨機試驗。
3. 乳房彩色彈性超音波之電腦輔助診斷。
4. 雙波段紅外線乳房影像系統之三維模型建立與血管增生定量分析。
5. 萌芽個案計畫-雙波段紅外線乳房影像系統：化療反應監控

三、其他研究計畫Other Research
1. 轉譯醫學資源中心之臨床試驗合作聯盟：乳癌

四、臨床試驗 Clinical Trial (2014~至今)
1. Kristine：一個隨機分配、多中心、開放性、雙組的第三期試驗，比較trastuzumab emtansine 併用pertuzumab與化學療法併用 trastuzumab 及 pertuzumab做為HER2陽性乳癌患者之前置輔助療法。
2. Kaitlin：一個隨機分配、多中心、開放性的第三期試驗，比較使用anthracyclines後併用trastuzumab、pertuzumab及taxane與使用anthracyclines後併用trastuzumab emtansine及pertuzumab作為可手術切除的HER2陽性原發性乳癌患者之術後輔助治療。

3. BMN 673：一項第3期、開放性、隨機分配、平行、雙組、多中心試驗，比較BMN 673與醫師選用之藥物用於罹患局部晚期及/或轉移性乳癌，且過去接受過不超過2種轉移性疾病化學治療之生殖細胞BRCA突變患者的效果。
4. PPD_GO29227：一項以AKT抑制劑 Ipatasertib (GDC-0068) 與 Paclitaxel併用，作為轉移性三重陰性乳癌病患第一線治療的隨機分配、第二期、多中心、安慰劑對照試驗。
5. AZ_OlympiAD：一個第三期、開放性、隨機、對照的多中心試驗，針對先天性BRCA1/2突變的轉移性乳癌患者，評估Olaparib之單一療法相較於醫師選用之化療的療效與安全性。
6. AZ_OlympiA：一個隨機、雙盲、平行組別、安慰劑對照的多中心第三期試驗，針對具有先天性BRCA1/2突變與高風險HER2陰性，且已完成明確的局部治療與前置輔助性（neoadjuvant）或輔助性化療的原發性乳癌患者，評估olaparib相較於安慰劑作為輔助療法之療效與安全性。
7. Abbvie：一項針對患有初期三重陰性乳癌 (TNBC) 受試者，以評估增添 Veliparib 加 Carboplatin 於標準前導性化療相較於增添 Carboplatin 至標準前導性化療相較於標準前導性化療的安全性與療效之隨機分配、安慰劑對照、雙盲、第 3 期試驗。
8. PPD Her2+：一項第 3 期、雙盲、隨機分配、平行分組、活性藥物對照試驗，比較 CT-P6 與 Herceptin作為 HER2 陽性早期乳癌患者的新輔助性與輔助性療法，其療效與安全性。
9. Kailee：一項隨機、多中心、開放標示第三期臨床試驗，針對疾病進展或復發之HER-2陽性局部晚期或轉移性乳癌患者，評估Trastuzumab emtansine (T-DM1)對照Trastuzumab併用 Docetaxel，作為第一線治療之療效與安全性。
10. JPBL：一項隨機分配、雙盲、安慰劑對照的第3期試驗，使用fulvestrant搭配LY2835219 (一種CDK4/6抑制劑)或單獨使用fulvestrant治療荷爾蒙受體陽性、HER2陰性的局部晚期或轉移性乳癌女性患者。
11. JPBM：一項隨機分配、雙盲、安慰劑對照的第3期試驗，使用非類固醇類芳香環轉胺酶抑制劑(Anastrozole或Letrozole)合併LY2835219 (一種CDK4/6抑制劑)或合併安慰劑，治療荷爾蒙受體陽性、HER2陰性的局部復發或轉移性乳癌停經女性患者且此疾病未曾接受過全身性治療。
12. Pfizer：一項多中心、隨機分配、雙盲之第三期臨床試驗，以 Palbociclib (口服 CDK 4/6 抑制劑) 併用 letrozole，比對安慰劑併用 letrozole，治療具ER (+)、HER2 (-) 晚期乳癌且不曾接受過治療之亞洲停經女性患者。
13. JPBY：第二期前導性試驗，評估於荷爾蒙受體呈陽性(HR+)、人類上皮細胞生長因子受體2呈陰性(HER2-)乳癌停經後女性施予2週Abemaciclib (LY2835219)與Anastrozole合併療法，相較於使用Abemaciclib單一療法和Anastrozole單一療法的生物效應，以及評估後續14週Abemaciclib (LY2835219)與Anastrozole合併療法的臨床療效和安全性。
14. 1280.4：一項比較BI 836845聯合Exemestane和Everolimus與僅使用Exemestane和Everolimus用於治療患有局部晚期或轉移型乳癌的女性患者的Ib / II期隨機臨床試驗。
15. 評估 Afatinib 合併太平洋紫杉醇用於三重陰性乳癌之術前治療第II 期臨床試驗的療效並尋求預測 Afatinib 有效性之生物標記。
16. 一項多國多中心，針對三陰性乳癌治療的長期結果與影響的長期追蹤研究。
17. 與賀爾蒙受體陽性、Her2陰性的早期乳癌預後相關的單核.酸多型性變異的功能性分析暨探討次世代基因定序發現的單核.酸多型性變異在預後的重要性。

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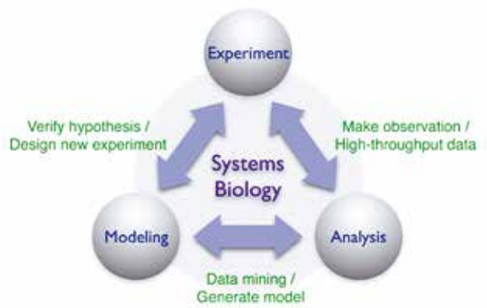
國立臺灣大學基因體與系統生物學學位學程

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，內容包括運用各種體學資料進行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，及非編碼核酸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藥物誘導下胃癌、乳癌、肺癌及神經母細胞瘤細胞的分子作用機制；同時，利用系統生物學和合成生物學研究法開發新的治療方法。

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



MicroRNAs and long non-coding RNAs (lncRNAs) are non-coding RNA molecules which play a key role in post-transcriptional regulation of mRNAs. A non-coding RNA can affect many downstream targets which in turn form a complicated network. Our lab has characterized the roles of non-coding RNAs in the regulation of cellular networks and revealed that non-coding RNA-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

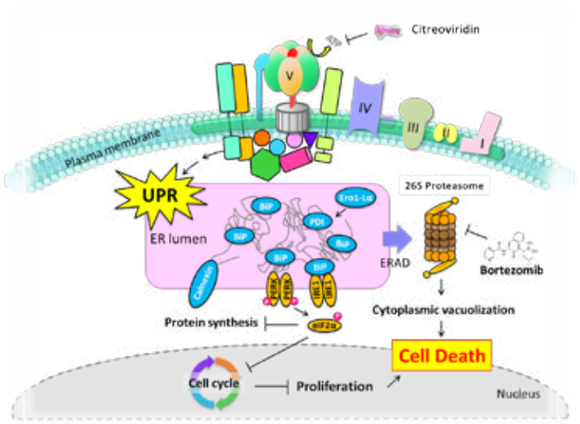
系統生物學、蛋白質體學、生物資訊、合成生物學

Systems Biology, Proteomics, Bioinformatics, Synthetic Biology

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. 新穎致癌蛋白ZNF322A之蛋白質交互作用網路與訊息路徑研究
   Studying protein interaction networks and signal pathways of novel oncoprotein ZNF322A
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
4. 神經母細胞瘤MYCN癌蛋白所驅動之microRNA調控網路
   MicroRNA-mediated regulatory network driven by MYCN in neuroblastoma

■ **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：



Summary of the plausible mechanisms in breast cancer cell death induced by combination therapy targeting ectopic ATP synthase and 26S proteasome.
本圖顯示藉由以ATP合成酶和26S蛋白酶體為標靶的合併治療而誘導乳癌細胞死亡的可能機制。

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

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，藉此探究植物的抗逆境機制（生物與非生物），以及植物與病原菌間的蛋白質交互作用，協助開發抗蟲抗病抗逆境之高產量高品質農產品。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。

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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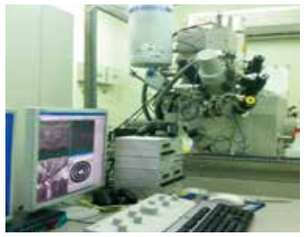
電子束暨奈米元件實驗室

E-beam and Nano Device Lab.

- 電子束微影製程與電子束顯微鏡實驗室
  (Direct-Writing Electron Beam Lithography System Lab., Scanning Electron Microscope Lab.)
- 聚焦離子束實驗室 (Focus Ion Beam 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.)

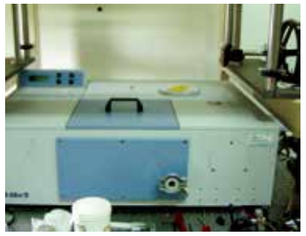


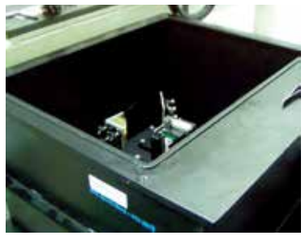
Focus Ion Beam -FIB,聚焦離子束設備

電子束微影系統(100KeV高加速電壓)

電子束微影系統(50KeV中加速電壓)

電子束顯微鏡與微影系統
(5KeV低加速電壓)

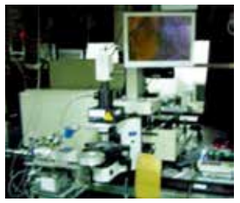




Bruker FTIR 紅外線光譜儀及變角度反射模組

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
(含XY平面定位掃描功能)

電子束顯微鏡系統
(5KeV低加速電壓)

主要研究領域 Major Research Areas

紅外線光偵測器、發光二極體、太陽能電池、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. 發展電子束微影技術與聚焦離子束技術於製作三維微結構
   Development of eBeam Lithography technology and Focused-ion Beam technology for Three-dimensional Nano-fabrication
2. 共振式太陽能電池Resonant Solar Cell
3. 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
4. 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
5. 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
6. 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
7. 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
8. 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
9. 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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附設醫院復健部主治醫師

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細胞行為實驗室
Cell Behavior Lab.

本實驗室主要研究細胞物理學、力學生物學的基礎原理以及相關臨床運用。力學生物學為一新興的跨領域學科，主要探討與力學訊息相關的生物反應。力學訊息目前被認為與多種生理及病理過程有強烈相關，包括組織生成、傷口癒合、血管新生、動脈硬化、心肌肥大、以及腫瘤進展等。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。因此在大範圍組織整合過程，包括組織發育、修補、以及退化，惡化，光學訊號可能扮演了具有相當決定性的角色。我們特別對壓力對生物體的影響、生物體如何利用力學訊息通訊、並互相調節功能、以及改造周遭力學環境有興趣。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。我們的短期目標是發展出能精確測量、並調控細胞與細胞間、以及與介質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啟益。目前本實驗室的研究主題為

- 壓力在細胞生理學以及生物物理學的角色
- 利用生物微機電技術製作可供研究細胞間通訊、以及多重物理因子對細胞生理影響肢體外實驗平台
- 建立可監控細胞與環境力學互動之三維體外實驗平台，並探討該平台在臨床上如藥物篩檢等應用
- 建立臨床上可用於監測及治療緻密結締組織，如肌腱及韌帶，力學功能失常時之非侵入性工具及技術

Mechanobiology is a new field focusing on understanding how living organisms generate, sense, and respond to various mechanical stimuli, which are believed to play a key role in numerous physiological and pathological processes, such as tissue development, tissue repairing, atherosclerosis, cardiac hypertrophy, and cancer progression. My researches primarily focus on the fundamental mechanisms and clinical applications of mechanobiology. Specifically, we investigate the effects of hydrostatic pressure and environmental elasticity on cell physiology, how cells remodel the mechanical properties of their environment, and develop tools quantitatively evaluate the mechanics of cell-matrix interactions. Our previous achievements and ongoing projects include

1. Elucidate the role of hydrostatic pressure on cell physiology

Hydrostatic pressure is an important physical factor in tissue physiology and pathology. We investigated how hydrostatic pressure affects muscle differentiation, immunological activities, cell motility, and cancer invasiveness. Currently we are working on the possible biological signaling pathways involving these processes.

2. Evaluate the effects of multiple biophysical and biochemical stimuli on cell physiology

The cells in vivo are generally exposed to the coexistence of multiple biophysical and biochemical cues. Knowledge of how cells response to these complex stimuli is important for many disciplines such as regenerative engineering and cancer biology. Using BioMEMS techniques, we have developed several platforms allowing the coexistence of mechanical, electrical, and chemical stimuli for cultured cells. Currently we are delineating the antagonistic and agonistic roles between these stimuli.

3. Develop a 3D cell culture system that allows quantitatively accessing the mechanics of cell-matrix interactions

The changes of mechanical properties such as stiffness of a tissue usually are hallmarks of various physiological and pathological processes, such as arthrosclerosis and tumor malignant transformation. In vitro assays quantitatively measuring the mechanics of cell-matrix interactions are of great importance to understand the mechanisms and facilitate the development of corresponding therapeutic strategies of these processes. Cells cultured in a 3D environment behave far different from that cultured in 2D and recapitulate more physiological characteristics in vivo. An important ongoing project in our lab is to develop a 3D cell culture system using state-of-the-art imaging and scaffold fabrication techniques to quantitatively access the mechanics of live cell-matrix interactions.

4. Develop clinical tools for treatment and monitoring of the mechanical dysfunction of dense connective tissues

Mechanical malfunction of dense fibrous tissues usually leads to protracted and debilitating conditions, such as joint capsule contracture, tissue fibrosis, and tendinosis. Our goal is to develop clinical tools that allow treating these disorders non-invasively, while the change of mechanical function of the diseased tissues can be non-invasively and quantitatively monitored. We have combined the state-of-the-art ultrasonic techniques and developed a prototypical system for this purpose. Our ongoing project is to evaluate its effectiveness in various clinical conditions.

主要研究領域 Major Research Areas

生物物理、力學生物學、生物力學、組織工程、醫用超音波
Biophysics, Mechanobiology, Biomechanics, Tissue engineering, Medical ultrasound

研究計畫 Research Projects

1. 靜水壓力對肌母細胞型態及分化影響
2. 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
3. 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
4. 用於肌腱治療之超音波剪力影像
5. 萌芽個案計畫-三維細胞培養系統與影像觀測技術
6. 三維折射率活細胞顯微術
7. 適用多波影像之三維細胞培養支架開發

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Hsinyu Lee, 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

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

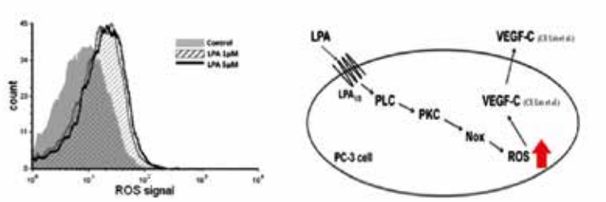
內皮細胞分子生物學實驗室
Laboratory of Endothelial Cell Molecular Biology

Research on Lysophospholipids

Lysophosphatidic acid (LPA) and sphingosine 1-phosphate (S1P) are two low molecular weight lysophospholipids (LPLs) highly enriched in serum. They are derived from enzymatic cleavage of membrane phospholipids. Through the efforts of my laboratory, we have demonstrated that LPLs enhance endothelial cell proliferation, migration and secretion of proteases. These observations strongly suggested that LPLs are regulators for vessel formation. In addition, LPLs also enhance ICAM-1 expression, CD31 phosphorylation and IL-8, MCP-1 secretion from endothelial cells through activating specific G-protein coupled receptors. These results suggested that LPLs are important regulators for inflammation processes. Our most recent findings suggested that LPA is also an important regulator for lymphatic vessel development. These results strongly suggested that LPA might be an important regulator for cancer metastasis. LPLs are also demonstrated by our laboratory to be important regulators for tumor development and cancer cell survival. Therefore, we expanded our research to LPL biology in different cancer models.

■ **右圖說明：**

Lysosphosphatidic acid induces reactive oxygen species generation by activating protein kinase C in PC-3 human prostate cancer cells
Biochem Biophys Res Commun. 2014. 440(4):564-9

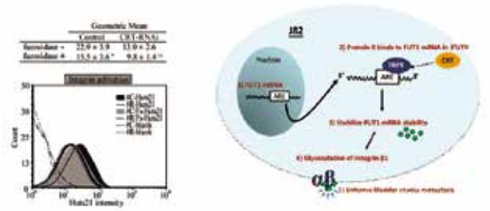


Research on Cancer cell biology

Through collaboration with colleagues at NTU hospital, we extended our research to identify neuroblastoma and hepatoma related cancer markers and exploring their potential roles in tumor formation. Calreticulin (CRT) was therefore identified as an important target. Based on these observations, we further explore the roles of CRT in bladder tumor development. Our results demonstrated that alteration of CRT levels affected cell adhesion and metastasis in bladder cancer. Furthermore, we observed that CRT regulated cell adhesion through modifying α1,2-linkaged glycan on β1-integrin, which was catalyzed by fucosyltransferase 1 (FUT1). Most importantly, we made a novel finding that higher levels of fucosylation catalyzed by FUT-1 directly activate β1-integrin. Moreover, mechanistic investigation demonstrated that CRT affected FUT1 levels through regulating mRNA stability. Our results may provide a potential clinical treatment strategy for bladder cancer patients.

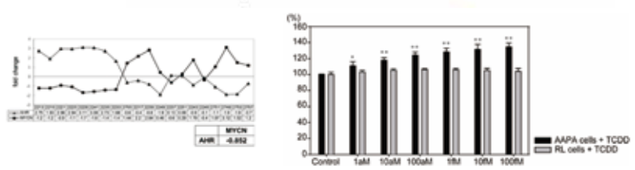
■ **右上圖說明：**

Calreticulin activates β1 integrin via fucosylation by fucosyltransferase 1 in J82 human bladder cancer cells
Biochem J. 2014 May 15;460(1):69-78



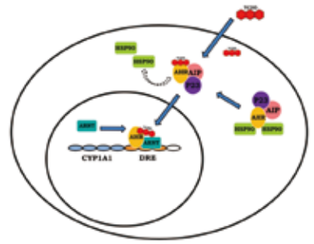
■ **右中圖說明：**

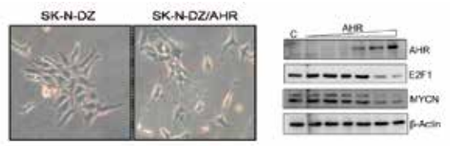
Aryl Hydrocarbon Receptor Down-regulates MYCN Expression and Promotes Cell Differentiation of Neuroblastoma
PLoS One. 2014 Feb 21;9(2):e88795.



Dioxin detection systems and bioassay development

In the past ten years, our laboratory has intensively exploring the possibility of developing more sensitive and low cost bioassay for dioxin like compounds. Two assays, including FRET and BRET based dioxin detection systems were developed.





■ **上圖說明：**

Establishment of a cell-free bioassay for detecting dioxin-like compounds
Toxicol Mech Methods. 2013 Jul;23(6):464-70

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Ju-Hong Lee, Distinguished Professor

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國立臺灣大學電機工程學系教授
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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。

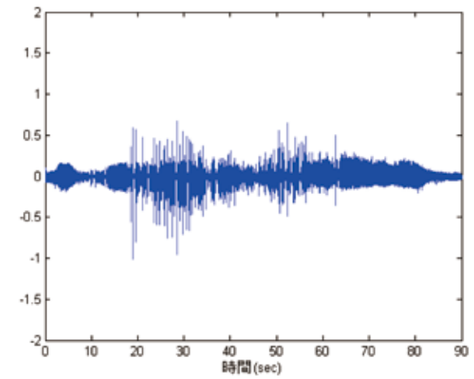
3. 由國立臺灣大學醫學院牙科部提供人體顳顎關節病變所產生之振動訊號，應用相關信號處理理論研發建立此振動訊號之數學模型的技術，以協助臨床上分析診斷人體顳顎關節病變之型態與種類，以期提供醫生進行正確且必要醫療措施所需之資訊。目前進行的研究希望利用此特性進而更精確的找出膝關節振動訊號的特徵，進而發展實用簡單方便的非侵襲性關節診斷系統。

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)

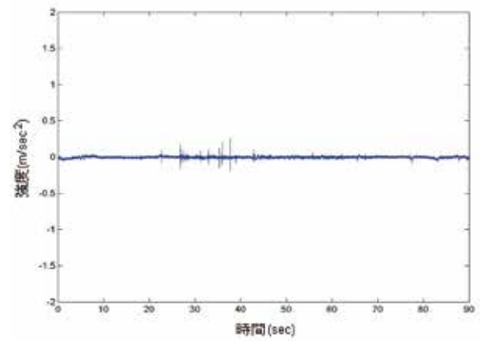
II. Statistical Digital Signal Processing:
   (1) Adaptive Signal Processing for Array Signals
   (2) Adaptive Array Beamforming Under Random Mismatches
   (3) Adaptive Array Bearing Estimation Under Random Mismatches
   (4) Adaptive Beamforming Using 2-D Circular Array for Wireless CDMA Systems
   (5) 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

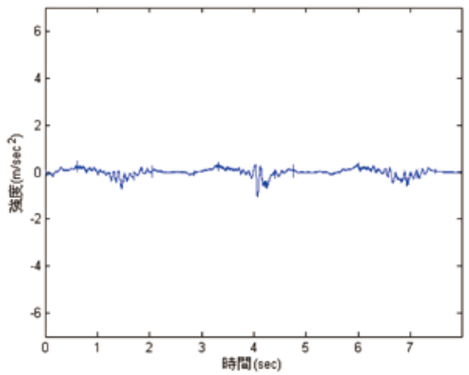
Goal of this research: To conduct research on Vibration Arthrometry (VAM) and provide the public a noninvasive, accurate tool (Expert Systems) for the diagnosis of joint disorders in clinical medicine.



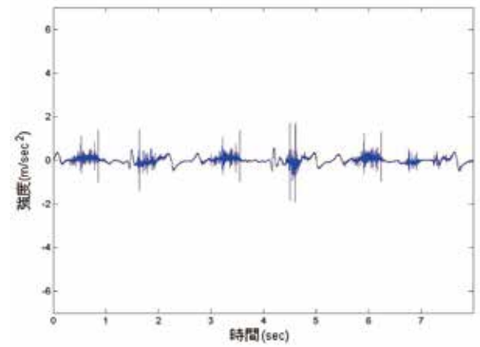
(A) 正常著膝關節在慢速擺動下所產生的振動訊號
(Physiological Patellofemoral Crepitus; PPC)



(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)

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.

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Si-Chen Lee, Distinguished Professor

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紅外線元件實驗室

IR Device Laboratory

紅外線元件實驗室（IR Device Laboratory）由李嗣涔教授領導，是臺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；電阻式記憶體；非晶矽、多晶矽、氧化物薄膜電晶體的創新製程研究等。

本實驗室利用操控黑體輻射發光頻譜與表面電漿效應，開發出室溫、窄頻且可調變波長之多波長紅外光表面電漿熱輻射發射器和波導熱輻射發射器。雙波長窄頻紅外光發射器是利用兩組三層堆疊的金/二氧化矽/金結構所組成。當上下兩層二氧化矽薄膜的厚度不同時所得等效折射率也不一樣，儘管金屬的大小相同時仍會產生不同模態的侷域型表面電漿共振現象，因此達到雙波長窄頻紅外光的發射。第二種多波長窄頻紅外光發射器是利用將一金屬柵狀結構埋入一共振腔型窄頻紅外光發射器的二氧化矽層中。金屬柵狀結構可以看成是一分光器，將元件分成兩種不同偏振態的共振模式。此兩種不同偏振態的共振模式所發射出來的窄頻紅外光波長可藉由調整金屬柵狀結構的上下方二氧化矽層的厚度來控制。

近年來全透明式電子元件因能夠應用在全透明式電子電路之設計，有著極大的潛力，而變得更為重要。由於市場對於非揮發性記憶元件的仍然是以由矽所製作的快閃記憶體為主流，對於全透明式的記憶體研究仍舊是非常缺乏。本實驗室近期發展以氧化銦錫/非晶二氧化鈦/氟摻雜二氧化錫玻璃基板的結構製作出全透明式電阻式記憶體元件。元件擁有良好的光學穿透率並在可見光範圍可達到~80%之穿透，且在電性量測結果中，此元件具有雙極性開關及低的操作電壓 -0.5 V/+1 V之特性，相信在未來有極大的潛力可以運用在全透明式電子電路之設計。

The Infrared Device Laboratory 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；Resistive random access memory；a-Si:H, poly-Si and oxide thin film transistors.

Our lab has developed the narrow bandwidth, multiple wavelengths and room temperature-operated infrared plasmonic thermal emitter and waveguide thermal emitter utilizing the manipulation of the blackbody radiation spectrum and surface plasmon polaritons. A double wavelength infrared emission by plasmonic thermal emitter using double tri-layer Au/SiO2/Au structure was investigated. Two different localized surface plasmon modes were excited with the same metal width, but different SiO2 layer thicknesses in top and bottom Au/SiO2/Au tri-layer structures. Thereby achieve narrowband dual wavelength infrared light emitting. The second kind of the multi-wavelength infrared thermal emitter is the Au/SiO2/Au waveguide thermal emitter incorporating a metallic grating embedded in the SiO2 layer. The metal grating acts as a beam splitter, dividing the device into two waveguide structures determined by the polarization of the waveguide modes. The emitted wavelengths of the two waveguide modes with different polarization can be adjusted by controlling the thickness of the SiO2 layers on both sides of the metallic grating.

Recently, the optically transparent devices become important because of their great potential for applications in next generation integrated transparent circuitry technologies. However, studies on transparent nonvolatile memory are still lacking because the inherent opaque silicon based technology dominates the nonvolatile memory market. We develop the transparent resistive random access memory (T-RRAM) with the structure of ITO/a-TiOx/FTO/Glass. A fully transparent T-RRAM device shows the good optical transparency ~80% at a wavelength of visible region and excellent reliable bipolar switching characteristics with low operation voltage of -0.5 V/+1 V. Our devices demonstrate the great potential for future transparent electronic applications.

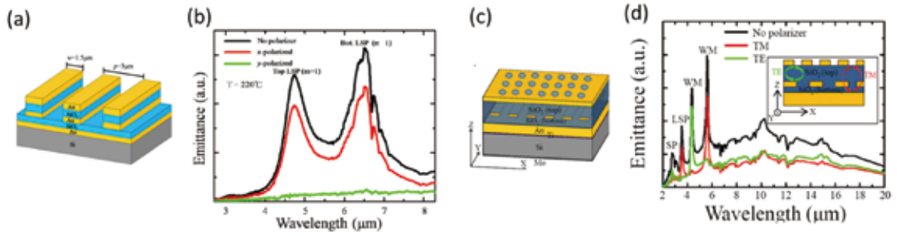

圖1 (a) 雙波長侷域型表面電漿熱輻射發射器結構圖，其晶格週期是a金屬寬度是w (b) 發光頻譜之主要峰值是位於4.7μm與6.5μm (c) 雙波長波導型熱輻射發射器結構圖，其晶格週期是a孔洞直徑是d (d) 發光頻譜之主要峰值是位於4.3μm與5.6μm

Fi. 1 (a) Schematics of dual wavelengths LSP thermal emitter. The lattice constant is a and metal width is w, respectively. (b) The peak position of wavelength of dual wavelengths LSP thermal emitter is 4.7 μm and 6.5 μm. (c) Schematics of dual wavelengths waveguide thermal emitter. The lattice constant is a and hole diameter is d, respectively. (b) The peak position of wavelength of dual wavelengths LSP thermal emitter is 4.3 μm and 5.6 μm.

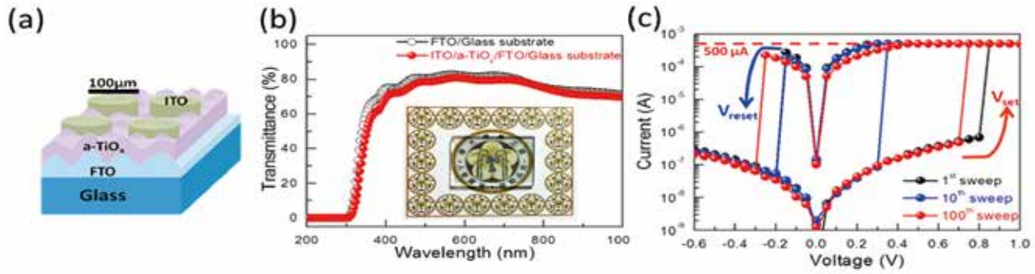

圖2 (a) T-RRAM元件結構示意圖 (b) 全透明式氧化銦錫/非晶二氧化鈦/氟摻雜二氧化錫玻璃基板電阻式記憶體之紫外光-可見光光譜分析結果 (c) 電阻式記憶體連續100次電流-電壓掃描之蝴蝶曲線關係圖

Fig. 2 (a) Schematics of T-RRAM device structures. (b) UV-visible transmittance of FTO/Glass substrate and ITO/a-TiOx/FTO/Glass substrate T-RRAM device. (c) Consecutive excellent 100 I-V repeatable switching cycles.

研究計畫 Research Projects

1. 1~10 μm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 1~10 μm Narrow-band High Power Infrared Light Source with Applications in Si-photonics, biotechnology and cancer therapy (3/3)
2. 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
3. 前瞻技術產學合作計畫-7-5nm半導體技術節點研究(1/5)
   Pathfinding for 7–5nm Semiconductor Technology Nodes

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生醫晶片技術實驗室
CMOS Biotechnology 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)

■ **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
補助單位：行政院國家科學委員會
計畫期間：2011/08/01 - 2014/07/31

心臟冠狀動脈(Coronary Artery Disease)退化及心肌退化症，往往會使患者過勞或進行一些劇烈活動時，引起心絞痛甚至造成患者死亡，已經成為國人十大死因之第二名。雖然近幾年來醫學上對於治療心血管疾病有相當之進步，但心臟衰竭之治療仍具有相當之挑戰性及極限，因此如何提供心衰竭患者全面性的照護，是刻不容緩的議題。其中，最為重要的即為心衰竭的長期及緊急照護之用藥，然而，用藥的效果及用量，會因為心衰竭病患基因之不同而有不同的感受性，因此，如何進一步利用DNA晶片技術進行檢驗及資料篩檢即成為心臟疾病相關早期預警及輔助用藥等生醫照護科技下一步重要的發展。
本研究團隊針對此一課題發展以標準半導體製程為基礎的DNA檢測晶片系統。本研究團隊計劃將以對DNA分子及元件表面處理的了解做為為基礎，利用對奈微米電子元件的知識為工具，先以元件理論分析的方式來建構此一DNA檢測晶片的基礎模型，而後以標準半導體製程技術進行DNA檢測晶片及其相關電路之設計及製作，進一步與臨床資料進行分析比對，期能使國內生物感測元件知識與技術可以確實與臨床治療技術更進一步的整合，並可藉由國內獨步全球之半導體製程技術將此一研究成果落實於生物科學之應用層面上，以提升既有之產業價值。

■ Project title: The development of poly-silicon nanowire sensor-system-on-chip for biomarkers in heart failure diagnosis

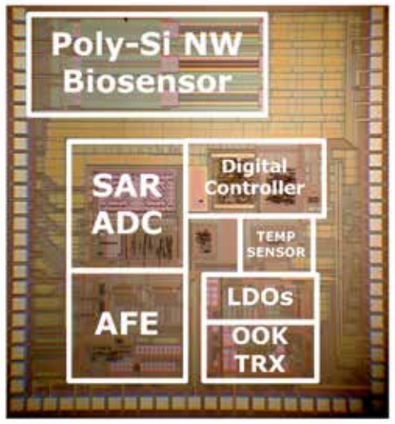
Supported by: National Science Fundation

Project period: 2011/08/01 - 2014/07/31

With rapid advancements of System-On-Chip and MEMS/nanotechnologies, a wide variety of new chemical analysis devices and their integrated system, such as biomolecular analysis devices and micro-total-analysis systems, have been designed, implemented, and demonstrated. However, few of them integrated with clinical analysis and achieve the practical requirement of the modern biomolecular diagnosis. As the consequence, this research project will aim at the development of DNA analysis system-on-chip for the clinical heart-failure-medicine-treatment, which is one of the most important steps toward the heart failure disease treatment in both emergency and chronic recovery. In specific, this research project will be based on the basic understanding of electronic devices, biomolecular interaction, and nano/micro fabrication to design and implement the DNA chip for heart-failure medicine treatments. Furthermore, this research project will also compare with clinical data in order to bridge the electronics, bioinformatics, and clinical applications into a fully integrated system.

代表圖及中英文說明：

利用CIC以台積電0.35μm標準製程製做出多晶矽奈米線生物分子系統晶片，晶片之特性如圖所示，此一系統晶片包含：一組多晶矽奈米線生物分子感測元件；一組介面放大電路(Interface Circuit)；一組類比數位轉換電路(Analog-to-Digital Converter)；一組微處理器單元(Microcontroller)及一組無線收發器(On-Off Key Tranceiver)。此一晶片將可以有效地將生物分子感測之信號，以無線收發的方式發送至PC，此一系統晶片為首顆落實半導體奈米線生物分子感測之系統晶片。



Technology	TSMC 0.35μm CMOS	*Digital Controller*	
Chip Area	6.26mm²	Clock Rate	1MHz
Poly-Si NW Biosensor		Power Consumption	9.8 μW
Type	N Type NW	*SAR ADC*	
Width/Height	625/170 nm	Resolution	10 bits
Analog Front-end (AFE)		Conversion Rate	100KSPS (Max)
Power Consumption	IA: 387 μW@3V LPF:130 μW@3V	ENOB	9.4 bit @0.57KHz
ICMR	0~2.75V	Power Consumption	1.8μW @1KSPS 20μW @10KSPS
CMRR	137dB	*OOK Receiver*	
Unit-Gain BW of DDIA	1.7MHz	Operation Freq.	433.92 MHz
Chopping Freq.	10kHz	Sensitivity	-62 dBm
Temperature Sensor		Power Consumption	7.2 mW @ 1.8V
Power Consumption	194.2μW @3V	*OOK Transmitter*	
R-Squared Value	0.9999	Operation Freq.	433.92 MHz
Temperature Range	-20~120 ℃	Output Power	-10 dBm
		Power Consumption	7.2 mW @ 1.8V

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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.

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. 針對大腸腫瘤及淋巴結轉移的早期發現和清除的光電醫學診斷與治療關鍵問題研究
   102-2218-E-002 -014-MY3
2. 無線充電高頻脈衝電刺激貼片於腕隧道症候群之應用研發
   102-2320-B-002 -040 -MY2

2015 年校友回娘家參訪新實驗室

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人腦實驗室
Lab of Brain Imaging and Modeling

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.

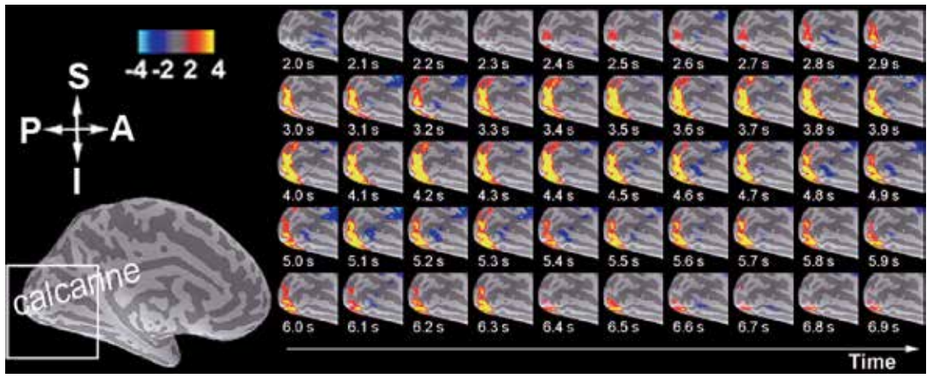
主要研究領域 Major Research Areas

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 andMEG
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】

■ **研究計畫** - 利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
之代表圖及中英文說明：



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.

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。

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演算法實驗室
Algorithmic Research Lab.

演算法實驗室於2005年成立，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. Our research focuses on fundamental algorithms and their applications.

主要研究領域 Major Research Areas

演算法、圖論
Algorithms, Graph Theory

研究計畫 Research Projects

圈與洞之圖論演算法
圖論演算法與資料結構之研究

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孫啟光 特聘教授
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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

Head of Core Laboratory, 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

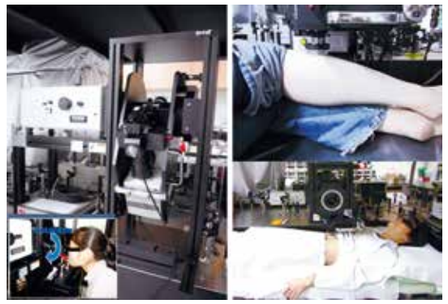
非侵入式光學奈米影像與操控、兆赫波與微波生醫應用、奈米超音波
Non-invasive optical microscopy and manipulations, THz and Microwaves for biomedicine, nano-ultrasonics.

研究計畫 Research Projects

1. 兆赫聲譜學及奈米聲子成像術 (1/3)
   THz Phonon Spectroscopy and Nanoscopy
2. 頻譜解析三倍頻顯微術 (1/3)
   Spectrally-resolved Third Harmonic Generation Microscopy
3. 倍頻式光學虛擬活體切片術 (第二年)
   Harmonics-Based Invio Optical Virtual Biopsy
4. 倍頻式光學虛擬活體切片術 (第三年)
   Harmonics-Based Invio Optical Virtual Biopsy
5. 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 (2014)
   Advanced Optical Virtual Biopsy for Early Disease Diagnosis
6. 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 (2015)
   Advanced Optical Virtual Biopsy for Early Disease Diagnosis
7. 萌芽個案計畫-倍頻式光學切片術之商轉評估與認證實驗 (II)
   Evaluation on the marketing potential and FDA application for multi-harmonic generation biopsy

■ **研究計畫** - 倍頻式光學虛擬活體切片術
Harmonics-based in vivo optical virtual biopsy

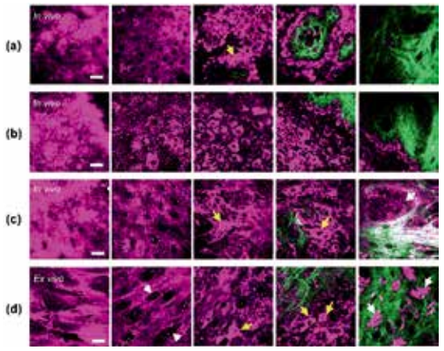
之代表圖及中英文說明-1：



Version 1 Version 2

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).
頻式光學虛擬活體切片系統架構圖。

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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臺灣大學腦與心智科學研究所合聘教授
臺灣大學生物醫學與電子研究所合聘教授

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Chair, Center for Emergency Medical Service, 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：敞開各專業的籓籬，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. 輸液幫浦研發（經濟部學界科專委託計畫）
3. 應用巨量資料探勘、地理空間資訊分析技術與實證醫學針對我國緊急救護服務之醫療資源配置、管理與未來規劃進行整體研究計畫（科技部委託計畫）
4. 基於生命之鏈週期探討智慧型穿戴式裝置之臨床應用─以急重症及術後照護為例（科技部委託計畫）

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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.

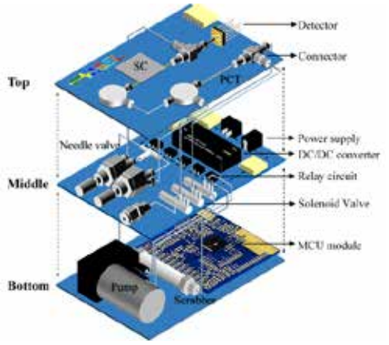
主要研究領域 Major Research Areas

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.

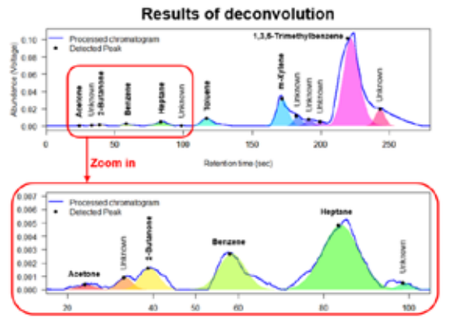
研究計畫 Research Projects

1. 微型氣相層析儀 (Micro Gas Chromatography, μGC)
   應用於揮發性有機化合物檢測之可攜式微型氣相層析系統
   計劃補助單位：改善前瞻研究領航計畫 (三年期計劃) 計劃編號：104R7624-2

隨著科技日新月異，人類平均壽命增長造成人口老化；工業的發達，其背後也伴隨著各類型汙染物的產生，接踵而來的是慢性病和癌症之好發率提高。根據研究指出，揮發性有機化合物(Volatile organic compounds, VOCs)於環境中或者是人體內的含量扮演著非常重要的指標，因此，若能對空氣或者人體進行長期監控檢測，是非常重要的。由於傳統的揮發性有機化合物檢測儀器，其體積較為龐大，並且操作較不便利，因此本團隊提出一可攜式微型氣相層析儀(Micro gas chromatography, μGC)，將其應用於檢測揮發性有機混合氣體。



可攜式微型氣相層析儀架構示意圖

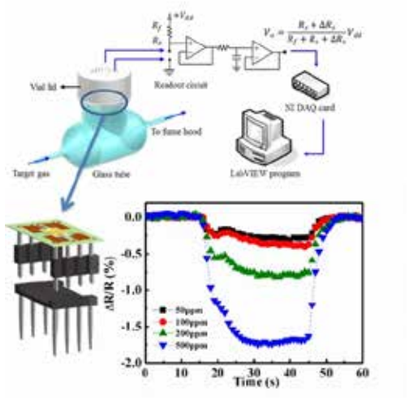


七種潛在性肺癌因子氣體層析圖

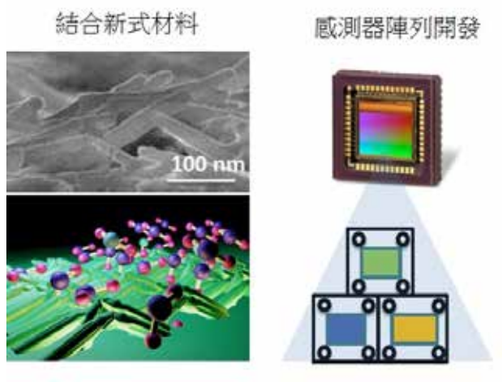
2. 氣體感測器陣列 (Sensor arrays)
   開發揮發性有機氣體偵測之高靈敏與常溫氣體感測器陣列

對於未知氣體在環境檢測一直是十分重要的角色，如過量的有毒氣體(如甲苯)可能對人體造成如抑制中樞神經系統、致癌等危害；此外，對於環境中的未知氣體(如丙烯)在特定的濃度內，更可能發生氣爆等不可忽視的問題，所以開發量測快速與未知氣體的氣體感測器陣列是十分重要的課題。

本組具體之研究主題有二：1. 結合新式材料(如奈米材料)且具備高靈敏度的常溫型量測氣體感測器。我們使用微機電 (Microelectromechanical Systems, MEMs) 製程開發平面指叉狀電極，並結合奈米技術，或是其他極具潛力的氣體感測材料，提高氣體感測器的靈敏度與量測極限。2. 感測器陣列開發。結合多種不同材料之氣體感測器並組成陣列，目的為量測未知氣體濃度與組成比例，量測結果結合電路整合，將所得之感測訊號以矩陣處理，目前所開發氣體感測器陣列對於未知氣體的分析預測組成，誤差皆達 5% 以下，可靠度佳，並期望最終可應用於電子鼻(Electronic Nose) 之前端系統。



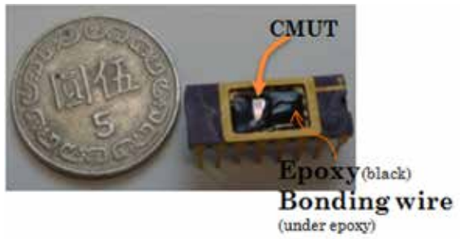
量測氣體生成系統與感測器對應甲苯的反應數據



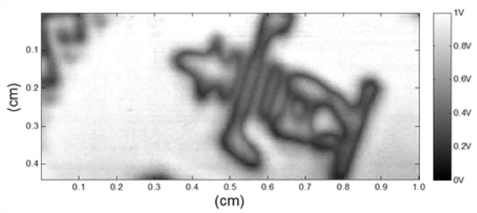
氣體感測器之研究主題

3. 電容式微機電系統傳感器 (cMUT)
   應用於血管內超音波之前視型互補式金氧半導體超音波換能器開發
   計劃補助單位：科技部 (三年期計劃) 計劃編號：103-2221-E-002-061-MY3

心血管疾病長年來位居我國十大死亡原因的第二名，根據統計，在民國101年有高達11.1%的人死因是由其相關疾病所造成。心導管檢查為其最主要的方式，此方式有主要三個缺點：1. 血管本身的彎度或是走向會使得影像無法精確呈現出冠狀動脈的血管硬化程度，2. 在阻塞率不到50%或是硬化堆積均勻時無法藉由心導管檢查判斷真實病況，3. 顯影劑的注射對人體的腎臟會造成負擔。超音波影像不會產生游離輻射(Ionizing radiation)對人體造成輻射傷害，且具有非侵入性(Non-invasive)、即時性(Real time)、可攜性的優點，因此在臨床醫學上的運用十分廣泛。因此，本團隊利用台積電0.35μm製程，基於CMOS-MEMS所開發的CMUT元件，主要優點在於經由適當設計，可以讓元件與後端電路進行最緊密的整合，以達到最大微小化；並可降低寄生電阻，提昇訊號品質。



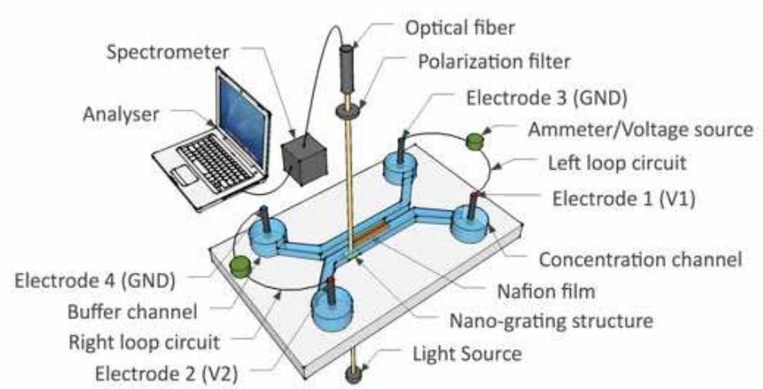
TSMC 0.35 μm CMOS-MEMS製程之cMUT封裝圖



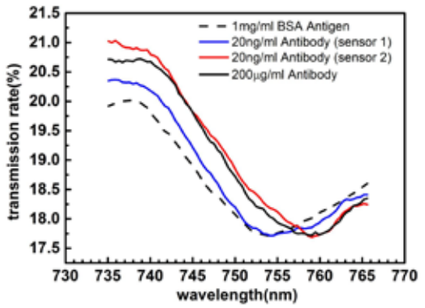
一元硬幣非破壞性檢測結果圖

4. 微奈米流道 (Micro/nanofluidic)
   開發奈米預濃縮與週期性奈米金屬閘表面電漿共振感測器結合於免標定光學免疫分析平台

在現今免疫分析方法中，要做到免標定的超低濃度檢測是目前多數生物感測平台所面臨的一大困難。表面電漿共振生物感測器，有免標定且可即時檢測等優點，在這幾年被大量的研究以及應用，但因為其檢測原理的限制，使其最低檢測濃度往往無法符合我們需求。在本研究中，我們將奈米預濃縮的功能加入表面電漿共振的感測器中，完成一可預濃縮生物分子再進行表面電漿共振感測的全程免標定免疫分析平台。



奈米預濃縮結合週期性奈米金屬閘表面電漿共振感測器之免標定光學免疫分析平台



牛血清蛋白用於免疫分析平台之量測結果

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數位信號處理實驗室
Digital Signal Processing Lab.

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、超音波成像

B-mode脈衝壓縮影像系統常被用在內科的診斷上，由於成像的發射和接收系統常是固定的設定參數，以及非適應性的訊號處理技術，以致影像的品質受到限制。我們提出–最佳化發射-可適性接收脈衝壓縮對比劑諧波成像系統，此技術主要包含兩部份，分別是最佳化發射訊號，以及回波訊號之可適性脈衝壓縮。特別考慮非線性參數組織和微汽泡之時變訊號的影響。由於(1)組織發生變異時，會導致其非線性參數特性改變，影響產生二倍頻諧波強度的機制，以及(2)氣泡濃度分布隨著時間的變化，在這兩個重要條件影響之下，使用一般固定發射頻率的超音波成像系統，無法達到最佳的對比度以及解析度，因此發射和接收的系統參數的最佳化是需要被研究的。本研究提出的最佳化系統，在發射系統方面透過Optimal Iterate Search Method 找出最佳發射頻率來提高回波訊號功率，且利用即時回波訊號頻譜估測，自動產生新的envelope function 發射訊號，達到Pre-enhancement的目的，進而提高解析度。在接收系統方面，將透過估測頻譜技術，對回波之諧波訊號進行可適性的脈衝壓縮，再一次提高訊號對比度以及解析度。透過發射和接收部分的兩次最佳化，有別於一般的脈衝壓縮影像系統，以期將來使用於心臟內科以及肝臟的臨床診斷。

二、生醫訊號處理：

含麻醉生理訊號分析及胎兒心電圖的研究。

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。

研究計畫 Research Projects

1. 一個用於二次諧波脈衝壓縮成像之多頻合成技術　2010 ~ 2013
2. 超音波對比劑諧波成像之最佳訊號參數選擇　2013~ 2014

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Shoei-Shen Wang, Professor

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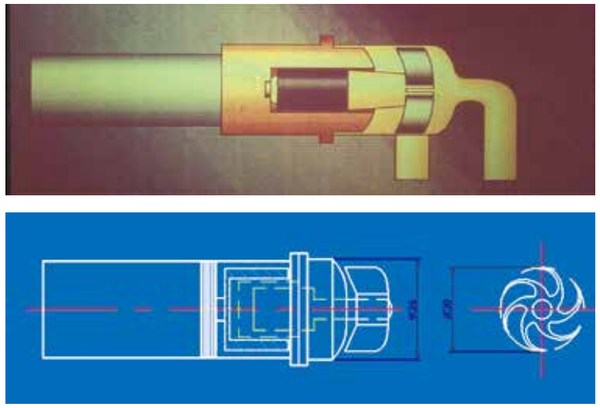
國立臺灣大學醫學院心臟血管外科教授
國立臺灣大學附設醫院心臟移植及心肺移植召集人

Professor, Graduate Institute of Biomedical Electronics and Bioinformatics/ Division of Cardiovascular Surgery, NationalTaiwanUniversity
Director, Heart Transplantation and Heart-Lung Transplantation, National Taiwan University Hospital

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

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100 mmHg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、尿毒症血液透析之瘻管手術等
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 ~ 2016)
   Heart-lung transplantation. (NTUH, 2006 ~ 2016)
2. 以綠色螢光蛋白(GFP)轉染的自體間葉幹細胞(MSC)探討MSC(G)/SF/HA心肌綴補片於含有幾丁聚醣微、奈米粒子傳遞紅血球生成素 (EPO) 對促進MI心臟之動物心肌再生之效應及機制的探討(1/2,2/2)
   Efficacy of using chitosan nanoparticles to delivery EPO and MSC(G) (GFP transfection MSC)/SF/HA patches on promoting MI heart re- modeling and vascularization, and related mechanisms- an in-vivo study
   (NSC101-2314-B-002-021-MY2, 2012/08/01~ 2014/07/31)

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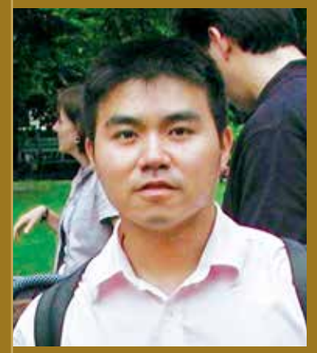

吳文超 副教授

Wen-Chau Wu, Associate Professor

國立臺灣大學腫瘤醫學研所副教授
國立臺灣大學生醫電子與資訊學研究所合聘副教授
國立臺灣大學醫學院附設醫院影像醫學部合聘副教授
國立臺灣大學臨床醫學研究所合聘副教授

Associate Professor, Graduate Institute of Oncology, National Taiwan University
Adjunct Associate Professor, Graduate Institute of Biomedical Electronics and Bioinformatics, National Taiwan University
Adjunct Associate Professor, Department of Medical Imaging, National Taiwan University Hospital
Adjunct Associate Professor, Graduate Institute of Clinical Medicine, National Taiwan University

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、神經部、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 for 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 two 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, Neurology, 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 Contrast-Material-Based Methods), Functional Magnetic Resonance Imaging, Medical Image Processing, Biomedical Signal Analysis

研究計畫 Research Projects

1. 以進階磁振影像參數診斷腦瘤：延伸擴散影像與對比劑灌流影像之結合與比較
   Diagnosis of brain tumors using advanced magnetic resonance imaging parameters – combination and comparison of extended diffusion imaging and contrast-material-based perfusion imaging
2. 結合血氧濃度對比與動脈氫質子標記磁振影像探討咖啡因對大腦功能性連結之影響
   Investigation of caffeine’ s effect on cerebral functional connectivity using combined BOLD and ASL MRI

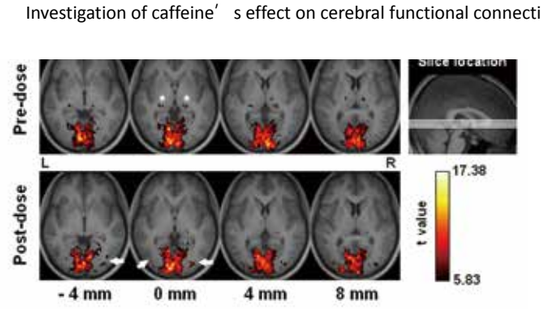

Figure 1. Group functional connectivity of the visual cortex (N = 17, eyes-open during the scan). Slice location is marked in units of millimeters. Caffeine alters the integration of relay area (the lateral geniculate nuclei as indicated by asterisks) and attention-associated area (the extrastriate visual areas as indicated by arrows) in the functional connectivity of the visual cortex.

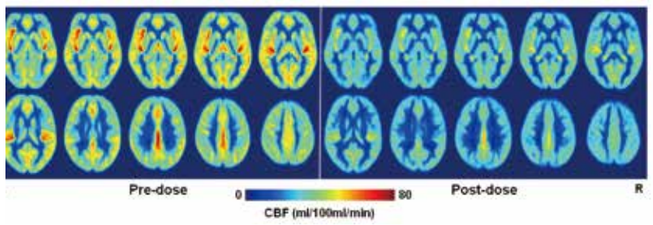

Figure 2. Quantitative perfusion maps averaged over 17 healthy participants before and after caffeine ingestion. Two hundred milligrams of caffeine decreased the gray matter perfusion by 24% ±7%. No significant perfusion change was found in placebo data.

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中研院生醫所

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。

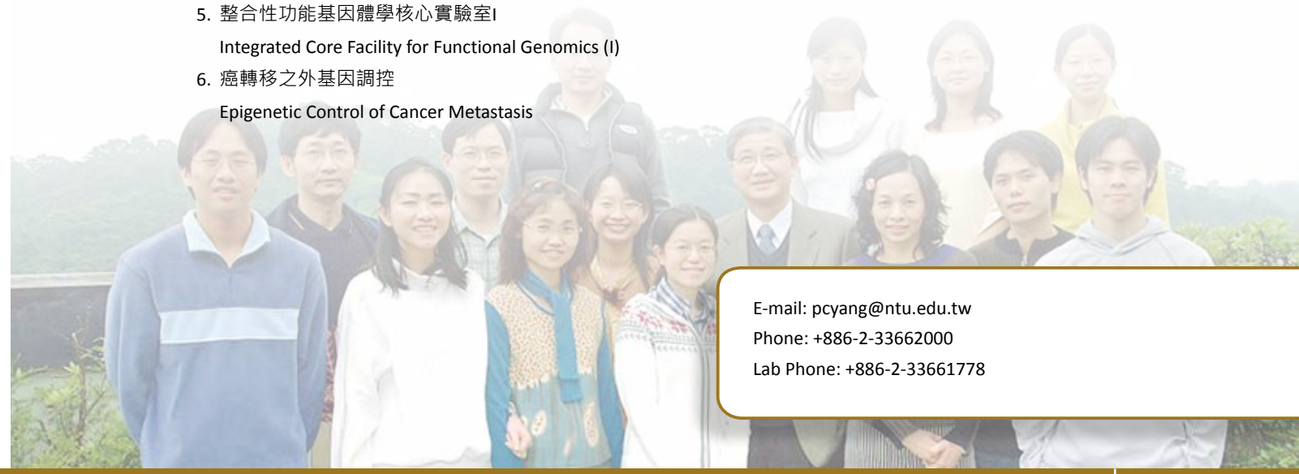
Our research teams are interested in studying the molecular pathogenesis of lung cancer in Taiwan and mechanisms of cancer metastasis. We focus on four aspects: (1) identification of novel risk genes for lung cancer in Taiwan, (2) molecular signature for prognostic prediction and personalized therapy 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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陸 發表論文 Publications

趙坤茂教授 Kun-Mao Chao, Professor

※ 學術期刊論文 Journal articles

1. WY Lin, YW Wu, HL Wang, KM Chao. Forming Plurality at Minimum Cost.WALCOM: Algorithms and Computation, 77-88
2. JY Wang, MC Lee, CC Shu, CH Lee, LN Lee, KM Chao, FY Chang. Optimal Duration of Anti-TB Treatment in Patients With Diabetes: Nine or Six Months? CHEST Journal 147 (2), 520-528.
3. RR Lin, YH Chang, KM Chao.Locating Valid SLCAs for XML Keyword Search with NOT Semantics. ACM SIGMOD Record 43 (2), 29-34.

※ 研討會論文 Conference & proceeding papers

1. Lin, W.-Y., Wu, Y.-W., Wang, H.-L., and Chao, K.-M., 2015, "Forming Plurality at Minimum Cost, *" The 9th International Workshop on Algorithms and Computation (WALCOM 2015), Lecture Notes in Computer Science*, Bangladesh.
2. Wu, Y.-W., Lin, W.-Y., Wang, H.-L., and Chao, K.-M., 2014, "The Generalized Popular Condensation Problem," The 25th Annual Symposium on Algorithms and Computation (ISAAC 2014), Lecture Notes in Computer Science, Korea.

莊曜宇教授 Eric Y.Chuang, Professor

※ 學術期刊論文Journal articles

1. Chiu Y.C., Wu C.T., T.H. Hsiao, Y.P. Lai, C.K. Hsiao, Y. Chen, E.Y. Chuang*. Co-modulation analysis of gene regulation in breast cancer reveals complex interplay between ESR1 and ERBB2 genes. BMC Genomics, 16(Suppl 7):S19, 2015.
2. Chiu YC, Hsiao TH, Chen Y, Chuang EY*. Parameter optimization for constructing competing endogenous RNA regulatory network in glioblastoma multiforme and other cancers. BMC Genomics, 16(Suppl 4):S1, 2015,.
3. Chang YY, Kuo WH, Hung JH, Lee CY, Lee YH, Chang YC, Lin WC, Shen CY, Huang CS, Hsieh FJ, Lai LC, Tsai MH, Chang KJ, Chuang EY*. Deregulated microRNAs in triple-negative breast cancer revealed by deep sequencing. Molecular Cancer, 14:36, 2015.

※ 研討會論文 Conference & proceeding papers

1. Y.C. Hsu, Y.C. Chiu, Y. Chen, E.Y. Chuang, T.H. Hsiao,"A gene set approach to analyze copy number alterations profiles of breast cancer.", International Conference on Intelligent Biology and Medicine (ICIBM2014), December 4-6,2014, San Antonio, TX, USA.
2. Y.C. Chiu, C.T. Wu, T.H. Hsiao, Y.P. Lai, C.K. Hsiao, Y. Chen, E.Y. Chuang, "Co-modulation analysis of gene regulation in breast cancer reveals complex interplay between ESR1 and ERBB2 genes", International Conference on Intelligent Biology and Medicine (ICIBM2014), December 4-6, 2014, San Antonio, TX, USA.
3. M.K. Chuang, Y.C. Chiu, W.C. Chou, H.A. Hou, E.Y. Chuang, H.F. Tien, "A Simple, Powerful, and Widely Applicable Micro-RNA Scoring System in Prognostication of De Novo Myeloid Leukemia Patients". Oral and poster presented at 56th ASH® Annual Meeting and Exposition, December 6-9, 2014, San Francisco, CA, USA.
4. C.T. Wu, M.H. Tsai, T.P. Lu, L.C. Lai, E.Y. Chuang, "Performances evaluation of algorithms for identifying differently expressed genes in RNA-seq data". Poster presented at 2015 AACR annual meeting, Abstract 2123, April 18-22, 2015, Philadelphia, PA, USA.
5. W.A. Wang, L.C. Lai, M.H. Tsai, T.P. Liu, E.Y. Chuang, "Survival prediction model with long non-coding RNA profile in lung adenocarcinoma cancer". Poster presented at 2015 AACR annual meeting, Abstract 4196, April 18-22, 2015, Philadeplhia, PA, USA.

鍾孝文教授 Hsiao-Wen Chung, Professor

※ 學術期刊論文 Journal articles

1. Wu PH, Cheng CC, Wu ML, Chao TC, Chung HW, Huang TY ," Effects of RF profile on precision of quantitative T2 mapping using dual-echo steady-state acquisition", Magnetic Resonance Imaging 2014;32:102-106.
2. Chang HC, Juan CJ, Chiu HC, Cheng CC, Chiu SC, Liu YJ, Chung HW, Hsu HH, "Effects of gender, age, and body mass index on fat contents and apparent diffusion coefficients in healthy parotid glands: an MRI evaluation", European Radiology 2014;24:2069-2076.
3. Fu JH, Chuang TC, Chung HW, Chang HC, Lin HS , Hsu SS, Wang PC, Hsu SH, Pan HB, Lai PH, "Discriminating pyogenic brain abscesses, necrotic glioblastomas and necrotic metastatic brain tumors by means of susceptibility-weighted imaging", European Radiology 2015;25:1413-1420.
4. Chu ML, Chang HC, Chung HW, Truong TK, Bashir MR, Chen NK, "POCS-based reconstruction of multiplexed sensitivity encoded MRI (POCSMUSE): a general algorithm for reducing motion-related artifacts", Magnetic Resonance in Medicine 2015, accepted.
5. Wang CY, Tsai PH, Siow TY, Lee HS, Chang YC, Hsu YC, Chiang SW, Lin MH, Chung HW, Huang GS, "Change in T2* relaxation time of Hoffa fat pad correlates with histologic change in a rat anterior cruciate ligament transection model", Journal of Orthopaedic Research 2015, accepted.

※ 研討會論文 Conference & proceeding papers

1. Wu PH, Chung HW, Chen NK (2015) Reliable phase gradient mapping and phase unwrapping for low-SNR images: a novel procedure based on k-space energy peak quantification, in International Society of Magnetic Resonance in Medicine, 23rd Annual Meeting, #100, Toronto, Canada.
2. Cheng CC, Mei CS, Ciris PA, Mulkern RV, Balasubramanian M, Chung HW, Chao TC, Panych LP, Madore B (2015) Simultaneous frequency and T2 mapping, applied to thermometry and to susceptibility-weighted imaging, in International Society of Magnetic Resonance in Medicine, 23rd Annual Meeting, #333, Toronto, Canada.

3. Wang CY, Chiang SW, Tsai PH, Liu HS, Chung HW, Kao HW, Juan CJ, Chen CY (2015) Pituitary perfusion characteristics in idiopathic central precocious puberty: evaluation with dynamic contrast enhanced T1-weighted MR imaging using Brix pharmacokinetic model, in International Society of Magnetic Resonance in Medicine, 23rd Annual Meeting, #1268, Toronto, Canada.
4. Cheng CM, Chung HW, Hsieh JC, Lin SJ, Yeh TC (2015) The impact of fluctuated tCBF induced by cardiac pulsation on the global CMRO2 measurement, in International Society of Magnetic Resonance in Medicine, 23rd Annual Meeting, #1446, Toronto, Canada.
5. Tsai YH, Chen HC, Tung HC, Chen DC, Chen CCC, Chai JW, Chung HW, Chen WC (2015) Effectively improving accuracy and reliability in intracranial volume change for MR intracranial pressure measurement, in International Society of Magnetic Resonance in Medicine, 23rd Annual Meeting, #2288, Toronto, Canada.
6. Lin JM, Zhu C, Chung HW, Graves MJ, Patterson A (2015) Optimized free-breathing inner-volume black-blood (FB-IV-BB) cine FSE of the descending aorta, in International Society of Magnetic Resonance in Medicine, 23rd Annual Meeting, #2594, Toronto, Canada.
7. Wu PH, Chung HW, Cheng CC, Wu MT, Ko CW (2015) Investigation of spatial flow profile pattern in branch pulmonary arteries after repaired Tetralogy of Fallot, in International Society of Magnetic Resonance in Medicine, 23rd Annual Meeting, #2729, Toronto, Canada.
8. Tsai PH, Liu HS, Chung HW, Lu CF, Hsu FT, Hsieh LC, Chen CY (2015) Effects of maximal b value and sampling interval on water displacement profile in q-space imaging, in International Society of Magnetic Resonance in Medicine, 23rd Annual Meeting, #2894, Toronto, Canada.
9. Lin TM, Chiu SC, Cheng CC, Wu WC, Chung HW (2015) Quantitative evaluation of the effect of reduction of signal acquisition number in MR fingerprinting, in International Society of Magnetic Resonance in Medicine, 23rd Annual Meeting, #3388, Toronto, Canada.
10. Lin JM, Patterson A, Chang HC, Chuang TC, Chung HW, Gillard JH, Graves MJ (2015) Whitening of colored noise in PROPELLER using iterative regularized PICO reconstruction, in International Society of Magnetic Resonance in Medicine, 23rd Annual Meeting, #3738, Toronto, Canada.
11. Chu ML, Chang HC, Chung HW, Truong TK, Bashir MR, Chen NK (2015) POCS-based reconstruction of multiplexed sensitivity encoded MRI (POCSMUSE): a general algorithm for reducing motion-related artifacts, in International Society of Magnetic Resonance in Medicine, 23rd Annual Meeting, #3789, Toronto, Canada.
12. Wang CY, Huang GS, Chiang SW, Hsu YC, Lin MH, Chung HW (2015) Knee cartilage and subchondral bone marrow changes of chronic kidney disease in a rat model investigated by quantitative MR imaging, in International Society of Magnetic Resonance in Medicine, 23rd Annual Meeting, #4195, Toronto, Canada.
13. Chang HC, Juan CJ, Chung HW, Guhaniyogi S, Chen NK (2014) , "Quantification of chemical-shift apparent diffusion coefficients (ADC) of fat and water signals using interleaved EPI based IDEAL method and multiplexed parallel image reconstruction: application to studies of parotid glands ", in International Society of Magnetic Resonance in Medicine, 22nd Annual Meeting, #823, Milan, Italy.
14. Wang CY, Tsai PH, Chiang SW, Hsu YC, Lee HS, Chang YC, Chou MC, Lin MH, Lin CY, Chung HW, Huang GS (2014) , "T2* value change of Hoffa's fat pad with histologic correlation in a rat model of anterior cruciate ligament transection ", in International Society of Magnetic Resonance in Medicine, 22nd Annual Meeting, #1183, Milan, Italy.
15. Tsai PH, Chung HW, Huang TY, Chan WP, Chen CY, Tsai FY (2014) , "Accelerated T2* measurements in human meniscus using projection reconstruction with data sharing from adjacent echo ", in International Society of Magnetic Resonance in Medicine, 22nd Annual Meeting, #1184, Milan, Italy.
16. Chiang SW, Chung HW, Wang CY, Hsu YC, Huang GS (2014) , "MR T2 values of the knee cartilage and meniscus in chronic kidney disease ", in International Society of Magnetic Resonance in Medicine, 22nd Annual Meeting, #1210, Milan, Italy.
17. Chiu SC, Chung HW, Buechert M, Bock M (2014) , "MR fingerprinting: fat-water separation imaging ", in International Society of Magnetic Resonance in Medicine, 22nd Annual Meeting, #1668, Milan, Italy.
18. Lai JCW, Cheng CC, Chung HW (2014) , "Susceptibility-weighted imaging using unbalanced steady-state free precession gradient-echo imaging with multiple echoes ", in International Society of Magnetic Resonance in Medicine, 22nd Annual Meeting, #1785, Milan, Italy.
19. Chuang TC, Shui WP, Chung HW, Lai PH (2014) , " Quantitative intra-tumoral susceptibility signal in grading brain astrocytomas with susceptibility-weighted imaging ", in International Society of Magnetic Resonance in Medicine, 22nd Annual Meeting, #1849, Milan, Italy.
20. Chen CY, Kuo DP, Chung HW, Chang C, Tsai PH (2014) , "Evolution of fractional anisotrophic changes in an animal model of ischemic stroke: relative contribution of anisotropic versus magnitude diffusivity ", in International Society of Magnetic Resonance in Medicine, 22nd Annual Meeting, #1868, Milan, Italy.
21. Chiang SW, Chen CY, Tsai PH, Chung HW, Wang CY, Chou MC (2014) , " Altered axonal integrity of lower limb motor tracts in idiopathic normal pressure hydrocephalus: a DTI biomarker for differentiating lumbar-drainage responders from non-responders ", in International Society of Magnetic Resonance in Medicine, 22nd Annual Meeting, #1909, Milan, Italy.
22. Chen YC, Chen CY, Chiang SW, Chung HW, Wu YT, Tsai PH, Hsiao YH, Chou MC, Kao HW, Wang WC (2014) , "Possible compensatory plasticity of anterior thalamic nucleus to memory impairment in normal pressure hydrocephalus patients manifested as increased anisotropy and fiber density ", in International Society of Magnetic Resonance in Medicine, 22nd Annual Meeting, #1947, Milan, Italy.
23. Hsiao YH, Chen YC, Chen CY, Chiang SW, Chung HW, Tsai PH, Chou MC, Kao HW, Wang CY (2014) , "Increase of fractional anisotropy in contralateral thalamic motor nucleus in MCA stroke using tract-based segmentation method ", in International Society of Magnetic Resonance in Medicine, 22nd Annual Meeting, #2032, Milan, Italy.
24. Wu PH, Chung HW, Ko CW, Wu MT (2014) , " Quantitative assessment of spatial and temporal pulmonary arterial regurgitation after repaired Tetralogy of Fallot ", in International Society of Magnetic Resonance in Medicine, 22nd Annual Meeting, #2494, Milan, Italy.
25. Wu PH, Chung HW, Wu MT, Ko CW (2014) , "Investigation of flow instabilities in branch pulmonary arteries after repaired Tetralogy of Fallot ", in International Society of Magnetic Resonance in Medicine, 22nd Annual Meeting, #2496, Milan, Italy.
26. Hsiao YH, Chen CY, Tsai PH, Chung HW, Chou MC, Chiang SW, Chen YC, Kao HW (2014) , "Segmentation of anterior thalamic nucleus in DTI study: comparison of CSD-based nethod and conventional DT model ", in International Society of Magnetic Resonance in Medicine, 22nd Annual Meeting, #2654, Milan, Italy.
27. Tsai PH, Chou MC, Chen CY, Chiang SW, Wang CY, Chung HW, Kao HW, Hsiao YH (2014) , " Leukoencephalopathy in acute CO intoxication: diffusion kurtosis versus diffusivity ", in International Society of Magnetic Resonance in Medicine, 22nd Annual Meeting, #2683, Milan, Italy.
28. Cheng CM, Hung JJ, Chung HW, Hung SC, Liang ML, Hsieh JC, Lin SJ, Yeh TC (2014) , " The application of functional challenge tasks in Moyamoya patients ", in International Society of Magnetic Resonance in Medicine, 22nd Annual Meeting, #4782, Milan, Italy.

賴飛羆教授 Fei-Pei Lai, Professor

※ 學術期刊論文Journal articles

1. Feng-Sheng Lin, Chia-Ping Shen, Chia-Hung Liu, Han Lin, Chi-Ying F. Huang, Cheng-Yan Kao, Feipei Lai, Jeng-Wei

Lin, “A High Performance Multiclass Classification Framework Using Cloud Computing Architecture ,” Journal of Medical and Biological Engineering.

2. Yi-Ju Tseng, Jung-Hsuan Wu, Hui-Chi Lin, Ming-Yuan Chen, Xiao-Ou Ping, Chun-Chuan Sun, Rung-Ji Shang, Wang-Huei Sheng, Yee-Chun Chen, Feipei Lai, Shan-Chwen Chang, “Development and Evaluation of a Web-Based, Hospital-Wide Healthcare-Associated Bloodstream Infection Surveillance and Classification System,” JMIR Medical Informatics.
3. Jin-Ming Wu, Te-Wei Ho, Ting-Chun Kuo, Ching-Yao Yang, Hong-Shiee Lai, Pin-Yi Chiang, Su-Hua Hsieh, Feipei Lai, and Yu-Wen Tien, “Glycemic Change after Pancreaticoduodenectomy - A Population-based study,” Medicine, 2015 June.
4. Te-Wei Ho, Jin-Ming Wu, Ting-Chun Kuo, Ching-Yao Yang, Hong-Shiee Lai, Su-Hua Hsieh, Feipei Lai, and Yu-Wen Tien , “Change of both endocrine and exocrine insufficiencies after acute pancreatitis in nondiabetic patients: a nationwide population-based study,” Medicine, 2015 June.
5. Te-Wei Ho, Chen-Wei Huang, Ching-Miao Lin, Feipei Lai, Jian-Jiun Ding, Yi-Lwun Ho, Chi-Sheng Hung, “A Tele-surveillance System with Automatic ECG Interpretation based on Support Vector Machine and Rule-based Processing,” JMIR Medical Informatics.
6. Chen KH, Wu JM*, Ho TW, Yu HJ, Lai F. A cross-hospital cost and quality assessment system by extracting frequent physician order set from a nationwide Health Insurance Research Database. Computer methods and programs in biomedicine 2015;120:142-53.
7. Jin-Ming Wu, Hwan-Jeu Yu, Te-Wei Ho, Xing-Yu Su, Ming-Tsan Lin and Feipei Lai, “Tablet PC-Enabled Application Intervention for Patients with gastric cancer undergoing gastrectomy,” Computer Methods and Programs in Biomedicine 2015;119:101-9.
8. Xiao-Ou Ping, Yi-Ju Tseng, Yan-Po Lin, Hsiang-Ju Chiu, Feipei Lai, Ja-Der Liang, Guan-Tarn Huang, Pei-Ming Yang, “A multiple measurements case-based reasoning method for predicting recurrent status of liver cancer patients,” Computers in Industry.
9. Jin-Ming Wu, Hwan-Jeu Yue, Hong-Shiee Lai, Po-Jen Yang, Ming-Tsan Lin, Feipei Lai, “Improvement of heart rate variability following decreased insulin resistance after sleeve gastrectomy for morbidly obesity patients,” Surgery for Obesity and Related Diseases: official journal of the American Society for Bariatric Surgery 2015;11:557-63.

※ 研討會論文 Conference & proceeding papers

1. Zih-Heng Wu, Wei Chen, Feipei Lai, Jian-Jhong Wang, Kai-Ti Chang, Meng-Chun Lin, Ron-Bin Shu, Chun-Fu Lai and Tun-Jun Tsai, “Web-based Pulse Analysis System for Detection of Acute Kidney Injury,” 2015 IEEE MTT-S International Microwave Workshop Series on RF and Wireless Technologies for Biomedical and Healthcare Applications, Taipei, Taiwan, September 21-23, 2015.
2. Xin-Yu Lin, Te-Wei Ho, Cheng-Chung Fang, Zui-Shen Yen, Bey-Jing Yang, Feipei Lai, “A Mobile Indoor Positioning System Based on iBeacon Technology,” IEEE Engineering in Medicine and Biology Society (EMBC'15), Milano, Italy, August 25-29, 2015.
3. Wei Chen, Chia-Ping Shen, Ming-Jang Chiu, Qibin Zhao, Andrzej Cichocki, Jeng-Wei Lin, Feipei Lai, “Epileptic EEG Visualization and Sonification Based on Linear Discriminate Analysis,” IEEE Engineering in Medicine and Biology Society (EMBC'15), Milano, Italy, August 25-29, 2015.
4. Chien-Han Kuo, Xiao-ou Ping, Feipei Lai, Yi-Ju Tseng, Ja-Der Liang, Guan-Tarn Huang, Pei-Ming Yang, “Predictive Model with Liver Cancer Multiple Measurements Data Based on Support Vector Machines: A Case Study,” The Second World Conference on Targeting Liver Diseases, St. Julian’s, Malta, June 25-56, 2015.
5. Peter Shaojui Wang, Shyh-Wei Chen, Chien-Han Kuo, Chien-Ming Tu, and Feipei Lai, “An Intelligent Dietary Planning Mobile System with Privacy-preserving Mechanism,” IEEE International Conference on Consumer Electronics 2015, Taipei, Taiwan, June 6-8.
6. Xiao-Ou Ping, Yi-Ju Tseng, Ja-Der Liang, Guan-Tarn Huang, Pei-Ming Yang, and Feipei Lai, “Missing Value Imputation on Multiple Measurements for Prediction of Liver Cancer Recurrence: A Comparative Study,” International Computer Symposium 2014, Taichung, Taiwan, December 12-14.
7. Lichin Chen, Te-Wei Ho, Yi-Lwun Ho, Feipei Lai, Tse-Pin Hsu, “Evaluating the Requirements of Patients with Heart Diseases in a Telehealthcare Service,” 2014 Biomedical Engineering International Conference (BMEiCON 2014), Fukuoka, Japan, Nov 26-28, 2014.
8. Yan-Bo Lin, Xiao-Ou Ping, Te-Wei Ho, and Feipei Lai, “Processing and analysis of imbalanced liver cancer patient data by case-based reasoning,” 2014 Biomedical Engineering International Conference (BMEiCON 2014), Fukuoka, Japan, Nov 26-28, 2014.
9. Bo-Chiang Huang, Yi-Ju Tseng, Te-Wei Ho, Hui-Chi Lin, Yee-Chun Chen, and Feipei Lai, “A Healthcare-associated Surgical Site Infection Surveillance and Decision Support System,” 2014 Biomedical Engineering International Conference (BMEiCON 2014), Fukuoka, Japan, Nov 26-28, 2014.
10. Te-Wei Ho, Horng-Yih Lai, Yu-jie Wang, Wei-Hsin Chen, Yi-Lwun Ho, Chi-Sheng Hung, and Feipei Lai, “A Clinical Decision and Support System with Automatically ECG Classification in Telehealthcare,” 2014 IEEE 16th International Conference on e-Health Networking, Applications and Services (Healthcom 2014), October 15-18, 2014, Natal, Brazil.
11. Xing-Yu Su, Fong-Ci Lin, Lichin Chen, Kuo-Chin Huang, Chia-Wen Lu, Chia-Yi Chen, Te-Wei Ho, and Feipei Lai, “A Service Oriented Tele-health Promotion Information System with Mobile Application,” The 4th International Conference on Current and Future Trends of Information and Communication Technologies in Healthcare (ICTH-2014), Sept. 22-25, 2014, Halifax, Canada.
12. Wei Chen, Zih-Heng Wu, Chin-Jung Yang, Zhen-Kai Liao, Feipei Lai, Chia-Lin Hsu, and Wei-Zen Sun, “Pulse Analysis System with a Novice Periodic Function Examination Method on Sepsis Survival Prediction,” The 4th International Conference on Current and Future Trends of Information and Communication Technologies in Healthcare (ICTH-2014), Sept. 22-25, 2014, Halifax, Canada.
13. Wei-Ti Su, Xiao-Ou Ping, Yi-Ju Tseng, and Feipei Lai, “Multiple Time Series Data Processing for Classification with Period Merging Algorithm,” The 4th International Conference on Current and Future Trends of Information and Communication Technologies in Healthcare (ICTH-2014), Sept. 22-25, 2014, Halifax, Canada.
14. Chien-Ming Tu, Shih-Han Ku, Ju-Chi Tseng, Hsiang-Ting Kao, Fang-Sun Lu, and Feipei Lai, "CHT Cloud Orchestration: an Integrated Cloud System of Virtualization Platform," The 16th Asia-Pacific Network Operations and Management Symposium, September 17-19, 2014, National Chiao Tung University, Taiwan, APNOMS 2014.
15. Lichin Chen, Hui-Chu Yu, Hung-Chang Lee, Yufang Chung, Rung-Ji Shang, Hsiu-Yun Liu, Ching-Ting Tan, and Feipei Lai, “Improving Inpatient Fall Prevention Strategies Using Interactive Data Repository Information System,” The 12th International Congress on Nursing Informatics, June 21-25, 2014, Taipei, Taiwan.

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

※ 學術期刊論文Journal articles

1. T.-C. Chen, J.-H. Liu, P.-Y. Chao and P.-C. Li, “Ultra-Wideband Synthetic- Aperture Radar for Respiratory Motion Detection”, IEEE Transactions on Geoscience and Remote Sensing, Vol. 53, No. 7, pp. 3749-3763, July 2015.
2. U-W. Lok, G.-W. Fan and P.-C. Li, “Lossless Data Compression for Improving the Performance of a GPU-Based Ultrasound Beamformer,” Ultraonic Imaging, pp. 1-17, August, 2014.

3. Y.-H. Wang and P.-C. Li, "SNR-Dependent Coherence-Based Adaptive Imaging For High-Frame-Rate Imaging and Photoacoustic Imaging," IEEE Transactions on Ultrasonics, Ferroelectrics and Frequency Control, Vol. 61, pp 1419-1432, Aug, 2014.
4. Yu-Hsin Wang, Shi-Ping Chen, Ai-Ho Liao, Ya-Chuen Yang, Cheng-Ru Lee, Cheng-Han Wu, Pei-Chun Wu, Tzu-Ming Liu, Churng-Ren Chris Wang, and Pai-Chi Li, "Synergistic delivery of gold nanoparticles using multifunctional microbubbles for enhanced plasmonic photothermal therapy ," Scientific Reports 4, Article number: 5685, July, 2014.

※ 研討會論文 Conference & proceeding papers

1. S.-W. Liu, W.-W. Liu and P.-C. Li, "Triggered vaporization of gold nanodroplets for enhanced photothermal therapy", SPIE Photonics West 2015, San Francisco, California, February 7-12, 2014.
2. P.-C. Li, "Theranostic agent for enhanced plasmonic photothermal therapy", invited talk, the Second Congress of New Development on Molecular Imaging, Guangzhou, China, December 19-21, 2014.
3. P.-C. Li, " Diagnostic Ultrasound Safety: Radiation Force Based Imaging as an Example", invited talk, the 11-th Congress of the Asian Federation of Societies for Ultrasound in Medicine and Biology, Kuala Lumper, Malaysia, October 30-November 1, 2014.
4. P.-C. Li, "Ultrasound for Preclinical Research on Small Animals and 3D Cell Culture Systems", keynote speech, International Conference on Biomedical Ultrasound (ICBMU), Shenzhen, China, October 21-22, 2014.
5. P.-C. Li, "Ultrasound for Preclinical Research: Theranosis and 3D Cell Culture System", the 9th International Conference on Ultrasonic Biomedical Microscanning (UBM 2014), keynote speech, Edinburgh, Scotland, September 28-October 1, 2014.
6. P.-C. Li, "Open Platforms for Biomedical Ultrasound Research", invited talk, CUMB 2014, Xian, China, September 19-20, 2014.
7. P.-C. Li, "Enhanced photoacoustic imaging and photothermal therapy with synergistic delivery of gold nanorods", invited talk, World Molecular Imaging Congress (WMIC), Seoul, Korea, September 17-20, 2014.
8. L.-Y. Tseng, Y.-R. Liou, C.-H. Wang, D.-L. Ou and P.-C. Li, " Evans Blue Extravasation in Mouse Tumor Model Using Ultrasound Image-Guided Sonoporation", World Molecular Imaging Congress (WMIC), Seoul, Korea, September 17-20, 2014.
9. U.-W. Lok and P.-C. Li, "Improving Performance of GPU-based Software Beamforming using Transform-based Channel Data Compression ", IEEE International Ultrasonics Symposium (IUS), Chicago, USA, September 3-6, 2014.
10. T.-T. Chu, C.-L. Yeh, P.-C. Li and P.-L. Kuo, "Finite element analysis of strain-stiffening behaviors of tendons: compared with shear wave elasticity imaging ", IEEE International Ultrasonics Symposium (IUS), Chicago, USA, September 3-6, 2014.
11. S.-W. Liu, Y.-R. Liou, Y.-H. Wu, Y.-C. Yang, C.-R. Wang and P.-C. Li, "Enhanced Photothermal Therapy Using Gold Nanodroplets", IEEE International Ultrasonics Symposium (IUS), Chicago, USA, September 3-6, 2014.
12. P.-Y. Chao and P.-C. Li, "Shear Modulus Imaging Based on Full-Field Laser Speckle Contrast Analysis for Improved Spatial Resolution", IEEE International Ultrasonics Symposium (IUS), Chicago, USA, September 3-6, 2014.
13. M. Sun, P.-L. Kuo and P.-C. Li, "Imaging 3D Cell Culture Systems Using an Optical Resolution Photoacoustic Microscope ", IEEE International Ultrasonics Symposium (IUS), Chicago, USA, September 3-6, 2014.
14. C.-L. Yeh, P.-L. Kuo and P.-C. Li, "Stiffness Dynamics of Rabbit's Achilles Tendons Evaluated by Shear Wave Elastography in vivo", IEEE International Ultrasonics Symposium (IUS), Chicago, USA, September 3-6, 2014.
15. C.-L. Yeh, B.-R. Chen, L.-Y. Tseng, P. Jao, T.-H. Su and P.-C. Li, "Shear Wave Elastography of a Liver Fibrosis Mouse Model Using a High Frequency Ultrasound System with Mechanical Scanning", IEEE International Ultrasonics Symposium (IUS), Chicago, USA, September 3-6, 2014.
16. C.-T. Li, P.-C. Li and P.-L. Kuo, "3D Cell Mechanobiology Study using Shear Wave Elasticity Imaging", IEEE International Ultrasonics Symposium (IUS), Chicago, USA, September 3-6, 2014.
17. Y.-H. Wang, S.-P. Chen and P.-C. Li, "Enhanced plasmonic photothermal therapy by combining targeted delivery of gold nanoparticles with sonoporation", The 35th PIERS, invited talk, Guangzhou, China, August 25-28, 2014.
18. C.-Y. Lee, T. T. Loc and P.-C. Li, "Automatic conformal ultrasound scanning for breast cancer screening", The 28th International Congress and Exhibition on Computer Assisted Radiology and Surgery (CARS 2014), Fukuoka, Japan, June 25-28, 2014.
19. P.-C. Li, "Open platforms for biomedical ultrasound research", 2014 Advanced Biomedical Ultrasound Technology Summit, invited talk, Shenzhen, China, June 14, 2014.

歐陽彥正教授 Yen-Jen Oyang, Professor

※ 學術期刊論文 Journal articles

1. Chang KW, Huang NA, Liu IH, Wang YH, Wu P, Tseng YT, Hughes MW, Jiang TX, Tsai MH, Chen CY, Oyang YJ, Lin EC, Chuong CM, Lin SP.Emergence of differentially regulated pathways associated with the development of regional specificity in chicken skin.BMC Genomics. 2015 Jan 23;16:22.
2. Huang CT, Oyang YJ, Huang HC, Juan HF.MicroRNA-mediated networks underlie immune response regulation in papillary thyroid carcinoma.Sci Rep. 2014 Sep 29; 4:6495.
3. Nancy A. Huang, Yen-Jen Oyang: Microbial abundance patterns of host obesity inferred by the structural incorporation of association measures into interpretable classifiers. BIBM 2014: 315-319

宋孔彬副教授 Kung-Bin Sung, Associate Professor

※ 學術期刊論文 Journal articles

1. Shih-Chung Wei, Pei-Tung Yang, Tzu-Heng Wu, Yin-Lin Lu, Frank Gu, Kung-Bin Sung*, and Chii-Wann Lin*, "Characteristic investigation of scanning surface plasmon microscopy for nucleotide functionalized nanoarray," Optics Express, 23(15), 20104-20114, Jul. 2015.
2. Shih-Chung Wei, Tsung-Liang Chuang, Da-Shin Wang, Hui-Hsin Lu, Frank X. Gu, Kung-Bin Sung, and Chii-Wann Lin*, "Tip-enhanced fluorescence with radially polarized illumination for monitoring loop-mediated isothermal amplification on Hepatitis C virus cDNA," Journal of Biomedical Optics, 20(2), 027005, Feb. 2015
3. Kung-Bin Sung*, Kuang-Wei Shih, Fang-Wei Hsu, Hong-Po Hsieh, Min-Jie Chuang, Yi-Hsien Hsiao, Yu-Hui Su, and Gen-Hao Tien, "Accurate extraction of optical properties and top layer thickness of two-layered mucosal tissue phantoms from spatially-resolved reflectance spectra," Journal of Biomedical Optics, 19(7), 077002, Jul. 2014
4. Jing-Wei Su, Wei-Chen Hsu, Jeng-Wei Tjiu, Chun-Ping Chiang, Chao-Wei Huang, and Kung-Bin Sung*, "Investigation of influences of the paraformaldehyde fixation and paraffin embedding-removal process on refractive indices and scattering properties of epithelial cells," Journal of Biomedical Optics, accepted, Jun. 2014

※ 研討會論文 Conference & proceeding papers

1. Y.H. Hsiao, G.H. Tien, M.J. Chuang, F.W. Hsu, H.P. Hsieh, K.B. Sung*, “Development of a Movable Diffuse Reflectance Spectroscopy System for Clinical Study of Esophageal Precancer,” Symposium on Clinical and Biomedical Spectroscopy and Imaging IV, European Conferences on Biomedical Optics (ECBO), paper 9537-63, Munich, Germany (Jun. 2015) - Runner-up of the Best Student Poster Award

曾宇鳳教授 Y. Jane Tseng, Professor

※ 學術期刊論文 Journal articles

1. Su, B. H., Tu, Y. S., Lin, C, Shao, C. Y., Lin, O. A., Tseng, Y. J.* (2015). Rule-based Prediction Models of Cytochrome P450 Inhibition. Journal of chemical information and modeling. (IF =4.34, Ranking = 3/100, 3%, Category: Computer Science, Interdisciplinary Applications)
2. Chen H. H., Tseng, Y. J.*, Wang, S. Y., Tsai, Y. S., Chang, C. S., Kuo, T. C., Yao, W. J., Shieh, C. C., Wu, C. H., Kuo, P. H. The metabolome profiling and pathway analysis in metabolic healthy and abnormal. International Journal of Obesity. (IF =5.38, Ranking = 6/79, 7%, Category: Nutrition & Dietetics)
3. Su, B. H., Tu, Y. S., Lin, O. A., Harn, Y. C., Shen, M. Y., & Tseng, Y. J.* (2015). Rule-based Classification Models of Molecular Autofluorescence. Journal of chemical information and modeling. (IF =4.34, Ranking = 3/100, 3%, Category: Computer Science, Interdisciplinary Applications)
4. Wang, S. Y., Kuo, C. H., & Tseng, Y. J.* (2015). An Ion Trace Detection Algorithm to Extract Pure Ion Chromatograms to Improve Untargeted Peak Detection Quality for Liquid Chromatography/Time-of-Flight Mass Spectrometry-based Metabolomics Data. Analytical chemistry. (IF=5.69, Ranking = 3/75, 4%, Category: Chemistry, Analytical)
5. Chen, G. Y., Liao, H. W., Tseng, Y. J., Tsai, I. L., & Kuo, C. H. (2015). A matrix-induced ion suppression method to normalize concentration in urinary metabolomics studies using flow injection analysis electrospray ionization mass spectrometry. Analytica Chimica Acta. (IF= 4.517, Ranking = 5/76, 6%, Category: Chemistry, Analytical)
6. Shao, C. Y., Su, B. H., Tu, Y. S., Lin, C., Lin, O. A., & Tseng, Y. J.* (2015). CypRules: A rule-based P450 inhibition prediction server. Bioinformatics, btv043. (IF = 5.32, Ranking = 2/47, 4%, Category: Mathematical & Computational Biology)
7. Hung, C. S., Li, H. Y., Kuo, C. H., Lin, M. S., Kuo, T. C., Tsai, S. J., Liu, P. H., Lin, C. H., Yang, C.Y., Chuang, L.M., Chen, M.F., Tseng, Y.J.*, & Kao, H. L. (2015). Fasting But Not Changes of Plasma Metabolome During Oral Glucose Tolerance Tests Improve the Diagnosis of Severe Coronary Arterial Stenosis. Clinical endocrinology. (IF = 3.353, Ranking=53/124, 42% Category: Endocrinology & Metabolism)
8. Chen, G. Y., Chiu, H. H., Lin, S. W., Tseng, Y. J., Tsai, S. J., & Kuo, C. H. (2015). Development and application of a comparative fatty acid analysis method to investigate voriconazole-induced hepatotoxicity. Clinica Chimica Acta, 438, 126-134. (IF = 2.764, Ranking=7/31, 22% Category: Medical Laboratory Technology)
9. Lin, S. W., Kang, W. Y., Lin, D. T., Lee, J. C., Wu, F. L. L., Chen, C. L., & Tseng, Y. J.* (2014). Comparison of warfarin therapy clinical outcomes following implementation of an automated mobile phone-based critical laboratory value text alert system. BMC medical genomics, 7(Suppl 1), S13. (IF = 3.466, Ranking=57/161, 35% Category: Genetics & Heredity)

※ 研討會論文 Conference & proceeding papers

1. Shao, C. Y., Su, B. H., Tu, Y.S., Lin, C., Lin, O. A., Tseng, Y. J.*, CypRules: A rule-based P450 inhibition prediction server, 248th ACS National Meeting & Exposition, San Francisco, California, Aug. 10-14. 2014
2. Wang, S. Y., Kuo, C. H., Tseng, Y. J.*, An ion trace detection algorithm to extract pure ion chromatogram to improve untargeted peak detection quality for LC/TOF-MS-based metabolomics data, 10th International conference of the Metabolomics Society, Tsuruoka, Japan, June 26-29, 2014
3. Tsai, D. M., Kuo, C. H., Tseng, Y. J.*, Strategy of UPLC/MS-based Targeted Metabolomics, 10th International conference of the Metabolomics Society, Tsuruoka, Japan, June 26-29, 2014
4. Tan, C. E., Chung, Y. Y., Tseng, Y. J.*, IDMass: GC/MS Data Management and Analyzes Software for Metabolomics Studies, 10th International conference of the Metabolomics Society, Tsuruoka, Japan, June 26-29, 2014

張瑞峰教授 Ruey-Feng Chang , Professor

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1. Chang SC, Lee YW, Lai YC, Tiu CM, Wang HK, Chiou HJ, Hsu YW, Chou YH, Chang RF*, 2014.10, “Automatic slice selection and diagnosis of breast strain elastography,” Medical Physics, vol. 41, no. 10, pp. 10902-1-10.
2. Huang YH, Chang YC, Huang CS, Chen JH, Chang RF*, 2014.10, “Computerized breast mass detection using multi-scale Hessian-based analysis for dynamic contrast-enhanced MRI,” Journal of Digital Imaging, vol. 27, no. 5, pp. 649-660.
3. Chang YC, Huang YS, Huang CS, Chen JH, Chang RF*, 2014.08, “Intrinsic subtypes and tumor grades in breast cancer are associated with distinct 3-D power Doppler sonographic vascular features,” European Journal of Radiology, vol. 83, no. 8, pp. 1368-1374.
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5. Lo CM, Chen RT, Chang YC, Yang YW, Hung MJ, Huang CS*, Chang RF*, 2014.07, “Multi-dimensional tumor detection in automated whole breast ultrasound using topographic watershed,” IEEE Transactions on Medical Imaging, vol. 33, no. 7, pp. 1503-1511.
6. Chang YC, Huang YH, Huang CS, Chen JH, Chang RF*, 2014.06, “Computerized breast lesions detection using kinetic and morphologic analysis for dynamic contrast-enhanced MRI,” Magnetic Resonance Imaging, vol. 32, no. 5, pp. 514-522.

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1. Chang RF, 2014.11, “Computer-aided diagnosis in breast image,”103年度乳房篩檢疑陽個案處置教育訓練精進課程(北區場4-臺大醫學院), Taipei, Taiwan, Nov. 1, 2014. (Invited Talk)
2. Lo CM, Chang RF, Huang CS, Moon WK, 2014.10, “Computer-aided diagnosis of breast tumors using textures from intensity transformed sonographic images”, 1st Global Conference on Biomedical Engineering in conjunction with the 9th Asian-Pacific Conference on Medical and Biological Engineering (GCBME 2014 & APCMBE 2014), Y06, p.62, Tainan, Taiwan. (IFMBE Young Investigator Awards)
3. Chang RF, 2014.10, “Computer aided diagnosis in breast imaging,” 2014 Annual Convention of Taiwan Society of Ultrasound in Medicine, Taipei, Taiwan, Oct. 18-19, 2014, p. 24. (Invited Talk)
4. Lo CM, Chang RF, Chou YH, Lai YC, 2014.08, “Elasticity evaluation of breast tumors using multiple channel quantizations of shear-wave imaging,” 27th IPPR Conference on Computer Vision Graphics and Image Processing (CVGIP), Pingtung, Taiwan, C4-2, p.111.

5. Chang RF, Lo CM, 2014.06, “Computer-aided diagnosis for B-mode, elastography and automated breast ultrasound,”IWDM2014- 12th International Workshop on Breast Imaging, Juroku Plaza, Gifu City, Japan, June 29-July 2, 2014, LNCS 8539, pp. 9-15. (Keynote Speaker)
6. Chang RF, Lo CM, Chen RT, Huang CS, Yang YW, Chang YC, Hung MJ, 2014.06, “Tumor detection in automated whole breast ultrasound using topographic watershed,” CARS 2014 Computer Assisted Radiology and Surgery, Proceedings of the 28th International Congress and Exhibition, Fukuoka, Japan, June 25-28, 2014, vol. 9, supp. 1, p. S232.
7. Chang RF, 2014.06, “Computer-aided diagnosis for B-mode, elastography and automated breast ultrasound,”中華民國醫用超音波學會 2014 年第三次學術研討會, Taipei, Taiwan, June 15, 2014. (Invited Talk)

陳志宏教授 Jyh-Horng Chen, Professor

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1. Chi-Yu Huanga, Kai-Hsiung Hsub, Jyh-Horng Chen, Rong-Sen Yang, “Treating severe phantom limb pain by applying far infrared ray to ‘phantom limb’”. J Formos Med Assoc. 2015 Apr 27. Epub 2015 Apr 27.
2. Manli Song, Jyh-Horng Chen, Ji Chen, In-Tsang Lin. “Comparisons between the 35 mm Quadrature Surface Resonator at 300 K and the 40 mm High-Temperature Superconducting Surface Resonator at 77 K in a 3T MRI Imager”, PLoS ONE 10(3): e0118892, 2015 Mar 26. (IF: 3.737; 7/56 in BIOLOGY)
3. Lei BH, Chen JH*, Yin HS*. ”Repeated amphetamine treatment alters spinal magnetic resonance signals and pain sensitivity in mice”, Neurosci Lett. 2014 Nov 7; 583:70-5. doi: 10.1016/j.neulet.2014.09.031. Epub 2014 Sep 22.
4. Wu EL, Chiueh TD*, Chen JH*, “Multiple-frequency excitation wideband MRI (ME-WMRI)”. Med Phys. 2014 Sep;41(9):092304. doi: 10.1118/1.4893502.
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1. Y.-H. Tung, Y.-A. Huang, E. L. Wu, W.-T. Zhao, T.-D. Chiueh, J.-H. Chen, “A Preliminary Study of Self-Gated Rat Cardiac Imaging by Using Wideband MRI Technique”, Proceedings of the 23th ISMRM Annual Meeting, Toronto, Canada, May 30 - June 05, (2015) (Poster).
2. Y.-J. Li, M.-C. Hsieh, I.-T. Lin, X.-L. Zhang, J.-H. Chen, “Two-channel High-Temperature Superconducting Array for Diffusion Tensor Imaging of Rat Spinal Cord at 7T”, Proceedings of the 23th ISMRM Annual Meeting, Toronto, Canada, May 30 - June 05, (2015) (e-poster).
3. P.-W. Cheng, Y.-H Chuang, Y.-A Huang, E. L Wu, T.-D. Chiueh, J.-H Chen "The high resolution 3D Rat Spine diffusion study by Utilizing Wideband MRI Technique". ISMRM 23rd Annual Meeting & Exhibition, 30 May - 05 June 2015, Toronto, Ontario, Canada (E-Poster)
4. Y.-A. Huang, S.-H. Yang, T.-H. H. Chao, E. L. Wu, D.-Y. Chen, K.-H. Cho, Y.-C. Chang, T.-D. Chiueh, C. W. Wu, L.-W. Kuo, J.-H. Chen , “A Pilot Study of 2X Temporal Resolution Wideband Gradient-Echo in Rodent fMRI.”, The 20th Annual Meeting of the Organization for Human Brain Mapping, Hamburg, Germany, June 8-12, (2014) (Poster).

陳永耀教授 Yung-Yaw Chen, Professor

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2. Y. L. Yu; Y. T. Chao; J. Y. Yen; C. J. Hsu; M. Kam; M. C. Ho; Y. Y. Chen; F. L. Lian; “A novel application for enlarge focus area based on High Intensity Focused Ultrasound (HIFU) probe with a high directivity structure design,” Innovation, Communication and Engineering – Meen, Prior & Lam (Eds), 2014 Taylor & Francis Group, London, ISBN 978-1-138-00117-6, pp. 409-412. (EI)
3. Y. T. Chao; Y. L. Yu; J. Y. Yen; M. Kam; C. J. Hsu; S. T. Liu; M. C. Ho; Y. Y. Chen; F. L. Lian; “Dynamics stress analysis for a high rigidity bendable Minimal Invasive surgical (MIS) instrument design,” Innovation, Communication and Engineering – Meen, Prior & Lam (Eds), 2014 Taylor & Francis Group, London, ISBN 978-1-138-00117-6, pp 413-416. (EI)

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2. M. Kam, S. T. Liu, J. Y. Yen., Y. T. Chao, Y. L. Yu, Y. T. Liao, Y. Y. Chen, M. C. Ho, “Four-bar linkage based minimally invasive surgical instrument design and stiffness synthesis,” 2014 CACS International Automatic Control Conference, Kaohsiung, Taiwan, Nov. 26, 2014.
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成佳憲教授 Chia-Hsien Cheng, Professor

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2. Tsai CL, Hsu FM, Tzen KY, Liu WL, Cheng AL, Cheng JC*. Sonic Hedgehog Inhibition as a Strategy to Augment Radiosensitivity of Hepatocellular Carcinoma. Journal of Gastroenterology and Hepatology 30:1317-1324, 2015 (SCI)
3. Liu WL, Gao M, Tzen KY, Tsai CL, Hsu FM, Cheng AL, Cheng JC*. Targeting phosphatidylinositide3-kinase/Akt pathway by BKM120 for radiosensitization in hepatocellular carcinoma. Oncotarget 5:3662-3672, 2014 (SCI)
4. Cheng JC, Graber MS, Hsu FM, Tsai CL, Castaneda L, Lee JM, Chang DT, Koong AC*. High serum levels of vascular endothelial growth factor-A and transforming growth factor-β1 before neoadjuvant chemoradiotherapy predict poor outcomes in patients with esophageal squamous cell carcinoma receiving combined modality therapy. Annals of Surgical Oncology 21:2361-2368, 2014 (SCI)

5. Wang CC, Liang JT, Tsai CL, Chen YH, Lin YL, Shun CT, Cheng JC*. Neoadjuvant bevacizumab and chemoradiotherapy in locally advanced rectal cancer: early outcome and technical impact on toxicity. World Journal of Surgical Oncology 12:329, 2014 (SCI)

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2. Hsu F, Tsai C, Chang Y, Lee J, Hsieh M, Huang P, Lin C, Hsu C, Cheng J. Clinical application of the seventh UICC-AJCC TNM staging system in patients treated with trimodality therapy for esophageal squamous cell carcinoma. Proceedings of the 56th Annual Meeting of the American Society for Radiation Oncology. San Francisco, U.S.A., September 14-17, 2014.
3. Chiang Y, Cheng J., Graber M, Hsu F, Tsai C, Lee J, Chang D, Koong A. Serum vascular endothelial growth factor-A and transforming growth factor-β1 can predict pathological response and disease-free survival of esophageal cancer patients treated with neoadjuvant chemoradiation therapy followed by esophagectomy. Proceedings of the 56th Annual Meeting of the American Society for Radiation Oncology. San Francisco, U.S.A., September 14-17, 2014.

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1. Jason Chia-Hsien Cheng, Chia-Chun Wang, Inigo San Miguel, and Laura A. Dawson. Part IV Hepatocellular Carcinoma and Intrahepatic Cholangiocarcinoma. Target Volume Delineation for Conformal and Intensity-Modulated Radiation Therapy, N.Y. Lee, N. Riaz, J.J. Lu (eds.), ISBN 978-3-319-05726-2, © Springer-Verlag Berlin Heidelberg 2015
2. Jason Chia-Hsien Cheng, Feng-Ming Hsu, Abraham J Wu, and Lisa A. Kachnic. Part IV Esophageal Cancer. Target Volume Delineation for Conformal and Intensity-Modulated Radiation Therapy, N.Y. Lee, N. Riaz, J.J. Lu (eds.), ISBN 978-3-319-05726-2, © Springer-Verlag Berlin Heidelberg 2015

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

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2. Chang YL, Chen TF, Shih YC, Chiu MJ, Yan SH, Tseng WY.Regional cingulum disruption, not gray matter atrophy, detects cognitive changes in amnestic mild cognitive impairment subtypes.J Alzheimers Dis. 2015; 44(1):125-38. doi: 10.3233/JAD-141839.
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5. Li HC, Chen YS, Chiu MJ, Fu MC, Huang GH, Chen CC.Delirium, Subsyndromal Delirium, and Cognitive Changes in Individuals Undergoing Elective Coronary Artery Bypass Graft Surgery.J Cardiovasc Nurs. 2015 Jul-Aug; 30(4):340-5.
6. Sun Y, Lee HJ, Yang SC, Chen TF, Lin KN, Lin CC, Wang PN, Tang LY, Chiu MJ. A nationwide survey of mild cognitive impairment and dementia, including very mild dementia, in Taiwan.PLoS One. 2014 Jun 18; 9(6):e100303

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

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1. Huang PM, Chou NK, Lin TH, Chen CN. Intrapleural Epinephrine Irrigation for Massive Malignant Hemothorax. Thorac Cardiovasc Surg. 2014 Dec 17.
2. Chen CH, Sun HY, Chien HF, Lai HS, Chou NK. Blastocystis hominis infection in a post-cardiotomy patient on extracorporeal membrane oxygenation support: A case report and literature review. Int J Surg Case Rep. 2014;5(9):637-9.
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黃念祖助理教授 Nien-Tsu Huang, Assistant Professor

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1. A. B. Simon, J. P. Frampton, N. -T. Huang, S. Paczesny, K. Kurabayashi, S. Takayama, " Multiplex biomarker assay for detection of acute graft-versus-host disease", Technology, in press, 2014.
2. B.-R. Oh, N.-T. Huang, W. Chen, J. H. Seo, P. Chen, T. T. Cornell, T. P. Shanley, J. Fu, and K. Kurabayashi ,"Integrated Nanoplasmonic Sensing for Cellular Functional Immunoanalysis Using Human Blood", ACS Nano, Vol. 8, pp.2667-2676, 2014.
3. N.-T. Huang, Hua-li Zhang, M.-T. Chung, J. H. Seo and K. Kurabayashi,"Recent advancements in optofluidics-based single-cell analysis: optical on-chip cellular manipulation, treatment, and property detection", Lab on a Chip, Vol. 14, pp. 1230-1245, 2014. (Selected as the front cover image)

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2. Po-Yen Lu, Che-Pin Chang, Nien-Tsu Huang, "Developing integrated optofluidic platform for cellular immunophenotyping", Optofluidis 2015, Taipei, Taiwan, July 26-29, 2015.
3. Sheng Yang, Chao-Han Yang, Nien-Tsu Huang, "Developing multiple microfiltration membranes microfluidics for monitoring early-stage inflammation of peritoneal dialysis patients", Optofluidis 2015, Taipei, Taiwan, July 26-29, 2015.
4. Yu-Shin Chang, Frank Shyu, Kai-Wei Chang, Mon-Hsun Tsai, Nien-Tsu Huang, "Point Mutation Detection by Microfluidic DNA Microarray for Long QT Syndrome", Optofluidis 2015, Taipei, Taiwan, July 26-29, 2015.
5. Yeu-Farn Shih, Nien-Tsu Huang, Chih-Kung Lee, "Capturing CD4 cells using a functionalized circular microfluidic

device and glutaraldehyde as biolinker for tuberculosis detection and diagnosis", SPIE Phonics West, 2015,San Francisco, USA, February 7-12, 2015.

傅楸善教授 Chiou-Shann Fuh, Professor

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1. C. K. Liaw, T. Y. Wu, S. M. Hou, R. S. Yang, C. S. Fuh, and K. S. Shih,"How to Evaluate Three-Dimensional Angle Difference from Plain Radiographs," Proceedings of SICOT/SIROT Annual International Conference, Rio de Janeiro, Brazil, Paper# 37642, 2014.
2. J. M. Wang, H. P. Chou, S. W. Chen, and C. S. Fuh, "Image Compensation for Improving Extraction of Driver's Facial Features," Proceedings of International Conference on Computer Vision Theory and Applications, Lisbon, Portugal, pp. 329-338, 2014.

黃俊升教授 Chiun-Sheng Huang, Professor

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1. Chung-Ming Lo, Woo Kyung Moon, Chiun-Sheng Huang, Jeon-Hor Chen, Min-Cun Yang, Ruey-Feng Chang. Intensity-Invariant Texture Analysis for Classification of BI-RADS Category 3 Breast Masses. Ultrasound in Medicine & Biology, 2015 Jul. 41(7):2039-2048.
2. Woo Kyung Moon, Yao-Sian Huang, Chung-Ming Lo, Chiun-Sheng Huang, Min Sun Bae, Won Hwa Kim, Jeon-Hor Chen & Ruey-Feng Chang. Computer-aided Diagnosis for Distinguishing between Triple-negative Breast Cancer and Fibroadenomas Based on Ultrasound Texture Features. Medical Physics, 2015 Jun. 42(6):3024-3035.
3. Chih-Hsing Chou, Miao-Juei Huang, Chi-Hau Chen, Ming-Kwang Shyu, John Huang, Ji-Shiang Hung, Chiun-Sheng Huang*, Min-Chuan Huang. Up-regulation of C1GALT1 promotes breast cancer cell growth through MUC1-C signaling pathway. Oncotarget, 2015 Mar. 6(8):6123-35.
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6. Ching-Hung Lin, Chen-Yang Shen, Jih-Hsiang Lee, Chiun-Sheng Huang, Chih-Hsin Yang, Wen-Hung Kuo, Dwan-Ying Chang, Chia-Ni Hsiung, Kuan-Ting Kuo, Wei-Wu Chen, I-Chun Chen, Pei-Fang Wu, Sung-Hsin Kuo, Chien-Jen Chen, Yen-Shen Lu* & Ann-Lii Cheng*. High Prevalence of the BIM Deletion Polymorphism in Young Female Breast Cancer in an East Asian Country. PLoS One, 2015 Apr. 10(4): e0124908. doi:10.1371/journal.pone.0124908
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12. Ching-Te Kuo*, Hao-Kai Liua, Guan-Syuan Huang, Chi-Hao Chang, Chen-Lin Chena, Ken-Chao Chena, Ruby Yun-Ju Huang, Ching-Hung Lin, Hsinyu Lee*, Chiun-Sheng Huang*, and Andrew M. Wo*. A Spatiotemporally Defined In-Vitro Microenvironment for Controllable Signal Delivery and Drug Screening. Analyst, 2014 Oct. 139(19):4846-4854.

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阮雪芬教授 Hsueh-Fen Juan, Professor

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2. Lin, L.-L., Huang, H.-C.*, Juan, H.-F.* (2015) "Circadian systems biology in metazoa" Briefings in Bioinformatics (Mar 10 online) (SCI)
3. Huang, M.-J., Hu, R.-H., Chou, C.-H., Hsu, C.-L., Liu, Y.-W., Huang, J., Hung, J.-S., Lai, I-R., Juan, H.-F., Yu, S.-L., Wu, Y.-M.* and Huang, M.-C.* (2015) "Knockdown of GALNT1 suppresses malignant phenotype of hepatocellular carcinoma by suppressing EGFR signaling" Oncotarget 6(8):5650-65. (SCI)
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5. Lin, L.-L., Hsia, C.-R., Hsu, C.-L., Huang, H.-C.* and Juan, H.-F.* (2015) "Integrating transcriptomics and proteomics to show that tanshinone IIA suppresses cell growth by blocking glucose metabolism in gastric cancer cells" BMC Genomics 16(1):41. (SCI)
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曹建和副教授 Jenho Tsao, Associate Professor

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吳文超副教授 Wen-Chau Wu, Associate Professor

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楊泮池特聘教授 Pan-Chyr Yang, Distinguished Professor

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柒 教師得獎、專利及技術轉移 Award、Patents and Technology Transfer

一、教師得獎 Award

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1. 林啟萬，科技部103年度傑出特約研究員獎，2015。
2. 陳志宏，103年度國家發明創作獎～發明獎銀牌，2015。
3. SPIE Fellow, 2015.
4. 林致廷，台灣化學感測器科技協會年度最佳論文獎，2015。
5. 林致廷，國家晶片系統設計中心優良晶片特別設計獎，2015。
6. 林致廷，國家晶片系統設計中心優良晶片特優設計獎，2015。
7. 林致廷，國家晶片系統設計中心優良晶片優等設計獎，2015。
8. 林致廷，旺宏金矽獎優勝，2015。
9. 曾宇鳳，2015 IBM Faculty Award
10. 曾宇鳳教授、田維誠教授、李嗣涔教授與呂學士教授實驗室，2015優良晶片特別設計獎
11. 呂學一，台灣大學教學優良獎，2015。

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1. 李百祺，TBF生技講座財團法人台灣生技發展基金會 (Taiwan Bio-development Foundation)，2014。
2. 孫啟光，「第十二屆有庠科技講座-光電科技類」得主，2014。
3. 林發暄，芬蘭傑出教授獎，芬蘭國家科學院，2010-2014。
4. 莊曜宇，國立臺灣大學學術研究績效獎，2014。
5. 莊曜宇，國立臺灣大學傑出期刊論文獎，2014。
6. 莊曜宇，國立臺灣大學優良期刊論文獎，2014。
7. 陳志宏，103年國家發明創作獎發明獎銀牌，2014。
8. 陳志宏，台灣大學103年度研發創新傑出獎，2014。
9. 王水深，故高天成教授紀念演講獎，2014。
10. 成佳憲，國立臺灣大學103學年度現職績優研究加給
11. 呂學一，台灣大學教學優良獎，2014。
12. 阮雪芬，國立臺灣大學103年度學術研究績效獎勵（傑出期刊3），2014。
13. 阮雪芬，103學年度科技部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）
14. Wen-Chau Wu，Editor’ s Recognition Award (for reviewing with distinction), Radiology 2014

※ 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. 孫啟光，潘文淵文教基金會研究傑出獎，2013
3. 賴飛羆，2013台灣遠距照護傑出貢獻獎 (Telehealthcare Distinguished Contribution Award)，2013
4. 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
5. 曾宇鳳，American Chemical Society Chemluminary award，2013
6. 阮雪芬，102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）
7. 阮雪芬，台灣大學101學年度學術研究績效獎勵（傑出期刊3）
8. 莊曜宇，國立臺灣大學學術研究績效獎，2013。
9. 莊曜宇，國立臺灣大學傑出期刊論文獎，2013。
10. 莊曜宇，國立臺灣大學優良期刊論文獎，2013。
11. 陳志宏，第10屆國家新創獎(學術研究組)，2013。
12. 陳志宏，the Magna Cum Laude Merit Award for the 21th Annual ISMRM meeting，2013。

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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. 孫啟光，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）
9. 曾宇鳳，American Chemical SocietyIPG award， 2012。
10. 莊曜宇，國立臺灣大學學術研究績效獎，2012。
11. 莊曜宇，國立臺灣大學傑出期刊論文獎，2012。
12. 莊曜宇，國立臺灣大學優良期刊論文獎，2012。

二、專利 Patents

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1. "超音波影像補償方法"，李百祺、魏裕明，中華民國專利I485420號(2015/05/21公告)。
2. "An ultrasound imaging system", P.-C. Li and Y.-F. Li U.S. Patent number 9,007,869, 2015/04/14.
3. "A method of compensating ultrasound image", P.-C. Li and Y.-M. Wei U.S. Patent number 9,008,403, 2015/04/14.
4. "超音波自動掃描系統及其掃描方法"，李百祺，中華民國專利I476403號(2015/03/11公告)。
5. 乳房超音波影像掃描及診斷輔助系統，張瑞峰、周宜宏、黃俊升、張允中、章少謙、楊閔淳、黃耀賢、羅崇銘，中華民國專利I473598號 (2015/2/21~2032/5/17)。
6. "利用光聲效應產生超音波之系統與成像方法"，李百祺、趙珮妤、吳凱文，中華民國申請號104102102（申請日2015/01/22）
7. 利用脈衝雷射光源產生的聲學信號之造影系統，孫啟光，賴昱宏，張界逢，李思宇，中華民國申請號102113270。

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1. "System and method for treating a nerve symptom", Chii-Wann Lin, Yeong-Ray Wen, Shey-Shi Lu,Hung-Wei Chiu, Yao Joe Yang, Win-Pin Shih,Chi-Heng Chang, Wei-Tso LIN,Application number:US8855776 B2,Application date:Oct 7, 2014.
2. “利用超寬頻雷達偵測物體之運動狀態之成像方法及系統”，李百祺、陳宗銓，中華民國專利I453415號(2014/09/21公告)。
3. “Implantable Medical Device and System ”, Jian-Hao Pan, Chii-Wann Lin, Chi-Heng Chang , Application number:US 20150209590 A1, Application date: Jul 30, 2015.
4. “Programmable segmented volumetric modulated arc therapy for respiratory coordination”, J-C Cheng (filed for U.S. Patent, 13/364,014, 2014/04/25)
5. "Programmable Segmented Volumetric Modulated Arc Therapy for Respiratory Coordination in Cancer Radiotherapy", Jason C.-H. Cheng, J.-K. Wu, Application number: 13/364,014
6. 用於偵測光源頻率的偵測方法，陳世明、戴宏碩、黃春福、傅楸善，中華民國專利I434130號(有效日2014/04/11-)。
7. "解析中文輔助閱讀發音之方法及系統"，高成炎、朱學亭，中華民國專利第I432978號(2014/04/01公告)。
8. "超音波診斷系統及其手持式超音波診斷裝置"，李百祺、李彥鋒，中華民國專利I431256 (2014/03/21公告)。
9. "醫學成像系統及其醫學成像方法"，李百祺、陳婉雅，中華民國專利I430778 (2014/03/21公告)。
10. 電子束漂移偵測裝置及偵測電子束漂移之方法，顏家鈺、陳永耀、郭逸宏、吳政儒，中華民國發明第I 426359號(2014.2.11~2031.4.10)
11. "A METHOD OF CALIBRATING ULTRASOUND VELOCITY", P.-C. Li and Y.-M. Wei (filed for US Patent, 14/164566, 2014/01/27)
12. "A METHOD OF COMPENSATING ULTRASOUND IMAGE", P.-C. Li and Y.-M. Wei (filed for US Patent, 14/164588, 2014/01/27)
13. “A Three-Dimensional Cell Culture System and Manufacturing Method Thereof”, P.-C. Li , P.-L. Kuo and C.-H. Tsai (filed for US Paten, 14/208006, 2014/03/13)
14. 用於偵測光源頻率的偵測方法，陳世明、戴宏碩、黃春福、傅楸善，中華民國I434130號(有效日2014/04/11-)。
15. 一種增進顯微術空間解析度的方法，孫啟光、郭唯誠，申請美國專利，申請日2014/04/23。

16. 電子束漂移偵測裝置及偵測電子束漂移之方法，顏家鈺、陳永耀、郭逸宏、吳政儒，中華民國發明專利第I 426359號(有效日2014/2/11~2031/4/10)

17. "Porous film microfluidic device for automatic surface plasmon resonance quantitative analysis", Tsung-Liang Chuang, Chii-Wann Lin, Chia-Chen Chang, Shih-Chung WEI, Application number:US 20150010916 A1,Application date:Jan 8, 2015.

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1. "基因測序序列的組合系統及方法"，朱學亭、高成炎、陳麗貞，中華民國專利第I420007號(2013/12/21公告)。
2. "概念圖學習系統及方法"，岳修平、林致廷、徐式寬、黃若詒、潘貞君、陳俊宇、周彥良，中華民國專利 I 402786號，2013。
3. "三維細胞培養結構及其製造方法"，李百祺、郭柏齡、蔡錦雄，中華民國申請號102142071（申請日2013/11/19）
4. 多截面/區塊磁共振訊號之控制方法、成像方法及系統，陳志宏、闕志達、吳億澤、郭立威，中華人民共和國專利第ZL200810211671.7號(2013.11.6公告)
5. " A method to determine the chronological age of human skin"，孫啟光、廖怡華，申請美國專利，申請日2013/10/08。
6. "A method and apparatus to differentiate pigmented skin lesions"，孫啟光、廖怡華，蔡明容，申請美國專利，申請日2013/10/18。
7. "超音波聲速校正方法"，李百祺、魏裕明，中華民國專利申請號102136744（申請日2013/10/11）
8. "超音波影像補償方法"，李百祺、魏裕明，中華民國專利申請號102135058（申請日2013/9/27）
9. "Structure-Based Fragment Hopping For Lead Optimization And Improvement In Synthetic Accessibility", Tseng YJ, Lin FY, U.S. Patent No. US 2013/0226549 A1, August 29, 2013
10. "A stepped-shape structure", P.-C. Li and Y.-C. Wu (filed for US Patent, 13/966576 , 2013/8/14)
11. "True ion pick (TIPick): a denoising and peak picking algorithm to extract ion signals from liquid chromatography/mass spectrometry data", Tseng YJ, Ho TJ,Kuo CH,U.S. Provisional Patent No.61/861544, August 2, 2013
12. "特定群核酸序列組合之最小群多用引子及特異群雙重探針及其鑑別檢測應用方法"，張春梵、黃友正、高成炎，中華民國專利第I403587號(2013/08/01公告)。
13. "光聲成像系統、編碼雷射發射裝置與光聲訊號接收裝置"，李百祺，中華民國專利I403784號(2013/08/01公告)。
14. "影像探頭"，李百祺、謝寶育，中華民國專利I402054號(2013/7/21公告)
15. "A Distribution-based Classification Method for Baseline Correction of Metabolomic 1D Proton Nuclear Magnetic Resonance Spectra", Tseng YJ, Wang KH, U.S. Provisional Patent No. 61/137048, June 24, 2013
16. "檢測一胃癌預後程度方法"，阮雪芬、陳炯年、曾建偉、張金堅，中華民國專利第Ⅰ399541號(2013.6.21~2029.5.26)
17. "高密度微電極陣列及其序列式控制方法" ，林啟萬、陳志宏、楊豐旗，097147521(2013/05/23核准)
18. 發光裝置及其製造方法，李嗣涔、江昱維、吳奕廷、蔡明瑋、張沛恩，中華民國專利第I 396308號(2013.05.11~2032.03.16)
19. "Method for k-space reconstruction in magnetic resonance inverse imaging", Fa-Hsuan Lin, issued on March 19, 2013 (United States Patent 8,400,152)
20. "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" ，林啟萬、邱南福、李世光、吳光鐘，中華民國I359269號，有效日2027/10/29
21. "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"，林啟萬、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
22. "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)。
23. "利用脈衝雷射光源產生的聲學信號之造影系統"，孫啟光、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。
24. "Ultrasonic diagnostic system and portable ultrasonic diagnostic apparatus thereof", P.-C. Li and Y.-F. Li (filed for US Patent, 13/849607, 2013/3/25).
25. "An image generation system", P.-C. Li and B.-Y. Hsieh (filed for U.S. Patent, 13/803657, 2013/03/14).
26. "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)。
27. "超音波探針"，李百祺、劉建宏，中華民國專利I384252號。(2013/2/1公告)
28. "An ultrasound imaging system", P.-C. Li and Y.-F. Li (filed for U.S. Patent, 13/746548, 2013/01/22).
29. "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)。
30. "A multi-bits parallel prefix adder and the domino logics for implementing the adder" ,陳中平, 專屬I406172。

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1. "結構物即時安全監測系統,"，林致廷、曾惠斌、韓仁毓，中華民國專利M443724號， 2012。
2. "變位監測系統"，韓仁毓、曾惠斌、林致廷，中華民國專利 M443725號， 2012。
3. "Method for detecting the motion of object by ultra-wideband radar imaging and system thereof", P.-C. Li and T.-C. Chen (filed for U.S. Patent, 13/726274, 2012/12/24).
4. 預測食道癌病患對於化學暨放射線療法之反應的生物標記，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I380018號，專利權起/迄日2012/12/21~2029/10/19
5. "超音波影像處理系統及其超音波影像處理方法"，李百祺，中華民國專利I378255號。(2012/12/1公告)
6. "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)
7. "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)。
8. "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).
9. "Ultrasonic scanhead", P.-C. Li and J.-H. Liu, U.S. Patent number 8,308,645, 2012/11/13.
10. "超音波成像系統"，李百祺、李彥鋒，中華民國專利申請號101141329 (申請日2012/11/07)。
11. "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-).
12. "利用超寬頻雷達偵測物體之運動狀態之成像方法及系統"，李百祺、陳宗銓，中華民國專利申請號101140755(申請日2012/11/02)。

13. 遠距照護裝置以及儲存遠距照護方法之電腦可讀取紀錄媒體，林明燦、賴飛羆、吳經閔、蘇醒宇，申請日102/10/23
14. “Imaging probe”, P.-C. Li and B.-Y. Hsieh, U.S. Patent number 8,262,576, 2012/09/11.
15. "影像校正方法及影像校正積體電路"，張博思、傅楸善、尤智人士、陳俊宇，中華民國I370411號(有效日2012/08/11-2028/01/15)。
16. "Photoacoustic imaging system, coded laser emitting apparatus and photoacoustic signal receiving apparatus”, P.-C. Li (filed for US Patent, 13/098611, 2011/5/2; publication date 2012/07/05, US 2012/0167694).
17. “Medical imaging system and medical imaging method thereof”, P.-C. Li and W.-Y. Chen (filed for US Patent, 13/116286, 2011/5/26; publication date 2012/06/28, US 2012/0165677).
18. “Wireless power transmission system, wireless power transmitting apparatus and wireless power receiving apparatus", P.-C. Li (filed for US Patent, 13/071813, 2011/3/25; publication date 2012/06/21, US 2012/0157019).
19. "Quinazolinone and quinazoline compounds and their pharmaceutical uses", Fu WM, Kang KH, Liou HH, Liou HC, Tseng, YJ, U.S. Provisional Patent No. 61/649425, May 21, 2012
20. "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"，孫啟光、蔡沅甫、陳華，申請中華民國專利，申請號101114805，申請日2012/4/25。
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