EPA-95-HA14-03-D117

「第 21 屆近代工程技術暨第 28 屆中美工商聯合會議」

計畫名稱：第 21 屆近代工程技術暨第 28 屆中美工商聯合會議」
計畫編號：EPA-95-HA14-03-D117
計畫執行單位：社團法人中國工程師學會
計畫執行期間：95 年 8 月 15 日至 95 年 10 月 15 日
計畫經費：玖拾萬元整

行政院環境保護署編印
中華民國 95 年 10 月

「第 21 屆近代工程技術暨第 28 屆中美工商聯合會議」基本資料表

甲、委辦單位	行政院環境保護署		
乙、執行單位	社團法人中國工程師學會		
丙、年　　度	95 年度	計畫編號	EPA-95-HA14-03-D117
丁、專案性質	勞務類其他（標的分類代碼 299）		
戊、專案領域	廢棄物管理		
己、計畫屬性	□科技類	■非科技類	
庚、全程期間	95 年 8 月～ 95 年 10 月		
辛、本期期間	95 年 8 月～ 95 年 10 月		
壬、本期經費	0 億 900 千元		
	資本支出	經常支出	
	土地建築＿＿＿＿千元	人事費＿＿＿＿千元	
	儀器設備＿＿＿＿千元	業務費 900 千元	
	其　　他＿＿＿＿千元	材料費＿＿＿＿千元	
		其　他＿＿＿＿千元	

癸、摘要關鍵詞（中英文各三則）
資源回收再利用 Environmental Protection & Resource Recycle
廢棄物管理 Waste Management
電池 Battery

參與計畫人力資料：（如僅代表簽約而未參與實際專案工作計畫者則免填以下資料）

參與計畫人員姓名	工作要項或撰稿章節	現職與簡要學經歷	參與時間（人月）	聯絡電話及 e-mail 帳號
傅勝利	籌備委員會主任委員	現職： 義守大學校長 學歷： 國立成功大學電機研究所博士	2 個月	07-6577001
徐祥禎	執行秘書	現職： 義守大學機械與自動化工程學系系主任 學歷： 北卡羅來納州立大學機械與航空工程學系博士	2 個月	07-6577711 Ext 3201
唐次朗	研討會主講人	現職： Secience Review Administrator, US Environmental Protection Agency 學歷： Ph.D., Env. Eng., University of Iowa	2 個月	Phone: 002-1-202-343-9778 Email: tang.don@epa.gov

勞長春	研討會主講人	現職： Residence Project Manager, CP Project 學歷： Ph.D., Chemistry., University of Corolado at Denvor	2 個月	Phone: 002-1-905-415-0869 Email: rclconsulting@comzik.com
張克致	研討會主講人	現職： Program Manager, Office of Environmental Management, DOC 學歷： PhD Environmental Engineering, Georgia Institute of Technology, Atlanta, GA	2 個月	Phone: 002-1-240-462-8900 Email: kerchichang@comcast.net
張四立	研討會主講人	現職： 國立台北大學自然資源與環境管研究所教授兼所長 學歷： 美國賓州大學能源管理與政策博士	2 個月	Phone: 02-2500-9744 E-mail: ssuli@mail.ntpu.edu.tw
賴秋助	研討會主講人	現職： 工研院材化所微小型燃料電池實驗室主任 學歷： 國立交通大學電子所博士	2 個月	Phone: 03-591-7570 Email: Tim_Lai@itri.org.tw
張添晉	研討會主講人	現職： 國立台北科技大學環境規劃與管理研究所副教授 學歷： 國立中央大學土木工程研究所博士	2 個月	Phone: 02-2781-1334 Email: tcchang@ntut.edu.tw

「第 21 屆近代工程技術暨第 28 屆中美工商聯合會議」計畫成果中英文摘要（簡要版）

一、中文計畫名稱：
第２１屆近代工程技術暨第２８屆中美工商聯合會議

二、英文計畫名稱：
The 2006 Biennial ROC-USA Business Conference and The Modern Engineering & Technology Seminar 2006

三、計畫編號：
EPA-95-HA14-03-D117

四、執行單位：
社團法人中國工程師學會

五、計畫主持人（包括共同主持人）:
義守大學傅勝利校長

六、執行開始時間：
95/08/15

七、執行結束時間：
95/10/15

八、報告完成日期：
95/10/11

九、報告總頁數：
72

十、使用語文：
中文

十一、報告電子檔名稱：
EPA95HA1403D117.DOC

十二、報告電子檔格式：
WORD

十三、中文摘要關鍵詞：
資源回收再利用，廢棄物管理，電池

十四、英文摘要關鍵詞：
Environmental Protection & Resource Recycle, Waste Management, Battery

十五、中文摘要（約三百至五百字）

資源回收再利用方式已由 80 年代 3R（Reduce 減量、Reuse 再利用、Recycle 回收）理念，延伸為 6R（3R 加上 Refuse 拒絕、Research 研究及 Replace 替代），因此減量、資源回收與再利用已成為國際環境發展之主流。我國也順應潮流，對於廢棄物的管理，已由妥善處理導向為「全回收、零廢棄」及永續環境的方向推行。

本計畫係辦理「第 21 屆近代工程技術暨第 28 屆中美工商聯合會議」，其中「資源回收再利用組」，討論的議題是與「電池」有關的回收處理政策與技術，邀請美洲地區與國內在電池回收再利用、處理技術與政策相關領域之專家學者進行共 6 項議題演講，國外專家訪台期間在台灣參觀了工研院及國內電池回收廠等，了解台灣資源回收制度與法規已相當完備，技術發展與教育宣導工作也做得很紮實，未來如再強化市場機制的輔導運作，有助於台灣的資源回收再利用成果的提升。本次研討會「資源回收再利用組」是以電池的回收再利用管理政策與技術為主題進行研討，對於乾電池、鉛蓄電池的回收都有深入的討論與交流，期望能對台灣邁向「資源循環型社會」的目標有所幫助。

十六、英文摘要：

In 1980s, the resource recycle techniques include of 3R concept, namely reduce, reuse, and recycle. And nowadays, the notion has been extended to 6R (3R plus refuse, research, and replace). Along with this global trend in environment protection, the waste management in Taiwan has been devoting the attention to “Total Recycle, Zero Waste” and “Sustainable Environment”.

In this project “The 2006 Biennial ROC-USA Business Conference and The Modern Engineering & Technology Seminar 2006”, we have invited three researchers from America as well as some Taiwanese experts to give their presentations in the “Environmental Protection and Resource Recycle Seminar” and to share their experiences on the issues of battery recycling policy and techniques. During the guest speakers’ stay in Taiwan, a visit to ITRI as well as to a battery recycling company has been arranged to recognize the status quo of resource recycling system and regulations in Taiwan. Through this project, we expect to find feasible ways to facilitate a “Recycle-Oriented Society”.

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附件一、大會手冊

附件二、論文集

附件三、總結報告

第一章、前言

（一）會議緣起

為了結合海內外傑出工程界人士，共同為國家經濟建設貢獻力量，1965 年李國鼎先生在擔任經濟部長暨本學會（中國工程師學會）理事長期間，尤感於美國中止對我國的經濟、技術援助，國家面臨重大難關，為持續推動國家經建計畫，避免工程技術的斷層，經多方奔走，終於促成由中工會與美洲中國工程師學會聯合於 1966 年 7 月在台灣舉辦第 1 屆「近代工程技術討論會」（Modern Engineering and Technology Seminar，簡稱 METS），邀請旅美學人專家回國建言，引進前驅性的科技新知及技術。

由於幾次會議的效果良好，經各方決議每兩年續與美洲中工會共同在台北舉辦「近代工程技術討論會」，邀請旅居美國暨歐洲之學人、專家專程歸國，針對最新工程技術與議題進行研討。此後，每屆的 METS 得到政府及相關單位如經濟部工業局、環保署、水利署、衛生署、工業技術研究院、國科會、資策會、電信總局、榮工處，以及中國石油公司、中華電信、中國鋼鐵、台電公司等企業界的全力支持。此期間李國鼎先生及孫運璿先生等多位工程及經貿界前輩，更是不遺餘力，在幕前幕後領導、支持。

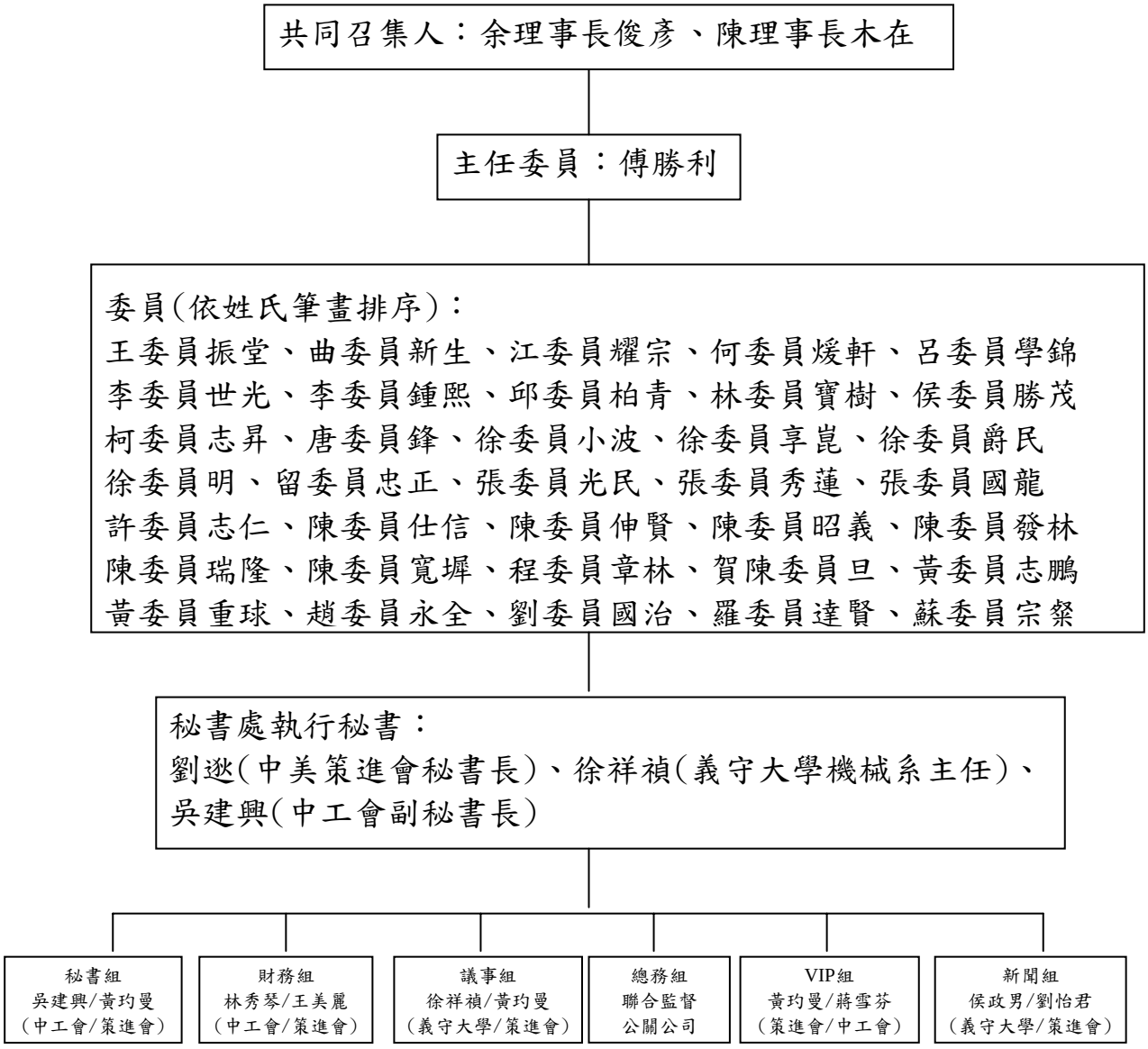
METS 舉辦至今已屆 40 載，截至 2004 年 11 月，成功舉辦了 20 屆會議，從 2002 年（第 19 屆 METS）開始，本學會首次與中美經濟合作策進會共同舉辦聯合會議；希望結合技術與商務平台，共同推動美國與台灣兩地在科技產業、服務業、資金上的合作，交換商業資訊，以謀求科技水準與經營能力更高層次的提昇。

（二）本屆會議籌劃內容

為普及技術交流與經驗分享效果，本學會循例與中美經濟

合作策進會共同規劃「第 21 屆近代工程技術暨第 28 屆中美工商聯合會議」，本計畫係辦理「第 21 屆近代工程技術暨第 28 屆中美工商聯合會議」，該會議暨相關活動於本（95）年 9 月 22 日至 9 月 27 日在台北舉辦。大會計分 18 個分組，包括近代工程技術討論會（以技術議題為主）10 個分組、中美工商界聯合會議（以經貿議題為主）8 個分組，邀請國內及旅居美國、加拿大與歐洲的學者專家，對最新工程技術與議題提出研討與交流。籌劃內容包括各分組會前交流與安排參訪活動、晚宴、分組研討會、綜合座談及拜會政府單位及行政長官等。

（三）籌備委員會組織架構



第二章、執行方法

「第 21 屆近代工程技術暨第 28 屆中美工商聯合會議」之大會活動於本（95）年 9 月 22 日至 27 日假台北國際會議中心舉辦，活動日程如下表：

日期	時間	活動	地點
9 月 22 日(星期五)	全日	美方專家抵台 分組會前交流	台北喜來登飯店
9 月 23 日(星期六)	08:30~17:30	續前各分組活動或遠雄自由貿易港區	桃園縣
	18:30~20:00	歡迎晚宴	台北國際會議中心宴會廳
9 月 24 日(星期日)	09:00~16:00 08:00~17:30	高爾夫球賽或 知性之旅	 台北縣鶯歌(陶瓷文化)
	18:30~21:00	台北之夜	台北 101 金融大樓 5 樓
9 月 25 日(星期一)	08:30~10:00	開幕典禮	台北國際會議中心大會堂
	10:30~17:30	分組研討會	台北國際會議中心
9 月 26 日(星期二)	08:30~12:00	分組研討會(部分組別)	台北國際會議中心
	16:00~18:00	綜合座談會	喜來登飯店祿廳
	18:30~21:00	惜別晚宴	喜來登飯店祿廳
9 月 27 日(星期三)	全日	美方貴賓行程(總統府)	大會安排

第三章、結果

（一）活動過程

本計畫以「資源回收再利用」分組的相關活動與研討會為主，期間分別於 9 月 22 日安排國外專家學者參觀國內電池回收廠，針對台灣資源回收制度及法規交換意見；9 月 23 日由大會安排前往桃園縣遠雄經貿園區及桃園縣政府拜會，晚間由中國工程師學會余理事長俊彥及中美經濟合作策進會辜名譽理事長濂松及陳理事長木在設宴歡迎全體與會貴賓。9 月 24 日續安排來訪貴賓前往台北縣參觀市政建設及縣府硬體規劃，晚間台北市政府設宴款待來訪貴賓。

9 月 25 日舉行開幕典禮暨分組研討會，其中「資源回收再利用組」，主要議題為與「電池」有關的回收處理政策與技術，邀請之主講人皆為國內外對「電池」議題學有專精的專家學者：在廢電池的回收技術議題方面，主辦單位邀請國外專家勞長春博士與國立台北科技大學張添晉教授進行專題演講，在電池回收處理政策與效益分析議題方面，邀請國外唐次朗博士與國立台北大學張四立教授進行演講，另外，針對目前最熱門的燃料電池的科技發展與應用議題，則是邀請美國能源專家張克致博士與工研院賴秋助主任發表研究成果。是日研討會討論踴躍，獲得來自產、官、學、研各界與會人員之熱烈回響。

9 月 26 日下午召開綜合座談會，雙方主講人續針對討論議題提出結論與建議。9 月 27 日上午大會安排美方全體貴賓晉見總統，另美方籌備委員會總召集人方玉山博士一行 6 人亦於是日下午拜會行政院蘇院長，針對會議結論交換意見。

是項計畫透過各項參訪、拜會及研討活動之執行，成功提供業者與專家學者在經營與技術開發、引進上的意見交流，對於乾電池、鉛蓄電池的回收都有深入的討論與交流，不僅讓國外的專家學者了解到台灣資源回收制度與法規、技術發展與教育宣導工作的執行，及化市場機制的輔導運作，對於國內回收再利用成果的提升有相當的幫助；會後並提出 10 項結論與建議，期望能對台灣邁向「資源循環型社會」的目標有所幫助。包括目前國際上廢電池回收的最佳可行處理技術與管理策略、未來國內在燃料電池的發展方向與應用，將可以提供國內相關單位執行政策的參考。

（二）研討會議程

時間	議程內容	主講人
08:30-09:00	報到 Registration	
09:00-10:00	開幕典禮 Opening	
10:00-10:20	Coffee Break	

時間	議程內容	主講人
10:20-10:30	主持人致詞 Welcome	
10:30-11:15	Hazard Control Strategies and Recycle Treatment Policy of Used Dry Batteries	Dr. Don T.L.Tang
11:15-12:00	燃料電池科技與應用	賴秋助主任/工研院材料所儲能材料及技術研究組
12:15-14:00	午餐 Lunch Time	
14:00-14:45	Battery Technologies and Energy Source Materials	Dr. Ker-Chi Chang
14:45-15:30	國內廢鉛蓄電池回收處理體系架構研究與成本分析	張四立教授/臺北大學資源管理研究所
15:30-15:45	Coffee Break	
15:45-16:30	Waste Battery Resources Recycling: Process Systems and Strategies for Waste Lead Battery Recovery and Recycling and Associated Cost Analysis	Dr. Robert Lao
16:30-17:15	廢乾電池再利用處理技術探討	張添晉教授/國立台北科技大學環境規劃與管理研究所
17:15-17:45	綜合討論 Panel Discussion	

（三）研討會主講人及論文

1. 唐次朗博士（Dr. Don T. L. Tang）

A.簡歷

Name: Don T. L. Tang 唐次朗

Address: 754 Ridge Drive, McLean, VA 22101, U.S.A.

Phone: (202) 343-9778 (Office)
(703) 893-9308 (Home)

E-mail: **tang.don@epa.gov**

Education:

B.S. Sanitary Eng., National Taiwan University 1960
M.S. Env. Eng., University of Florida 1968
Ph.D. Env. Eng., University of Iowa 1972

Experience:

Department Head, Connell/Metcalf & Eddy, Inc 1977-78
Program Manager, U.S. Environmental Protection Agency (USEPA) 1978-95

Present Position: Science Review Administrator, USEPA

Specialty:

Managing peer review operation in resource recovery, recycle, and reuse, and other environmental areas.

Selected Publications and Patents:

Viable Fee Collection Systems in Solid Waste Management, *a paper at 2nd International Conference on Solid Waste Management 2000.*
Energy from Waste, *Proc. 18th METS.*
The Future of Solid and Hazardous Waste Management, *Proc. 2nd MTETS.*

Social Activities and Honors:

Bronze Medals for Commendable Service, Twice, and Special Achievement Awards in Recognition of High Quality Performance, Three Times at USEPA
General Leader of the National Development Seminar 1992
Vice-Chair of the Organizing Committee from CIE/USA for METS 1994
Overseas Chinese Environmental Engineers and Scientists Association (President 1991, Adviser 1993-Present)
Chinese Institute of Engineers (National Council Member 1990-96, Treasurer 1991)
Member of Chinese-American Professional Association of Metropolitan Washington , DC
Life Member of Water Environment Federation
Life Member of American Water Works Association
Registered Professional Engineer in the States of Florida and Virginia

B.論文

HAZARD CONTROL STRATEGIES AND RECYCLE TREATMENT POLICY OF USED DRY BATTERIES

Don T. L. Tang

Science Review Administrator, U. S. Environmental Protection Agency, Washington, DC, USA

ABSTRACT

Batteries which are used and disposed of improperly may cause damages to the public and environment. Batteries may contain mercury, cadmium, lead and other heavy metals. When introduced into the environment through landfill disposal or incineration, these heavy metals make their way into the food chain, and present serious consequences. To prevent the release of hazardous substances into the environment from the used batteries, appropriate laws and regulations should be

established, followed by efficient and cost-effective collection and recycling and proper disposal of used batteries.

Keywords: battery, recycling, collection, labeling

1. INTRODUCTION

In the United States of America, nearly 3 billion dry-cell batteries are sold every year to power radios, toys, cellular phones, watches, laptop computers, and portable power tools. Batteries contain heavy metals such as mercury, lead, cadmium, and nickel, which can contaminate the environment when batteries are improperly disposed of. When incinerated, certain metals might be released into the air or can concentrate in the ash produced by the combustion process.

Recycling batteries keeps heavy metals out of landfills and the air. Recycling saves resources because recovered plastic and metals can be used to make new batteries. Mercury was phased out of certain types of batteries in conjunction with the "Mercury-Containing and Rechargeable Battery Management Act" (The Battery Act).

Lead-acid automobile batteries and non-automobile lead-based batteries are covered in another subtopic, and will not be discussed in this paper.

2. BATTERY RECYCLING

2.1 Dry Batteries

The term "dry cell" refers to the type of electrolyte contained in the batteries. In dry cell batteries, the electrolyte is absorbed or gelled in other materials rather than being a separate body of liquid such as those used in automobiles (1).

Dry-cell batteries include alkaline and carbon zinc (9-volt, D, C, AA, AAA), mercuric-oxide (button, some cylindrical and rectangular), silver-oxide and zinc-air (button), and lithium (9-volt, C, AA, coin, button, rechargeable). On average, each person in the United States discards eight dry-cell batteries per year.

Alkaline and zinc-carbon batteries are the everyday household batteries used in flashlights, remote controls, and other appliances. Several reclamation companies now process these batteries.

Most small, round "button-cell" type batteries found in items such as watches and hearing aids contain mercury, silver, cadmium, lithium, or other heavy metals as their main component. Button cells are increasingly targeted for recycling because of the value of recoverable materials, their small size, and their easy handling relative to other battery types (2).

2.2 Rechargeable Batteries

Rechargeable batteries are designed for the long haul. Depending on the application, some rechargeable batteries can recharge up to 1,000 times.

Recharging the battery simply reverses the chemical reaction inside it. This changes the battery's components nearly back to their original state and allows them to be reused. About 80 percent of rechargeable batteries are currently composed of nickel and cadmium (Ni-Cd). Ni-Cd rechargeable batteries are commonly found in cellular and cordless telephones, video cameras, portable power tools, and laptop computers. Small sealed lead acid batteries (SSLA) are used in emergency lighting, security and alarm systems, computer backup devices, and hospital equipment. They are also used in cellular phones, laptop computers, and power tools. Rechargeable batteries may initially be more expensive than single-use batteries, and they sometimes require the purchase of a recharger, but the upfront costs are often outweighed by the long-term cost savings and environmental benefits of rechargeables (4).

Rechargeable batteries are mostly handled by the Rechargeable Battery Recycling Corporation (RBRC), a nonprofit public service organization. RBRC targets four kinds of rechargeable batteries for recycling: nickel-cadmium (Ni-Cd), nickel metal hydride, lithium ion, and small-sealed lead. Its "Charge Up to Recycle!" program offers various recycling plans for communities, retailers, businesses, and public agencies (2).

2.3 Battery Collection Systems (1)

There are three main collection systems for used dry batteries: joining existing hazardous waste collection programs, battery drop-off collections, and curbside collections.

Qualified professionals are available for handling the collected hazardous waste and ensuring its safe disposal. Incorporating dry cell battery collection into the existing program might be the easiest and lowest cost collection option.

Drop-off collections avoid the labor and equipment investment costs associated with curbside collection operation, but generally have low participation rates if the consumers are not well informed about the program.

Curbside collections have the higher participation rates than other methods, but generally are more expensive unless they can be coordinated with curbside collections of other materials.

2.4 Health and Safety

Dry cell battery collections pose special health and safety risks if not properly handled. Mercury vapors can accumulate in a sealed drum if stored for an extended period of time. Waste batteries still contain a residual charge. When collected together, they may discharge each other, forming hydrogen gas. If the container is not properly ventilated, there is a danger of explosion. Partially charged or corroded batteries may leak caustic chemicals. Protective clothing including rubber gloves, eye protectors, and heavy canvas or rubberized aprons are needed (1).

2.5 Recycling and Proper Disposal of Used Batteries

The toxic heavy metals, such as cadmium and lead, are contained within the battery's casing and pose no real risks while the battery is in use. But they can be of concern when discarded with ordinary municipal solid waste, as most batteries are. Ni-Cd rechargeable batteries were estimated to represent approximately 75 percent of the cadmium found in municipal solid waste. Approximately 73 percent of municipal solid waste is either landfilled or incinerated. Neither of those methods is ideally suited for batteries that contain heavy metals. In landfills, especially these without liners and controls, heavy metals have the potential to leach slowly into soil, ground water, and surface water, When incinerated, metals such as cadmium and lead can concentrate in the ash produced by combustion or enter the atmosphere through incinerator smokestack emissions. When disposed of, the metals in incinerator ash can leach into the environment. In the environment, certain types of heavy metals can also concentrate in the tissues of organisms and make their way up the food chain. Several metals, such as cadmium, are known carcinogens. The possible health effects associated with ingestion or inhalation of water, food, or air that has been contaminated with high levels of heavy metals range from headaches and abdominal discomfort to seizures, cancer, comas, and even death. Recycling programs for Ni-Cd and SSLA rechargeable batteries can address the potential risks posed by landfilling or incinerating these batteries by diverting them from the waste stream. In the case of battery recycling, metals are recovered from the used batteries, and the remainder of the product is recycled or properly discarded (4).

2.6 Promoting Recycling of Used Batteries

To implement an effective local education program, governments can identify the major users of Ni-Cd and SSLA batteries in their areas; create an education committee to work with recycling staff or volunteers; develop a plan to educate businesses and industries on the importance of recycling their Ni-Cd and SSLA batteries; and work with retailers serving as collection points to develop and distribute educational materials. In addition, governments can send press releases promoting the program to local newspapers, radio, cable television stations, and internet. A variety of other creative channels, including distributing flyers through community schools or utility bill inserts, can also help promote the program (4).

Retailers, businesses, and public agencies can institute "take-back" programs and contribute funds for public education and batter collection. Retailers of Ni-Cd and SSLA batteries can work with state and local governments to collect used batteries. Retailers can display posters or signs informing the community of the need to recycle these batteries and of the names and addresses of battery collection sites. Retailers can also provide used-battery collection containers that will be sent to an appropriate storage or recycling facility. Businesses and public agencies, such as hospitals, computer companies, auto manufacturers, and police and fire department, that use a large number of Ni-Cd or SSLA batteries can work on their own or with state and local governments to facilitate the collection of their used batteries. These businesses and agencies can develop their own collection programs by educating their employees about the importance of recycling these batteries and by providing containers or schedules for the collection of their used batteries. In addition, businesses and public agencies can fund or staff community collection

programs and/or sponsor employee collection events that may last from one day to a week. All businesses that use cordless products—such as cellular phones, laptop computers, video recorders, and power tools—whether large companies, small companies, or conditionally exempt small quantity generators, should be encouraged to participate in the collection and recycling of rechargeable batteries (4).

Rechargeable Battery Recycle Corporation (RBRC), a nonprofit organization representing many rechargeable battery manufacturers, developed the *Charge Up to Recycle!* program to help keep Ni-Cd batteries out of the solid waste stream and prevent toxins from ending up in landfills or municipal incinerators. The program offers various recycling plans for communities, retailers, businesses, and public agencies. For each group, RBRC pays or shares the cost of consolidating the batteries, shipping them to the processing facility, and recycling them. The program sends all Ni-Cd batteries to the International Metals Reclamation Company, a cadmium recovery facility in Ellwood City, Pennsylvania. At the facility, the nickel and iron are separated from the cadmium and shipped to specialty steel producers for use in stainless steel products, The recovered cadmium, at a 99.95 percent purity level, is used to produce new Ni-Cd rechargeable batteries (4).

3. REGULATIONS FOR BATTERY WASTE MANAGEMENT

3.1 Battery Recycling Prior to the Battery Act

In the U.S. prior to the Battery Act, 13 states took the lead by passing laws to facilitate the collection and recycling of used rechargeable batteries. These laws required that rechargeable dry cell batteries be labeled as recyclable and be easily removable from consumer products. Although somewhat similar, there were slight differences in the laws enacted by the states. The law differed in whether the battery labels were required to include the three chasing arrows or some other recycling symbol, the manufacturer's name, or a toll-free telephone number. There were also differences regarding whether the text must appear on the product or the packaging, in the instruction manual, or on the battery itself. On the federal level, the Resource Conservation and Recovery Act (RCRA) regulates hazardous wastes and establishes comprehensive reporting, handling, and transportation requirements for hazardous wastes. Since batteries often contain hazardous or potentially hazardous constituents, many batteries, including Ni-Cd and SSLA rechargeable batteries, may be regulated under RCRA. The law does exempt household waste, which often includes some batteries. Certain small businesses may be exempt from some RCRA regulations under certain circumstances. Other businesses and institutions that handle batteries that are hazardous waste may be subject to the full array of hazardous waste regulations (4).

3.2 Requirements of the Battery Act (3,4)

The U.S. Congress passed the Mercury-Containing and Rechargeable Battery Management Act (Battery Act) in 1996. The Act targets battery and product manufacturers and battery waste handlers--not consumers. There are two major sections of the Act. The first section facilitates the efficient recycling of Ni-Cd,

certain SSLA, and other rechargeable batteries. The second section phases out the use of batteries that contain mercury.

In the first section, the Act requires that regulated batteries must bear the three chasing arrows or a comparable recycling symbol; nickel-cadmium batteries must be labeled "nickel-cadmium" or "Ni-Cd," with the phase "BATTERY MUST BE RECYCLED OR DISPOSED OF PROPERLY."; regulated lead-acid batteries must be labeled "Pb" or with the words "LEAD," "RETURN,' and "RECYCLE" and, if the regulated batteries are sealed, the phrase "BATTERY MUST BE RECYCLED."; rechargeable consumer products containing nonremovable Ni-Cd batteries must be labeled with the phrase "CONTAINS NICKEL-CADMIUM BATTERY. BATTERY MUST BE RECYCLED OR DISPOSED OF PROPERLY"; rechargeable consumer products containing nonremovable regulated lead-acid batteries must be labeled with the phrase "CONTAINS SEALED LEAD BATTERY. BATTERY MUST BE RECYCLED"; the required labeling also must be carried on the packaging of rechargeable consumer products containing regulated batteries that are not easily removable, and on the packaging of regulated batteries that are sold separately from such products, if the labeling on the product or battery is not visible through the packaging; battery and product manufacturers may use a different label if it conveys the same information as described above or it conforms with a recognized international standard that is consistent with the intent of the Battery Act. The manufacturers must apply for USEPA certification; no municipality, state, or federal agency may enforce any easy removability or labeling requirement for a rechargeable battery or product that is no identical to that described in the Act; rechargeable consumer product manufacturers may petition USEPA for an exemption from the easy removable batteries and with equivalent performance could not be made without posing a threat to human health, safety, or the environment, or without violating other public or private standards.

The other major provision of the first section involves the federal Universal Waste Rule. To prevent states from having different regulations for managing batteries covered by the Battery Act, the Act made the Universal Waste Rule for covered batteries effective in all 50 states since May 13, 1996. This provides national uniformity in the collection, storage, and transportation of used Ni-Cd and certain other rechargeable batteries and certain mercury-containing batteries. The Act also preempts state legislative and regulatory authority for the collection, storage, and transportation of covered batteries. Normally, under RCRA, states can choose to be more stringent than the federal government. The Battery Act does not give states the option of establishing more stringent regulations than specified in the Act, in regard to the collection, storage, and transportation of covered batteries. States may seek USEPA approval to implement and enforce requirements identical to those found in the Act.

The purpose of the second section is to phase out the use of batteries that contain mercury. It specifically prohibits the sale of any alkaline-manganese (except for button cells containing up to 25mg mercury) and zinc-carbon batteries that contain mercury that was intentionally introduced (as distinguished from mercury that may be incidentally present in other materials used to produce these batteries). Also prohibited is the sale of button cell mercuric-oxide batteries. Other mercuric-oxide batteries are prohibited from being sold unless the manufacturer (1)

identifies a collection site in the United States where mercuric-oxide batteries can be sent for recycling or proper disposal, (2) informs each of its purchasers of the collection site, and (3) provides each of its purchasers with a telephone number that the purchaser may call to get information about sending mercuric-oxide batteries for recycling or proper disposal. USEPA may exempt from the second section prohibitions a new product or use for a second section battery, if there exist reasonable safeguards against disposal of the battery in an incinerator, composting facility, or landfill, which are other than a facility regulated under the hazardous waste requirements of RCRA.

The USEPA promulgated the Universal Waste Rule to reduce the amount of hazardous wastes entering the municipal solid waste stream, encourage the recycling and proper disposal of certain common hazardous wastes, and reduce the regulatory burden on businesses that generate these wastes by simplifying the applicable regulations and making them easier to comply with. This rule recognizes that same common hazardous wastes--such as used Ni-Cd rechargeable batteries--do not require the full array of hazardous waste regulatory requirements. It also eases the regulator burden on battery handlers and transporters by streamlining a number of hazardous waste collection and management requirements, including those related to notification, labeling/marking, accumulation time limits, employee training, and offsite shipment, among others. This Rule provides national uniformity in the collection, storage, and transportation of used Ni-Cd and certain other rechargeable batteries and certain mercury-containing batteries.

According to the Act, states can implement and enforce any requirement that is identical to (and hence not more or less stringent than) that in the Act with respect to the labeling and easy removability of rechargeable batteries, and the collection, storage, and transportation of covered batteries. States can, however, adopt more stringent requirements for any other Battery Act provision. Finally, the Act does not govern the recycling and disposal of covered batteries. States can, therefore, continue to adopt and enforce standards for recycling and disposal of covered batteries that are more stringent than existing federal standards under RCRA.

3.3 Enforcement of the Battery Act

To enforce the Act, USEPA may require compliance and/or assess a civil penalty of up to $10,000 for each violation of the labeling, easy removability, and other requirements of the Act. Some exemptions are allowed. Violations of the requirements of the Universal Waste Rule are enforced separately by USEPA under the Solid Waste Disposal Act. These requirements involve the collection, storage, and transportation of used Ni-Cd and certain other rechargeable batteries and certain mercury-containing batteries. Violations of these requirements are subject o the stringent penalties and broad remedies available under RCRA (4).

3.4 Public Education Program

Public education and participation are keys to the success of any recycling program—and are particularly important with materials like batteries that have not been commonly recycled. A public education program can heighten awareness of

the recycling program, involve more individuals and businesses, and increase the number of batteries collected, The Act requires USEPA to consult with rechargeable battery manufacturers, rechargeable consumer product manufacturers, and retailers to establish a public education program on battery recycling and the proper handling and disposal of used Ni-Cd and certain SSLA batteries.

4. CONCLUSIONS

The hazards caused by improper disposal of used batteries are widespread and serious, and have to be stopped. The best ways to control these hazards are recycling, treatment, reuse and proper disposal of used batteries. Comprehensive laws and regulations for battery waste management should be established and implemented. To recycle and properly dispose of used batteries, all the entities involved from different levels of governmental agencies to manufacturers, businesses, retailers and the consumers have to take up their share of duty and responsibility. Different countries in the world may have different ways of living and require dissimilar legal systems. However, many basic principles to set up laws, regulations and enforcement of battery waste control are in many times interchangeable. In the same token, experiences of battery waste management obtained from some countries and areas can be applied to other countries and areas.

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B.論文

燃料電池科技與應用

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摘要

近年來因為能源短缺與環境污染的議題發酵,新世代能源-燃料電池逐漸嶄露頭角，被視為高能量轉換效率之能源解決方案，不僅可有效提升能源利用率，亦能達到廢棄物減量之目的。雖然未來商品化過程中，燃料電池將面臨價格競爭力的考驗，但由於小型攜帶式系統應用之成本接受度高，被認為最有機會將燃料電池推向普及化之應用。本文將介紹燃料電池的原理與其可能應用機會，尤其是燃料電池在可攜式電子產品的應用優勢，並針對現行二次電池的使用生態，及對環境面減廢與回收所產生的效應做一基本說明。

***關鍵詞:* 燃料電池，可攜式電子產品，直接甲醇燃料電池，電池回收**

1. 燃料電池發展與其應用

燃料電池是一種透過觸媒將化學能直接轉換成電能的發電裝置，它與二次電池不一樣，雖然叫電池，但實際為一發電機，其基本原理可以說是水電解的逆反應，真正的反應如圖一所示，陽極端氫氣或燃料透過觸媒的反應直接轉換成質子跟電子，質子會穿透中間的電解質膜來到陰極，電子則沿著外部電路做功後傳送至陰極，透過陰極觸媒把質子、電子跟氧氣反應轉化成水，單一 Cell 的理論反應電位是 1.21V [1-2]。其轉換效率較內燃機等裝置(如火力發電)高出許多[1]，其原因在內燃機運作時，需先將化學能轉換成熱能，續將熱能轉換成機械能再轉為電能，造成能量之損耗；而燃料電池則是直接將儲存在燃料中的化學能轉為電能，而且反應僅產生水及二氧化碳，是屬於一種高效能之潔淨能源。

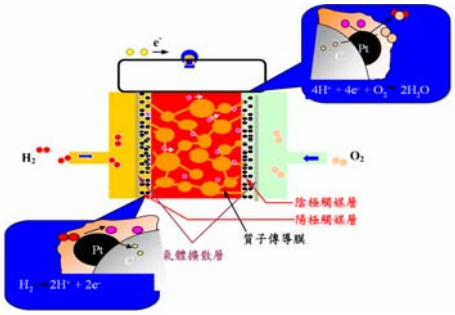
多年來燃料電池的系統發展，技術上已經相對成熟，但是市面上並未發現大量使用燃料電池的電源存在，其主要的原因是目前燃料電池的發電成本過高，與現有能源體系相比仍缺乏產品價格之競爭優勢。因此如何找到一種產品應用，能夠接受價格相對高之能源系統，而且數量夠大，以加速整體氫能源產業之商品普及化效益。

燃料電池的發展，依操作溫度可區分為低溫型與高溫型燃料電池兩種，高溫型燃料電池操作溫度範圍介於 200^{o}C~1000^{o}C之間，如固態電解質燃料電池(SOFC)與熔融碳酸鹽燃料電池(MCFC)、磷酸燃料電池(PAFC)等，低溫型燃料電池操作溫度為室溫~200^{o}C，應用種類包含太空船之鹼性燃料電池(AFC)及高分子質子交換膜燃料電池(PEMFC)。燃料電池應用因本身不同之操作特性，其系統的工作溫度範圍也有所限制，表一為各種燃料電池的特性以及應用範圍，一般而言高溫型燃料電池的能源轉換效率高，所以一般作為集中式發電系統；如能與熱回收方法整合，其整體能量轉換效率將可以大幅提高。

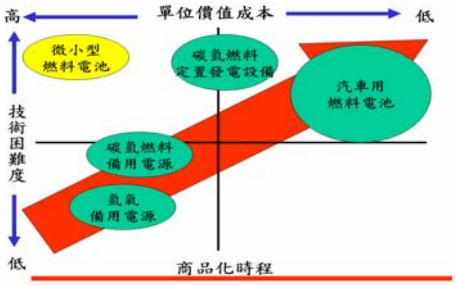
如考量應用於可攜式電子產品時，低溫型燃料電池是較適當之選擇，但仍需滿足啟動快、操作溫度低、燃料供應方便、系統簡單、外界環境條件變化大、無安全顧慮等攜帶式電源之要求。在低溫啟動操作方面，鹼性燃料電池與高分子質子傳導膜燃料電池均是適合的選擇，但鹼性燃料電池所使用之液態鹼性電解質，存在安全與系統複雜度高等缺點，不利於隨身產品之應用。而高分子質子傳導膜燃料電池因使用固態電解質，所以整體系統設計不需考量液態電解質漏液，以及電解質對周邊材料的腐蝕問題，在系統結構設計上較為簡單，是可攜式電源系統較佳之選擇[3]。圖二為目前進行中燃料電池的應用機會、技術挑戰度以及可能發展時程，由圖中可以看出在可攜式電子產品的應用，雖然其技術挑戰度很高，但是因為市場大，可以接受相對較高的價格，所以我們認為如果此應用可以成功，未來材料性能及製程能力將因市場的投入致使成本下降，待材料與製程技術成熟後，其他應用之商品化便一蹴可磯。

表一、各類燃料電池系統之特性與其應用狀況

分類 / 特徵	鹼性型燃料電池	磷酸型燃料電池	熔融碳酸鹽型燃料電池	固體電解質型燃料電池	質子傳導膜燃料電池	直接甲醇燃料電池
燃料	氫氣	氫氣	氫氣	氫氣	氫氣	甲醇
燃料來源	氫氣、電解工業副產品	氫氣、天然氣、石油等	氫氣、天然氣、石油等	氫氣、天然氣、石油等	氫氣、天然氣、石油等	石油、農產品再生產品等
電解質	OH^-	H^+	CO^{-2}_3	O^{-2}	H^+	H^+
操作溫度	100 ^{0}C以下	約200 ^{0}C	約650 ^{0}C	約1000 ^{0}C	100 ^{0}C以下	100 ^{0}C以下
發電效率	~60 %	40 ~50 %	50 ~60 %	45 ~55%	40 ~50 %	~20 %
商品化程度	少量商品化	少量商品化	商品驗證中	研發驗證中	少量商品化	少量商品化
用途	太空 海洋設施	分散型電氣事業用 可移動式電源	分散型電氣事業用 大規模定置電源	分散型電氣事業用 中大規模定置電源	電動車 可移動式電源 小規模發電 緊急發電	3C電源 可移動式電源 小規模發電 緊急發電



圖一、 燃料電池運作原理示意圖

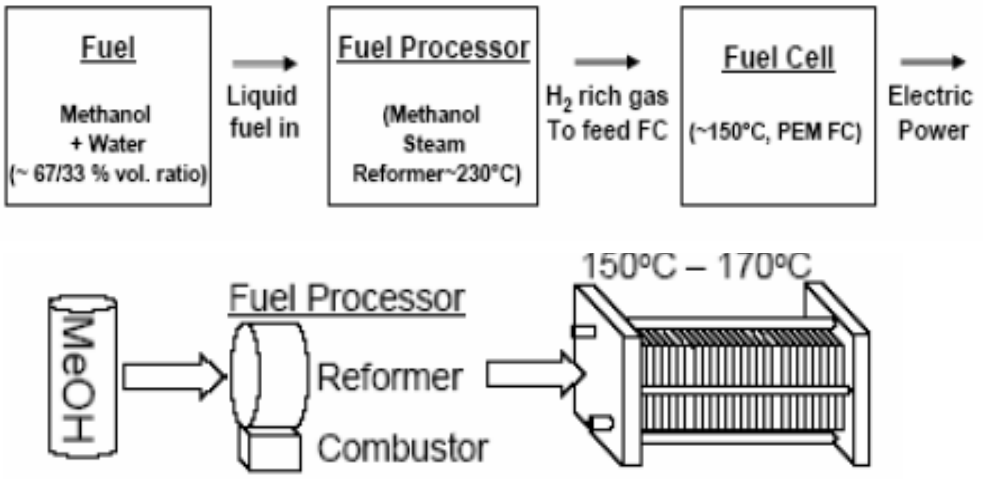


圖二、燃料電池的應用以及技術困難度

2. 可攜式燃料電池發展定位與其技術

近年來可攜式電子產品風靡全球，出貨量屢創新高，供應其電力之鋰電池系統也相繼成長，但對未來需要高能量電源來延長操作時間之產品而言，燃料電池應是最佳之選擇，面對龐大之可攜式產品商機，攜帶式燃料電池系統應是最有希望加速燃料電池產業蓬勃發展的應用。在可攜式產品開發及市場競爭上，應具有可接受較高的產品價格、有強烈需求利基性、生產投入的資源較小等特點，對作為攜帶式電子產品能源用之微小型燃料電池是一項利多，況且市場使用數量極為龐大，對系統成本控制更加有利，且在可攜式產品應用之瓦數較小，材料使用成本遠較一般大型系統為低，最重要的是攜帶式燃料電池的使用壽命要求相對又較低，所以吸引全球重要的公司紛紛投入研發，帶動各種相關技術之蓬勃發展；以下將就幾個重要的技術做說明。

諸如前文所述，高分子質子交換膜燃料電池應是攜帶式產品最佳之燃料電池系統選擇，所使用之燃料則以液態燃料為主，如甲醇燃料，選用主因在於考量液態燃料容易攜帶、安全性佳、且能量密度高等特點，以滿足可攜式產品隨身攜帶之要求。目前高分子質子交換膜燃料電池開發重點在於如何提高其發電功率密度，如以燃料供應方式來區分，目前至少有兩種技術並形發展中，其一為直接利用液態甲醇作為燃料的直接甲醇燃料電池；另一為利用改質器將甲醇燃料轉化為氫氣，再輸送進入燃料電池進行反應之間接式甲醇燃料電池，其結構示意圖如圖三所示。間接式甲醇燃料電池因供應氫氣作為發電之燃料使用，所以具有燃料電池發電功率大及燃料效率高之優點，但就間接式甲醇燃料電池系統設計而言，高溫改質器之轉化效能則成為決定整體發電性能優劣之重要關鍵。在考量高溫改質器之設計上，必須面對改質器需要有較長之啟動時間、維持改質器高溫環境之保溫材料設計、燃料電池系統高溫操作之壽命問題，以及如何搭配負載端需求來改變供應氫氣量之做法，儼然成為商品化必須克服之難題。因此目前僅 CASIO、Motorola 及 Ultracell 等廠商進行此技術的開發。直接甲醇燃料電池雖然發電功率較低，但甲醇燃料攜帶方便且安全性高，系統熱管理設計較容易，因此在可攜式產品之應用更具有優勢，並且隨著膜電極材料特性及系統水回收技術之突破精進，使得可攜帶之甲醇燃料濃度越高，甚至可使用純甲醇燃料，有助於燃料電池系統整體能量密度之提昇，達到可攜式產品長時效操作的要求。



圖三、間接式甲醇燃料電池系統組件配置圖

3. DMFC 優缺點及全球應用發展方向

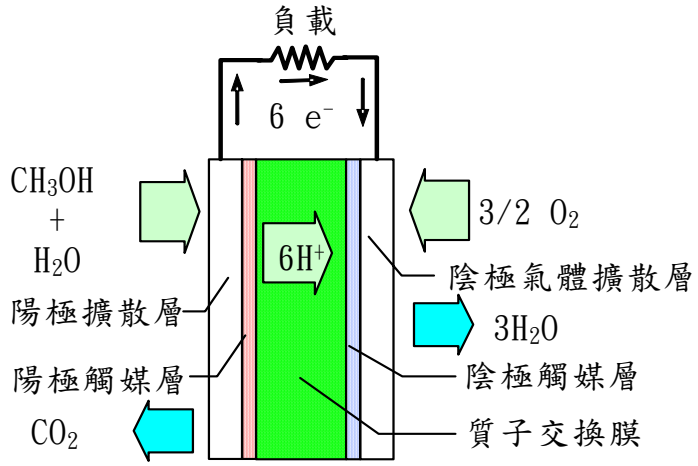
直接甲醇燃料電池使用甲醇水溶液作為燃料，經電觸媒催化進行甲醇氧化及氧氣還原之化學反應，將化學能轉變為電能，提供系統運作之用。整體構造相似於高分子質子傳導膜燃料電池，如圖四所示之發電基礎組件：包括陽極擴散層、陽極觸媒層、質子交換膜、陰極觸媒層、和陰極氣體擴散層。透過這些元件組合而成膜電極組(MEA, Membrane Electrode Assembly)，是整個電池發電的核心。陽極所發生的電化學反應可用下式表示：

$CH_3OH + H_2O \rightarrow 6\ H^+ + 6\ e^- + CO_2$

在陽極端甲醇透過陽極擴散層擴散到觸媒層，經由觸媒之電催化反應，甲醇可氧化產生二氧化碳並釋放出質子及電子，質子再由分隔電極的質子交換膜傳送到達陰極。電子則經由外部電路，流經負載到達陰極，兩者與穿透陰極氣體擴散層擴散至觸媒層之氧氣反應產生水。在陰極所發生的電化學反應如下式所示：

$3/2\ O_2 + 6\ H^+ + 6\ e^- \rightarrow 3\ H_2O$

整體反應除了在陽極產生二氧化碳及陰極產生水外，陰極水合反應將釋放大量熱量(每莫耳甲醇分子反應釋放 720 仟焦耳熱量)，造成系統溫升現象。為提升系統燃料效率，對系統進行適當的熱量管理是絕對必要的。因此，未來如果搭配應用系統整合在一起的話，除須考量系統熱量管理外，更多系統介面整合的問題急待解決克服，以維持系統高性能輸出，並能達到應用產品之電能使用需求。



圖四、DMFC 發電基礎組件及運作原理示意圖

直接甲醇燃料電池係屬於電觸媒催化之系統，反應物透過電化學轉換方式將化學能轉變成電能，其發電能力則決定於電觸媒催化反應活性、質子交換膜之特性及物質傳輸之能力，觸媒分散技術及耐甲醇毒化特性則為高活性電極觸媒開發必備之要件，白金合金觸媒亦為目前常用之觸媒系統，以克服甲醇氧化產生 CO 毒化之效應[4-5]。質子交換膜除了要有良好之質子傳導性，降低內阻之功耗外，甲醇穿透的問題，亦須降低，以避免因濃度的差異或電流的驅使，使甲醇分子以擴散或電滲透方式從陽極穿透至陰極，佔據陰極觸媒活性位置，並與氧氣產生燃燒反應，造成系統反應電位之降低及反應效能之損耗。除了藉由材料結構特性來提升系統性能外，對於不同輸出功率之應用系統，在系統設計上，亦可透過物質傳輸之控制，在系統反應效率及能量密度使用率上，取得系統最佳之操作控制方式。藉由其陰、陽極物質輸送控制之設計概念，可分為主動式直接甲醇燃料電池(Active DMFC)及被動式直接甲醇燃料電池(Passive DMFC)兩種，其差異點在於燃料電池本身是否提供額外電力來輔助燃料電池循環系統之作動，補充系統發電時之反應物消耗所需。

直接甲醇燃料電池因具備高能量密度及可快速補充燃料之優勢，能量密度 4800Wh/L 相當於鋰離子電池之 10 倍，無須充電電源，僅靠燃料補充即能達到充電效果，非常有機會取代現有之鋰二次電池系統，應用於可攜式產品上。直接甲醇燃料電池的工作原理與質子交換膜氫氣燃料電池相似，差別只是其燃料使用甲醇與水的混合溶液，因為使用液態燃料，所以在燃料的運送、補充及攜帶上非常方便。但缺點是直接甲醇燃料電池發電效率較差，如應用於大型定置型發電設施將難與其他系統競爭。因此考量全球系統面的設計發展，攜帶式電源系統被視為直接甲醇燃料電池最有機會成功之應用領域，其範圍包括攜帶式備用電源、小型車輛之混成電源、3C 可攜式電子元件的使用電源等。其中又以 3C 電子產品應用領域之發展較為蓬勃，主要是受燃料電池的特性及產品市場的定位所影響，由於 3C 電子產品所需的發電功率較小，且可接受較高之單位成本價格，因此在 3C 產品應用上，直接甲醇燃料電池具有絕對的發展優勢。目前國際上 DMFC 開發仍以發電功率做為應用之區隔，一為需藉助相關循環控制元件耗能運作，來維持系統持續穩定放電之主動式 DMFC 系統，具有較大之輸出功率，約 10~20W 左右，適合筆記型電腦、不斷電系統等耗功率大之產品使用，系統設計必須考量淨電能之

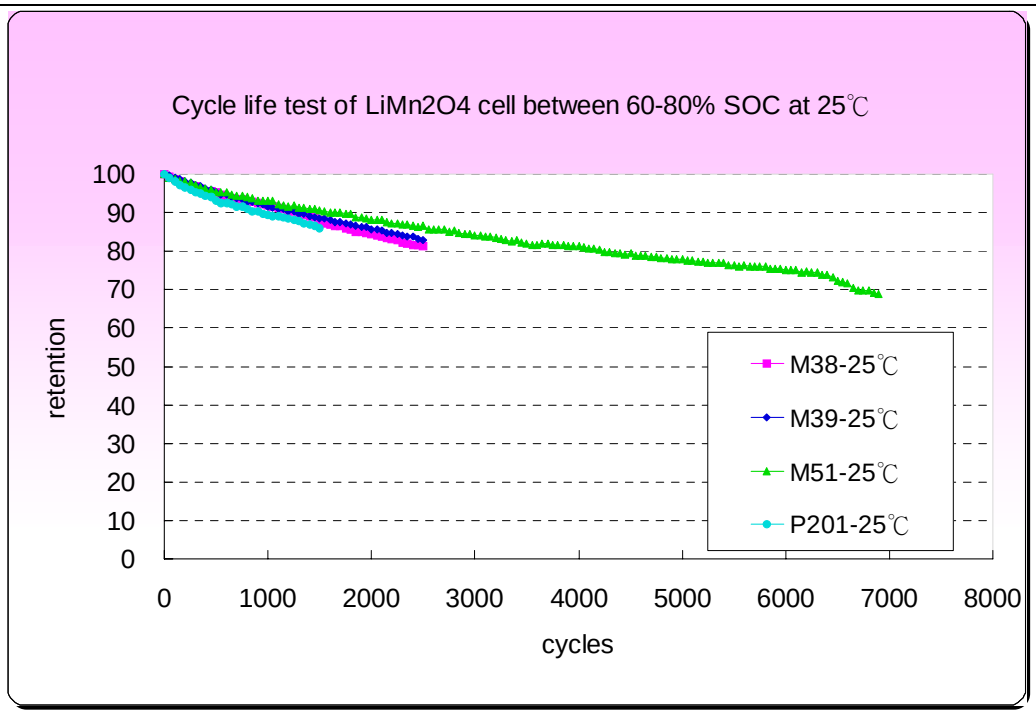
輸出及耗費成本之間平衡，以取得最適化的匹配，才有商品化的契機。另一為不需要靠耗能元件，即可維持系統穩定操作之被動式 DMFC 系統，因此構造上比較簡單，且尺寸易於縮小化，但受限於操作條件的關係，通常單位面積功率密度較低，約 5W 以下，應用上較適合耗電量及體積皆小之可攜式電子產品，如行動電話、個人數位助理等。

4. 燃料電池在可攜式電子產品應用的環境效益

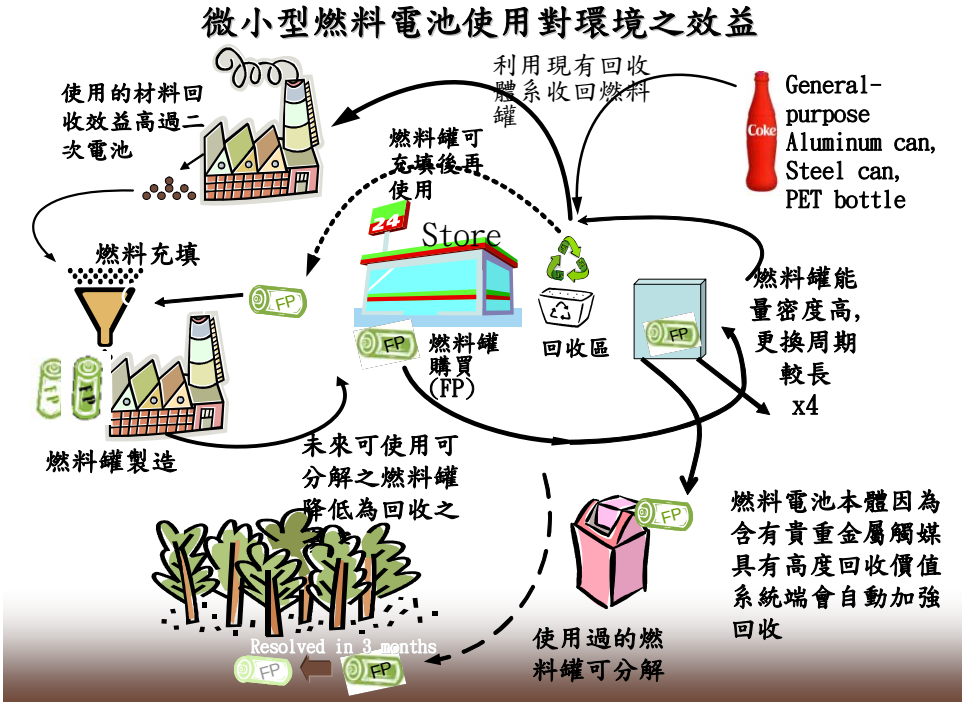
直接甲醇燃料電池在 3C 可攜式電子產品的應用，除了可以延長攜帶式電子產品的使用時間以及提升電子產品功能多樣化的機會外，對於環境廢棄物減量與回收再生也將扮演極重要的角色。

目前燃料電池應用於可攜式電子產品時，需要搭配現行二次電池進行混成供電，以彌補系統尖峰耗電需求之不足，其中燃料電池提供系統平均功率消耗所需之電能來源，而系統相關尖峰用電需求則由現行二次電池提供，現階段就混成供電系統設計發展來看，燃料電池並無法完全取代二次電池的相關應用領域，如著眼於減廢方面議題，無疑是增加了廢棄電池的產生。但是從油電混合車相關測試分析結果得知，良好的混成控制模式設計，可以大幅提升二次電池的循環壽命，相對的，對減少失效電池數量卻有明顯的效用。圖五為鋰二次電池在 60-80%SOC 間進行充放電循環之電容量維持情況，最佳特性之材料於 80%電容量維持率之循環壽命可大幅提升至 4000 次，此數據顯示在攜帶式電子產品的使用壽命週期中，只要使用一組鋰二次電池，不需要再另外購置其他二次電池，即可維持系統長期穩定運作。另外混成控制器的設計，也可參考二次電池容量的大小調整輸出，或是將燃料電池的額定輸出值調高，以降低系統對二次電池電力的需求，並可要求二次電池僅輸出尖峰用電，以降低其串並聯數量，根據以上幾種作法，均能減少二次電池的使用與廢棄量產生，有效達到減廢的功效。

在燃料電池組件回收方面，主要可分成兩部分—包括燃料電池本體及燃料罐本身。在燃料電池本體方面，由於燃料電池所使用的觸媒皆屬於貴重金屬如鉑、釕等元素，這些觸媒組成佔了燃料電池絕大部分的成本，如能有效回收，對燃料電池成本之管控，將有明顯的助益[6-7]。也因為具有商業利基，所以有機會造就觸媒回收產業的成形，藉由燃料電池本體的回收與再利用體系之建立，環保體系可進而追蹤這些回收後廢棄物的處理情況，或是要求燃料電池本體的製造多使用可回收或可分解的材料，相信利用對這個回收價值體系監控，可以達到很好的污染控制效果。



圖五、鋰離子二次電池在 60-80% SOC 間充放電的循環壽命曲線



圖六、攜帶式燃料電池的可能回收循環體系

在燃料罐的回收體系方面，將因燃料電池廣泛作為可攜式電能來源之後，逐漸的擴大燃料罐的使用量，目前燃料罐本體的材質仍以高分子材料為主，不過透過環保法規的限制，可以要求燃料供應商進行燃料罐的回收，而其回收體系可以利用現行廢電池回收體系或是塑膠廢棄物的回收體系來進行，這些高分子材料的回收處理安全性與成本，相較於現有電池，具有更低廉且簡化的處理程序；此外未來這些燃料罐本體，可以嘗試用可分解的材料

來製作，以降低燃料罐被丟棄所造成的環境污染。然而在燃料電池實際的運作體系下，燃料罐可設計為重複充填的罐體，使用者可依系統需求攜帶較大的燃料罐，對依附於燃料電池本身的燃料槽進行充填使用，如此可以大幅降低燃料罐的使用量，此外因為燃料電池的電源轉換效率高，燃料罐的能量密度可以是目前二次電池的 4 倍以上，因此燃料罐的使用量可以更加壓縮，其對社會環境的整體效益是利多於弊的;圖六為我們依據 Fujitsu 所提燃料電池的社會衝擊所做的修改版，其中描繪出整個燃料電池產業對未來燃料電池使用的願景，工研院材化所有鑒於環境減廢與回收的需求，在燃料電池開發計畫裡，已經著手開發燃料電池的回收技術，並與國內廠商合作建立安全的貴重金屬觸媒回收技術，相信可以減少燃料電池對環境面的衝擊。

五、結論

整體而言，可攜式電子產品是燃料電池應用的一個絕佳載具，但是應用端對於燃料電池的需求，因為牽涉到廣泛使用者端的安全問題，所以相對的在安全規範上有較嚴苛的規範，但是可以想見的是微小型燃料電池開發成功，除了可以提供使用者端更加充裕的攜帶式能源、對攜帶式電子產品提供設計的餘裕度，可以加入更多功能設計於產品之中，尤其是這樣的產品在市場所需的污染控制或回收需求，均較現行二次電池系統更有市場驅動力，雖然無法解決現行二次電池回收之需求，但是有降低使用量或提升性能的功能；更重要的是微小型燃料電池的成功，將為燃料電池產業帶入足夠的資源，以繼續投入大型發電或車用燃料電池的研究，如此氫能產業才能真正建立在自給自足的產業基石上，人類期待的高效能氫能源世代才能真正來臨。

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Experience:

Currently a Program Manager in the Office of Environmental Management (EM) at the Department of Energy (DOE). Duties include: serve as a member of the Departmental working group within the Federal Energy Management Program of DOE to implement Energy Policy Act of 2005. Champion the Pollution Prevention Program across the EM/DOE complex; coordinate with the National Academy of Science to identify environmental management issues and provide recommendation for improvement. Other past duties include: program manager in Science and Technology, coordinator of the Environmental Management Advisory Board, and Risk Management Program. Worked for the U.S. Environmental Protection Agency in the Office of Air and Radiation, duties include: develop air quality standards and volatile organic compounds control technologies. In addition to 18 years of federal experience, also have eight years of experience with private sectors: Division Director of CPCT at ITRI (Taiwan), Environmental Manager at ICI Americas, Inc., and Site Manager for two superfund sites at CDM, and senior project engineer at Cooper Industries.

Present Position: Program Manager, Office of Environmental Management, DOE

Specialty:

More than 25 years of experience and knowledge in: environmental, chemistry, civil, health & safety, risk assessment, nuclear, water resources, environmental impact assessment, energy conservation & recovery, sustainable development, renewable energy, hazardous and radioactive wastes, construction, planning, budgeting, contract and personnel management.

Selected Publications and Patents:

more than 60 publications and reports; presented papers at domestic and international (Taiwan) conferences.

Social Activities and Honors:

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B.論文

BATTERY TECHNOLOGIES AND ENERGY SOURCE MATERIALS

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ABSTRACT

A battery is a device that utilizes electrochemical technology to convert energy source material into electric power for various applications. Based on their application, batteries can be grouped into four categories: vehicle batteries, household batteries, specialty batteries, and other batteries. Each category contains two types: 1. primary cells, disposable or non-rechargeable batteries, and 2. secondary cells, accumulators or rechargeable batteries. The technologies and energy source materials of these four categories differ from each other and each has strong and weak points in its applications.

The worldwide battery industry generated US$48 billion in sales in 2005. The trend in the development of new battery technologies and energy source materials in the US, as well as other nations, is aimed at two major targets: meeting energy policies and environmental regulations. This report provides an overview of the current and future battery technologies and energy source materials.

Keyword: battery, technology, material, energy

1. INTRODUCTION

The battery was developed by the Italian physicist Alessandro Volta in 1800 (1). Each voltaic cell consists of a positive electrode, a negative electrode, and an ion-carrying electrolyte, made of solid or liquid, that separates the electrodes. The electrolyte contains ions that can react with chemicals in the electrodes. Chemical energy is converted into electrical energy by chemical reactions that transfer charge between the electrodes and the electrolyte at their interface.

The worldwide battery industry generated US$48 billion in sales in 2005 (1). The trend in the development of battery technologies and energy source materials in the US, as well as other nations, is aimed at two major targets: meeting energy policies and environmental regulations. For example, the Pollution Prevention Act of 1990 and the Energy Policy Act of 2005 both have strong impact on future battery development and market.

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2.1 Battery Categories

Batteries can be categorized into four categories based on their primary

applications: vehicle batteries, household batteries, specialty batteries, and other batteries. Each category contains two types: 1. primary cells, disposable or non-rechargeable batteries, and 2. secondary cells, accumulators or rechargeable batteries (2). The following sections discuss each category of batteries and its correspondent technology and energy source materials.

2.1.1 Vehicle Batteries

This category includes batteries that drive electric motors directly or those that provide starting energy for combustion engines. This category also includes large stationary batteries used as power sources for emergency building lighting, remote-site power, and computer backup. Lead-acid batteries are the first commercially applied batteries. They can produce high or low currents over a wide range of temperatures; they have good shelf life and life cycles, and are inexpensive and usually rechargeable. Rechargeable lead-acid batteries are the most used battery in the world, more then 20 times than the others. In fact, battery manufacturing is the largest use for lead in the world (3). Lead-acid batteries have many shapes and sizes, from household batteries to large batteries for use in submarines. The most noticeable shortcomings of lead-acid batteries are their relatively heavy weight and falling voltage during discharge.

Vehicle lead-acid batteries are further grouped into three subcategories;

2.1.1.1 Starting-Lighting-Ignition - these batteries are used for short, quick-burst, high-current applications. An example is an automotive battery, which is expected to provide high current, occasionally, to the engine's starter.

2.1.1.2 Traction - traction batteries provide moderate power through many deep discharge cycles. One typical use of traction batteries is to provide power for small electric vehicles, such as golf carts. This type of battery use is also called Cycle Service.

2.1.1.3 Stationary - stationary batteries have a long shelf life and deliver moderate to high currents. These batteries are most often used for emergencies. Typical uses for stationary batteries are in uninterruptible power supplies and for emergency lighting in stairwells and hallways. This type of battery use is also called Standby or Float.

2.1.2 Household Batteries

Household batteries are primarily used in small, portable devices such as flashlights, radios, laptop computers, toys, and cellular phones. Typically, they are 1.5-Volt cells and come in standard shapes and sizes such as D, C, AA, AAA, AAAA, and N. D, C, and AA types occupy 90% of the market demand. They also made in 6-Volt and 9-Volt cells. Most household batteries are zinc-carbon cells because of low cost. Household batteries can be subcategorized as below:

2.1.2.1 Zinc-Carbon - Zinc-carbon cells are composed of a manganese-dioxide-and-carbon cathode, a zinc anode, and zinc chloride (or ammonium chloride) as the electrolyte. This type of battery is generally not rechargeable. One drawback to this type of battery is that the zinc anode for the cell is the protective casing of the battery. If the anode does not oxidize evenly,

the casing can develop holes that allow leakage of the acidic electrolyte.

2.1.2.2 Zinc-Manganese-Dioxide Alkaline Cells (Alkaline Batteries) - when an alkaline electrolyte is used in a zinc-carbon battery, it is called an alkaline battery. This type of battery has a useful life of five to six times than that of a zinc-carbon battery.

2.1.2.3 Rechargeable Alkaline Batteries

Alkaline batteries are generally not rechargeable. One battery manufacturer, however, has designed a reusable alkaline battery (4). The manufacturer states that their rechargeable alkaline batteries contain no toxic metals, such as mercury or cadmium, to contribute to the poisoning of the environment. Rechargeable alkaline batteries are most appropriate for low and moderate power portable equipment, such as hand-held toys and radio receivers.

2.1.2.4 Nickel-Cadmium (Ni-Cd) –the most commonly used rechargeable household batteries for powering small appliances such as garden tools and cellular phones. The Ni-Cd battery contains a cadmium anode, a nickel-hydroxide cathode, and an alkaline electrolyte. If a Ni-Cd battery has incurred memory loss, a few cycles of discharge and recharge can restore the battery to maximum memory. Unfortunately, this battery is expensive and cadmium is expense and toxic. Recent regulation on the disposal of this battery also contributes to the higher cost of making and using these batteries. However, it is more cost effective to recycle and reuse many of the components of a Ni-Cd battery than other types of batteries.

2.1.2.5 Nickel-Metal Hydride (Ni-NH) - an alternative for the Ni-Cd battery which is less expensive and more compact. The anode of a Ni-MH cell is made of a hydrogen storage metal alloy, the cathode is made of nickel oxide, and the electrolyte is a potassium hydroxide solution. This type of battery has a longer life span and useful for high energy devices such as laptop computers, cellular phones, and camcorders. This battery has a high self discharge rate and relatively expensive.

2.1.2.6 Nickel-Iron (Ni-I) - also known as the Edison battery, these are much less expensive to build and to dispose of than nickel-cadmium cells. The cells are rugged and reliable, but do not recharge very efficiently. They are widely used in industrial settings and in Eastern Europe, where iron and nickel are readily available and inexpensive.

2.1.2.7 Nickel-Zinc (Ni-Z) - another alternative to cadmium electrodes is zinc electrodes. Although the nickel-zinc cell yields promising energy output, the cell has some unfortunate performance limitations that prevent the cell from having a useful lifetime of more than 200 or so charging cycles.

2.1.2.8 Lithium and Lithium Ion - Lithium is a promising reactant in battery technology, due to its high electropositivity. The specific energy of some lithium-based cells can be five times greater than lead-acid cell and three times greater than alkaline batteries (5). Lithium cells will often have a starting voltage of 3.0 V. These characteristics translate into batteries that are lighter in weight, have lower per-use costs, and have higher and more stable voltage profiles.

However, many of the inorganic components of the battery and its casing are destroyed by the lithium ions and, on contact with water, lithium will react to create huge volumes of hydrogen which can ignite or can create excess pressure in the cell. Lithium also has a relatively low melting temperature for a metal 180°C (356°F). If the lithium melts, it may come into direct contact with the cathode, causing violent chemical reactions.

2.1.3 Specialty Batteries

Button batteries are small and shaped like a button. They are typically used in small devices such as cameras, calculators, and electronic watches. Miniature batteries are even smaller and custom built for devices, such as hearing aids and electronic bugs.

Most button and miniature batteries need a very high energy density to compensate for their small size. The high energy density is achieved through the use of highly electropositive metals such as silver or mercury. These metals aren't cost effective enough to be used in larger batteries.

Several mostly used specialty batteries are described below.

2.1.3.1 Metal-Air - a very practical way to obtain high energy density in a galvanic cell is to utilize the oxygen in air as a liquid cathode. A metal, such as zinc or aluminum, is used as the anode. Small metal-air cells are available for applications such as hearing aids, watches, and clandestine listening devices.

2.1.3.2 Silver-Oxide – these cells use silver oxide as the cathode, zinc as the anode, and potassium hydroxide as the electrolyte. Silver-oxide cells can provide higher currents for longer periods than most other specialty batteries, such as those designed from metal-air technology. Due to the high cost of silver, silver-oxide technology is currently limited to use in specialty batteries.

2.1.3.3 Mercury-Oxide – these cells are constructed with a zinc anode, mercury-oxide cathode, and potassium hydroxide or sodium hydroxide as the electrolyte. Mercury-oxide cells have a high energy density and flat voltage profile resembling the energy density and voltage profile of silver-oxide cells. These mercury-oxide cells are also ideal for producing specialty batteries. The component, mercury, unfortunately, is relatively expensive and its disposal creates environmental problems.

2.1.4 Other Batteries

This section describes battery technology that is not mature enough to be available off-the-shelf, has special usage limitations, or is otherwise impractical for general use.

2.1.4.1 Nickel-Hydrogen (Ni-H) - Nickel-hydrogen cells were developed for the U.S. space program. Under certain pressures and temperatures, hydrogen can be used as an active electrode opposite nickel. Although these cells use an environmentally attractive technology, the relatively narrow range of conditions under which they can be used, combined with the volatile nature of hydrogen, limits these cells for other uses.

2.1.4.2 Thermal Batteries - a thermal battery is a high-temperature molten-salt primary battery. At ambient temperatures, the electrolyte is a solid non-conducting inorganic salt. When power is required from the battery, an internal pyrotechnic heat source is ignited to melt the solid electrolyte, thus allowing electricity to be generated electrochemically for periods from a few seconds to an hour. Thermal batteries are completely inert until the electrolyte is melted and, therefore, have an excellent shelf life, require no maintenance, and can tolerate physical abuse between uses.

Thermal batteries can generate voltages of 1.5 to 3.3 V, depending on the battery's composition. Due to their rugged construction and absence of maintenance requirements, they are most often used for military applications such as missiles, torpedoes, and space missions and for emergency-power situations such as those in aircraft or submarines.

2.1.4.3 The Sea Battery - another battery design uses a rigid framework containing the anode and cathode which is immersed into the ocean to use sea water as the electrolyte. This configuration seems promising as an emergency battery for marine use.

2.2. Environmental Regulation and Energy Policy

Some battery components, such as cadmium, lead, and mercury are heavy metals and toxic to the environment. In order to minimize negative environmental impact, battery manufacturers are designing nickel-metal hydride, lithium-ion, and rechargeable-alkaline secondary batteries that contain only trace amounts of cadmium, lead, or mercury.

One of the most important environmental regulations that direct the new battery design is the Pollution Prevention Act of 1990. The Act delineates the following: there are significant opportunities for industry to reduce or prevent pollution at the source through cost-effective changes in production, operation, and raw materials use. Such changes offer industry substantial savings in reduced raw material, pollution control, and liability costs as well as help protect the environment and reduce risks to worker health and safety (6). Other environmental regulations that concern the battery industries can be found broadly in air, wastewater, solid and hazardous waste management arenas.

The Energy Policy Act is the key driver for energy related industries in developing new products. The Energy Policy Act of 2005 requires the nation to achieve energy savings under various provisions (7). It is further reinforced into executive orders that require federal agencies to implement. For example, Executive Order (EO) 13101, “Greening the Government Through Waste Prevention, Recycling, and Federal Acquisition”, states that it is the national policy to prefer pollution prevention, whenever feasible. EO 13123 “Greening the Government Through Efficient Energy Management”, states that as a major consumer that spends $200 billion annually, the Government can promote energy efficiency, water conservation, the use of renewable energy products, and help foster markets for emerging technologies. Executive Order 13148 “Greening the Government Through Leadership in Environment Management”, requires the federal government to identify proven substitutes and established facility

management practices, including pollution prevention. Each agency shall reduce its use of selected toxic chemicals, hazardous substances, and pollutants, or its generation of hazardous and radioactive waste types at its facilities by 50 percent.

Executive Order 13419 "Greening the Government Through Federal Fleet and Transportation Efficiency", is to ensure that the Federal Government exercises leadership in the reduction of petroleum consumption through improvements in fleet fuel efficiency and the use of alternative fuel vehicles (AFVs) and alternative fuels.

2.3 New Battery Technologies and Materials

The U.S. Department of Energy (DOE) is responsible for the implementation of national energy policies. The Office of Energy Efficiency and Renewable Energy at DOE is the champion of the development of new technology and materials for energy related products and the battery is one of the focuses in recent research and development areas.

The FreedomCAR & Vehicle Technologies Program (FCVT) at DOE was established as a result of the environmental and energy policies cited in the previous sections. It is teamed with the US Council for Automotive Research to create the FreedomCAR and Fuels Partnership. This partnership is focused on funding high-reward/high-risk research that promise improvements in critical components needed for more fuel efficient, cleaner vehicles and provides ongoing guidance and expertise to program activities. Members in the partnership include DOE national laboratories and major automobile manufacturers such as Daimler Chrysler, Ford, and General Motors.

Six technology programs are established under FCVT. The Energy Storage Technologies Program has been identified as one of the critical technologies for advanced, fuel-efficient, light and heavy duty vehicles. The program concentrates on: battery technology development, applied battery research, and long-term battery research (8). A summary of the work in each of these areas is presented below:

2.3.1. Battery Technology Development

This program is subdivided into three activities: full system development, technology assessment, and benchmark testing.

2.3.1.1 Full System Development – this program is focused on developing and evaluating lithium-battery and ultracapacitor technologies and designs for advanced vehicles.

2.3.1.2 Technology Assessment - technology assessments are conducted on newly emerging technologies prior to full system development. These projects assess a developer's overall capabilities and validate technical claims through independent testing.

2.3.1.3 Benchmark Testing - FCVT purchases and independently tests

hardware against the manufacturer's specifications and the most applicable technical targets.

It is noteworthy to mention that the Small Business Innovation Research program at DOE is designed to support the technology competitiveness of small business. There are currently over $4 million contracts focusing on the development of new anodes, cathodes, electrolytes, separators, salts, or assembly components.

2.3.2 Applied Battery Research

This program addresses the cross-cutting barriers that face lithium-ion systems which are closest to meeting all of the energy and power requirements for vehicle applications. Five national laboratories participate in this activity, each bringing its own expertise to critical barrier areas: life, abuse tolerance, low temperature performance, and cost.

2.3.3 Focused Long-term Battery Research

This program addresses fundamental problems of chemical instabilities that impede the development of advanced batteries. The work presently concentrates on research into several promising systems, including $LiNiCoMnO_2$, $LiFePO_4$, Li/Polymer, and new materials such as composite cathodes and non graphitic anodes.

3. CONCLUSIONS

Due to the ever stringent energy and environmental requirements, the development of more powerful, longer life, more environmentally benign, cheaper, and safer batteries will be the challenge for the next generation of battery technology and energy source material. It can be concluded that:

1. The growing popularity of high-drain electronic products and alternative fuel vehicles will lead to an acceleration of demand in the market for a new type of vehicle battery.

2. The market for lithium battery will continue to grow. The development of its technology and energy source materials will be of high demand.

3. Energy source materials used in electrolytes and other functions such as additives can be a focus of research and development for reducing cost and improving performance.

4. Governmental support is crucial to the success of research and development programs of the battery industries.

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B.論文

廢鉛蓄電池回收處理體系架構研究與成本分析

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摘要

廢鉛蓄電池的主要來源為工業用電池及汽車用電池，隨著台灣經濟、社會的繁榮進步，工業快速成長、汽機車數量之大幅增加，使得不論是工業用電池或汽車電池的使用量與廢棄量也隨之增加。廢鉛蓄電池由於其主要成份主要為鉛（包括鉛金屬、硫酸鉛、二氧化鉛，約占 70%），而其外殼(塑膠外殼的成分以聚丙烯（PP）、苯烯、丁二烯、苯乙烯共聚體樹脂（ABS）為主，亦有以鋼鐵材質為外殼)及廢硫酸液等廢棄物，若隨意棄置堆積，未妥善回收處理，將造成空氣、土壤或地下水的污染，對環境的損害或人體的健康影響都值得重視。廢鉛蓄電池之回收處理在台灣已行之多年，但是隨著政府資源回收政策方向的轉變及公權力介入程度的深化，參與此物品回收系統中之各成員之角色與互動型態，亦隨之不同。國內廢鉛蓄電池之回收清除處理體系有其特殊性，多年來持續維持一家合法處理廠的狀況，而回收處理率則維持在七成左右。在『廢棄物清理法』的規範下，國內廢鉛蓄電池的回收體系之運作乃在『生產者責任制』的原則下，由鉛蓄電池的製造與進口業者，依環保署『資源回收管理基金管理委員會』(以下簡稱基管會)所訂定之費率，繳交回收清除處理費，作為廢鉛蓄電池回收處理體系運作的財務基礎，而回收處理廠則可依其實際之回收清除處理量，經過第三公正團體稽核認證後，向環保署基管會領取回收清除處理補貼費。本文的重點，即在說明國內廢鉛蓄電池回收處理體系架構的設計與運作實務，以及回收清除處理成本與回收清除處理費率與補貼率的訂定狀況。

Abstract

Lead-acid battery components are toxic and corrosive, and can also be a fire and explosion hazard. Spent lead-acid batteries, if handled and managed improperly, may leak or spill and cause lead and sulfuric acid contamination of the air, soil and water. The operation of recycling system for spent lead-acid batteries in Taiwan is currently subject to the regulation of Waste Disposal Act. Recycling Fund was established under the direction of the Environmental Protection Administration (EPA) of which producer responsibility principle is adopted that manufacturers or importers of lead-acid batteries were mandated to pay recycling fee designed by the EPA. EPA then uses the recycling funds to subsidize collection and recycling of the spent batteries. The purpose of this study is to examine the relationship between treatment cost and technologies for the recycling of specific lead-acid batteries as well as to propose a recycling fee schedule based on the cost structure of the collection, storage and treatment of the above-mentioned batteries.

1. 簡介

鉛蓄電池的主要來源為工業用電池及汽車用電池，隨著台灣經濟、社會的繁榮進步，工業快速成長、汽機車數量之大幅增加，使得不論是工業用電池或汽車電池的使用量與廢棄量也隨之增加。由於其主要成份主要為鉛（包括鉛金屬、硫酸鉛、二氧化鉛，約占 70%），若處理不當則可能造成人體鉛中毒、土壤土質的破壞、並進而影響到農業糧食的生產；此外，其塑膠外殼（以聚丙烯（PP）、苯烯、丁二烯、苯乙烯共聚體樹脂（ABS）為主）或鋼鐵外殼的隨意棄置則造成堆積、無法掩埋處理、塑膠易燃並產生廢氣；硫酸液的傾倒亦造成環境的再度污染。因此，未妥善回收處理的蓄電池，對空氣、土壤或地下水污染所形成的潛在危機，及對環境生態的損害或人體的健康影響，都是值得正視的廢棄物管理議題。

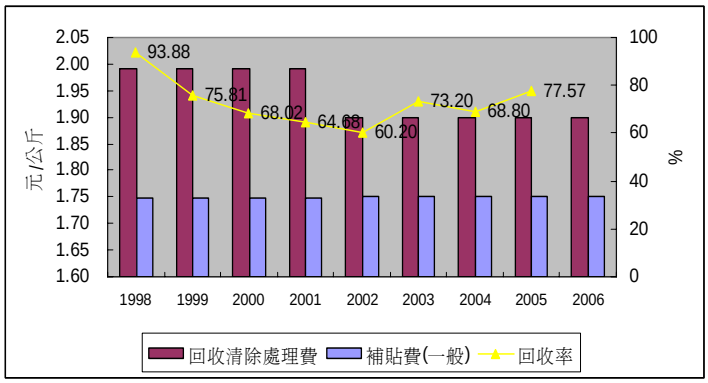
一般而言，廢鉛蓄電池以其資源再利用的特性及再生鉛處理技術的發展成熟以及再生鉛市場機制的運作無礙，其回收率的表現一向優於其他廢棄物品的回收率。但是另一方面，現行費率的決定須經環保署「資源回收管理基金管理委員會」的提報，並經「資源回收費率審議委員會」審議核可的情況下，費率訂定的原則及費率水準的決定必須結合多方因素的考量。現階段之基管會對於由消費者經由汽機車修理場與廢車拆解廠等管道所棄置之蓄電池，乃定義為一般廢棄物，由於長期以來國內廢鉛蓄電池的合格處理廠商僅有一家—泰銘公司，該公司除負責回收處理由一般廢棄物管道所排出之廢鉛蓄電池外，亦接受相關事業單位之委託，協助處理其所產生之事業廢棄物。由於其在事業廢棄物與一般廢棄物所面對之交易條件不同，因此在若干定義不明的廢鉛蓄電池（如大型客貨車輛、船舶、電信機房等之廢鉛蓄電池，以下依據基管會各年度公告之『資源回收各項物品回收清除處理費率及補貼費率』，稱之為特用廢鉛蓄電池）產生時，其究應屬一般事業廢棄物，由泰銘價購處理，並請領回收、處理補貼金；或應屬事業廢棄物，由產生源以委託代處理方式，委託泰銘公司處理，即生爭議。一般而言，特用電池之處理方式較為耗時、耗費人力，且須要額外之處理工具（如乙炔焊切工具、大吊車等）。另由於特用電池之材質與車用電池亦有所不同，如工業用電池之瓶身為非 PP 材質，電池中，亦常充填有瀝青等物質，這些材質都無法被資源再生，而須以廢棄物來處理。此外，工業用電池由於材質較為緻密亦可能造成後續處理設備之耗損。上述因素都會造成特用廢鉛蓄電池之清除處理成本增加。在此情況下，回收清除處理補貼費，如採單一費率，可能將導致特用電池的回收處理誘因不足，無法進入合法回收處理系統，而形成回收處理體系缺口的問題。

此外，長期維持穩定的國際鉛金屬市場，自 2003 年下半年起，受到國際其他原物料價格波動的影響，交易價格開始持續攀升(見圖 1)，以倫敦金屬交易市場之鉛金屬現金交易價格為例，相較於 2000 年 1 月份每公噸 500 美元的價格，至 2006 年 8 月份的接近 1200 美元/公噸的價格，漲幅已在 140%左右。同時期國內廢鉛蓄電池之回收市場的交易狀況，包括回收商的收購價格、處理廠的進料成本，及廢鉛蓄電池資源化後之粗鉛售價，理論上均會隨國際鉛金屬的市場價格變化而產生變化，但是觀諸國內廢鉛蓄電池回收處理體系及環保署基管會之上游業者回收清除處理費率及下游業者的補貼費率的決策，均維持相當的穩定(見圖 2)，但就廢鉛蓄電池的歷年回收率之變化而言，則自 1998 年的 9 九成左右、下滑至目前的 7 成 5，顯示國內廢鉛蓄電池回收

處理體系的運作，事實上已經發生內部結構性變化，此項變化對環保署基管會的相關費率決策的意涵為何，值得深入檢視。

資料來源：http://www.lme.co.uk/dataprices_pricegraphs.asp

圖 1 國際鉛金屬交易市場價格(2000-2005)



資料來源：1. 行政院環保署資源回收基管會網站，http://recycle.epa.gov.tw/
2. 中華經濟研究院，『廢物品責任業者範圍及費率檢討評估計畫』，行政院環保署 92 年委託研究計畫，EPA-92-HA15-03-A157。
3. 本研究。

析言之，國內廢鉛蓄電池回收清除處理體系，在現行的行政、財務與市場機制的運作下，共計有三問題值得深入檢視：

1. 廢鉛蓄電池之產生源不一，但高資源價值的特性，無法杜絕體制外處理廠對資源廢品的競爭，導致其流向與流量難以精確掌握並監督，而造成回收處理體系的缺口及潛在環境污染問題。

2. 特用鉛蓄電池的回收清除處理成本的差異性與費率決策中差別誘因提供的必要性評估。

3. 國際鉛金屬市場交易價格的變化對國內費鉛蓄電池回收市場運作的影響以及相關費率決策的政策意涵。

有鑑於此，本文的重點在於檢視國內鉛蓄電池的產業型態，據以分析其回收處理體系的特性，並將依據國內廢鉛蓄電池之回收清除處理實際成本，估算並說明特用廢鉛蓄電池之差別補貼費用。

2. 國內鉛蓄電池回收處理體系的演變及其所牽動產業上、中、下游關係之

變化

2.1 廢鉛蓄電池回收制度的演變

國內處理廢鉛蓄電池的工作自民國八十年四月由國內著名之生產業者（如湯淺、統一、神戶、成光等鉛蓄電池廠）為配合廢棄物清理法公告實施而組成「台灣區廢鉛蓄電池回收清除處理基金管理委員會」，正式推動廢鉛蓄電池回收清除處理工作，迄今已歷時 15 年。截至目前為止，廢鉛蓄電池的回收工作隨著廢棄物清理法的修正，其回收組織已迭經變革。以現行的回收制度為例，計包括負責資源回收相關行政業務之中央主管機關的環保署（資源回收管理基金管理委員會，下簡稱基管會）、地方主管機關之環保局、稽核認證團體，以及實際執行蓄電池回收處理業務之回收點業者，回收商及處理商，與負責繳交「回收清除處理費」之鉛蓄電池進口及製造業者，回收處理系統中各組織成員的互動關係，如圖 3 所示。

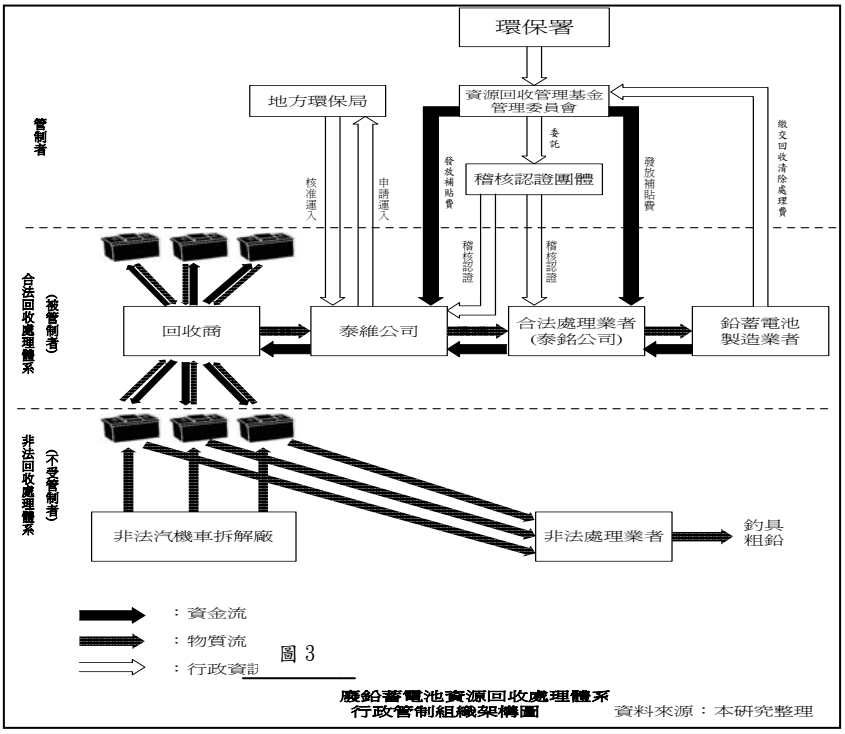


圖 3

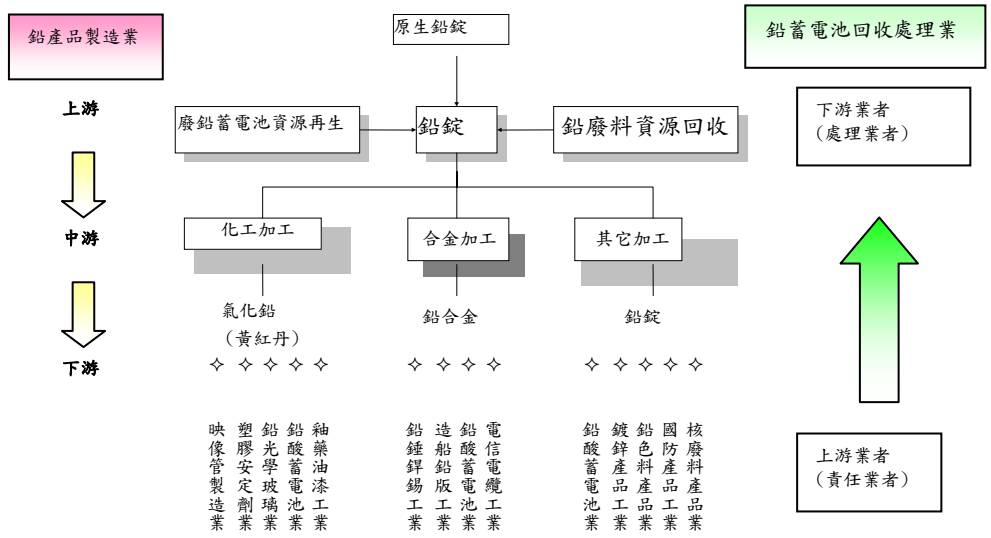
廢鉛蓄電池資源回收處理體系行政管制組織架構圖　資料來源：本研究整理

2.2 鉛蓄電池製造業者與廢鉛蓄電池處理業者之上、下游互動與關聯特性

鉛的熔點極低、再生容易，使得廢鉛亦成為有價金屬，而鉛品工業在我國非鐵金屬工業中，重要性僅次於鋁、銅、鋅。其原料來源主要有二：其一為國外進口之原生鉛，其二即為由回收之廢鉛蓄電池中所熔煉再製之再生鉛。在全球對鉛品需求成長快速，而原生

鉛礦產量與蘊藏量有限的情況下，再生鉛的使用已成為重要的鉛品原料來源，其數量甚至超過原生鉛。

國內鉛製品產業具有上、中、下游密切關聯的特性（見圖 4）。其中上游業者之原料來源主要以廢鉛蓄電池資源再生、廢鉛料回收及進口鉛錠為主，製成



資料來源：1. 泰銘公司股票上市公開說明書
2. 本研究

圖 4 鉛製品產業關聯圖

鉛合金、氧化鉛及加工鉛錠，供下游之鉛酸電池業、釉藥業、油漆業、映像管業、鉛光學玻璃業之使用。其中尤以鉛蓄電池業，由生產、消費、棄置至回收再利用、已形成封閉式之物質循環再利用體系。在現行公辦公營之資源回收體系下，鉛蓄電池資源回收體系中，位居上游的乃是繳費的鉛蓄電池製造與進口業者，而其所繳的費用，主要用途乃是補助廢鉛蓄電池之回收清除與處理業務。而在一元化的回收處理體系下，從事回收處理業者，同時亦是繳費業者的原料供應商，此一特殊關係，勢必影響雙方的議價地位，而此一議價地位，同時又受到國際鉛價行情與國內公權力介入資源回收市場之介入程度與手段工具運用的影響。一般而言，廢鉛蓄電池以其回收技術的單純，及每單位廢電池中粗鉛之回收比例高達 70%左右，因此極易形成一封閉式之物質循環體系，但以台灣之廢鉛蓄電池回收率一般多維持在 7 成左右，且合格處理廠僅一家的情況下，體制外的回收處理業者的存在，以及其收購行為對廢鉛蓄電池回收體系運作之影響，乃是必須正視的議題。析言之，由於現行的廢鉛蓄電池資源回收管理基金乃由鉛蓄電池製造業與進口業者所繳納之回收清除處理費彙聚而成。當繳費業者與領取補貼金之處理業者間，存在密切的上下游產業關聯關係時，合理的回收清除處理費率與補貼費率的訂定，可適度經由上下游業者的協商與相互監督，而取得合理費率水準的共識。且一旦共識形成，在處理技術和市場結構穩定不變的情況下，相關費率水準亦可維持穩定，此一狀況，可以合理解釋國內 2002 年以前之廢鉛蓄電池回收處理體系的實際運作情形。但當市場結構發生劇烈變動時，穩定無彈性的回收處理費率，反給予體制外的非法處理廢鉛蓄電池的業者以可以操作的空間，而對封閉式的廢鉛蓄電池回收處理體系造成缺口。因此，在不同的鉛金屬交易市場及回收體系市場主客觀情況下，不同的費率幅度及國際原生鉛價的組合，將導致參與回收體系的利害關係人之間互動關係的改變，亦使廢鉛蓄電池的回收處理體系，呈現不同的資源回收政策效果。由表 1 之分析內容觀之，在四種情況下，僅狀況 I 之回收清除處理費之繳納，可以發揮提昇回收率的效果，其他三種狀況，或因費率可以輕易向前轉嫁給處理業者或

向後轉嫁給鉛蓄電池消費者，或是費率所提供之誘因效果不足，而難以發揮落實生產者責任的效果。基於國內鉛蓄電池產業的關聯特性，本人於執行基管會所委辦之廢鉛蓄電池回收清除處理費率(國立中興大學資源管理研究所，民 88 年，民 89 年)時，即建議本項材質之回收清除處理費率與補貼率之訂定，應捨經濟誘因的觀點，而採反映回收處理成本的原則作為相關費率訂定的基礎，同時應持續追蹤國際鉛金屬價格的漲跌變化，特別是在國際行情低迷時，應密切關注國內廢鉛蓄電池的回收率變化，而當國際行情高漲時，則應精準掌握國內廢鉛蓄電池的市場價購成本的變化，以避免非體制內的處理廠以高價進入廢料市場的競購行為，方能確保廢鉛蓄電池回收清除處理體系能以最符合成本有效性的原則下，順利運作。

表 1　國際鉛價行情及廢鉛蓄電池回收清除處理費率高低對廢鉛蓄電池回收處理績效與費率歸宿的影響

		國際原生鉛價	
		高	低
回收清除處理費率與補貼率	高	I ✧ 二次鉛賣方市場 ✧ 體制外處理業者有購買廢料的誘因 ✧ 體制內處理業者對上游繳費業者具議價優勢 ✧ 上游費率無法向前轉嫁 ✧ 補貼費率對體制外業者的搶量行為有抑制效果 ✧ 費率具提昇回收市場之誘因效果 ✧ 整體回收處理體系運作具成本有效性	II ✧ 二次鉛買方市場 ✧ 體制外處理業者沒有購買廢料的誘因 ✧ 繳費業者具議價優勢 ✧ 費率可向前與向後轉嫁 ✧ 高補貼率造成處理業者成本負擔，降低其回收處理意願 ✧ 整體回收處理體系運作不具成本有效性 ✧ 協商共識的費率政策可確保回收體系的穩定運作
	低	III ✧ 二次鉛賣方市場 ✧ 體制外處理業者有購買廢料的誘因 ✧ 體制內處理業者對上游繳費業者具議價優勢 ✧ 無法抑制體制外業者進入廢料購買市場 ✧ 費率無法向前轉嫁 ✧ 費率政策無助於形成提升回收率的誘因。 ✧ 整體回收處理體系運作不具成本有效性 ✧ 協商共識的費率政策可確保回收體系的穩定運作	IV ✧ 二次鉛買方市場 ✧ 繳費業者具議價優勢 ✧ 體制外處理業者沒有購買廢料的誘因 ✧ 低補貼率造成處理業者成本負擔，降低其回收處理意願 ✧ 整體回收處理體系運作不具成本有效性 ✧ 協商共識的費率政策可確保回收體系的穩定運作

資料來源：本研究整理

3. 廢鉛蓄電池處理技術與回收處理成本分析

3.1 廢鉛蓄電池之回收清除處理成本因子分析

誠如前述，國內從事廢鉛蓄電池之回收處理體系與市場狀況，相對於其他廢物品與容器的回收體系而言，較為單純。就回收清除業者而言，泰維股份有限公司的回收量幾佔全國的 75%以上。然以特用廢鉛蓄電池而言，由於其產生源具集中，大量且規律之特性，另就其用途而言，無論通信業、運輸業或工業用鉛蓄電池的需求廠商多具經營規模，因此對於定期產生之廢電池，一般均傾向循合法且正式的回收清除管道進行廢棄物的清除處理，在此情況下泰維公司因係國內廢鉛蓄電池唯一合法處理業者泰銘公司之關係企業，因此在特用廢電池回收清除業務上，亦具完全的優勢。有鑑於此，本文所引用之廢鉛蓄電池之回收清除處理之成本資料，其中回收清除廠商乃以泰維公司為樣本來源，而處理廠商則以泰銘公司為樣本來源。本文乃依據此二公司之回收清除處理技術(見圖 5)，定義廢鉛蓄電池再生處理技術之成本效益因子，如表 2。據以作為調查並計算廢鉛蓄電池之單位回收處理成本的基礎，根據國

立中興大學資源管理研究所(民 89 年)的研究報告，國內廢鉛蓄電池的回收清除處理成本，如表 3。

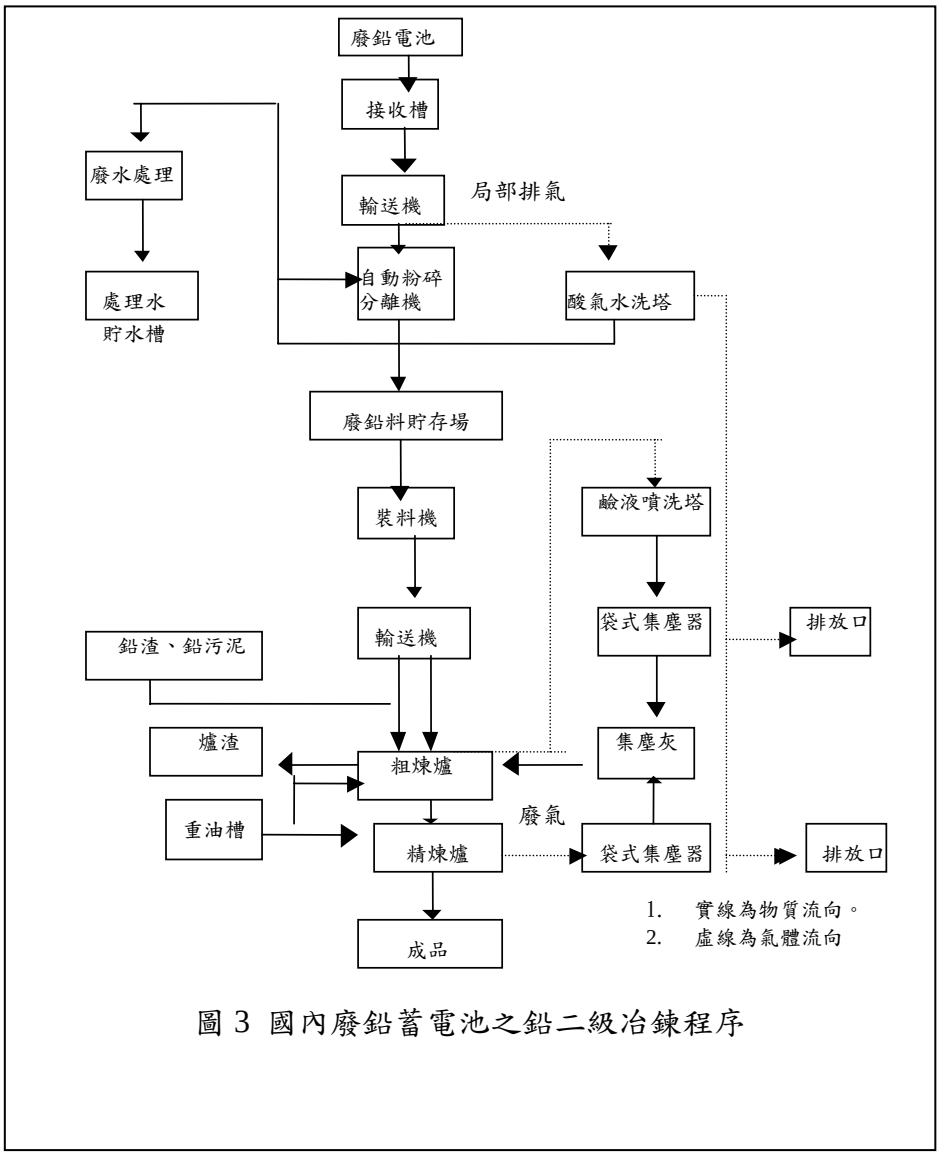


圖 3 國內廢鉛蓄電池之鉛二級冶鍊程序

表 2. 廢鉛蓄電池再生處理之市場經濟面向成本效益分析因子

成本項目	處理廠商之購料成本		
	再生處理成本	設備資本成本	機器購置成本
			.維修費用
		人工成本	員工薪資
		管銷成本	廠房土地成本
			營業費用
			所得稅費用
	最終廢棄物處理成本	最終廢棄物委外清除處理成本	
效益項目	再生化資源之市場價值		

資料來源：本研究

表 3 廢鉛蓄電池(含一般及特用)之回收清除處理成本之估算[1]

	廢鉛蓄電池(包括一般及特用)			最小成本[2]	特用廢鉛蓄電池			
	2500噸/月	3000噸/月	平均成本		160噸/月(壓克力)	40噸/月(鐵殼)	加權平均成本	最小可能成本
(A)回收清除成本(1+2+3+4+5-6)	0.1381	0.0795	0.1088	0.0586	1.0355	1.0355	1.0355	1.0355
(1)廢料購價	4.6300	4.6300	4.6300	4.6300	4.6300	4.6300	4.6300	4.6300
(2)運輸成本	0.2077	0.1731	0.1904	0.0649	0.1904	0.1904	0.1904	0.1904
(3)其他設備資本成本	0.0637	0.0530	0.0584	0.0199	0.0584	0.0584	0.0584	0.0584
(4)儲存成本	0.1167	0.1167	0.1167	0.1167	0.1167	0.1167	0.1167	0.1167
(5)吊運費	0.0800	0.0667	0.0734	0.0250	1.0000	1.0000	1.0000	1.0000
(6)回收商售價	4.9600	4.9600	4.9600	4.9600	4.9600	4.9600	4.9600	4.9600
(B)處理成本(1+2+3+4-5)	2.4609	1.8634	2.1622	0.4108	4.2157	4.4947	4.2715	2.2892
(1)回收商售價	4.9600	4.9600	4.9600	4.9600	4.9600	4.9600	4.9600	4.9600
(2)合金廠處理成本	2.4773	2.0644	2.2709	1.1330	2.2709	2.2709	2.2709	1.1330
(3)有害廢棄物成本	1.2213	1.0463	1.1338	0.5550	1.1338	1.1338	1.1338	0.555
(4)拆解費用	0.0574	0.0478	0.0526	0.0179	0.0815	1.0914	0.2835	0.0179
(5)資源回收價值	6.2551	6.2551	6.2551	6.2551	4.2305	4.9614	4.3767	4.3767
單位回收清除處理成本(A+B)	2.5990	1.9429	2.2710	0.4108	5.2512	5.5302	5.3070	3.3247

註 1：設備使用年限設定為 7 年

註 2：以最大處理量 8,000 公噸／月下時之單位處理成本為準。

資料來源：國立中興大學資源管理研究所，(民 89 年)，頁 4-47。

3.2 回收清除處理補貼費率訂定的理論與實務

前小節表 3 中所呈現之國內廢鉛蓄電池之回收清除處理成本資訊，結合環境經濟學的理論，可作為訂定回收清除處理費率與補貼率之基礎。依據環境經濟學理論，污染物的最適費率乃決定於其邊際效益（MB, marginal benefit）及其邊際成本（MC, marginal cost）的交點，依此標準向污染者收取污染費，符合污染者付費原則，且可迫使排放污染物的生產者將其污染成本內部化，而使市場的經濟活動達到社會最適的水準。然而，廢棄物的社會損害較其他污染物質更加難以量化，污染物排放量的多寡和社會損害之間的因果關係，極難確定。因之實務上，多考量回收處理業者實際發生的成本，依平均成本定價法，訂定相關費率。此一做法的優點，在於可以確實反映階段性廢棄物資源回收的市場與技術狀況，在確保財務可行且損益兩平的情況下，制定費率決策。由於廢棄物回收清除處理廠商的生產技術多具有規模經濟的特性，致使目前國內的廢棄物回收清除處理多仍處於平均成本(AC)遞減的階段(如圖 6 所示）其原因即在於當廠商生產規模擴大時，在生產技術、管理及財務等各方面均可產生大規模生產的利益，使其平均成本降低；此時，費率即應為廠商的平均成本，以免費率過低而影響回收處理廠商從事廢棄物回收清除處理的意願。相反的，若廠商的回收處理成本低於費率，廠商即有誘因自行回收處理至一最是水準之上，因此當回收處理成本資訊存在資訊不對稱的情況下，掌握回收處理業者的平均成本變化狀況，作為費率訂定的基礎，亦可發揮經濟誘因工具的效果，促使回收處理業者追求技術的進步與成本的降低，並且發揮回收處理廠的規模經濟，而達到提升整體資源回收率的效果。綜合表 3 及圖 6 的國內廢鉛蓄電池回收處理的成本資訊，我們可確定一般電池與特用電池間，確實存在顯著的成本差異，因之現行資源回收政策對二者的回收處理採差別補貼費率的決策，應屬合理，且可確保特用廢鉛蓄電池的最終妥善處理。

必須強調的是，表 3 中之回收商廢料購價、回收商售價，及資源回收價值，均反映民國 89 年前後的廢鉛蓄電池回收處理市場狀況。然如前所述，國際鉛金屬市場，自 2003 年起價格及呈巨幅上揚，國內的鉛金屬市場行情，理論上亦會受到程度不等的波及，有鑑於此，本研究另參酌 1999 年以來國際鉛金屬交易價格的漲幅，設定下列二情境，設算歷年國內廢鉛蓄電池回收處理成本的變化狀況，並將之與實際之補貼費率比較，以檢視歷年補貼費率水準的合理性：

情境一：國內回收商的廢料購價及售價(義及處理廠的進料成本)，及資源回收價格

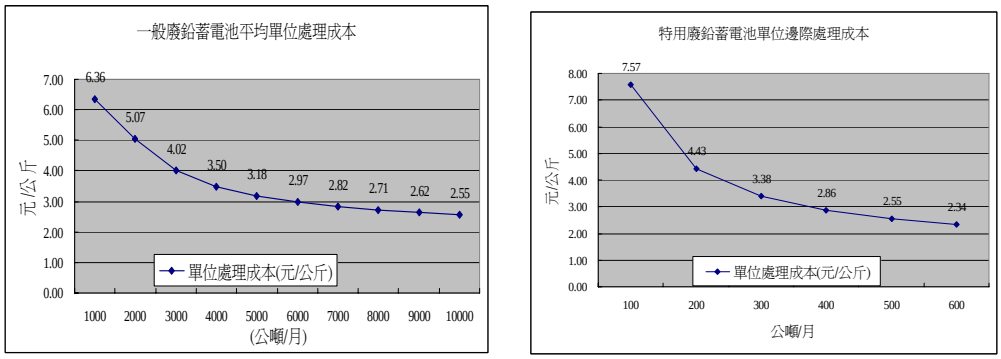


圖 6 一般及特用廢鉛蓄電池回收清除處理單位成本與處理量之關係

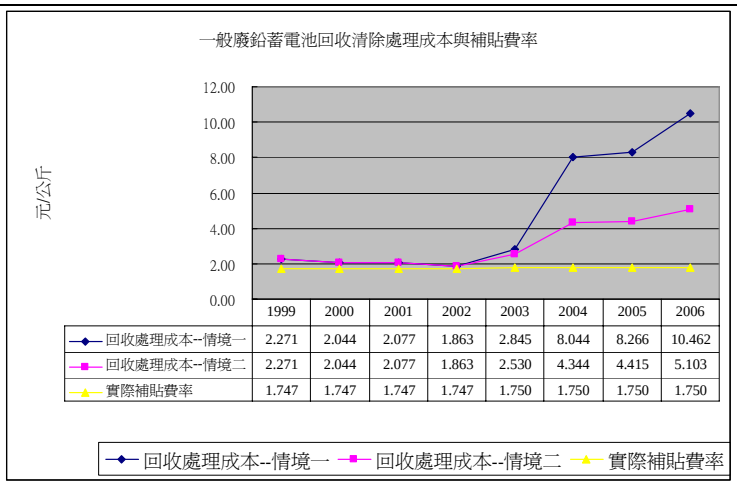
1. 的漲幅，與倫敦金屬交易市場之鉛金屬現貨交易價格的漲幅相同。
2. 情境二：國內回收商的廢料購價及售價(義及處理廠的進料成本)，及資源回收價格的漲幅，為倫敦金屬交易市場之鉛金屬現貨交易價格漲幅的一半。

本部分模擬結果(如圖 7)顯示與實際補貼費率相較，自 2002 年始，廢鉛蓄電池之回收處理成本與補貼費率間的差距，顯著的逐漸加大，表示由環保署資源回收基管會所訂定的廢鉛蓄電池回收處理補貼費率，對於吸引廢電池進入體制內回收處理體系所能發揮的誘因效果有限，換言之，在國際鉛金屬價格變動劇烈的市場客觀情況下，穩定的補貼費率政策的正確性，值得進一步檢討與調整。

3.3 上游業者之回收清除處理費率的合理性檢視

以廢鉛蓄電池處理業者於從事回收處理行為過程中所實際衍生的成本為基礎，所計算出之上游繳費業者所需繳交之回收清除處理費，計可在下列二原則下分別進行：

1. 反映回收清除處理成本原則：在此原則下，上游費率的計算應將環保署基管會運作所需之行政成本納入費率計算的考量。

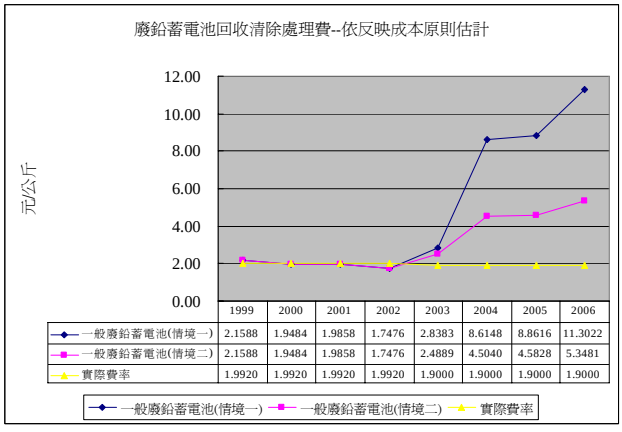


	1999	2000	2001	2002	2003	2004	2005	2006
回收處理成本--情境一	2.271	2.044	2.077	1.863	2.845	8.044	8.266	10.462
回收處理成本--情境二	2.271	2.044	2.077	1.863	2.530	4.344	4.415	5.103
實際補貼費率	1.747	1.747	1.747	1.747	1.750	1.750	1.750	1.750

圖 7 一般廢鉛蓄電池回收清除處理成本與實際補貼費率之比較(1999-2006)

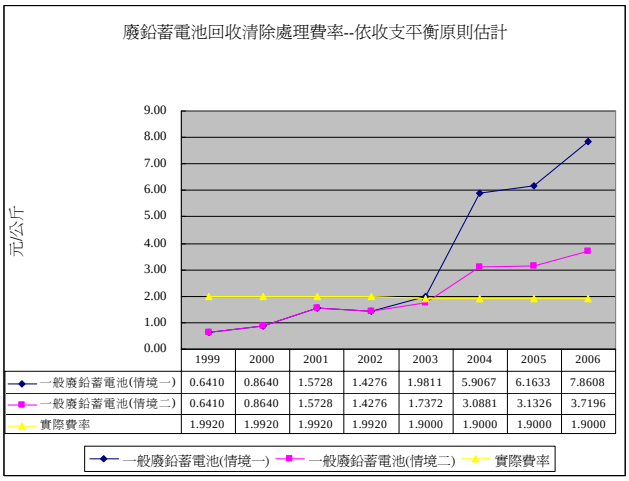
2. 年度資源回收基金收支平衡原則：本原則所需考量的費率因子，尚包括回收基金當年收入(進口與製造業者的實際營業量)及支出(處理業者的回收處理量)。因為費率決策必須預先公告，因之此二因子乃為預估值。

本文據此原則，同時考量前小節之國際鉛金屬市場交易價格上漲幅度對國內廢鉛蓄電池回收處理體系之市場機制運作之影響程度，分別估算自 1999 年以來之回收清除處理費費率變化，並將之與歷年之實際費率比較，結果如圖 8 與圖 9。此二研究結果顯示， 依反映成本原則所估計的費率，在 2002 年以前，基本上與實際費率極為接近，但自 2002 年以後，後者則呈現嚴重低估回收處理市場的成本現象。而依收支平衡原則所估算之費率，則顯示在 2003 年以前，實際徵收的費率較維持收支平衡所需的費率，有高估現象，(此時資源回收基金收入，應有餘裕)。而 2004 年以後，則顯示回收基金的收入部份，並不足以支付實際支出之所需，而有產生虧損的可能。此時，基金費率若持續維持原有的水準，則基金收入將不足以滿足廢鉛蓄電池回收處理體系正常運作之所需，而可能導致體系運作的無效率及回收率的難以提升。



	1999	2000	2001	2002	2003	2004	2005	2006
一般廢鉛蓄電池(情境一)	2.1588	1.9484	1.9858	1.7476	2.8383	8.6148	8.8616	11.3022
一般廢鉛蓄電池(情境二)	2.1588	1.9484	1.9858	1.7476	2.4889	4.5040	4.5828	5.3481
實際費率	1.9920	1.9920	1.9920	1.9920	1.9000	1.9000	1.9000	1.9000

圖 8 一般廢鉛蓄電池回收清除處理費率與實際費率之比較—依反映成本原則估計



	1999	2000	2001	2002	2003	2004	2005	2006
一般廢鉛蓄電池(情境一)	0.6410	0.8640	1.5728	1.4276	1.9811	5.9067	6.1633	7.8608
一般廢鉛蓄電池(情境二)	0.6410	0.8640	1.5728	1.4276	1.7372	3.0881	3.1326	3.7196
實際費率	1.9920	1.9920	1.9920	1.9920	1.9000	1.9000	1.9000	1.9000

圖 9 一般廢鉛蓄電池回收清除處理費率與實際費率之比較—依收支平衡原則估計

4. 結論與建議

本文針對國內鉛蓄電池的產業型態、廢鉛蓄電池回收清除處理體系在現行的行政、財務與市場機制的運作情況，及國際鉛金屬交易市場的價格變化趨勢，共計提出三項議題，分別檢視國內廢鉛蓄電池之回收清除處理實際成本的變化；特用廢鉛蓄電池之差別補貼費率之必要性，及現行持續維持穩定的相關費率與補貼費率決策的合理性。茲將重要結論彙整如下：

1. 一般電池與特用電池間，確實存在顯著的成本差異，因之現行資源回收政策對二者的回收處理採差別補貼費率的決策，應屬合理，且可確保特用廢鉛蓄電池的最終妥善處理。

2. 與實際補貼費率相較，自 2002 年始，廢鉛蓄電池之回收處理成本與補貼費率間的差距，顯著的逐漸加大，表示由環保署資源回收基管會所訂定的廢鉛蓄電池回收處理補貼費率，對於吸引廢電池進入體制內回收處理體系所能發揮的誘因效果有限，換言之，在國際鉛金屬價格變動劇烈的市場客觀情況下，穩定的補貼費率政策的正確性，值得進一步檢討與調整。

3. 依反映成本原則所估計的費率，在 2002 年以前，基本上與實際費率極為接近，但自 2002 年以後，後者則呈現嚴重低估現象。而依收支平衡原則所估算之費率，則顯示在 2003 年以前，實際徵收的費率較維持收支平衡所需的費率，有高估現象，而 2004 年以後，則顯示回收基金的收入，並不足以支付實際支出之所需，而有產生虧損的可能。此時，基金費率若持續維持原有的水準，則基金收入將不足以滿足廢鉛蓄電池回收處理體系正常運作之所需，而可能導致體系運作的無效率及回收率的難以提升。

4. 在現行國際鉛價高漲的前提下，國內鉛金屬二次料市場應呈賣方市場的優勢，此時依反映成本原則，調升廢鉛蓄電池的上游業者費率及補貼率，市場反彈聲浪較小，同時有助於廢棄物清理法所賦予繳費業者的『生產者責任制』的落實，並可有效防堵體制外處理業者搶購廢料所形成之

回收處理體系之缺口，因此值得環保署基管會深入調查鉛金屬回收處理市場與原料及二次料市場的變化，據以調整現行廢鉛蓄電池的費率政策。相信對於廢鉛蓄電池回收率的進一步提升，將可發揮助益。

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B.論文

WASTE BATTERY RESOURCES RECYCLING：

PROCESS SYSTEMS AND STRATEGIES FOR WASTE LEAD BATTERY RECOVERY AND RECYCLING AND ASSOCIATED COST ANALYSIS

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ABSTRACT

Battery, including, lead/acid type, is one of the most important sources for electricity in the modern society. In last fifty years, its consumption rate has been far out that of economic growth worldwide.. While the society is enjoying the pleasure and convenience by the advanced development of battery technology, the volumes of used batteries has increased in an alarming speed. Its disposal has become a heavy burden and threatened to human beings and the environment as large amount of social resources and severe pollution required to deal with the problem which remains to be a focal issue and concern for resources utilization and the environmental protection/pollution prevention.

However waste batteries contain many valuable substances including metals and other reusable/recyclable materials. With proper and reasonable treatment, it will not only resolve the environmental problems but have remarkable economic benefits. This discussion paper will be focused on lead/acid type waste batteries, their current treatment technologies, cost associated with recycling processes, and

problems encountered.

Keywords: lead/acid type waste batteries, recycling processes, cost analysis.

1. INTRODUCTION

Lead/acid batteries (or called storage batteries) are those systems using chemical-electrical characteristics to convert directly the chemical energy into DC current. It consists of a lead compound, lead oxide, as anode, metallic lead the cathode and sulfuric acid the electrical solution. The early type of such battery has been invented in 1850s. During 180-1890, the fixed - type lead battery was used in industries including as an auxiliary power source for power generation stations.. In 1898, the first set of lead battery was installed in submarines, and subsequent applications were found as power source in railroad illumination, signal and electrical meters, and wireless receiving and transmission equipment.

The rapid development of lead battery has been resulted from its increasing application to
automobiles as the starting power source. In recent years, with the discovery of new materials and technologies, the manufacturing process for lead battery has entered a new era. The continuous improvement and application of new materials has extended the life cycle of battery and raised its electricity discharge property, additional advantages are also found in structure changes, automation and mechanical improvement for the manufacturing process as well as anti-dust and anti-hazard areas.

In accordance with its applications, the types of lead batter are different in voltage, size and quality, ranging from as light as 2 kg for constant voltage to more than two tons. By its major and extensive applications, lead battery has served as

(1) Automobile ignition power, to supply a large amount of electricity in a short time, and can be operated normally in a severe sub zero weather condition,
(2) Stationary type for industries, it requires large capacity, up to several thousand ampere-hour and long life. Major uses are for power plant, starting power for transmission station, stand-by power source for public facilities and communication.
(3) Power source for vehicles including those used by wharf, railroad station, and fork-lifting in factories. Others are for airport baggage transportation, wheel chairs, electric cars and people and goods carrying means.
(4) Specialized uses, found in scientific, medical and military areas.

Lead/acid type is the largest in production and the most in application world wide. Its total global sales and output are above 30% of the battery market, and consumes 80% of world lead production. The extensive application of lead battery is interrelated to its characteristics. It can discharge a large amount of electricity, adaptability, current adjustment over a wide range of temperature, and high reversible properties. Lead batteries can carrying out several hundred charging-discharging cycles, high EMF, abundant raw material sources, relatively simple manufacturing process, and inexpensive price.

Due to high competitions, in Europe and USA the merge and acquisition of lead battery manufacturers has become a rapid trend with a large amount of investment. In China, there are more numbers of lead battery producers than those for other types in the sector. Their production techniques, size, quality, and pollution problems are varying considerably, covering from hand-operation to mechanical, pollution-free closed system and automation. From 1980-1990, 650 key systems for lead battery were imported, of which 425 are for ignition kinds, and 68 for industrial types. In addition, there were 7 production lines for making battery anode-cathode and plating, and 136 for testing. In the meantime, more than ten factories upgraded their manufacturing abilities to produce maintenance-free and small-size closed-system battery units., and reaching the capacity of 2×10^5 kW-hr and 4×10^5 kW-hr respectively.. Through a series of technologic improvement, the production capacity and product quality have been greatly enhanced, and reached to the international standard of 1990s though. At present. The production capacity is in the neighborhood of 3×10^7 kW-hr and increasing.

2. HAZARDOUS PROPETIES OF LEADBATTERY TO HUMAN HEALTH

Either by the “Basel Conversion” Treaty or international standards, waste lead battery can be classified as a hazardous and dangerous substance., and has a major impact on the environment rooted in its contents of chemicals including sulfuric acid, heavy metals of lead, antimony, zinc and arsenic. A whole waste lead battery can contain 20-30% of electrolytic solution including 15-20% of sulfuric acid and lead-content suspended solid. Table 1 illustrates the metallic components in the solution.

Table1. Concentrations of Metals in the Solution

Metals	Concentration (mg/L)	Metals	Concentration (mg/L)
Lead particles	60-240	Zinc	1-13.5
Dissolved lead	1- 6	Tin	1- 6
Arsenic	1- 6	Calcium	5-60
Antimony	20- 175	Iron	20-100

During operations, lead battery causes a little hazard, but once used and its collection and recovery are not in accordance with the protocols, serious consequences of damage to the environment and human health can happen.

Lead and sulfuric acid are the major cause on environmental impact. If waste batteries are discarded directly in the environment, corrosive and hazardous substances can be released through the broken pieces of the container. (every waste lead battery used for automobile can release 2-3 L pH- 0.8 sulfuric acid.). Even for any closed system, the direct threat from solutions is small, but a pollution source still existing.

Open discharge of solution to the environment will contaminate soil and ground water by strong acidic property, and the metal contents have certain toxicities to human health through the dust powder, smog, contaminated drinking water and

foodstuffs.

The purpose of lead refining process is to remove almost all copper, antimony, arsenic and tin contents and produces pure “soft” lead. Through the process the potential sources for the environment are: lead dust and smog produced from lead overheating; release of sulfuric dioxide; formation of suspended solid and cleaning process; cleaning and recovery of chlorine and tin using oxygen-rich air.

As mentioned,without proper handling of recycling spent solution which generating lead-content wastes can cause serious pollution to the surrounding soil and water bodies and result in serious damage to human health.

Lead intake by a human body can have an effect on diseases including metabolism, fertility, nerve system and death in the most serious cases. Medical research has demonstrated that minor lead
poison can cause brine damage to children, lowering their intelligence capability and deficient in nerve system development, and with heavy lead poison cases death. It has been found that the half-life period of lead in a human body is 1460 days, and long term accumulation through daily intake results in slow poison. If a body contents lead concentration twice over that of the normal amount, organs have already being damaged and serious diseases occurred.

3. WASTE LEAD BATTERY RECOVERY AND RECYCLINGTECHNOLOGIES

3.1 Dismantling and Pretreatment of Waste Lead/Acid battery

Among all non-ferrous metals, lead has the highest recycled rate. Statistically, the cost for lead recycling is 38% lower than that of originally produced. Besides the labor efficiency is 1.9 times higher, and energy consumption 67% lower. The cost to produce recycled lead from waste batteries, is even lower than that from others lead-contained waste materials. In 2003, the world production of recycled lead reached more than 65% of all lead produced.

Three kinds of lead recycling processes have been generated used, namely: dry; i.e. furnace-combustion; wet processes, and the combination of dry-wet methods.

No matter what kinds of dry technologies are used, during the melting process of lead, complex chemical reactions can take place in the acidic solution. The solution must be completely drained prior to undergo treatment process. The lead case is better crushed before treatment for high yield of lead soft; antimony; possible recovery of polypropylene; simplifying furnace smoke treatment and remove all the solution its existence is not allowed presenting in high temperature furnace. With the advanced development of battery industry, the closely sealed and other types batteries present more difficulty than before draining solutions.

3.1.1. Battery dismantling- Prior 1960s, it was mainly a manual job which is still practiced in many developing countries.. However, by doing so, strict protocols should be followed to protect labor health and the environmental contaminations. In 1960-1970s, the mechanical devices including axes and saws

were introduced to reduce risks. Since 1980s, the modern melting-refining facilities have adapted the fully automated recovery systems. In it batteries are crushed into fine pieces in order to recover all the components from a waste battery. Normally, it is dismantled, pressed, crushed, and separated substances by gravity producing acidic solution, fine particles and electrode paste, metallic particles, and polypropylene. In China, however, many plants are small, and dismantle waste batteries manually by axes.

3.1.2. Pretreatment- To minimize body contact, using automatic system and small-size vehicles to transported waste batteries into the open-lid container, crushed and followed by separation process for all compounds. Normally, lead oxides and sulfates will form fine particles which are separated by screening, filtration, watering, and sent into the furnace or other processes.

3.2. Reduction of lead- The crushed and pretreated pieces of waste batteries are in fact
mixtures of metallic lead, its oxides and sulfates; and others metals including calcium, copper, silver, antimony, arsenic, and tin. The efficiency for lead dioxide reduction is a major factor in the recovery process, and there are two methods commonly used.

3.2.1. High- temperature or melting method, which reduces PbO_2 with $PbSO_4$ and PbO mixtures in the smelter to elemental lead. As the consequence of SO_2 and high-temperature lead dust formation, secondary pollution will happen, coupled with high energy consumption and low efficiency, this obsolete technique has been greatly phased out but prevailing in some developing countries including in China.

3.2.2. Wet method refining process, by adding reducing agents, i.e. FeSO4 in sulfuric acid solution which can be the acid-washing waste water from the steel smelter. The electro-chemical process generated from applying electricity can selectively reduce lead compounds to metallic lead, and the major pollutants are waste water containing organic and inorganic compounds. Lead thus produced contains other metallic compounds. Further refining processes are needed to yield refined lead for industrial application purpose.

3.3. High-temperature furnace refining process: Using chemical reactions through heating and reduction processes facilities to achieve purification. Compounds like sodium carbonate, sodium hydroxide or a mixture of ferric oxide and calcium carbonate are added to get rid of sulfur in lead sulfate. At the same time, the emission of sulfur dioxide and the amount of slag are reduced. The acidic solution must be pretreated before sending into the smelter. Neutralized by sodium hydroxide, lead hydroxide will be formed and precipitated, filtered, and entered into the smelter with the reducing agent, normally coke. The added amount of agents must be carefully controlled, otherwise sulfur and impurities can be emitted by a large amount as sulfur-oxygen compounds, and lead contents, if insufficiently reduced will be increasing in slag and causing environmental concerns. Finally the melted lead is precipitated at the bottom, and contains valuable metallic impurities. Further refining process is necessary to recover high-quality lead.

3.4. Wet refining process: It is also called electrolysis- process converting lead compounds into metallic lead.. The process has better separation results but with high operating costs.

With the high-temperature smelter process, usually the blast-type furnace is used, simple, high yield and economic benefit. During the refining process, however, the vapor pressure of lead increases with temperature, and emitted with lead dust in the exhaust and cause serious air pollution. Many countries have put a great effort in researching and developing technologies for recycling lead, and the wet refining process is one of the major studying fields. Areas focused on include acidic and basic processes.

In China, some successful studies have been conducted and applied to practical use at a number of recently built and modern plants for lead recovery from waste batteries.

4. ENVIRONMENTAL PROBLEMS OF WASTE LEAD BATTERY RECOVERY

Waste lead battery provides a major source of recovered lead with great economic benefit. The pollution problems from the process must be carefully controlled to avoid the situation that exchanging benefit at the sacrifice of the environment. Pollution sources are from crushing, screening, and dry/wet refining process, which generate waste water and fume exhaust.

4.1: Waste water: Collects into the acid storage container, diluted, neutralized with basic lead slag to PH = 6--8.5, setting and centrifuging. Dry cake is recycled to the furnace, and water recycled as supplement for crushing.

4.2. Exhaust gas: Propylene-compound made bag filters are effective to collect lead oxide
particles, 0.2 to 0.5 microns with 98 to 99% efficiency. Lead dust from the operations has a concentration in the range of 0.04 – 4 mg/m^3 can be blown to the exhaust from the combustion. and treated by bag filters.

5. WASTE LEAD BATTERY RECOVERY PROBLEMS IN DEVELOPING COUNTRIES

Unlike in developed countries, the recovery of waste lead battery in many developing countries is not processed in a sound system which has economic, social and the environmental benefits. In China, as well, no hazardous treated cases are few. The reasons lie in:
(1). the pollution from waste lead battery (same as for other types) is not obvious and hidden to the people and indifferent to a long period of its explosive consequence;
(2). the rapid increase in volume of waste lead batteries;
(3). Knowledge of awareness and concerns is lacking, and should be raised among the public; and
(4). laws and regulations are not defined clearly enough for the treatment of waste

battery after being collected.

The necessity for non-hazardous recovery/recycling process for waste lead battery in developing countries especially those with rapid economic growth as India and China is essential based on the following facts.

(1). massive production- massive consumption- massive waste is one of the characteristics of modern economy. Entering 21 century, China has become a country on the road from huge battery production/consumption towards waste, and actions must be taken for its sustainable development,
(2). protecting the global environment on which human survive is dependent,
(3). protecting the one-time and precious natural resources. Contrary to the common saying that China has vast territory areas and abundant resources, many ferrous metal deposits worldwide are fast depleting. Only a short period of time left for mining operations at those sites.

In China, the situation is more acute and severe than others developing countries. For historical
reasons, there is a considerable gap between China and other countries in waste lead battery recycling technologies. There are only three major processing plants located in Jiangsu, Shanghai, and Hubei using modern facilities and techniques, for high production efficiency and minimum impact on the environment. The total output of these plants is about 100,000 tons/year, of recycled lead, more than 50% of the national production. By incomplete estimation, there are additional 20 plants with capacity about 5,000 tons per year, 11 with 10,000 tons or above, and the total numbers for processing waste lead battery, however, are over 300. The rest are either family- operation oriented or too small scale with low efficiency, resources wasteful, and causing serious damage to the environment. Even these plants with up-to-date technologies and facilities, the average recovery rate of recycled lead is 80-85% comparing with 90% in other countries. It is estimated that as a whole there are more than 30,000 tons of lead lost during the course of refining. The lack of screening/separation technique for most plants, the combined utilization efficiency is low, e.g. antimony in the alloy composition is not been recovered but left in the slag. The energy consumption is 2 to 4 time higher than in similar operations existing abroad, and 90% refining processes are without any filtration equipment for exhaust gases.

Cost factors associated with other sectors as collection, transportation and storage also have serious affects. In 2003, the government through SEPA issued No 163: “Policy on Waste Battery Pollution Control Technology”. It has specified the entire procedures and protocols for waste battery recovery and recycling process. What it lacks is the strong support from local governments and lukewarm response from the public. More pressing problem now for industrial/municipal waste disposals is what every one’s concern; the treatment of discarded batteries is minor for its shear volume despite the hazardous and toxic characteristics.

5. CHALLENGE AND BUSINESS OPPORTUNITY

The total number of battery produced in China is about 18 billion, and it increases rapidly over 10-20% a year. Of which lead battery has occupied considerably.

From its major use in automobiles and annual replacement, the following information from Beijing (which has a vehicle population of 2.5 million) well illustrates the frequency of battery changes.

TABLE 2: LEAD BATTRY CHANGING RATE FOR VEHICLES IN BEIJI

Type	Class	Frequency of change/yr
Vans	All sizes	2 – 5
Trucks	Small and medium Large	2 – 4 1 – 4
Sedan	Compact Medium size Full size	1 or 2 -5 2 or 3 – 5 2 or 3 – 5
Two-wheel Motor cycle	Motor bike Motor cycle	1 – 4 1 – 4

The total number of vehicles in China on the road is over 80 millions with at least 10-15% increase every year.. Based on the recovery rate of 50 – 60 kg of lead for each 100 kg of waste battery, a modern plant with a capacity of processing daily 100,000 waste batteries, its net profit after all the expenses is estimated to be 20,000 – 30,000 RMBs, with a capital investment in the order of 20-30 million RMBs for equipment. In a year, 1 billion of waste lead batteries are to be replaced, discarded and processed. If 50% of those are collected and treated by plants, the net profit can reach 0.8 – 1.0 billion RMBs.

Besides procession waste lead batteries, if the recoveries are extended to other types, the potential
business opportunities will extend and economic benefit increase. At present, the total number of all types of batteries manufactured is about 18 billion with 10 billion exported. After admission to WTO, China may have to take back, some time willingly for metal recovery as resources, a considerable portion of waste ones and processed within its boundary, e.g. the used cellular phones. In retrospect, the business opportunity and its associated economic benefit are expected.

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B.論文

廢乾電池回收再利用處理技術探討

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摘 要

電池可分為不能重複使用之一次電池（乾電池）與可重複充電使用的二次電池（蓄電池），為一種可將化學反應產生的化學能直接轉換為電能的裝置。然因一般電池壽命短則數月，長亦不過數年即會退化無法再用，其所含的汞、鎘、鉛、鋅、錳等有害重金屬成分隨其廢棄而散佈於環境之虞，對自然環境及人體健康潛在甚大之威脅，因此廢電池之處理與管理長期以來即倍

受世界各國所重視。

由於目前廢乾電池處理處置均採境外處理，國內目前還沒有經過稽核認證的廢乾電池的處理廠，清除處理業者的廢乾電池分類技術和所用流程也須再精進，透過國外技術以改進國內處理技術，本文將針對國外處理技術進行探討以作為提昇國內廢乾電池回收再利用技術與能力之參考。

關鍵詞：廢乾電池，處理技術，有害重金屬，資源化處理

1. 前言

國內目前廢乾電池之回收清理工作尚在起步階段，而歐美日等先進國家對於廢電池之回收工作已執行多年，且不斷持續檢討回收體系之成效和研發新技術，其經驗足勘我國借鏡。

根據文獻指出目前國外對廢乾電池回收處理技術通常有三種類型：藉由單一的採礦處理操作分離成份、高溫冶金法、濕法冶金法，如下分述之。

一、濕式冶金法（Hydrometallurgy）

透過濕式冶金方式進行回收再利用基本上包括廢棄物的酸或鹼性溶出（leaching），其把金屬放溶液中。一旦置於溶液中，金屬可以藉由沉澱、改變溶液pH值、或添加某些反應試劑，或藉由電解等方式予以回收。使用濕式冶金法的主要優點為其消耗較少的能源，但是後續需要再行處理廢棄物。TNO（Toegepast- Natuurwetenschappelijk Onderzoek）為用濕式法處理廢電池之典型工廠。

二、高溫冶金法（Pyometallurgy）

高溫冶鍊法基本上係使用高溫以回收廢電池中的金屬，其可去除含在鋅錳乾電池中的汞。在去除之後，鋅亦可藉由蒸餾方式予以回收；處理鎳鎘電池時，鎘也可以被蒸餾出來。3個具有代表性的高溫冶金製程為在法國的Snam，在瑞典的Sab Nife以及在美國的Inmetco（International Metal Reclamation Company）。與濕式相比較，此種方法的優點為不像濕式冶金會產生有害性廢棄物而需要進一步的處理。主要的缺點為能源消耗，因為操作溫度約為800~1000℃。

三、濕式冶金法（Hydrometallurgy）

此法特別是使用在工業電池上。電池以分離回收或濃縮處理，並透過其他製程做進一步的回收。此種型態的處理通常是回收再利用製程的第一階段。單一採礦處理操作僅使用物理方法，因此較其他處理方式便宜。儘管此程序有其應用上的限制，但卻可以降低進一步製程的成本。

2. 國內廢乾電池處理現況介紹

2.1 境外處理現況介紹

目前國內已取得環保署受補貼機構資格之廢乾電池處理業者共計3家，

分別位於桃園縣幼獅工業局之永續環保股份有限公司、台中縣大里市之永莊股份有限公司以及台南縣官田鄉之環蓄實業有限公司，其中又以永續環保股份有限公司加入處理之時間較長。國內廢乾電池之處理主要採境外處理為主，送往處理之國家包括比利時、德國、法國及韓國。

國內受補貼機構對於廢電池之處理流程為將所回收之廢乾電池篩選分為六類，即一次電池（錳、鋅及筒型鹼錳）、一次電池（筒型鋰）、鈕釦型、鎳氫電池、鎳鎘電池及二次電池（鋰），再全數委託境外廠商處理。茲將國內廢電池受補貼機構之處理設備、處理流程及境外處理機構之資料整理如表一所示。

目前國內廢乾電池輸出之境外處理廠，彙整說明如下。

1.法國 CITRON 公司

CITRON 公司位於法國北方的 Le Havre 港，處理重金屬廢棄物、汞廢棄物、有機廢棄物、廢照明光源及廢電池，CITRON 公司每年處理量可達 130,000 公噸（廢乾電池的最大處理能力為每年 100,000 公噸）其所採用的專利真空爐處理程序非常有效，基本上為一熱裂解處理程序。

CITRON 公司將廢電池分類後，大於 7cm 的各類電池須先經過破碎，再進入真空爐，而高含汞的鈕釦電池則進入汞分餾系統。最終產物為鐵及二氧化錳混合物、氫氧化鋅及汞。

2.法國 SNAM 公司

SNAM 公司以處理廢鎳鎘乾電池為主，年處理量可達 5,400 公噸以上，其基本處理技術為混合乾濕式煅燒蒸餾法，目前該公司亦開始處理廢鋰電池。SNAM 公司將鎳鎘電池組先進行粗破後再進入熱裂解程序。由控制熱裂解的溫度及時間，使鎘金屬以氣體狀態釋放出，再經過分餾的裝置，取得鎘金屬，其純度為 99.95%，剩餘的固體則為鎳鐵混合物。鎳鐵殘渣則回收賣給鋼鐵業使用。

3.韓國 Kobar Limited 公司

Kobar Limited 公司最大可處理能量為每年 2,400 公噸，其中鎳鎘及鎳氫電池約 1,500 公噸，鋰電池約 900 公噸。而此公司是以真空熱裂解方式處理鎳鎘及鎳氫廢電池，廢電池初步破碎後，將包裝塑料與電池本體分離，然後將電池本體粗破碎，再進入真空熱裂解爐中將鎘蒸發出來，經過金屬隔板收集並固化為 99.99%純度的鎘金屬。至於鎳鐵渣則賣至不銹鋼熔煉廠。

廢二次鋰離子電池在水中放電後，初步解體將包裝塑料與電池本體分離。電池本體再經過細破碎成粉末狀，並分選出鋰鈷粉

末及鋁。

4.比利時 REVATECH 公司

REVATECH 公司主要處理含金屬或有機物之工業廢液。該公司於 1993 年起開始處理廢乾電池， REVATECH 公司採用的技術基本上是濕式處理，利用電解法處理廢鹼性乾電池和廢碳鋅電池，目前的廢乾電池最大處理容量為每年 10,000 公噸，但實際上每年約處理 3,000 公噸的廢乾電池。

5.SAT 公司

SAT 公司之再生處理單元為真空熱回收（Vacuum Thermal Recycling process, VTR-process）系統，為熱裂解處理程序。SAT 公司廢乾電池處理流程首先需將電池前分類、拆解或破碎，再將所欲處理之同類電池移入 VTR-process 內並依所欲得到之產品來分段調整裂解溫度。由於整個系統屬真空操作，且氣化之物質皆經冷凝回收，故無污染排放之虞。

表一　國內廢電池境外處理之受補貼機構處理機構彙整表

處理機構	核准字號	處理項目	處理設備		處理流程	平均進貨量處理量（公噸/月）	預估處理量（公噸/月）	境外處理機構	處理項目	處理數量（公噸）	到期日
永續環保股份有限公司	桃回收字第0005-02號	廢乾電池境外處理	廠區僅作為廢乾電池貯存，故相關處理設備		廢乾電池進廠回收→人工篩選→分類裝箱→認證公司稽核認證封箱→境外輸出至經環保署核可之國外處理機構處理	80	80	1.法國 CITRON	錳鋅、鹼錳廢乾電池	1,500	申請中
			現場機具	推高機2輛、吊掛設備（天車）1套、緊急淋洗眼器1組				2.法國 SANAM	鎳鎘廢乾電池	200	95.11.30
								3.韓國 Kobar Limited	鎳鎘廢乾電池	100	95.11.30
									鎳氫廢乾電池	300	95.12.01
									鋰（二次）廢乾電池	40	95.11.30
永莊股份有限公司	93 中縣回廢處字第0008-01號	廢乾電池境外處理	廠區僅作為廢乾電池貯存，故相關處理設備		廢乾電池進廠回收→人工篩選→分類裝箱→認證公司稽核認證封箱→境外輸出至經環保署核可之國外處理機構處理	10	10	比利時 REVATECH	錳鋅、筒型鹼錳廢乾電池	500	95.08.30
			現場機具	推高機2輛、輸送設備1套、塑膠桶500個、緊急淋洗眼器3組							
環蓄實業有限公司	93 中縣回廢處字第0008-01號	廢乾電池境外處理	廠區僅作為廢乾電池貯存，故無相關處理設備		廢乾電池進廠回收→人工篩選→分類裝箱→認證公司稽核認證封箱→境外輸出至經環保署核可之國外處理機構處理	100	100	1.德國 SAT	一次電池（錳鋅、筒型鹼錳）	1,000	96.04.30
									一次電池（筒型鋰）	20	
									二次電池（鋰）	60	
			現場機具	推高機1輛、緊急淋洗眼器1組					鎳氫電池	20	申請中
								2.韓國 Kobar Limited	一次電池（錳鋅、筒型鹼錳）	-	
									二次電池（鋰）		
									鎳氫電池		

2.2 國內處理廠設置申請現況

目前已有延龍資源科技股份有限公司、瑞興機械有限公司及海光企業股份有限公司3家公司向環保署申請廢乾電池處理業（國內處理）受補貼機構資格，以下就各處理廠設置申請現況說明如表二。

表二　國內處理廠設置申請現況

公司名稱	處理項目	處理方法	再生料
瑞興機械有限公司	碳鋅電池及鹼錳電池	乾式熱處理	粉狀體物質之金屬固體殘留物、顆粒狀之金屬廢料混合物及磁性金屬（鐵）
延龍資源科技股份有限公司	碳鋅電池、鹼錳電池及二次電池	濕式冶金處理	塑膠、熟鐵、鎘、銅、鋅、鈷、氧化錳、氧化鎳
海光企業股份有限公司	碳鋅電池、鹼錳電池	電弧爐處理	鋅、氧化鋅、氫氧化鉀、鉛及錫

3. 國外廢乾電池回收處理技術介紹

國外較為常用的廢電池回收再利用相關技術彙整如表三所示，個別製程介紹如後。由表四可知，國外處理廠所使用之技術大致分為高溫冶煉法、濕式冶煉法和高溫/濕式法併用等三大類。

表三　國外常見之廢電池回收再利用製程

製程名稱	國別	說明
Sumitomo	日本	完全以回溫冶煉為主。其成本非常高，可用以回收所有型態的可攜式電池。其並不希望回收處鋰鎳鎘電池
Recytec	瑞士	包括高溫法、濕式法和物理處理。其可用以處理所有型態的可攜式電池，也可以處理螢光燈泡和含汞燈管。此製程的投資小於Sumitomo製程，但是操作成本較高
Snam-Savam	法國	法國之鎳鎘電池回收再利用製程完全以回溫冶煉法為基礎
Sab Nife	瑞典	瑞典鎳鎘電池回收再利用製程完全以回溫冶煉法為基礎
Inmetco	美國	由INCO(Intematlonal NickeI Company)所擁有之北美製程。剛開始開發以回收處理電弧爐煙塵為主，其也可以被用以回收從其他製程產生之金屬性廢棄物，不含汞的NiCd、NiFe、NiMH。Li離子和Zn-Mn電池亦可以使用Inmetco製程處理。

表三　國際間較常見之廢電池回收再利用製程（續）

waelz	德國	為回收煉鋼煙塵中之金屬之高溫冶煉製程。此製程使用一種旋轉式熔爐，並從煉鋼廢棄物中回收如鋅、鉛和鎘的金屬
TNO	荷蘭	電池回收再利用之濕式冶煉法。此製程發展兩種回收再利用替代方案，一種為回收碳鋅(Zn-C)和鹼性家用電池，另一種為回收鎳鎘電池。家用電池方案尚未商業化運轉
Accurec	德國	此製程專為鎳鎘電池的回收再利用而開發。第一套熔爐設於1997年，且處理容量每年為500公噸。第2套熔爐於2000年開始運轉
TERA	德國	可處理鈕釦型的汞-氧化物電池，以及鹼性和乾式家用電池。
Baenus	德國	為多重步驟之濕式提煉程序，可以處理許多種型態的電池

4. 先進國家實廠處理方法及污染防治技術

廢乾電池回收處理旨在於脫汞並回收鋅、鎘、鐵、錳及塑膠等有價物，依其回收處理的方式，可分為乾式法與濕式法。乾式法依處理溫度的高低可分高溫法和低溫法。高溫法冶煉溫度在1600℃以上，使汞、鎘、鉛和鋅都形成氣體再轉化成鐵錳合金；焙燒法乃將破碎乾電池加熱至約700℃，使汞、金屬鋅與鎘被蒸餾分離，之後加入氯化鈣並將溫度昇至800℃左右，使氧化鋅變成具揮發性的氯化鋅被蒸餾分離，剩下的氯化鈣與二氧化錳混合物可供提煉錳鋅的原料。本章就日本、美國、瑞士、德國現行廢乾電池及二次電池中之鎳鎘電池之處理方法如表四所示。其中，日本廢乾電池之處理技術主要可分為資源化技術及固化技術兩種，茲說明如下：

1.資源化技術

回收汞、鎘或相關有價金屬前，需先將各類型之電池先行分開處理，而進行回收程序作業時，需於嚴格的條件環境下進行，以防止汞和鎘等有害物質曝露，造成環境二次污染。而回收處理一次電池可採用之技術有：

（1）焦冶金（pyrometallurgical）技術

焦冶金技術包括烘烤電池和粉碎作業兩種程序。先將電池磨碎，再利用高溫低壓環境下將水銀蒸餾回收出來，電池加熱至365℃高溫狀態下蒸餾水銀，日本北海道野村興業株式會社即採用此種技術回收處理水銀。若再繼續加熱溫度，即可回收粗鋅和鎘金屬，當加熱至更高溫度，則將釋放出粗鎂和鎳。

（2）水冶金（hydromettallurgical）技術

進行水冶金技術需避免與焦冶金程序相互污染。水冶金程序包括粉碎及低於攝氏100℃的溫度下進行萃取電池。使用氫氯酸或硫酸進行萃取電池，使二氧化錳、Fe（OH）3、Zn（OH）2沈澱。而水銀的回收則是於萃取前藉由加熱將其移除。

2.固化技術

固化技術可將廢乾電池中的水銀做有效的安定處置，固化處理流程先將水銀電池粉碎，再利用硫化鈉、硫酸鐵等化學物質，以防止水銀溶出，再添加固化劑進行固化安定。可採用的固化劑如波特蘭（pozzolannic）水泥，將金屬轉化成不溶性氫氧化物和碳酸鹽，而限制其溶解性於移動性，波特蘭水泥凝結後具堅硬固體性質之功效。

表四 國外現行廢乾電池及二次電池中之鎳鎘電池之處理方法

資源化處理公司		處理程序
日本	ITOMUKA	先進行預先試驗，以決定廢棄物之處理方法，再依據其化學性質、物理性質及水銀之型態，採用最適合之處理系統及作業程序。廢乾電池經自動選別機具選別，再進入熔燒爐（Rotory Furamce）焙燒處理，以及水銀回收之處理系統，整體流程採用一貫作業。此技術可處理混合廢電池，破碎後之廢電池經磁選分離鐵類，而電極活性物質投入於 600℃~800℃旋轉窯內焙燒，使汞氣化再經冷凝回收粗汞，可再精煉成高純度汞，而旋轉窯排出的礦渣則再經磁選分離為鐵屑及粗鋅。
美國	BCTI	BCTI 公司主要業務包含有電池回收、處理及再生品販賣，接受使用過電池及報廢之電池，經專門處理程序，回收全部或部分電池，再行銷售回收之材質。BCIT 公司接受一般家用電池回收業務，但以鹼性電池為主，處理流程為各類電池先進行分類、再行粉碎、分離水銀、加熱處理、分離組件，最後將各類部分之有價物質轉售，該公司並自行擁有交通運輸車輛，可提供電池回收及載運作業。
	MRC	廢乾電池進廠後，經分類、檢驗及編號後先行貯存，再經前置處理、熱解及濃縮處理，回收汞物質後再行販售。在回收處理費用方面，水銀電池回收費用每磅約介於 2.48 元至 5.85 元美金之間，而錳鋅電池及鹼錳電池中汞含量較少，一般均低於 0.5% ，平均收費約每磅 4 元美金。
瑞士	RECYTEC SA	二段培燒法脫汞，經破碎磁選分離鐵類與鋅、銅、石墨後，熱焙燒粗產物為鋅錳粉末，可送窯爐精煉為鋅。該公司每年可處理 2,500 公噸之廢家用電池。
德國	BATENUS	此法先篩選出含汞鈕扣電池，其餘經粉碎、磁選分離鐵類，其剩餘物再磨成粉末後以稀硫酸萃取並經過濾，濾餅含氧化錳及碳可回收再利用；濾液中所含汞先藉離子交換樹脂予以分離，其後複經酸萃取、離子交換而將鋅、銅、鎳、鎘等予以依次分離之。

	ASA	當含鎘廢電池運至處理廠時，先進行分類/拆解動作。電池主體部分（電極、隔離板等）若體積過大先採破碎，並以火法提煉再生，其單元操作為VTM-unit（Vacuum Thermal Recycling unit，真空熱回收單元），其原理是利用金屬鎘的沸點為765℃，在加熱到900℃的高溫處理時，會昇華成鎘的蒸氣，而由金屬鎘與空氣接觸生成的氧化鎘，在900℃的高溫下，則亦會分解而呈金屬鎘狀態昇華，因此廢電池中的鎘成份在高溫會變成蒸氣分離出來，隨後經過冷凝收集成金屬鎘（處理系統為密閉），其純度可達99%以上，適合再作為電池原料。

5. 結語

廢乾電池回收再利用處理技術已有很長歷史，若國內要採用境內處理須考慮之因子很多。而國內提出受補貼機構資格申請之3家廢乾電池處理廠使用之處理技術為電弧爐處理法、濕式冶金處理法和乾式熱處理法，雖然處理方式與國外處理方法相近，但是在處理製程技術與設備操作條件之控制，乃至污染防治設施之設置上，是否能達到國外技術水準，則有待進一步證驗。

廢乾電池含有Hg、Cd及Pb等重金屬成分，有造成環境污染並危害人體健康之虞，最佳廢乾電池處理之管理境界，可減輕對自然環境及人體健康潛在之威脅，減毒及減量為並參採國外處理技術依據國內適用性加以評估，決定最適回收處理及再利用技術，以達提昇國內廢乾電池回收再利用技術與能力之目標。

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（四）活動照片

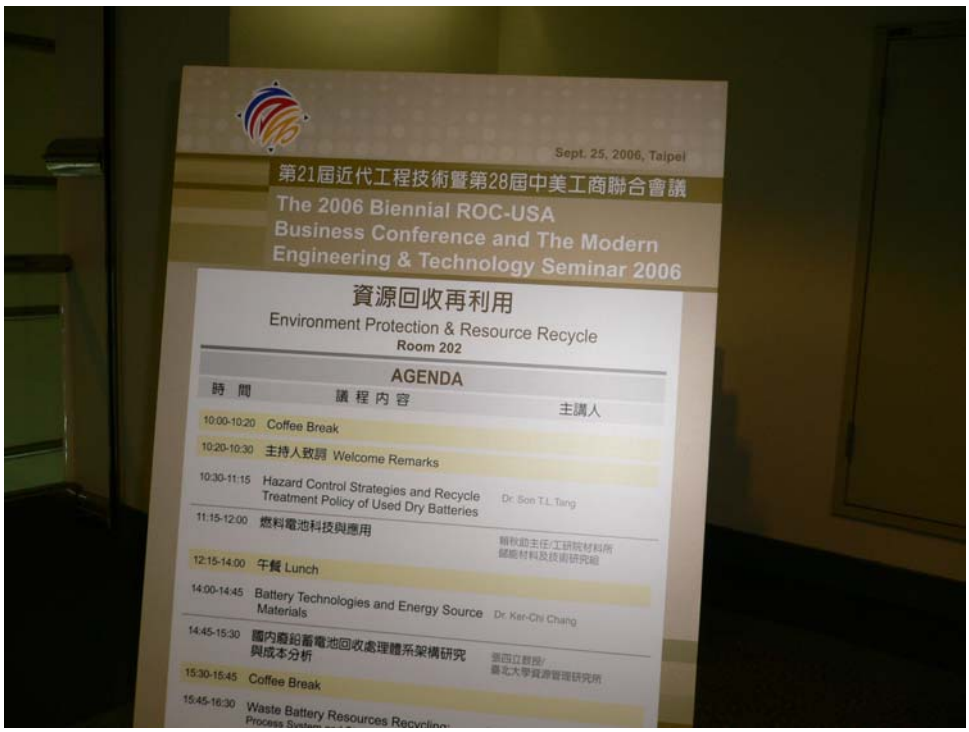
◎經濟部施政務次長顏祥於歡迎晚宴中致詞，歡迎來自美洲之專家學者回國建言

◎「第 21 屆近代工程技術暨第 28 屆中美工商聯合會議」開幕典禮（9 月 25 日）報到場景

◎外交部黃志芳部長於開幕典禮中致詞

◎開幕典禮出席貴賓，前排左起美國在台協會（AIT）代理處長 Mr. Robert Wang、外交部黃志芳部長、中美經濟合作策進會辜濂松名譽理事長、中國工程師學會余俊彥理事長、中美經濟合作策進會陳木在理事長、美洲中工會 METS 籌備會方玉山總召集人、籌備委員會傅勝利主任委員

◎「資源回收再利用」分組研討會於 9 月 25 日假台北國際會議中心 202 會議室舉行



◎「資源回收再利用」分組研討會開會場景（一）

◎「資源回收再利用」分組研討會開會場景（二）

◎「資源回收再利用」分組研討會開會場景（三）

第四章、結論與建議

（一）電池資源之回收雖是困難重重，但也勢在必行，尤其在處理技術，應防止二次污染的發生，尤其具有挑戰性的戰略規則及執行。我政府執行機構已具備良好的法規，能在政策方面輔導廠商，以收管理及資源利用之效能，而達到造福人民保護環境的目的。

（二）政府應參考國際間能源及環保政策，擬定適合國內電池業界的特長，訂出短程、中程、及長程研究發展（R&D）目標，編列預算，積極輔導台灣電池工業的成長。國內奈米技術居世界一流水準，宜考慮將 nano-technology 推廣至 nano-battery 及 nano-material 領域。

（三）根據世界各國對綠色環境的要求，以及台灣正積極融入世界社會、永續發展以及國際組織的時刻，我國必須提昇對節能降耗，資源重複利用和保護環境的積極性，才能在世界貿易急劇競爭的情形下，求生存求發展。

（四）我國發展民生用的燃料電池，以低溫型發展為主，而觸媒以白金系貴金屬為主，極具回收價值，當數量達到一定規模時，回收體系自然可以建立起來。

（五）廢鉛蓄電池的回收技術單純，每單位廢電池中粗鉛之回收比例高達 70%，因此極易形成一封閉的物質循環體系。目前台灣的廢鉛蓄電池回收率多維持在七成左右，且合格處理場僅有一家，因此，對於體制外的回收處理業者的存在，以及其收購行為對廢鉛蓄電池回收體系運作的影響，乃是必須正視的問題。

（六）國際鉛金屬市場行情的變化，牽動國內廢鉛蓄電池的廢料售價與二次鉛的市場價格。建議廢鉛蓄電池的回收清除處理費率與補貼廢率的訂定，應持續追蹤國際鉛金屬價格的漲跌變化，特別是在國際行情低迷時，應密切關注回收率的變化，而當國際行情高漲時，則應精確掌握國內廢鉛蓄電池的市場價格成本的變化，適度調整相關費率，並輔以積極查緝不符合環保規範之清除處理行為，確保廢鉛蓄電池回收清除處理體系能在最符合成效性的原則下，順利運作。

（七）在國外廢乾電池管制主要對象是製造業者、批發商和零售商，消費者常常只是受宣導教育的對象而已。在台灣除垃圾分類可以強制要求民眾分類排出外，亦可以對業者加重責任，其中包括進口的產品。

（八）廢乾電池含有 Hg、Cd 及 Pb 等重金屬成分，有造成環境污染並危害人體健康之虞，最佳廢乾電池處理之管理境界，可減輕對

自然環境及人體健康潛在之威脅，減毒及減量，並參採國外處理技術依據國內適用性加以評估，決定最適回收處理及再利用技術，以達提昇國內廢乾電池回收再利用技術與能力之目標。

（九）環保署補助回收商，而容許其自由選擇回收國外處理廠，雖然回收處理要求有相當標準，但常常出現所謂處理商只是中間經手，兩邊得利的現象。雖然資本主義商業表現應以自由為重，但環保署似可在旁協助，以保證我方之利益。

（十）當今發展中國家（尤其在亞洲鄰國）對廢棄物回收及利用，尚欠缺政策及有效實施。我國能先事發展出廢棄電池及其它廢電子產品重複利用的方法，推廣至這些發展中國家，不僅可受國際尊重，方便外交，亦可有睦鄰之效，對貿易商亦頗有裨益。

第五章、出席人員

召集人：張國龍

主持人：楊慶熙

主講人：唐次朗、張克致、勞長春、蔡克勤、張四立、張添晉

工作人員：劉怡焜、洪怡芳

報名與會人員名單：

編號	姓名	單位	職稱
1	丁一權	永續環保股份有限公司	廠長
2	王文革	彰化縣環保局	技士
3	王興如	普誠環保工程有限公司(台中分公司)	經理
4	何舜琴	環保署廢管處	處長
5	吳郁煌	環保署廢管處	工程員
6	呂仁宙	躍成科技股份有限公司	副總經理
7	宋以仁	環保署廢管處	科長
8	李守謙	環保署廢管處	環境技術師
9	李志怡	環保署基管會	副組長
10	李貞瑩	環保署廢管處	技正
11	李鴻源	環保署廢管處	技正兼組長
12	杜豐生	綠電再生(股)公司	總經理
13	周志儒	高雄第一科技大學環境與安全衛生工程系	系主任
14	林文華	國際超能源科技(股)公司	總經理
15	林玉韻	環境資源研究發展基金會	助理研究員
16	林玉麟	環保署廢管處	稽查督察員

編號	姓名	單位	職稱
17	林昌文	環保署環境督察總隊台北辦公室	正工程司
18	林政江	經濟部工業局	技士
19	林群超	環境資源研究發展基金會	副研究員
20	邱志鵬	核能研究所	副工程師
21	邱俊雄	環保署廢管處	薦任技士
22	洪榮勳	環保署	專業研究員
23	張木彬	中央大學環境工程研究所	所長
24	莊韻蓉	台中市環保局	課長
25	許明華	環保署廢管處	技正
26	許智倫	環保署廢管處	組長
27	郭益志	環保署廢管處	稽查督察員
28	陳文雅	環境資源研究發展基金會	助理研究員
29	陳宇揚	財團法人台灣產業服務基金會	副理
30	陳孝仲	康城工程顧問公司	工程師
31	陳秀玲	台中市環保局	稽查員
32	陳俊成	淡江大學水資源與環境工程系	系主任
33	陳俊融	環保署毒管處	技士
34	陳峻明	環保署廢管處	高級環境技術師
35	陳健銘	環保署廢管處	工程師
36	陳樺蓁	環保署廢管處	技士
37	傅素貞	彰化縣環保局	技士
38	曾宗瑜	台北縣環保局	技佐
39	費定國	中央大學化學與材料工程系	教授
40	費齊信	環保署基管會	環境技術師
41	黃冠穎	環保署科技顧問室	行政助理
42	黃輝源	環保署中區督察大隊	大隊長
43	黃麗玫	環保署中區督察大隊	稽查督察員
44	楊文雄	環境資源研究發展基金會	副研究員
45	楊慶熙	環保署廢管處	副處長
46	楊慧聆	苗栗縣環保局	約僱人員
47	楊麗貞	環保署毒管處	毒化物管理師
48	鄒倫	中技社	主任
49	廖彬良	環境資源研究發展基金會	副執行長
50	熊明德	環保署科技顧問室	行政助理
51	劉文馨	永續環保股份有限公司	總經理特助
52	劉偉成	綠園國際股份有限公司	總經理

編號	姓名	單位	職稱
53	劉清雄	博研燃料電池(股)公司	總經理
54	蔡志昌	台灣湯淺電池(股)公司	課長
55	蔡孟裕	高雄縣環保局	副局長
56	蔡敏行	台灣資源再生協會	理事長
57	鄭宏德	晶淨科技(股)有限公司	總經理
58	鄭清山	高雄市環保局	簡任技正
59	盧曉宜	環保署廢管處	技士
60	謝燕儒	環保署廢管處	簡任技正
61	鍾昀泰	環保署廢管處	工程員
62	藍文忠	中興工程顧問公司	工程師
63	藍得彰	工研院	副研究員
64	顏子修	環保署毒管處	助理毒管師
65	顏振華	經濟部工業局	技正
66	羅瑞玫	苗栗縣環保局	技佐
67	蘇意筠	環保署環境督察總隊	薦任技士
68	吳淑慧	台北科技大學環境工程所	
69	姚凱富	台北科技大學環境工程所	
70	李淑莉	台北科技大學環境工程所	
71	陳俞穎	台北科技大學環境工程所	
72	金珮瑩	台北科技大學環境工程所	
73	王嘉慶	台北科技大學環境工程所	
74	邱俊樺	台北科技大學環境工程所	
75	賴秉鴻	台北科技大學環境工程所	
76	張哲銘	台北科技大學環境工程所	
77	許繼穎	台北科技大學環境工程所	
78	黃致喬	台北科技大學環境工程所	
79	陳碩之	台北科技大學環境工程所	
80	李銘清	台北科技大學環境工程所	
81	吳欲齊	台北科技大學環境工程所	
82	陳育民	台北科技大學環境工程所	
83	陳世育	台北科技大學環境工程所	
84	陶令瑜	美國在台協會商務組	
85	周志儒	高雄第一科技大學環境與安全衛生工程系	系主任
86	彭致和	環保署環境督察總隊	副工程司
87	張雅淳	環保署環境督察總隊白北辦公室	行政助理

編號	姓名	單位	職稱
88	謝志武	台北市環保局	
89	蘇福欽	中國礦冶學會	理事長
90	黃啟瑞	南開醫技中心	主任
91	林達雄	環保署	副署長
92	陳永仁	台北市環保局	局長
93	盧世昌	台北市環保局	科長
94	謝哲隆	宜蘭大學環工系	助理教授
95	馮玉民		

附件一、大會手冊

Sept. 22-27, 2006, Taipei

第21屆近代工程技術暨第28屆中美工商聯合會議

The 2006 Biennial ROC-USA Business Conference and The Modern Engineering & Technology Seminar 2006

大會手冊 PROGRAM

主辦單位

中美經濟合作策進會
ROC-USA Business Council

中國工程師學會
Chinese Institute of Engineers

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理事長歡迎詞

Welcome Message

第21屆近代工程技術暨第28屆中美工商聯合會議歡迎詞

民國95年9月25日

欣逢第21屆近代工程技術暨第28屆中美工商聯合會議於本(95)年9月22日至27日在台北召開，謹代表中國工程師學會及中美經濟合作策進會對各位長官、貴賓、主講人及各產官學研界代表，表達最誠摯的歡迎。

本屆年會以「服務科技創新機，台灣產業新世紀」為主題，除邀請來自美國及台灣各產業界及學術界重量級的專家學者，針對產業現況提出研究分析並發表演說外，並盼能為各產業界提供對話交流平台。在此更感謝來自各界的召集人、主持人、與談人以及各界熱烈的參與，為本大會增添無限光寵。

今年的會議內容精彩可期，包含了17組產業研討會，其主題皆為當今最熱門之議題，更有高爾夫球賽、遠雄自由貿易港區參訪、台北縣鶯歌知性之旅、歡迎晚宴、台北之夜及惜別晚宴；由大會精心策劃為期5天的活動，結合知性與感性雙重考量，除希望能帶給與會人士各種產業發展新知及產業全球佈局之國際宏觀外，也希望藉由參訪行程及知性文化之旅，促進中美雙方往來更加密切與多元化。我們期許本屆會議可為中美雙方及各界帶來更多商業契機，讓台灣的對外經貿往來關係及實質關係更加緊密。最後祝大會圓滿順利，各位貴賓滿載而歸！

中國工程師學會　　理事長

中美經濟合作策進會　理事長

Welcome Message

September 25, 2006

It's our great honor to represent the ROC-USA Business Council and the Chinese Institute of Engineers (CIE) to extend their warmest welcome to all the distinguished guests from both the public and private sectors as well as the academia at the joint event of the 2006 Biennial Business Conference and the Modern Engineering & Technology Seminar 2006 in Taipei on September 22-27.

Under the theme of "Creating a New Era for Taiwan Business through Innovative Service and Technology", the biennial event is composed of various sessions and each will be featured with brilliant speeches and in-depth discussion on specific topics. We sincerely appreciate your participation which, we believe, will heighten the significance of the event as an important gathering of the industrial representatives and experts to look into the major issues concerning the current business relations between Taiwan and the U.S.

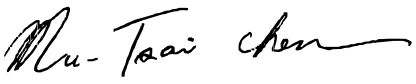
As our tradition, we plan for a series of social activities in conjunction with the two-day conference such as the golf tournament, visit to the Farglory Free Trade Zone, ceramics tour, welcome dinner, Taipei Night, and gala banquet. We hope the special arrangement will add to the joyfulness of the weeklong activities for this year, complement your understanding of today's Taiwan, and more importantly foster the friendship among all participants.

We are very glad to have you join us at our most important event for this year and look forward to your continued support to us in the future. Thank you.

John T. Yu
President

Chinese Institute of Engineers

Mu-tsai Chen
Chairman



ROC-USA Business Council

大會總日程表

General Schedule

Date 日期	Time 時間	Event 活動	Venue 地點
Sept. 22 Friday		Guest Arrival 美方專家抵台	Sheraton Taipei Hotel 台北喜來登飯店
Sept. 23 Saturday	08:00~16:00	Golf Friendship Tournament 高爾夫球賽	Ta Shee Golf & Country Club 桃園大溪高爾夫球場
	08:30~17:00	Business Tour－Far Glory Free Trade Zone 遠雄自由貿易港區	Taoyuan County 桃園縣
	18:30~21:00	Welcome Dinner 歡迎晚宴	Taipei International Convention Center Banquet Hall 台北國際會議中心宴會廳
Sept. 24 Sunday	08:00~17:30	Cultural Tour 知性之旅	Yingge Town/ Taipei County 台北縣鶯歌鎮 (陶瓷文化)
	18:00~20:00	Taipei Night 台北之夜	Taipei City Hall B1 Bai-Ma Hall 台北市政府大樓B1白馬廳
Sept. 25 Monday	08:30~10:00	Opening Ceremony 開幕典禮	Taipei International Convention Center Plenary Hall 台北國際會議中心大會堂
	10:30~17:30	Separate Groups of 17 Seminars 分組研討會	Taipei International Convention Center 台北國際會議中心
Sept. 26 Tuesday	09:00~17:15	Seminar Groups (Continued) 分組研討會	Taipei International Convention Center 台北國際會議中心
	16:00~18:00	Executive Summary 綜合座談會	Sheraton Taipei Hotel/ Longevity Ballroom 喜來登飯店壽廳
	18:30~21:00	Gala Banquet 惜別晚宴	Sheraton Taipei Hotel/ Prosperity Ballroom 喜來登飯店祿廳
Sept. 27 Wednesday		VIP Program 美方貴賓行程	Arranged by Secretariat 大會安排

大會議程

Conference Program

一、會議日期：95年9月22日至27日
Date: September 22-27, 2006

二、會議地點：台北國際會議中心
Venue: Taipei International Convention Center (TICC)

三、會議主題：服務科技創新機，台灣產業新世紀
Theme: Creating A New Era in Taiwan Business Through Innovative Service and Technology

四、議程Agenda

Saturday, September 23, 2006

06:00~16:00 高爾夫球賽 (桃園大溪高爾夫球場)
Golf Game

06:00 驅車前往高爾夫球場
Take bus to Golf Club

08:00 開球
Tee-off

13:00 午餐-明園餐廳
Lunch

14:30 搭車回台北
Take bus back to Taipei

08:30~17:00 桃園縣遠雄自由貿易港區參訪
Business Tour- Far Glory Free Trade Zone

18:30~21:00 歡迎晚宴(台北國際會議中心宴會廳)
Welcome Dinner (TICC Banquet Hall, 3rd Floor, TICC)

18:00 貴賓報到入場
Reception

18:30 主持人曲艾玲小姐開場
Opening Statement

18:35 太鼓表演
Drum Performance

18:35~19:00 貴賓致詞

中美經濟合作策進會辜名譽理事長濂松致歡迎詞
Welcome Remarks by Dr. Jeffrey L. S. Koo, Honorary Chairman of ROC-USA Business Council

中國工程師學會余理事長俊彥致詞
Welcome Remarks by Mr. John T. Yu, President of Chinese Institute of Engineers
中美經濟合作策進會陳理事長木在致詞
Welcome Remarks by Mr. Mu-Tsai Chen, Chairman of ROC-USA Business Council
經濟部陳部長瑞隆致詞
Greetings by Mr. Ruey-Long Chen, Minister of Economic Affairs, ROC
美台商會秘書長致詞
Greetings by Mr. Rupert J. Hammond-Chambers, President of US-Taiwan Business Council
美洲中國工程師學會METS籌備會總召集人方玉山博士致詞
Greetings by Dr. David Fong, General Chair of US Planning Committee, CIE/USA
籌備委員會傅主任委員勝利致詞
Greetings by Dr. Shen-Li Fu, Chairman of Organizing Committee

19:00 高爾夫球賽頒獎
Golf Awarding Ceremony

19:20~21:00 晚宴及表演活動
Dinner and Entertainment Program

Sunday, September 24, 2006

08:00~17:30 台北縣知性之旅
Cultural Tour to Taipei County

18:00~20:00 台北之夜 (台北市政府大樓B1白馬廳)
Taipei Night(Taipei City Hall B1 Bai-Ma Hall)

18:00 貴賓報到入場
Reception
貴賓致詞
台北市政府馬英九市長致歡迎詞
Welcome Remarks by Dr. Ying-jeou Ma, Mayor of Taipei City Government
中美經濟合作策進會陳理事長木在致謝詞
Response by Mr. Mu-Tsai Chen, Chairman of ROC-USA Business Council
美洲中國工程師學會METS籌備會總召集人方玉山博士致贈馬市長紀念品
Souvenir Presenting to Mayor Ma by Dr. David Fong, General Chair of US Planning Committee, CIE/USA

18:30 晚宴及表演活動
Dinner and Entertainment Program

Monday, September 25, 2006

08:30~09:00 大會報到（台北國際會議中心一樓大廳）
Registration (Lobby, TICC)

09:00~10:00 開幕典禮（台北國際會議中心三樓大會堂）
Opening Ceremony (Plenary Hall, 3rd Floor, TICC)

- 09:00 鴻勝醒獅團擊鼓開場：鼓徹雲宵．翻越新世紀
  Drum Performance by Hung Sheng Lion Dance Theater
- 09:10 中美經濟合作策進會宰名譽理事長濂松致開幕歡迎詞
  Opening Remarks by Dr. Jeffrey L. S. Koo, Honorary Chairman of ROC-USA Business Council
- 09:15 總統致詞
  Address by Honorable President Chen Shui-bian of Republic of China
- 09:30 宣讀美國布希總統賀詞
  Message from Honorable President George W. Bush of the United State of America
- 09:35 中國工程師學會余理事長俊彥致歡迎詞
  Welcome Remarks by Mr. John T. Yu, President of Chinese Institute of Engineers
- 09:40 中美經濟合作策進會陳理事長木在致歡迎詞
  Welcome Remarks by Mr. Mu-Tsai Chen, Chairman of ROC-USA Business Council
- 09:45 美國在台協會台北辦事處處長楊甦棣致詞
  Greetings by Mr. Stephen Young, Director of Taipei Office of American Institute in Taiwan
- 09:50 美洲中國工程師學會METS籌備會總召集人方玉山博士致詞
  Greetings by Dr. David Fong, General Chair of US Planning Committee, CIE/USA
- 09:55 籌備委員會傅主任委員勝利致詞
  Greetings by Dr. Shen-Li Fu, Chairman of Organizing Committee

10:00~10:30 Coffee Break

10:30~17:30 分組研討會（本日計15分組，分別於下列會議室同時舉行）
Seminars of 15 Separate Groups

1. 生物科技與醫療技術組－101B會議室
   Biotechnology & Medical Technologies－Room 101B
2. 能源科技與永續技術組－101D會議室
   Energy Technology and Sustainable Development－Room 101D
3. 平面顯示與光電技術組－102會議室
   Flat Panel Display and Optoelectronics－Room 102
4. 奈米與微機電技術組－201C會議室
   Nano and MEMS Technology－Room 201C

5. 資源回收再利用組－202會議室
   Environmental Protection & Resource Recycle－Room 202
6. 水管理組－101C會議室
   Water Management－Room 101C
7. 寬頻通訊與網路整合組－201E會議室
   Broadband Communication and Network System Integration－Room 201E
8. 知識型及數位創意產業管理組－201F會議室
   Management of Knowledge and Creativity Digital-Based Industries－Room 201F
9. 產業轉型與升級組－203A會議室
   Industrial Transition and Transformation－Room 203A
10. 感染性疾病組－201D會議室
    Infectious Disease－Room 201D
11. 金融服務組－4樓貴賓廳
    Financial Services－VIP Room, 4th Floor
12. 汽車零組件組－101A會議室
    Auto Parts & Components－Room 101A
13. 工業合作組－201B會議室
    Industrial Cooperation Program－Room 201B
14. 創意設計組－103會議室
    Creative Design－Room 103
15. 台灣創投產業的創新與發展組－201A會議室
    Innovation and Expansion: Advancing Opportunities for Taiwan's VC Industry－Room 201A

Tuesday, September 26, 2006

08:30~09:00 報到（台北國際會議中心一樓大廳）
Registration (Lobby, TICC)

09:00~17:00 分組研討會（本日計5分組，分別於下列會議室同時舉行）
Seminars of 5 Separate Groups

1. 金融服務組－4樓貴賓廳
   Financial Services－VIP Room, 4th Floor)
2. 創意設計組－103會議室
   Creative Design－Room 103
3. 數位家庭組－101C會議室
   Digital Home－Room 101C

4. 服務業的創新經營模式－醫療觀光－101A會議室
   New Business Model in Service Industry-Health Care and Tourism－Room 101A

5. 生物科技與醫療技術組－101B會議室
   Biotechnology & Medical Technologies－Room 101B

16:00~17:45 綜合座談會（台北喜來登飯店壽廳）
Executive Summary (by Invitation Only)
Venue at B2 Longevity Ballroom, Sheraton Taipei Hotel

18:10~21:00 惜別晚宴（台北喜來登飯店祿廳）
Gala Banquet (by Invitation Only)
Venue at B2 Prosperity Ballroom, Sheraton Taipei Hotel

18:10 主持人開場
Opening Statement

18:15 非洲鼓表演
Affrican Drum Performance

18:30~19:00 貴賓致詞
Honorable Guests Greetings

中美經濟合作策進會辜名譽理事長濂松致歡迎詞
Welcome Remarks by Dr. Jeffrey L. S. Koo, Honorary Chairman of ROC-USA Business Council

立法委員江丙坤先生致詞
Greetings by P. K. Chiang, Legislator

中國工程師學會余理事長俊彥致詞
Greetings by Mr. John T. Yu, President of Chinese Institute of Engineers

中美經濟合作策進會陳理事長木在致詞
Greetings by Mr. Mu-Tsai Chen, Chairman of ROC-USA Business Council

籌備委員會傅主任委員勝利致詞
Greetings by Dr. Shen-Li Fu, Chairman of Organizing Committee

美洲中國工程師學會METS籌備會總召集人方玉山博士致詞
Greetings by Dr. David Fong, General Chair of US Planning Committee, CIE/USA

19:00~21:00 晚宴及表演活動
Dinner and Entertainment Program

Wednesday, September 27, 2006

11:00 貴賓行程（總統府）
Visit Presidential Office

大會共同召集人

Co-Conveners

余俊彥
大會共同召集人
John T. Yu
Co-Convener

Present Position: 中國工程師學會 理事長
President
Chinese Institute of Engineers

陳木在
大會共同召集人
Mu-Tsai Chen
Co-Convener

Present Position: 中美經濟合作策進會 理事長
Chairman
ROC-USA Business Council

方玉山
大會共同召集人
David Fong
Co-Convener

Present Position: General Chair, US Planning Committee
President & CEO
Forte Connections, Inc.

研討會召集人

Seminar Conveners

留忠正
Chung-Cheng Liu
生物科技與醫療技術組召集人
Seminar Convener of Biotechnology & Medical Technologies

Present Position：工研院生技與醫藥研究所 副所長
Deputy General Director
Biomedical Engineering Research Laboratories
Industrial Technology Research Institute

陳寬墀
K. C. Chen
生物科技與醫療技術組召集人
Seminar Convener of Biotechnology & Medical Technologies

Present Position: 美吾華醫藥生技企業團 總裁
Chief Executive Officer
Maywufa Biopharmaceutical Enterprise Group

曲新生
Hsin-Sen Chu, Ph.D.
能源科技與永續技術組召集人
Seminar Convener of Energy Technology and Sustainable Development

Present Position: 財團法人工業技術研究院 副院長
Executive Vice President
Industrial Technology Research Institute

程章林
Janglin Chen
平面顯示與光電技術組召集人
Seminar Convener of Flat Panel Display and Optoelectronics

Present Position: 工研院影像顯示科技中心 主任
Vice President and DTC General Director
Display Technology Center
Industral Technology Research Institute

蘇宗粲
Tsung-Tsan Su
奈米與微機電技術組召集人
Seminar Convener of Nano and MEMS Technology

Present Position: 工研院奈米科技研發中心 主任
General Director
NanoTechnology Research Center
Industrial Technology Research Institute

張國龍
Kow-Lung Chang, Ph.D.
資源回收再利用組召集人
Seminar Convener of Environmental Protection & Resource Recycle

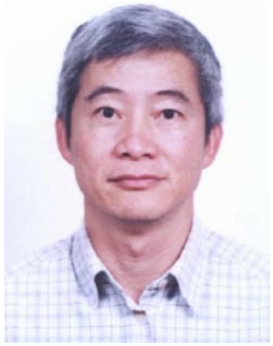
Present Position: 行政院環境保護署 署長
Minister
Environmental Protection Administration
Executive Yuan

陳伸賢
Shen-Hsien Chen
水管理組召集人
Seminar Convener of Water Management

Present Position: 經濟部水利署 署長
Director General
Water Resources Agency (WRA)
Ministry of Economic Affairs

徐享崑
Hsu, Shiang-Kueen
水管理組召集人
Seminar Convener of Water Management

Present Position: 台灣省自來水公司 董事長
Chairperson
Taiwan Water Corporation



賀陳旦
Ho-Chen,Tan
寬頻通訊與網路整合組召集人
Seminar Convener of Broadband Communication and Network System Integration

Present Position: 中華電信股份有限公司 董事長
Chariman & CEO
Chunghwa Telecom Co., Ltd.

柯志昇
Jyh-Sheng Ke
知識型及數位創意產業管理組召集人
Seminar Convener of Management of Knowledge and Creativity Digital-Based Industries

Present Position: 財團法人資訊工業策進會 執行長
President/CEO
Institute for Information Industry

陳昭義
Chao- Yih Chen
產業轉型與升級組召集人
Seminar Convener of Industrial Transition and Transformation

Present Position: 經濟部工業局 局長
Director General
Industral Development Bureau
Ministry of Economic Affairs

侯勝茂
Sheng-mou Hou
感染性疾病組召集人
Seminar Convener of Infectious Disease

Present Position: 行政院衛生署 署長
Minister
Department of Health
Executive Yuan

張秀蓮
Susan S. Chang
金融服務組召集人
Seminar Convener of Financial Services

Present Position: 行政院金融監督管理委員會 副主任委員
Administrative Vice Chairperson
Financial Supervisory Commission
Executive Yuan

趙永全
Yuen-Chuan Chao
汽車零組件組召集人
Seminar Convener of Auto Parts & Components

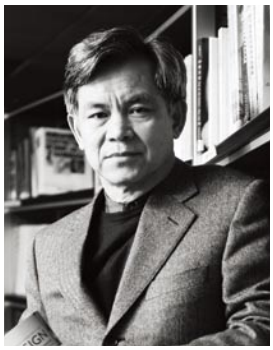
Present Position: 中華民國外貿協會 祕書長
President & CEO
Taiwan External Trade Development Council

唐 鋒
Jack F. Tang
工業合作組召集人
Seminar Convener of Industrial Cooperation Program

Present Position: 經濟部工業合作推動小組 主任
Director
Industrial Cooperation Program
Ministry of Economic Affairs

許志仁
C.J. Hsu
創意設計組召集人
Seminar Convener of Creative Design

Present Position: 台灣創意設計中心 董事長
Chairman
Taiwan Design Center



張光民
Tony K.M. Chang
創意設計組召集人
Seminar Convener of Creative Design

Present Position: 台灣創意設計中心 執行長
Director
Taiwan Design Center

王振堂
J.T. Wang
數位家庭組召集人
Convener of Digital Home

Present Position: 宏碁股份有限公司 董事長
Chairman
Acer Incorporated

陳仕信
Richard Chen
台灣創投產業的創新與發展組召集人
Seminar Convener of Innovation and Expansion: Advancing Opportunities for Taiwan's VC Industry

Present Position: 中華民國創業投資商業同業公會 理事長
Chairman
Taiwan Venture Capital Association

徐小波
Paul Hsu
服務業的創新經營模式-醫療觀光組召集人
Seminar Convener of New Business Model in Service Industry-Health Care and Tourism

Present Position: 時代基金會 執行長
President & CEO
Epoch Foundation

傅勝利
Shen-Li Fu
聯合會議籌備委員會主任委員

Present Position: 義守大學 校長
President
I-Shou University

劉遜
Lawrence T. Liu
大會執行祕書
Executive Secretary, Plenary Session

Present Position: 中美經濟合作策進會 祕書長
Secretary General
ROC-USA Businese Council
中華民國國際經濟合作協會 祕書長
Secretary General
Chinese International Economic Cooperation Association

吳建興
Steven Wu
大會執行秘書
Executive Secretary, Plenary Session

Present Position: 中國工程師學會 副秘書長
Deputy Secretary General
Chinese Institute of Engineers

徐祥禎
Hsiang-Chen Hsu
大會執行秘書
Executive Secretary, Plenary Session

Present Position: 義守大學機械與自動化工程學系 系主任
Chair
Department of Mechanical and
Automation Engineering
I-Shou University

主講人名單

Speakers of Seminars

組別一　Session 1

生物科技與醫療技術
Biotechnology & Medical Technologies

姓名 English Name	職稱 English Title	公司名稱 Company Name
劉主誠 Jue-Chen Liu	Senior Director	Johnson & Johnson
邱建興 Jang-Shing Chiou	Principal Scientist and Supervisor	Alcon Laboratories Inc.
楊　瑩 Pauline Y. Lau	President	Suntec Corporation, USA
陳　正 Jen Chen	董事長 Chairman	健亞生物科技公司 Genovate BiotechnologyCo., Ltd.
曾錙翎 Tzu-Ling Tseng	組長 Director of Molecular Biomedical Technology Division	工研院生技與醫藥研究所 Biomedical Engineering Research Laboratories, ITRI
林峰輝 Feng-Huei Lin	所長 Director and Professor	國立台灣大學醫學工程學研究所 Institute of Biomedical Engineering, National Taiwan University (NTU)
張鴻仁 Hongjen Chang Shaw T. Chen	總經理 President & CEO Director	上智生技創業投資股份有公司 Taiwan Global Biofund Food&Drug Administration Associate
廖繼洲 Chi-Chow Liao	處長 Director General	衛生署藥政處 Bureau of Pharmaceutical Affairs Department of Health
林國鐘 Ko-Chung Lin	總經理 Chairman & CEO	藥華醫藥股份有限公司 PharmaEssentiA
江滄炫 T. S. Jiang	總經理 President	懷特新藥股份有限公司 PhytoHealth Corporation
George J. Lee	Chairman	Biokey, Inc.
David Picard	CEO	Moleac
John H. Musser	Chief Operating Officer	Pharmagenesis Inc.

組別二 Session 2

能源科技與永續技術
Energy Technology and Sustainable Development

姓名 English Name	職稱 English Title	公司名稱 Company Name
余序江 Oliver S. Yu	President	The STARS Group, Los Altos, CA
Micheal Shu	President & CEO	Ztek Corporation
吳海生 Hai-Sheng Wu	Assistant, Associate, and Full Professor	Department of Physics & Astronomy Minnesota State University, Mankato
何無忌 Wu-Chi Ho	組長 Director	工研院能源與環境研究所產業節能組 EEL/ITRI Industrial Energy Conservation Technology Division
顏貽乙 Yi-yie Yan	副組長 Deputy Director	工研院能源與資源研究所新能源技術組 EEL/ITRI New Energy Technology Division
江雨龍 Yeu-Long Jiang	副教授 Associate Professor	國立中興大學電機工程學系 Department of Electrical Engineering National Chunghsing University

組別三 Session 3

平面顯示與光電技術
Flat Panel Display and Optoelectronics

姓名 English Name	職稱 English Title	公司名稱 Company Name
潘益宗 Alfred Pan	Principal Scientist Emerging Technologies	HP Labs, Hewlett-Packard
徐　榮 Rong Hsu	President	SPI-Asia
簡良吉 Liang-Chy Chien	Professor and Program Coordinator	Liquid Crystal Institute and Chemical Physics Interdisciplinary Program, Kent State University

韋忠光 Chung-kuang Wei	副總處長 Deputy Head Director	奇美電子股份有限公司 Technology Development Head Department, CMO
劉軍廷 C.T. Liu	副總處長 Vice President	友達科技中心 AUO Technology Center, AUO
陳政寰 Cheng-Huan Chen	助理教授 Assistant Professor	清華大學動力機械工程系 Department of Power Mechanical Engineering, National Tsing Hua University

組別四 Session 4

奈米與微機電技術
Nano and MEMS Technology

姓名 English Name	職稱 English Title	公司名稱 Company Name
莊順連 Shun Lien Chuang	Professor	University of Illiniois
吳明強 Ming C. Wu	Professor, Electrical Engineering & Computer Sciences	University of California, Berkeley
劉炯權 Chung-Chiun Liu	Wallace R. Persons Professor	Sensor Technology & Control
林唯芳 Wei-Fang Su	教授 Professor	國立台灣大學材料科學與工程學系 Department of Materials Science and Engineering of National Taiwan University
丁　晴 Ching Ting	副組長 Deputy Director/ Program Leader for Organic Solid Phase Photovoltaics	工研院材料與化學研究所 Organic Opto-electronic Materials and Applications Division, MCL/ITRI
謝達斌 Dar-Bin Shieh	副教授兼科主任主治醫師 Associate Professor	國立成功大學醫學院 Medical College Institute of Oral Medicine, National Cheng Kung University

組別五　Session 5

資源回收再利用
Environmental Protection & Resource Recycle

姓名 English Name	職稱 English Title	公司名稱 Company Name
唐次朗 Don T. L. Tang	Science Review Administrator	US Environmental Protection Agency
勞長春 Robert Lao	Residence Project manager	CP Project
張克致 Ker-Chi Chang	Program Manager	Office of Environmental Management, DOE
張四立 Ssu-li Chang	教授兼所長 Chairman and Professor	國立台北大學自然資源與環境管理研究所 Institute of Natural Resources Management, National Taipei University
賴秋助 Chiou-chu Lai	微小型燃料電池實驗室主任 Manager	工研院材料與化學研究所 Material and Chemical Engineering Laboratories, ITRI
張添晉 Tien-Chin Chang	副教授 Professor	國立台北科技大學環境規劃與管理研究所 Institute of Environmental Engineering and Management, National Taipei University of Technology

組別六 Session 6

水管理
Water Management

姓名 English Name	職稱 English Title	公司名稱 Company Name
張守玉 Shoou-Yuh Chang	DOE Samual Massie Chair Professor	North Carolina A&T State University
洪勝南 Sun-nan Hong	Vice President	Kruger, Inc./A Veolia Water Company
吳知行 Jy S. Wu	Professor and Graduade Program Director	University of North Carolina at Charlotte
張建祺 Chein-Chi Chang	Senior Engineer	District of Columbia Water and Sewer Authority
楊錦釧 Jinn-Chuang Yang	教授 Professor	國立交通大學土木工程學系 Department of Civil Engineering, National Chiao Tung University
蔣本基 Pen-Chi Chiang	教授 Professor	國立台灣大學環境工程研究所 Graduate Institute of Environmental Engineering, National Taiwan University
龔誠山 Chen-Shan Kung	協理 Manager	中興工程顧問公司 Sinotech Engineering Consultants, LTD
胡南澤 Nan-Tzer Hu	總工程師 Chief Engineer	台灣省自來水公司 Taiwan Water Corporation

組別七　Session 7

寬頻通訊與網路整合
Broadband Communication and Network System Integration

姓名 English Name	職稱 English Title	公司名稱 Company Name
周漁君 Yu-Cheun Jou	Vice President	QUALCOMM Inc.
陳清亮 Bob Chen	Information Technology Analyst	JPMorganChase
吳　迪 Woody D. Wu	Associate Professor	IT and Computer Science Department, Tarrant County College, TX, USA. CEO, Hightechteam, Inc.
吳傳禎 Chwan Jean Wu	副總經理 Vice President	台灣易利信公司 Ericsson Taiwan
郭輝煌 Yau-Hwang Kuo	教授 Professor	國立成功大學資訊工程學系 Department of Computer Science and Information Engineering, National Cheng Kung University
張光耀 Kuang-Yao Chang	主任 Managing Director	中華電信研究所資通安全技術研究室 Chung-Hwa Telecom Laboratories Information & Communication Security Laboratory
呂學錦 Shyue-Ching Lu	總經理 President	中華電信股份有限公司 Chunghwa Telecom Co., Ltd.
林寶樹 Bao-Shuh Lin	所長 General Director	工研院資訊與通訊研究所 Computer and Communications Research Laboratories, ITRI
李炎松 Yen-Sung Lee	所長 President	中華電信研究所 Chunghwa Telecom Laboratories
邱武志 Victor W. J. Chiu	副所長 Vice President	中華電信研究所 Chunghwa Telecom Laboratories

組別八　Session 8

知識型及數位創意產業管理
Management of Knowledge and Creativity Digital-Based Industries

姓名 English Name	職稱 English Title	公司名稱 Company Name
劉龍國 Lurng-Kuo Liu	Project Lead	IBM T.J. Watson Research Center
李偉森 Chris Li	Senior Manager of IT Architect	IBM
辛永光 Victor Hsin	Co-Founder and Chairman	LINX Communications Inc., Framlingham, MA
龔仁文 Gary Gong	所長 Vice President and General Director	資策會創新應用服務研究所 Innovative Digitech-Enabled Applications & Services Institute (IDEAS), Institute for Information Industry
林劍秋 Chien-Chiu Lin	副處長 Deputy General Director	資策會專案支援處 Project Resource Division, Institute for Information Industry
王郁琦 Yu-Chi Wang	主任 General Director	資策會科技法律中心 Science & Technology Law Center, Institute for Information Industry
林政緣 Cheng-Yuan Lin	正工程師	資策會數位教育研究所 Digital Education Institute, Institute for Information Industry
許素朱 Su-Chu Hsu	主任 Director	國立台北藝術大學藝術與科技中心暨科技藝術研究所 Center for Art and Technology at Taipei National University of the Arts (TNUA)
黃國俊 Gwo-Jiunn Huang	副執行長 Executive Vice President	資策會 Institute for Information Industry
高天助 Tien-Cheu Kao	處長 General Director	資策會專案支援處 Project Resource Division, Institute for Information Industry

組別九　Session 9

產業轉型與升級
Industrial Transition and Transformation

姓名 English Name	職稱 English Title	公司名稱 Company Name
鄭金蓮 Alice C.L. Hsin	CEO & President	LINX Communications Inc., Framlingham, MA
馮達旋 Da Hsuan Feng	Vice President for Research and Economic Development	The University of Texas at Dallas
黃肇鑣 John Chao-Piao Huang	Managing Director	Focus Capital Group
蔡宏明 Horng-Ming Tsai	副秘書長 Deputy Secretary General	中華民國全國工業總會 Chinese National Federation of Industries
王鳳奎 Feng-Kwei Wang	執行長 Executive Director	工研院產業學院 ITRI College, Industrial Technology Research Institute
陳信宏 Shin-Horng Chen	所長 Director and Research Fellow	中華經濟研究院 International Division, Chung-Hua Institution for Economic Research

組別十 Session 10

感染性疾病
Infectious Disease

姓名 English Name	職稱 English Title	公司名稱 Company Name
謝文儒 Wun-ju Shieh	Staff Pathologist/Medical Officer Infectious Disease Pathology Activity	Centers for Disease Control and Prevention (CDC)
張振東 Jang-Dong Chang	Head, Immunology, Virology and Molecular Diagnostic Services	Kord Animal Disease Diagnostic Lab Tennessee Department of Agriculture
林滄龍 Tsang-Long Lin	Professor of Veterinary Patholog	Department of Veterinary Pathobiology Diagnostic Pathologist and Head of Avian Section, Animal Disease Diagnostic Laboratory, Purdue University
邱浩彰 Hou-Chang Chiu	副院長 Deputy Superintendent	財團法人新光吳火獅紀念醫院 Shin-Kong Wu Ho-Su Memorial Hospital
賴秀穗 Shiow Suey Lai	教授 Professor	國立台灣大學獸醫學系暨研究所 Department of Veterinary Medicine, National Tiawan University
謝顯堂 Dennis P H Hsieh	副組主任 Investigator and Associate Division Director	財團法人國家衛生研究院環境衛生與職業醫學研究組 Division of Environmental Health and Occupational Medicine, National Health Research Institutes

組別十一　Session 11

金融服務
Financial Services

姓名 English Name	職稱 English Title	公司名稱 Company Name
胡勝正 Hu, Sheng-Cheng	主任委員 Chairperson	行政院經濟建設委員會 Council for Economic Planning and Development, Executive Yuan
程淑芬 Sophia Cheng	執行副總裁 Managing Director	美林證券台灣區研究部 Merrill Lynch Taiwan Research
盧正昕 Paul C. Lo	執行長 President & CEO	建華金融控股公司 SinoPac Holdings
黃男州 Joseph Huang	策略長 Chief Strategy Officer	玉山金融控股公司 E. Sun Financial Holding Co., Ltd.
顏慶章 Ching-Chang Yen	董事長 Chairman	復華金融控股公司 Fuhwa Financial Holding Co., Ltd
李賢源 Lee Shyan-Yuan	專任委員 Commissioner	行政院金融監督管理委員會 Financial Supervisory Commission, Executive Yuan
陳允懋 Dennis Yuan-Maw Chen	負責人 Executive Director	瑞銀台灣區財富管理 Head Wealth Management Taiwan, UBS AG , Taipei Branch
張秀蓮 Susan S. Chang	副主任委員 Vice Chairperson	行政院金融監督管理委員會 Financial Supervisory Commission, Executive Yuan
鄭林經 Dan Ting	總經理 President & CEO	國際紐約人壽保險股份有限公司 New York Life Insurance Taiwan Corp
林庭璿 Cynthia Lin	總經理 Director	富達證券 Fidelity International
薛琦 Chi Schive	院長 President	台灣金融研訓院 Taiwan Academy of Banking and Finance
管國霖 Victor Kuan	負責人 Country Business Manager	花旗銀行消費金融部 Country Business Manager, Citibank N.A.

林繼恆 George Lin	律師 Managing Partner	恆業法律事務所 Lin & Partners Attorneys at Law
徐小波 Paul S. P. Hsu	董事長 Chairman and CEO	宇智顧問公司 PHYCOS International Co., Ltd.
黃乃寬 Huang Naikuan	協理 Executive Vice President	臺灣證券交易所國際事務部 Taiwan Stock Exchange
詹彩虹 Chan Tsai-Hung	總經理 President	財團法人證券投資人及期貨交易人保護中心 the Securities and Futures Investors Protection Center
周國端 Gwoduan-David Jou	董事長 Chairman	宏泰人壽保險公司 Hontai Life Insurance Co., Ltd
郭大同 Datong Chang	董事 Director	花旗銀行環球金融交易服務處 Securities Country Manager, Global Transaction Services, Citigroup Taipei
Robert Mooney	Acting Deputy Director	美國聯邦存款保險公司 Federal Deposit Insurance Corporation in Washington DC, U.S.
Laurent Combalot	Head of Institutional Sales	瑞銀亞太區證券風險管理商品部 Equity Risk Management Products
Charles Donley	Director	德意志證券集團 Deutsche Securities

組別十二 Session 12

汽車零組件
Auto Parts & Components

姓名 English Name	職稱 English Title	公司名稱 Company Name
蘇評輝 Dr. Jet Shu	副所長 Deputy General Director of Mechanical and Systems Laboratories	工業技術研究院 Industrial Technology Research Institute
Wallace Tsuha	Chairman, CEO & President	

組別十三　Session 13

工業合作
Industrial Cooperation Program

姓名 English Name	職稱 English Title	公司名稱 Company Name
唐鋒 Jack F. Tang	主任 Director	經濟部工業合作推動小組 Industrial Cooperation Program Office
周家權 Gary Chou	副主任 Deputy Director	經濟部工業合作推動小組 Industrial Cooperation Program Office
蔡雅文 Verna Tsai	專案經理 Project Manager	經濟部工業合作推動小組 Industrial Cooperation Program Office
Kin Chong	Deputy Senior VP	EGAT
林凱釗 Eddie Lin	組長 Section Chief	經濟部工業合作推動小組 Industrial Cooperation Program Office
陳維穎 Lisa Chen	專案經理 Project Manager	經濟部工業合作推動小組 Industrial Cooperation Program Office
Greg Martin	Director	Lockheed Martin
J. Daniel Howard	Senior Advisor	Lockheed Martin
Ching Y. Wei	Project Leader	GE-Global Research
Jack Liu	Regional Director	GE Corporate

組別十四 Session 14

創意設計
Creative Design

姓名 English Name	職稱 English Title	公司名稱 Company Name
張光民 Tony K. M. Chang	執行長 CEO	台灣創意設計中心 Taiwan Design Center
林榮泰 Rungtai Lin	教授 Professor	國立台灣藝術大學 National Taiwan University of Arts
陳靜婷 Justine Chen	總監 Director	技嘉科技 GIGABYTE Technology
Claude Zellweger	Principal	One & Co
Martin Brandt	Principal	TrueBrand LLC

組別十五 Session 15

數位家庭
Digital Home

姓名 English Name	職稱 English Title	公司名稱 Company Name
黃肇雄 Jau Huang	董事長 Chairman	訊連科技股份有限公司 CyberLink Corp.
林永仁 Jackson Lin	副總經理 V.P.	宏碁股份有限公司 Acer Incorporated
Joe Van De Water	Director	Intel Corp.

組別十六　Session 16

台灣創投產業的創新與發展
Innovation and Expansion: Advancing Opportunities for Taiwan's VC Industry

姓名 English Name	職稱 English Title	公司名稱 Company Name
陳仕信 Richard Chen	理事長 Chairman	中華民國創業投資商業同業公會 Taiwan Venture Captial Association
葉明峰 Thomas M. F. Yeh	副主任委員 Vice Chairperson	行政院經濟建設管理委員會 Council for Economic Planning and Development, Executive Yuan
施振榮 Stan Shih	董事長 Chairman	智融集團 IDSoft Capital
盧宏鎰 William Lu	董事長 Vice Chairman	智碁創投 iDtechventures
周德虔 T.C. Chou	總經理 President	聯訊創投 Harbinger Venture Management
楊邦彥 Ben Yang	總經理 President	怡和創投 PVP Venture
許明全 Ming Hsu	總經理 President	新揚管理顧問公司 Pac-Link
鄭瑞明 Ray Jamp	合夥人 Partner	智融創新公司 iD Innovation
周大任 David Chow	合夥人 Managing General Partner	CTC Capital
Melissa Ma	Managing Director	Asia Alternative Management
Patricia M. Dinneen	Managing Director	Siguler Guff & Company, LLC
James Ho	Deputy Executive Secretary	Development Fund,Executive Yuan
Patricia M. Dinneen	Managing Director	Asia Alternative Management
Darren Wong	Head of VC Investments	HRJ Capital
Kelvin Chan	Senior VP	Partners Group

組別十七　Session 17

服務業的創新經營模式－醫療觀光
New Business Model in Service Industry－Health Care and Tourism

姓名 English Name	職稱 English Title	公司名稱 Company Name
徐小波 Paul Hsu	執行長 President	時代基金會 Epoch Foundation
陳文華 Wen-Hwa Chen	教授 Professor	國立台灣大學商學研究所 College of Management, National Taiwan University
張煥禎 Victor Chang	負責人 President	聯新國際醫療集團 LandSeed International Medical Group
Peter Kappert	President	Private Hospital Association of Switzerland

美洲分會代表

Delegation of US Planning Committee

美洲中國工程師學會METS籌備會 總召集人
General Chair, US Planning Committee, CIE/USA

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Phone: (408)738-4024 (H), (408)236-6680 (O), (408)296-6628 (FAX)
Email: david@forteconnections.com

Education:

Ph.D. Electrical and Computer Engineering, University of Cincinnati	1983
M.S. Electrical and Computer Engineering, University of Cincinnati	1980
B.S.Electrical Engineering, National Taiwan University	1973

Experience:

Assistant Professor, ECE Department, Clarkson University	1983-1989
Staff Scientist, Lockheed Palo Alto Research Labs	1989-1991
Program Manager, Photon Dynamics, Inc.	1991-1996
Project Manager, KLA-Tencor Corporation	1996-1998
Director, Web content, e-Commerce Technology, Inc.	1998-1999
Vice President, Engineering, e-Commerce Technology, Inc.	1999-2002

Present Position:

President and CEO, Forte Connections, Inc.
Co-Founder and Vice President, CITS Group, Inc.

Selected Publications and Patents:

"The Precursor of Optical Computer – Transistor Laser", The IT Magazine, February 2006, pp.28-29
"Technological Singularity", The IT Magazine, January 2006, pp.30-31
"Learn from Nature – Micro Flying Machine Modeled after Insects", The IT Magazine, December 2005, pp.26-27
"The Reality in Virtual World – The Engineering Support behind Online Games", The IT Magazine, November 2005, pp.30-31
"Introduction to the Application of OFDM in Wireless Telecommunications", The IT Magazine, October 2005, p. 31
"Battling in China – The Lawsuit of Microsoft vs. Google", The IT Magazine, September 2005, pp.26-27

Over 40 technical papers in the area of computer engineering, image processing and Web-based technologies

Social Activities and Honors:

Chairman, Chinese Institute of Engineers, San Francisco Bay Area Chapter, 2004
General Chair, 2004 Modern Engineering & Technology Seminars (METS)
Executive Secretary, 2006 Sino-American Technology and Engineering Conference (SATEC)
Music Director, Ching Ching Chorus, San Francisco Bay Area

美洲中國工程師學會METS籌備會 副召集人
Vice Chair, US Planning Committee, CIE/USA

Name: 張建祺 Chein-Chi Chang
Address: 3689 Cragsmoor Road Ellicott City, Maryland 21042, U. S. A.
Phone: (o) (202) 787-2459, (h) (410) 461-3923
Email: cheinchi_chang@yahoo.com

Education:

Ph.D./1988/Civil Engineering/University of Missouri-Rolla, USA
M.S./1981/Civil Engineering/Ohio State University, USA
B.E./1979/Hydraulic Engineering/Tamkang University, Taiwan

Experience:

Civil and structural design for water and wastewater treatment systems and facilities, civil and structural design for buildings and bridges, course teaching in computer science and MBA.

Present Position:

1. Senior Engineer, District of Columbia Water and Sewer Authority
2. Adjunct Professor, University of Maryland, Baltimore County
3. Adjunct Professor, University of Northern Virginia

Specialty:

water and wastewater engineering, structural design, floodplain study, water and sewer system modeling, project management, risk management, remote sensing, geographic information systems, operations research, quantitative methods for business, operations management.

Selected Publications and Patents:

1. Chang, C.-I, Wang, J.., Chang, C. C., Lin, C., "Progressive Coding for Hyperspectral Signature Characterization", Optical Engineering, September, 2006.
2. Shammas, N. K., Chang, C. C, and Wang, L. K., "Tertiary Microscreening, ADVANCED PHYSICOCHEMICAL TREATMENT PROCESSES, HANDBOOK OF ENVIRONMENTAL ENGINEERING Series, Humana Press, Inc., Totowa, NJ, USA, 2005.

Social Activities and Honors:

1. Vice Chair, Modern Engineering Technology Seminar, Taipei, Taiwan, 2006.
2. Vice President, Chinese Institute of Engineers – USA/Great New York Chapter, 2006.
3. Member, American Society of Civil Engineers.
4. Member, Water Environment Federation.

美洲中國工程師學會METS籌備會 顧問
Advisor, US Planning Committee, CIE/USA

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Email: tcschen@163.com

Education:

M. S. in Materials Science & Engineering, Polytechnic University, Brooklyn NY
Ph. D. in Materials Science & Engineering, Polytechnic University, Brooklyn NY

Experience:

1. General Manager, Global Business Partner and Alliance, Lucent (2005-2006)
2. General Manager, Supply Chain Network, Lucent (2003-2004)
3. General Manager, Shanghai Lucent Technologies Transmission Equipment Co., Ltd (2001-2002)
4. Marketing Director, China Marketing Management of INS, Lucent (2000)
5. Senior Manager, Global Partnerships/Special Project Management, Lucent (1999)
6. Product Manager, Transport Network Management Systems for China/AP, Lucent (1998)
7. Consulting Engineer, Lucent 1997
8. Special Assistant to the President, Polytechnic University (1996)
9. Adjunct Associate Professor, Electrical Engineering Department of the New York Institute of Technology (1994-1996)

Present Position:

General Manager, Bipolar Power Discrete Product Line, Philips Semiconductors Corp

Specialty:

Semiconductor/Telecommunications

Selected Publications and Patents:

Published a numbers of papers in the technical journals and international conferences
Invited Talk, International Optical Networking and Communication Forum, 2004

Social Activities and Honors:

General Chairman, METS, US committee, 2004
Vice Chairman, METS, US committee, 2002
President, Chinese Institute of Engineers, Greater New York Chapter, 2000
National Council, CIE-USA, 1998-2002
Executive Secretary, Chinese American Academic and Professional Society, 1996
Chinese Institute of Engineering Outstanding Service Award, 2001
Chinese American Academic and Professional Society, Community Service Award 1997
Award honor member of the Phi Tau Phi Scholastic Honor society of America, 1996

美洲中國工程師學會METS籌備會 顧問
Advisor, US Planning Committee, CIE/USA

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Phone: (972)282-0756(O) (972)248-6752(H) (972)248-6752(FAX)
Email: aaathlin@yahoo.com

Education:

Ph.D. E. E.	University of California, San Diego	1989
M. S. E. E.	University of California, San Diego	1985
B. S.	Electrophysics, National Chiao Tung University	1979

Experience:

MTS, SMTS, Branch Manager, Program Managers, Texas Instruments	1989-2001
Vice President Engineering, Board of Director, Tera Fiberoptics	2001-2003
Vice President R&D, Inshon, Inc.	2003-2006

Present Position:

Senior Technical Advisor, Lite-On Technology	2006-now

Selected Publications and Patents:

1. T.H. Lin, "Micromachining in RF, Photonics and Data Storage Applications" Invited speaker, Gordon Research Conf, June, 1998,
2. C. Goldsmith, et. al," Characteristics of micromachined switches at microwave frequencies", Invited paper, IEEE MTT-S Digest, p. 1141 (1996).
3. Tsen-Hwang Lin, "Integration of micromirror and mixed-signal IC for optical information processing", Invited paper, Proc. SPIE v. 2383, p 78. (1995).
4. T.H. Lin, "Implementation and characterization of a flexure-beam micromechanical spatial light modulator", Opt. Eng., v. 33, (11) p. 3643, (1994). Milestone Series of Selected Reprints on the subject Optical MEMS edited by Victor M. Bright.
5. T.H. Lin, et. al., "2-D Spatial Light Modulator Array Fab in Si/PLZT", Appl. Optics. v. 29, 1595 (1990)

(26 patent awards, 35 journal papers/presentations and 4 book chapters)

美洲中國工程師學會METS籌備會 總幹事
Administrator, US Planning Committee, CIE/USA

Name: 陳政仁 Cheng-Jen (Allen) Chen
Address: 5 Takolusa Drive, Holmdel, NJ, U.S.A. 07733
Phone: 732-957-9058 (H); 732-957-8889 (O)
Email: c.j.chen@ieee.org

Education:
- B.A. in Industrial Education, Taiwan Normal University, Taipei, Taiwan
- M.S. in Industrial Education, Stout State University, Menomonie, Wisconsin
- M.S. in Electrical Engineering, University of North Dakota, Grand Forks, N.D.
- Ph.D. in Electrical Engineering, University of Wisconsin, Madison, Wisconsin

Experience:
- VP of Engineering, Teleion Wireless Corp, Cranford, NJ: Development of CDMA 2000 Data Modules and GPS Based Fleet Management System.
- Senior Manager/Director of Operations, Auctor Corporation, Santa Clara, CA: Development of Windows CE Embedded Systems including PDAs, GPS Controllers, Single Board Computers, Set-Top Boxes.
- Distinguished MTS/Technical Manager, Lucent Technologies, NJ: Development of Base Stations for AMPS, GSM, and CDMA technologies and 32 bit microprocessor families.
- Development of CPU Subsystem for minicomputers at Perkin Elmer Corp, Tinton Falls, NJ and NCR Corp, Wichita, Kansas
- Development of Point of Sale terminals at Norand Corp., Cedar Rapids, Iowa
- Adjunct Professor in computer architecture at Monmouth University, Long Branch, NJ.

Present Position:
- President, Innovatech Solutions, Inc., Holmdel, NJ. Provide consultations in wireless communications and computer systems.

Specialty:
- Wireless communications including base stations and handset developments for various 2G and 3G technologies
- Computer architecture, system design, development and applications

Selected Publications and Patents:
- Published over 20 papers in conference proceedings and gave a large number of technical talks in wireless communications and computer architecture, development, and testing.
- One patent in design and development of a multiple function Chinese check printing system.

Social Activities and Honors:
- IEEE Industrial Electronics Society (IES) AdCom Life Member. Served as an IES officer, the 1995 IEEE IES Annual Conference General Chair, 1993 IEEE IES Annual Convention Technical Program Chair. Co-organized many other IEEE IES conferences and symposiums playing in various roles.
- Received an IEEE Third Millennium Metal Award, 2000 for recognition of services and contributions.
- 2004 President of Chinese Institute of Engineers-USA/Great New York Chapter.
- A founding member and an Advisory Board member of the Wireless/Optical Communication Conferences (WOCC) from 1993-2001.
- 2005-2006 Chairman of Board of Trustees, WOCC, Inc.
- 2004 SATEC Speaker in wireless communications
- Member of Sigma Xi and Epsilon Pi Tau
- Professional Engineer, State of Wisconsin.
- 1995 President of Association of Chinese Schools

美洲中國工程師學會METS籌備會 執行秘書
Executive Secretary, US Planning Committee, CIE/USA

Name: 林嘉孚 Barry Jia-fu Lin
Address: 10176 Mc Laren Place, Cupertino, CA 95014, USA
Phone: (O)408-577-6305, (H) 408-446-4550
Email: barry.lin@wj.com

Education:

B. S. in Electrical Engineering, National Taiwan University
M. S. in Electrical Engineering, University of Florida, Gainesville, Florida
Ph. D. in Electrical Engineering & Computer Science, Princeton University, Princeton, NJ

Experience:

10. Co-founder & Sr. VP of Manufacturing and Sales & Marketing, EiC Corp. Fremont, CA (1997-2005)
11. Engineering Manager, Litton Solid State Division, Santa Clara, CA (1995-1997).
12. Director of Technology, KFI Technology, Sunnyvale, CA (1992-1995)
13. Member of Technical Staff, Hewlett-Packard Labs., Palo Alto, CA (1985-1992)

Present Position:

Vice President, WJ Communications Inc, San Jose, CA

Specialty:

Wireless Communications

Selected Publications and Patents:

- Published over 40 papers in the technical journals and international conferences
- 1 US patent
- Session Chair, RFID session, 2004 METS in Taipei.
- Speaker, Telecommunications session, 2003 SATEC in Beijing

Social Activities and Honors:

National Council Advisor: CIE-USA, 2006
Chairman, National Council of Chinese Institute of Engineers, USA, 2003-2004
Chairman, Chinese Institute of Engineers, San Francisco Chapter, 2003-2004
President, Chinese Institute of Engineers, San Francisco Chapter, 2002-2003
Vice President, Joint Alumni Association of Chinese Colleges & Universities in Northern California, 1996-1997
Chairman, National Taiwan University Alumni Association in Northern California in 1995.
President, National Taiwan University Alumni Association in Northern California in 1994.

籌備委員會名單

Members of Organizing Committee

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委員	何煖軒	次長	交通部	100台北市長沙街一段2號
委員	呂學錦	總經理	中華電信股份有限公司	100台北市信義路一段21之3號
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委員	李鍾熙	院長	財團法人工業技術研究院	310新竹縣竹東鎮中興路四段195號
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委員	留忠正	副所長	財團法人工業技術研究院生技與醫藥研究所	310新竹縣竹東鎮中興路四段195號
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委員	張國龍	署長	行政院環境保護署	100台北市中華路一段41號
委員	許志仁	董事長	台灣創意設計中心	11503台北市南港區園區街3-1號G棟3樓
委員	陳仕信	理事長	中華民國創業投資商業同業公會	10542臺北市民權東路3段142號301室
委員	陳伸賢	署長	經濟部水利署	106台北市信義路三段41-3號
委員	陳昭義	局長	經濟部工業局	106台北市信義路三段41-3號
委員	陳發林	所長	財團法人工業技術研究院能源與環境研究所	310新竹縣竹東鎮中興路四段195號64館
委員	陳瑞隆	部長	經濟部	100台北市福州街15號
委員	陳寬墀	總裁	美吾華醫藥生技企業團	10547台北市復興北路167號5樓
委員	程章林	主任	財團法人工業技術研究院影像顯示科技中心	310新竹縣竹東鎮中興路四段195號
委員	賀陳旦	董事長	中華電信股份有限公司	100台北市信義路一段21之3號
委員	黃志鵬	局長	經濟部國貿局	10066台北市湖口街1號
委員	黃重球	處長	經濟部技術處	100台北市福州街15號
委員	趙永全	秘書長	中華民國對外貿易發展協會	11051台北市基隆路一段333號國貿大樓7樓
委員	劉國治	總經理	台灣高速鐵路股份有限公司	110台北市信義路五段100號3樓
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委員	蘇宗粲	主任	財團法人工業技術研究院奈米科技研發中心	310新竹縣竹東鎮中興路四段195號67館

工作小組名單

Secretariat

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執行秘書	吳建興	中國工程師學會	台北市仁愛路二段1號3樓	02-23925128
執行秘書	徐祥禎	義守大學機械與自動化工程學系	高雄縣大樹鄉學城路一段1號	07-6577711 ext. 3201
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秘書組	吳建興	中國工程師學會	台北市仁愛路二段1號3樓	02-23925128
秘書組	徐祥禎	義守大學機械與自動化工程學系	高雄縣大樹鄉學城路一段1號	07-6577711 ext. 3201
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新聞組	施美惠	義守大學	高雄縣大樹鄉學城路一段1號	07-6577711 ext. 2092
工作小組	方珮珍	義守大學	高雄縣大樹鄉學城路一段1號	07-6577711 ext. 5102
工作小組	許婷婷	義守大學	高雄縣大樹鄉學城路一段1號	07-6577711 ext. 2263
工作小組	許蕙蓉	中國工程師學會	台北市仁愛路二段1號3樓	02-23925128

中美經濟合作策進會英文簡介

Introduction of ROC-USA Business Council

ROC-USA Business Council

A. Introduction

The ROC-USA Business Council dates back to 1976 when a group of prominent business leaders and other elite in society advocated the establishment of a regular civil channel to promote Taiwan's bilateral business relations with the USA in case of any drastic change in the diplomatic relations between the two countries. The ROC-USA Economic Council was accordingly established on February 26, 1977, with the full support of former ROC Minister of Economic Affairs Yun-hsien Sun. It was later renamed as the current ROC-USA Business Council in 1998. Its American counterpart, the USA-ROC Economic Council, was founded earlier in December 1976, with former Minister of Finance David Kennedy of the USA as the first Chairman. It was renamed US-Taiwan Business Council on April 20, 1998.

Upon its establishment, the ROC-USA Business Council resolved to have a Board of 31 Directors and 9 Supervisors. The Chairmen of the Council since the years are as follows:

Chairmen, from 1977 till now	
Feb. 26,1977 - May 29, 1981	T. K. Chang
May 29,1981 - May 14, 1993	C. F. Koo
May 14,1993 - May 24, 1999	Jeffrey L. S. Koo
May 24, 1999 - Sept.27, 2005	C. Y. Wang
Sept. 28, 2005 - present	Mu-Tsai Chen

B. Missions

i. To provide services to members and make efforts to expand the Council's membership.

ii. To keep close contact with Taiwan's economic and trade offices in the USA and the American Institute in Taiwan, as well as the representative offices of individual American state governments in Taiwan, so as to promote Taiwan's bilateral links with the USA in the areas of trade, investments, and technology transfer.

iii. To receive visiting American Senators, Congressmen, officials as well as business and industrial delegations.

iv. To work with the government in helping private companies in Taiwan tackle the problems and barriers involved with their business activities in America, such as trade, investments, and technology transfer.

v. To gather and analyze the latest information related to bilateral business links between Taiwan and the USA and post it on the Council's Website as references for member companies in exploring opportunities for business cooperation with American companies.

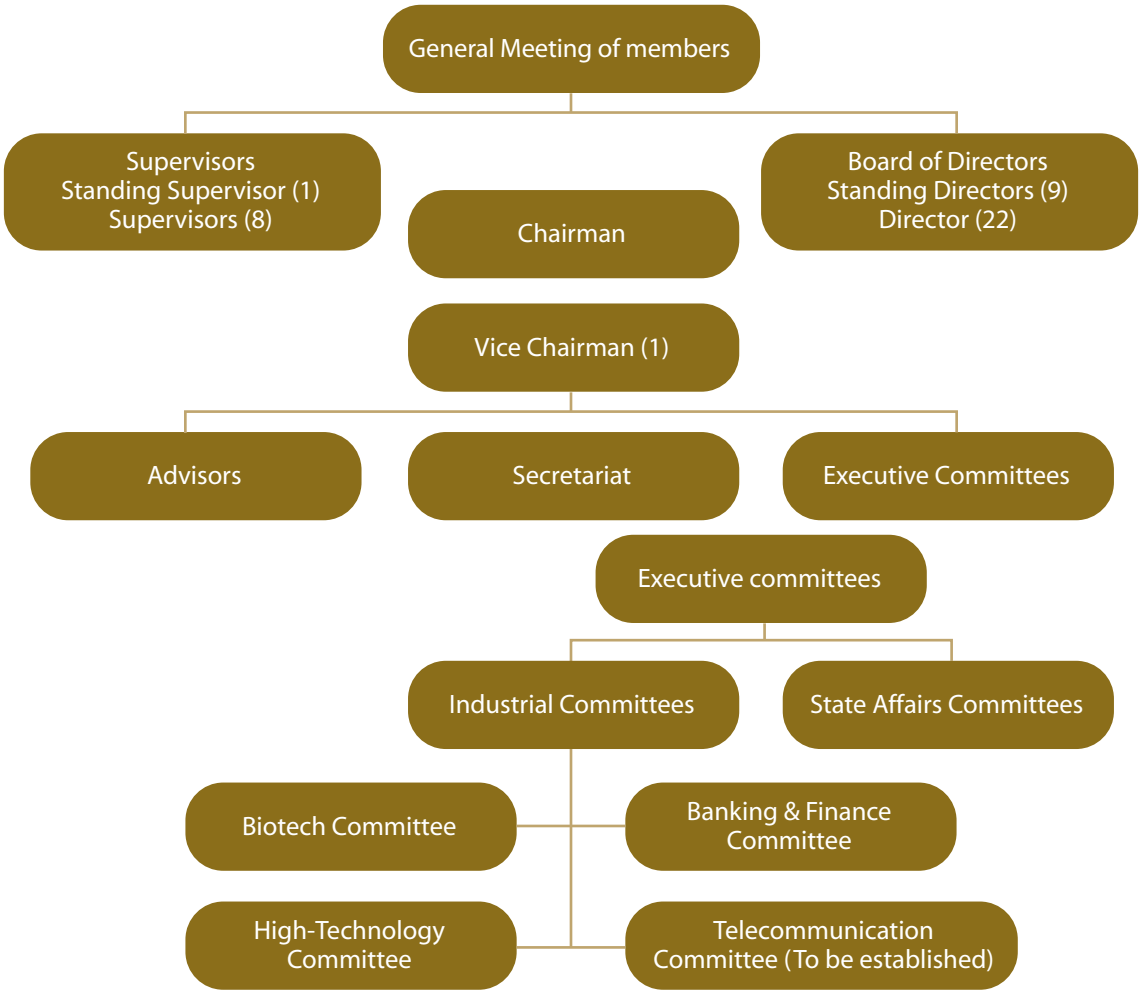
vi. To keep close interactions with the US-Taiwan Business Council and provide support for its affairs and activities.

C. Activities

i. To convene regular meetings of members and Board of Directors and Supervisors.
ii. To organize the biennial ROC-USA Business Conferences.
iii. To arrange seminars and conferences for entrepreneurs.
iv. To arrange e-conference through the Internet.
v. To issue bi-weekly newsletters.
vi. To hold conferences and forums.
vii. To promote the activities of each committee under the Council.
viii. To initiate and propose the establishment of committees on business affairs with individual American states.
ix. To deal with government-commissioned projects.
x. To help individual American state governments promote their business in Taiwan.

D. Organization

Organizational chart



E. Membership

1. Among the Council's 307 members at the end of 2005, there are four are honorary members, 232 corporate members, and 71 individual members.
2. Companies and non-profit institutions registered with the ROC government are welcome to join the Council as its members. They may call the Council at +8862-23458835 for detailed information.
3. Membership fee are:
   Honorary member: NT$60,000 per year
   Corporate member: NT$30,000 per year
   Individual member: NT$15,000 per year

中國工程師學會英文簡介

Introduction of Chinese Institute of Engineers

About CIE

The Chinese Institute of Engineers (CIE), a non-profit entity, is one of the oldest-established and largest multimodal professional organizations in Taiwan. CIE consists of more than 6,000 members from all engineering disciplines across industry, the public sector, relevant organizations and academic institutions.

CIE, with significant influence in Chinese engineering community, aims to bring together engineers of different disciplines to promote the interests of the engineering profession. CIE is also responsible for advancing engineering technology and techniques through sharing experiences, collecting information, defining issues and developing solutions both for our members and the government.

CIE maintains close links with professional organizations of engineers around Taiwan. This Institute also represents Taiwan, R.O.C. in the World Federation of Engineering Organizations (WFEO) in promoting goodwill and fellowship among all engineers in the world.

History

In 1912, some leading Chinese engineers, recognising the importance of combining the concerted efforts to develop our country and shape the future, came together and formed the Chinese Institute of Engineers as a pioneer society in Kuang Chou.

The Institute grew steadily over the next two decades until the outbreak of the Sino-Japanese War, when the institute affairs were intermitted for a while. Afterward, in October 1938, the General Assembly was reactivated in Chungking and then moved to Taipei in March 1951.

Since then, the Institute has flourished and continues to play a major part in actualising national development plans and promoting the well-being of the economy of R.O.C. on Taiwan.

Mission and Objectives

CIE's mission is to advance the science and profession of engineering, to pursue the sustainable development, and to create prosperity through the joint dedication of members and the authorities attached to the Institute.

The objectives of CIE are:

1. To keep abreast of knowledge of engineering science and technology, and to promote the best practice in engineering community;

2. To set up the standards of engineering ethics and conducts;

3. To provide extensive services to members, to assist them in developing their careers, and to maintain fellowship amongst members;

4. To facilitate engineering education and to encourage continuing training for the professional development for engineers;

5. To speak as the authoritative voice of the engineering profession for government and other appropriate organizations in Taiwan;

6. To establish strategic links with other engineering organizations both in Taiwan and overseas.

Organization and Activities

The supreme authority of the CIE is vested in the General Assembly of all members. The authority of the Institute consists of a President, twenty-seven Board Directors and five Board Supervisors. Current President of CIE is Mr. John T. Yu, Chairman of the CTCI Corporation, who is a prestigious business leader in Taiwan engineering community.

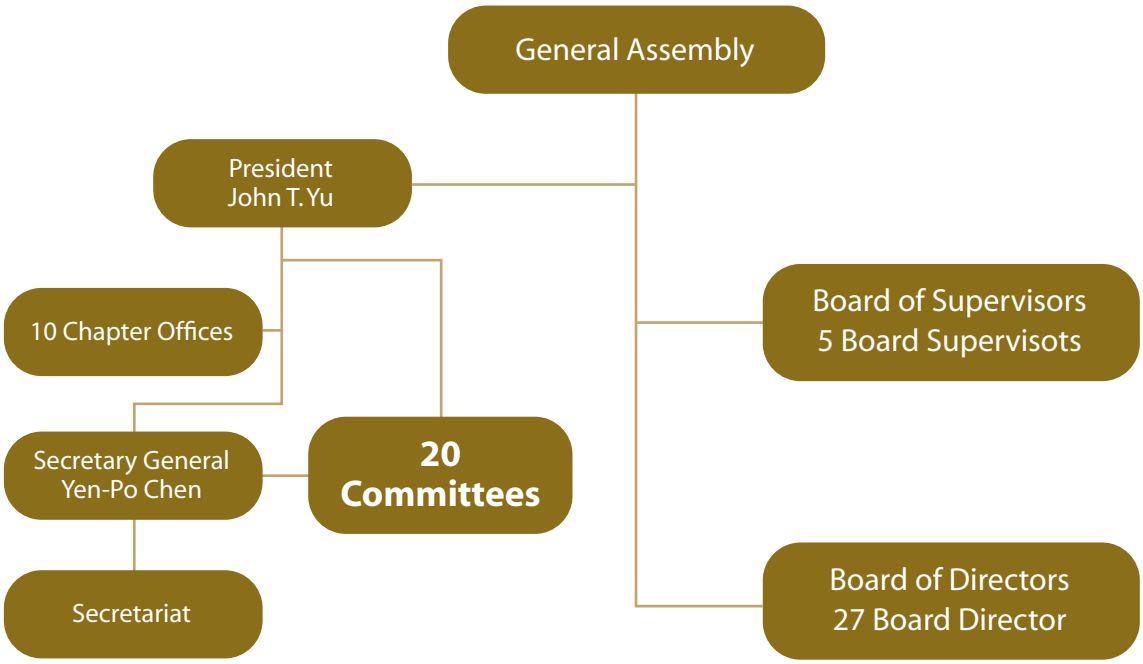
CIE operations are supported by a full time secretariat. The secretariat, reporting to the Secretary General who administrates the daily running of the Institute from the headquarters in Taipei, is a task force set up to provide information and service for members. Current Secretary General of CIE is Mr. Yen-Po Chen, the former President of China Engineering Consultants, Inc., who is experienced in engineering management and development.

This Institute is made up of 20 Committees and ten local and overseas chapter offices to help members have ready access to the institute, in Taiwan or overseas.

The 20 working Committees establish policies and carry out the activities for the operation of CIE. Major activities are currently undertaken by CIE Committees include:

- Organizing conferences, seminars and workshops for discussing or lecturing on engineering issues;
- Advancing engineering education and continuing training;
- Publishing the Journal of CIE and newsletters;
- Coordinating works of all the engineering societies in different disciplines;
- Commending technical papers;
- Bestowing the awards for distinguished engineers and engineering students;
- Collecting up-to-date information in engineering matters;
- Representing the professional interests of Taiwanese engineers in international organizations and forums;
- Establishing collaborative relationship with counterpart institutions in the international arena.

CIE Organisational Chart



研討會主辦 / 贊助單位

Seminar Organizers / Seminar Sponsors

研討會主辦／協辦單位　Seminar Organizers

生物科技與醫療技術組	財團法人工業技術研究院生技與醫藥研究所 美吾華醫藥生技企業團
能源科技與永續技術組	財團法人工業技術研究院能源與環境研究所 財團法人工業技術研究院太陽光電科技中心
平面顯示與光電技術組	財團法人工業技術研究院電子與光電研究所 財團法人工業技術研究院影像顯示科技中心 財團法人工業技術研究院材料與化工研究所
奈米與微機電組	財團法人工業技術研究院奈米科技研發中心 國科會奈米國家型科技計畫辦公室
資源回收再利用組	行政院環境保護署
水管理組	經濟部水利署 台灣省自來水公司
寬頻通訊與網路整合組	中華電信股份有限公司（主辦單位） 財團法人工業技術研究院資訊與通訊研究所（協辦單位） 中華電信研究所（執行單位）
知識型及數位創意產業管理組	財團法人資訊工業策進會
產業轉型與升級組	經濟部工業局
感染性疾病組	行政院衛生署
金融服務組	行政院金融監督管理委員會
汽車零組件組	中華民國對外貿易發展協會
工業合作組	經濟部工業合作推動小組
創意設計組	台灣創意設計中心
數位家庭組	宏碁股份有限公司
台灣創投產業的創新與發展組	中華民國創業投資商業同業公會
服務業的創新經營模式—醫療觀光	時代基金會

贊助單位 Sponsors

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桃園縣政府
大同股份有限公司
中國石油股份有限公司
中國鋼鐵股份有限公司
中華顧問工程司
中興工程顧問股份有限公司
中鋼碳素化學股份有限公司
友達光電股份有限公司
台北大眾捷運股份有限公司
台電公司電力綜合研究所
台灣思科系統股份有限公司
台灣高速鐵路股份有限公司
台灣電力股份有限公司
台灣諾基亞股份有限公司
私立元智大學綠色科技中心
京華工程顧問股份有限公司
奇美電子股份有限公司
南彰實業股份有限公司
香港商北電網絡(亞洲)有限公司台灣分公司
財團法人工業技術研究院
財團法人台灣大電力研究試驗中心
財團法人台灣經濟研究院
財團法人台灣綠色生產力基金會
財團法人金屬工業研究發展中心
財團法人塑膠工業技術發展中心
財團法人醫藥工業技術發展中心
勝華科技股份有限公司
華電聯網股份有限公司
聯華電子科技文教基金會
聯合光纖通信股份有限公司

中華民國對外貿易發展協會 Taiwan External Trade Development Council
國泰世華銀行 Cathay United Bank
新光金控 新光人壽
中華開發金控
遠東集團 FAR EASTERN GROUP
中央信託局
榮民工程股份有限公司 RSEA ENGINEERING CORPORATION
臺灣銀行 BANK OF TAIWAN

TAIPEI 臺北
IMEI
台新銀行 Taishin Bank
CHB 彰化銀行 CHANG HWA BANK SINCE 1905
TAIYEN
acer
中華電信
中國信託金融控股公司 Chinatrust Financial Holding Co., Ltd.
PharmaEssentia

附錄 1 - 會議中心位置圖

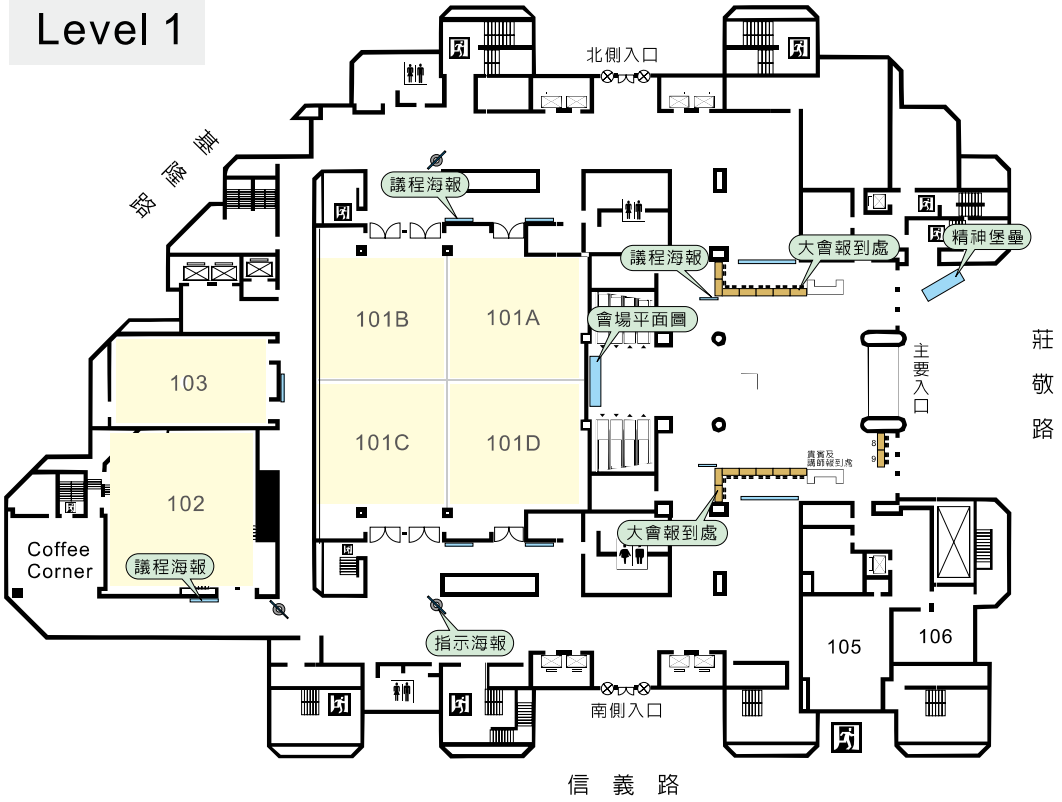
Location of Taipei International Convention Center

國父紀念館
S.Y.S.Memorial Hall
3
市政府
Taipei City Hall
4
往 昆陽
To Kunyang
忠孝東路 Jungshiau E. Rd.
國父紀念館
Sun Yat-Sen
Memorial
光復南路 Guangfu S. Rd.
基隆路
Jilung Rd.
市政府
Taipei City Hall
松高路 Sunggau Rd.
市府路 Shifu Rd.
松智路 Sungjr Rd.
松仁路 Sungren Rd.
展覽三館
TWTC
Exhibition Hall 3
新光三越
松壽路 Sungshou Rd.
華納威秀
紐約紐約
NewYork
NewYork
國泰綜合醫院
The Cathay General
Hospital
莊敬路 Zhuangjin Rd.
世貿中心
Taipei World
Trade Center
台北101大樓
Taipei 101 mall
國際會議中心
Taipei International
Convention Center

附錄2 - 會議中心平面圖

Site Map

Level 1



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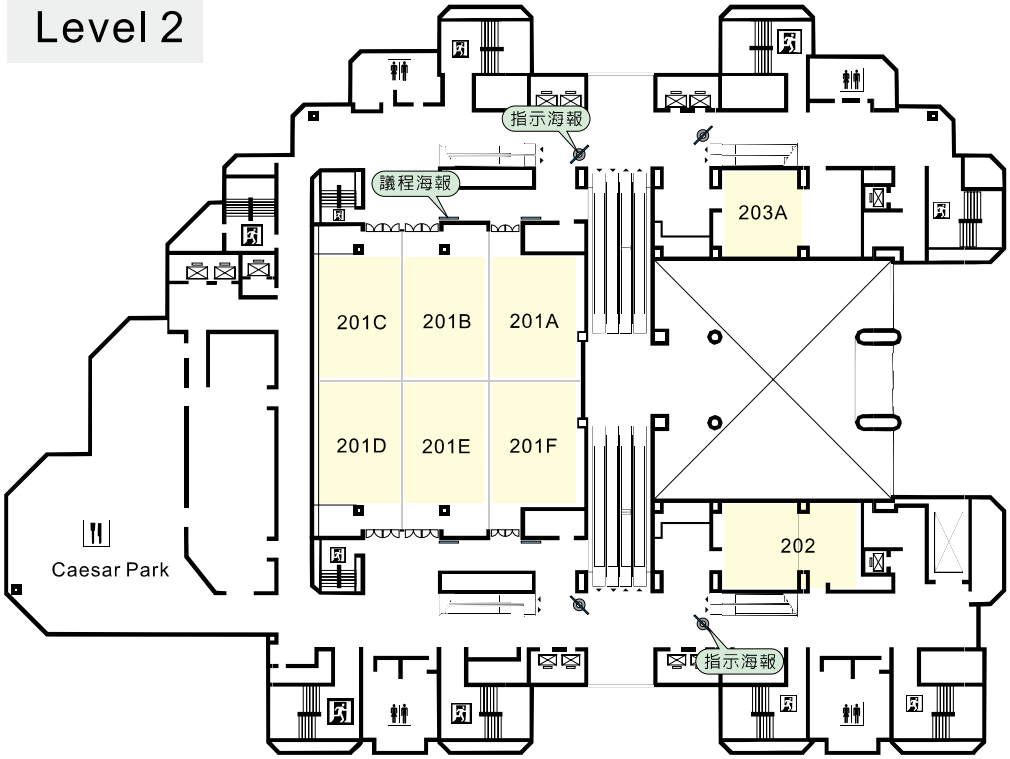
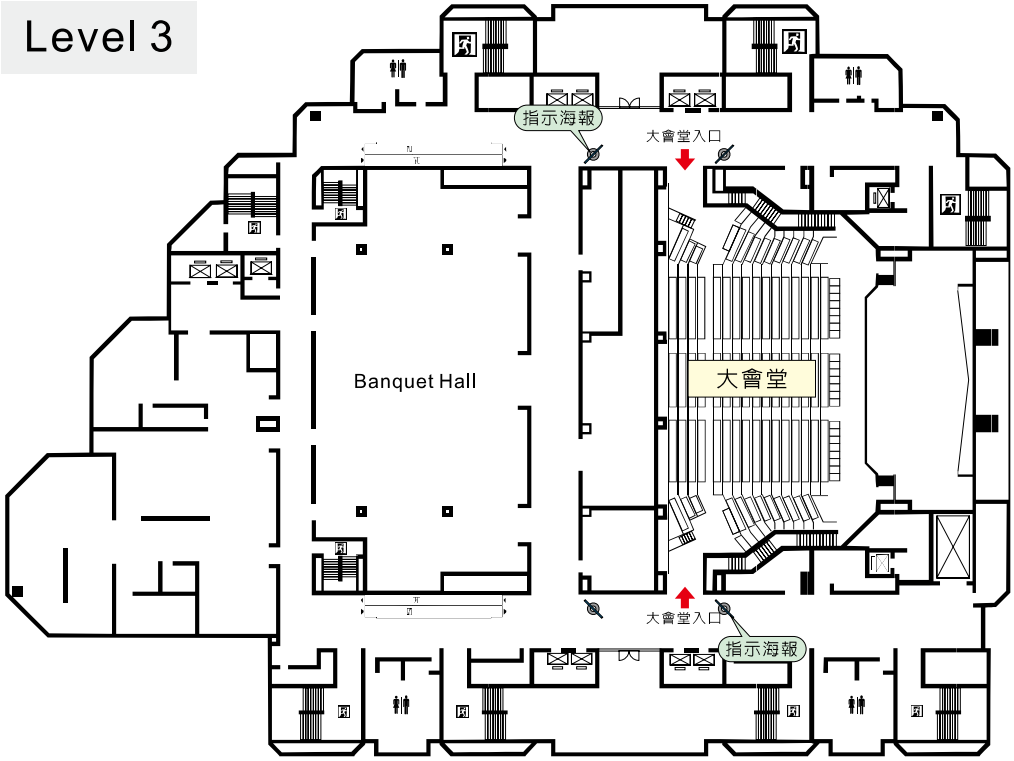


Level 3



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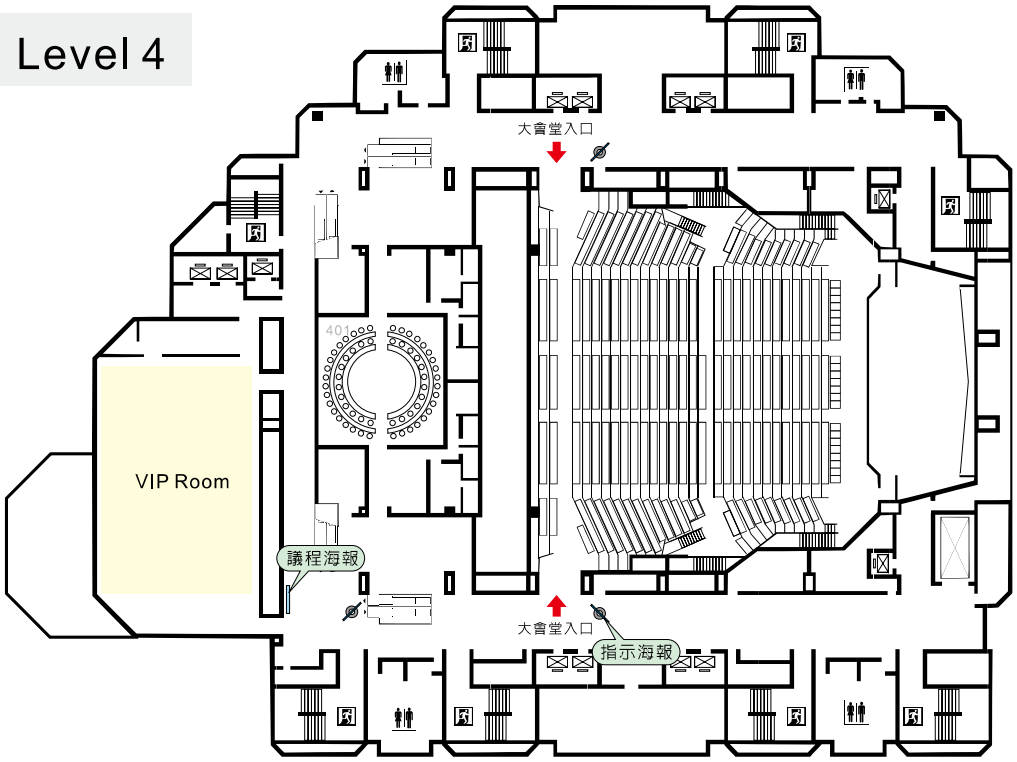

附件二、論文集

Sept. 22-27, 2006, Taipei

第21屆近代工程技術暨第28屆中美工商聯合會議

The 2006 Biennial ROC-USA Business Conference and The Modern Engineering & Technology Seminar 2006

論 文 集 / Conference Paper Abstract

主辦單位

中美經濟合作策進會
ROC-USA Business Council

中國工程師學會
Chinese Institute of Engineers

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Session 1

生物科技與醫療技術(R 101B)

Biotechnology & Medical Technologies

September 25 (Monday).2006

時 間	議 程 內 容	主 講 人
08:30-10:00	報到暨大會開幕典禮	
生物科技與醫療技術組 “Global Trends in Biomedical and Medical Devices Technology Development”		
Session I: Opportunities and Challenges in Re-Designed Drugs		
10:30-12:00	Opportunity and Challenges in Designing New Pharmaceutical Drug Products	Dr. Jang-Shing Chiou, Principal Scientist and Supervisor, Preformulation R & D, Alcon Laboratories, Inc., Fort Worth, Texas, USA
	Taiwan Opportunity and Challenge in Re-Designed Drugs	Dr. Jeng Chen, Chairman, Genovate Biotechnology Co., Ltd., ROC
12:00-13:30	午 餐	
Session II: Recent Advances and Trends in Medical Devices Technology Development		
13:40~15:10	Rewiring Your Body - the Future of Medical Treatment?	Dr. Jue-Chen Liu, Senior Director, Global Skincare Growth Platform and Active Delivery Systems, Consumer & Personal Worldwide, Johnson & Johnson, USA
	Recent Advances and Trends in Medical Device Technology and Development-Nanotechnology on Medical Diagnosis and Therapeutics	Dr. Feng-Huei Lin, Director, Institute of Biomedical Engineering, National Taiwan University, ROC
15:10~15:30	Break	
Session III: New Technologies and Progress in Biomarker and Its Clinical Applications		
15:30-17:00	Biomarker, System Biology, and Translational Medicine - the New Tools of Personalized Medicine	Dr. Pauline Y. Lau, President, Suntec Corporation, USA
	A Novel Autoantigen Screening Platform and Its Application	Dr. Tzu-Ling Tseng, Director, Molecular Biomedical Technology Division, Biomedical Engineering Research Laboratories, Industrial Technology Research Institute, ROC
17:00	Adjournment	

Curriculum Vitae

Name: Jang-Shing Chiou, 邱建興

Address: 3005 Rush Ct. Arlington, TX 76017 USA

Phone: (Work) 817-568-7461; (Home) 817-468-1473

Email: Jang-Shing.Chiou@alconlabs.com

Education: Ph.D. Chemistry, Arizona State University, Tempe, Arizona, 1989

Experience:

Principal Scientist and Supervisor, Alcon Laboratories, Inc., Fort Worth, Texas - 1995 to present
Research Scientist, Boots Pharmaceutical, Inc., Shreveport, Louisiana - 1993 to 1995
Research Scientist, Veterans Hospital, Salt Lake City, Utah - 1992 to 1993
Postdoctoral, School of Medicine, University of Utah - 1990 to 1992

Present Position: Principal Scientist

Specialty: Pharmaceutical Research and Development

Selected Publications and Patents:

J.S. Chiou, Airy, S., Nguyen, H., Gan, O., "Development of Stereo-Selective HPLC Method For The Analysis of AL-4862", AAPS, 2005.

J.S. Chiou and I. Ueda, "Ethanol Unfolds Firefly Luciferase while Competitive Inhibitors Antagonize Unfolding: DSC and FTIR Analyses", J. Pharm. & Biomed. Anal., Vol. 12, No. 8, pp. 969-975, 1994.

J.S. Chiou, T. Tatara, S. Sawamura, Y. Kaminoh, H. Kamaya, and I. Ueda, "The Alpha-Helix to Beta Sheet Transition in Poly(L-lysine): Effects of Anesthetics and High Pressure" Biochim. Biophys. Acta, Vol. 1119, pp. 211-217, 1992

J.S. Chiou, H. Ma, H. Kamaya, and I. Ueda, "Anesthesia Cutoff Phenomenon: Interfacial Hydrogen Bonding" Science, Vol. 248, pp.583-585, 1990.

S.J. Lo, Y.H. Wu Lee, J.S. Chiou, L.P. Ting, W. T. Liu, and K.B. Choo, "Characterization of Restriction Endonuclease Maps of Hepatitis B Viral DNAS" Biochemical and Biophysical Research Communications, Vol. 129, pp. 797-803, 1985.

Social Activities and Honors:

Member of AAPS and ACS
Journal reviewer for Pharmaceutical Review 1998
Coordinator of Biotech Section for The Chinese Institute of Engineers -DFW-2006
Member of Four Seasons Chinese Instruments Orchestra - DFW

OPPORTUNITIES AND CHALLENGES IN DESIGNING NEW PHARMACEUTICAL DRUG PRODUCTS

Jang-Shing Chiou[1], Subhash Airy[2], Huong Nguyen[3]

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2. Assistant Director, Alcon Research LTD, Fort Worth, Texas, USA, email: Subhash.Airy@Alconlabs.com
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ABSTRACT

The development of new drugs has long been an expensive and lengthy process that requires the diligence of both pharmaceutical personnel and the FDA. In recent studies, the average cost for the development of new drugs is $802 million* and the development time for a single drug to 8 years, while a similar study performed a decade ago shows that the cost then was nearly a quarter, $231 million US dollars, then that of now. Despite the efforts and time put into developing these drugs, only about one in every 10,000 submitted entries ever make it onto the market, thus putting all that time and money to waste. The low acceptance rate is regrettable, but much can be done to solve the other challenges the pharmaceutical industry faces such as high costs and substantial development time.

To solve these challenges, one idea may be the answer. Hence, the functional groups of existing drugs can be altered to develop a different drug instead of starting from scratch thus, cutting the length of development. Other advantages of this solution are reduction in development time, cost, and potentially improving on the existing drug. For instance, by converting the carbonyl group into a methylene of vancomycin, the binding affinity was increased, resulting in an analog that was 100-fold more active than vancomycin. In other words, by just changing a few of the amino acids, a chemical change will take place that allows exceedingly stable proteins to be fashioned. Therefore, this process allows a chemically different drug to emerge using little cost and time.

Although this process seems foolproof, it is not without obstacles to overcome. Recently, the advances in robotics have improved the development rate of drugs in the pharmaceutical industry. However, the technology has produced some unwanted effects, such as the robot producing un-optimized lead compounds, which the industry now must deal with.

Other ways of "Re-designing drugs" such as designing a product of enhanced permeability, formulation compatibility, alternate routes of administration, combination products and its physicochemical characterization, and scientific and regulatory issues will be presented during the seminar.

Keywords: Re-Designed drugs, Prodrugs, Alternate routes, formulation compatibility

*Tufts Center for the Study of Drug Development, Nov. 30, 2001

Curriculum Vitae

Name: Jen Chen ,陳正

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4F, No. 12, Jen-Ai Road, Sec. 2, Taipei, Taiwan 100, R.O.C.

Phone: 886-2-3393-1388

Email: jenchen@genovate-bio.com

Education:

Ph.D., Chemistry, University of Rochester, NY, U.S.A. 1984
B.S., Chemistry, National Tsing Hua University, Taiwan 1978

Experience:

2005 – Present	Chairman, Genovate Biotechnology Co., Ltd. Lead a specialty pharma to be internationally competitive.
1996 – Present	General Manager, Genovate Biotechnology Co., Ltd. Manage a fully integrated biopharmaceutical company engaged in developing new drugs, manufacturing high quality pharmaceuticals, selling and marketing products.
1994 – 1996	Vice President of Asian Operations, Genelabs Technologies, Inc. Seek partnerships with major pharmaceutical companies for the development of potential drugs. Supervise Genelabs Taiwan pharmaceutical business, particularly focus upon the development/marketing opportunities between the U.S.A. and Taiwan/Asia.
1992 – 1994	Sr. Director of Pharmaceutical Development, Genelabs Technologies, Inc. Responsible for preclinical and clinical sections of regulatory submissions including IND. Evaluate and monitor clinical data & activities in compliance with clinical protocols & overall objectives.
1991 – 1992	Director of Medicinal Chemistry, Genelabs Technologies, Inc. Direct drug discovery and development activities including synthesis, formulation, bioprofiling, and manufacturing of new chemical entities (NCEs).
1988 – 1991	Project Leader, CIBA-GEIGY Corporation Hypolipidemic project and the identification of innovative development compounds. Supervise four laboratories.
1985 – 1988	Senior Scientist, CIBA-GEIGY Corporation Discovery of new lead compound and its SAR for antihypertensive drugs leading to identification of drug candidate. Novel routes for the synthesis of chiral C2-substituted carbocyclic adenosine analogs.

Present Position: Chairman & General Manager, Genovate Biotechnology Co., Ltd.

Specialty: New drug discovery and development

TAIWAN OPPORTUNITY AND CHALLENGE IN RE-DESIGNED DRUGS

Jen Chen, PhD

Chairman & General Manager, Genovate Biotechnology Co.,Ltd.,
email: jenchen@genovate-bio.com

ABSTRACT

Recent research indicates that most of the value created in the pharmaceutical industry comes from marketing compounds that improve on effectiveness of an established drug, have fewer or less intensive side effects, can be used conveniently, or expand the use against a broader range of diseases. We may name those follow-on candidates “me-too” drugs. However, due to improved profile plus better understanding of the treatment, usually those follow-ons perform better on the market and become “best-in-class” when we compare them against “first-in-class”. Therefore, a better name for those follow-on drugs is “Re-Designed Drug (RDD)”. Over the past three years (2003-2005), FDA approved 68 New Molecular Entities (NMEs). Nearly one third of those NMEs are RDDs. Top 10 best sellers in the world in 2005 by IMS, more than 50% are RDDs. It is clear that RDD is an important approach to new drug discovery and development. Japanese pharma has done a good job in development of RDDs. In recent years, even Korean pharma also harvests a few success such as Factive and Zydena. While we believe RDD presents a good opportunity to us, we should not underestimate the challenge behind it, especially the influence of “Reference Pricing” for drugs. Today, company needs to examine rigorously the value of “New and Improved” by providing clear superior efficacy in the area of risk-benefit, cost-benefit, and therapeutic differentiation. This further means, if RDD can’t live up to the challenge of “Reference Pricing”, company needs to make earlier decision to either kill the project or redirect the development strategy to focus on more demonstrable endpoint as the basis for insurance pricing after launch. Such change clearly will increase the R&D cost for an innovator.

Curriculum Vitae

Name: Jue-Chen Liu, 劉主誠

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Email: juechenliu@yahoo.com

Education: Ph.D., Industrial and Physical Pharmacy, Purdue University, 1982
B.S., Pharmacy, National Taiwan University, 1978

Experience:

- A series of positions in Topical, Transdermal delivery systems and Skincare technology platforms supporting Rx, Device, OTC products at Johnson & Johnson, Skillman, NJ
- Assistant Professor, Rutgers, the State University of New Jersey, NJ

Present Position: Senior Director, Global Skincare Growth Platform and Active Delivery Systems, Johnson & Johnson, Skillman, NJ

Specialty: Drug delivery systems, formulation stabilization, electrical transport and consumer medical devices

Selected Publications and Patents:

- Being granted 15 US patents, 57 patent applications; published 10 book chapters, 38 research papers.
- Highlights of Relevant chapter and patents:
  "Transdermal Delivery of Proteins/Peptides by Iontophoresis: Development, Challenges and Opportunities", in Drug Permeation Enhancement: Theory and Applications, Marcel Dekker, Inc. p247-272, 1994
  US5961482; Iontotherapeutic device and process and iontotherapeutic unit dose
  US2004/0267232; Device for Delivery of Active Agents to barrier Membranes
  US2004/0267236**;** Device Containing a Light Emitting Diode for Treatment of Barrier Membranes

Social Activities and Honors:

- Members of American Association of Pharmaceutical Scientists (AAPS), The Controlled Release Society, The New York Academy of Sciences
- Johnson's Medal Winner
- Four times Grandview Award Winner, the highest business contribution award in Johnson & Johnson Consumer Sector

"REWIRING YOUR BODY" THE FUTURE OF MEDICAL TREATMENT?

J-C. Liu, Ph.D.

Senior Director, Johnson & Johnson, Skillman, USA, email: jliu@cpcus.jnj.com

ABSTRACT

Innovations in science, engineering and microelectronics have dramatically transformed the healthcare management. Treatment with medical devices is emerged to be one of the important treatment options for various ailments because it provides efficacy with few side effects, unlikely most drugs. In general, medical devices are aimed at prevalent diseases that cannot always be treated with drugs. Medical devices are comprised of wide ranges of technologies, including mechanical, electrical, material based engineering, as well as biotechnologies and other sciences. One of the key trends in medical devices is novel implant development delivering neuron electrical signals to govern neurotransmission to control communication in our body. Electrical signals, which could be adjusted by pulse magnitude, frequency, waveform, duty cycle and current direction, can deliver various neurosignals to treat diseases and symptoms. Researchers are leveraging electrical stimulation, modulation to treat diseases such as arrhythmia, Parkinson's disease, Alzheimer's disease incontinence, migraines, spinal cord injures, strokes, and many other diseases that neurons are involved. New treatments are become feasible as the size of device reduced and wireless battery charging evolves. It was reported that a rechargeable device can be small enough that can be injected almost anywhere in the body to treat pain or muscle dysfunction. Possible risks associated with implantable electrical medical devices are battery failure, signal interference, idiosyncrasy and infection. The expense of healthcare will also be significantly impacted due to the high cost of medical devices. Implants also could act as sensors, telling a miniature pump when to deliver a drug or customized protein to a precise location in the body. Additionally, leading cardiac-device makers are incorporating implants with sensors to detect environment and to modulate the patient's treatment as needed. Combination of device, sensor and drug is a key research area of interest to link sensor-laden neurostimulators to miniature drug pumps to treat the patient with exact dose when needed and at the precise site where the medication is most effective. As a result, reduced dosages by a thousand fold and side effects are averted. The initial focus of combined therapy is in the brain, where many disorders might be treated with protein drugs complemented by electrical pulses. Continued research is dedicated to further our understanding of the brain and nervous system and to advance microelectronics for broad therapy applications and cost-effective treatment.

Keywords: medical device, electricity, neuromodulation, implant

Curriculum Vitae

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Email: double@ha.mc.ntu.edu.tw

Education: 1.Dept. Mater. Sci., National Cheng-Kung University, Taiwan
Ph.D., 1985/09~1989/11, Institute of Materials Sciences, Biomaterials
2. Dept. Mater. Sci., National Cheng-Kung University, Taiwan
Master, 1983/09~1985/06, Institute of Materials, Biomaterials
3. Dept. Earth Sci., National Cheng-Kung University, Taiwan
Bachelor, 1976/10~1980/06, Dept Earth Science

Experience:
1. 2005/08-present, Director, Inst. Biomed. Eng., National Taiwan University (NTU)
2. 2002/08-2005/07, Director, Dept. Biomed. Eng., NTU-Hospital

Present Position:
Chair & Professor, Institute of Biomedical Engineering, National Taiwan University

Selected Publications and Patents: over 160 SCI papers since 1990
1. FH Lin, CH Chen, Winston TK Cheng, 2006, "Modified Montmorillonite as Vector for Gene Delivery", Biomaterials, 27:3333-3338 (SCI, Rank 1/15, IF: 4.377)
2. TW Wang, JS Sun, SL Wu, FH Lin, 2006, "Skin basement membrane and extracellular matrix proteins characterization and quantification by RT-PCR", Biomaterials, 27:29:5059-5068, (SCI, Rank 1/15, IF: 4.377)

專利類別	專利名稱	專利國家	專利號碼	專利發明人	專利權人
發明專利	The preparation of GTG bone graft	Japan	1111489	Feng-Huei Lin, Chu-Hsu Yao	Purzer Pharmaceutics Co. Ltd., Taipei
發明專利	Trilayer wound dressing composite and method for preparation	Taiwan	590764	TC Tsai, TM Chen, FH lin, KS Chen	Institute of Nuclear Energy Research
發明專利	Bone substitute composition and process of preparation thereof	USA	US 6,224,629 B1	Feng-Huei Lin, Chu-Hsu Yao	Purzer Pharmaceutics Co. Ltd., Taipei

Social Activities and Honors:
A. Social Activities
1. 2002/08-2006/07, Standing Committee Member, Society of Reg. Med., Taiwan
2. 2006/08-2008/07, Standing Committee Member, Society of Mater. Sci., Taiwan
B. Honors
1. 2004 Outstanding Teaching Award, National Taiwan University
2. 2004 Outstanding Research Award, National Science Council, Taiwan
3. 2006 Formosa Association of Regenerative Medicine, Annual Outstanding Research Award, "Skin Tissue Engineering".

RECENT ADVANCES AND TRENDS IN MEDICAL DEVICES TECHNOLOGY－NANOTECHNOLOGY ON MEDICAL DIAGNOSIS AND THERAPEUTICS

Feng-Huei Lin

Institute of Biomedical Engineering, National Taiwan University,
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ABSTRACT

Medical devices can be divided into three categories: preventive medicine, diagnosis technique and therapeutic devices. Lots of the techniques have been involved into the research to develop a new design for better quality of diagnosis and therapeutic effect. The topic will be more focused on how to use nanotechnology on the medical design.

Nanotechnology has the potential to have a revolutionary impact on modern medicine, not only through the development of novel diagnosis and imaging methods, but also through targeted therapies. It is universally accepted that early detection of disease is essential even before anatomic anomalies are visible. A major challenge in diagnostics in the 21st century is to be able to determine the exact relationship between biomarkers and the clinical pathology, as well as, to be able to non-invasively detect diseases at an early stage for maximum therapeutic benefit.

A clear picture to identify the disease is benefiting from the advances in the development of nanotechnology that improve and extend the capabilities of imaging techniques. These include novel contrast agents, quantum dot markers, engineered ligands, and smart particles that enable imaging down to the cellular and molecular scales with higher selectivity and signals that previously possible.

In nano medical therapy, targeting and localized delivery are the key challenges. To wage an effective war against disease, we have to have the ability to selectively target the diseased cells, while saving the normal tissue from excessive burdens of drug toxicity. In the present talk, we will address the potential ways in which nanotechnology can address these challenges.

Curriculum Vitae

Name: Pauline Y. Lau

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Email: pauline.lau@sbcglobal.net

Education: Ph.D.

Experience:
Roche Pharmaceuticals, Roche Diagnostics, Dupont Medical

Present Position: President

Specialty:
Biotechnology, medical device, personalized medicine, biomarker

Selected Publications and Patents:
Many publication and public speakings in medical devices and personalized medicine

Social Activities and Honors:
Active in professional organizations

Biomarker, System Biology, and Translational Medicine
The New Tools of Personalized Medicine

Pauline Y. Lau, Ph.D.

President, Suntec Medical,Palo Alto, CA, 94306,USA, email: pauline.lau@sbcglobal.net

ABSTRACT

Personalized medicine is the concept of tailored medicine to reduce the adverse effect and to increase treatment efficacy.

Generally, the success rate of drugs is around 30-70% with wide range of variations. For example, approximately 30% of patients treated with Statins for cardiovascular diseases show no response to therapy. More alarming is the fact that several of the individuals treated with statins have died and 15% of those treated show non-reversible nerve damage.

To respond to this demand, major pharmaceutical companies will partner with biotech companies or develop their own in-house capabilities that will permit efficient production of more effective and less toxic drug. Personalized medicine is the right drug for the right patients at the right time with the right dose.

Pharmacogenetics has been demonstrated to be able to help pharmaceutical companies to achieve these goals. Pharmacogenetics can segment patients as responder or non-responder, tolerant or non-tolerant to a particular drug based on their genetic compositions. It facilitates the development of personalized medicine – medicine tailored to a person's particular physiological and metabolic needs.

Three key areas essential to the development of personalized medicine are biomarkers, system biology, and translational medicine.

System biology is to study the relationship of biomarkers to the biological or pathological functions in a cell, tissue or organ. Systems Biology requires a comprehensive multiparameter (genes and proteins) data base to study disease relationships. They can generate a large set of potential biomarkers that are expressed only in particular organs potentially correlate with the onset, progression and treatment of disease. System biology requires cutting edge strengths in computational biology.

Translational medicine is to study the in-vitro tissue or organ changes to understand the in-vivo changes in human, or to study the animal tissue or organ changes to model the human tissue or organ changes. The in-vitro study or the animal modeling both need various

technological advances that are only available in recent years.

Several technologies shown useful to the study of system biology and translational medicines are nanotechnology, molecular imaging, genome-wide analysis of gene expression in tissues and body fluids, genotyping and sequencing technologies, and proteiomic profiling. These technologies will be discussed in details.

Personalize medicine in the 21st century created many new opportunities to the industry, the academic institutions and the healthcare systems in searching the new tools to better traditional medicines, to create new technologies, and to develop new business entities.

These new opportunities will enable high tech sector to redirect their efforts from micro-electronics to biotechnology and expand the mature electron industry to a much more profitable biomedical industry.

Curriculum Vitae

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Chung Hsing Rd.,Chutung, Hsinchu, Taiwan 310

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Email: tzuling_tseng@itri.org.tw

Education:

STATE UNIVERSITY OF NEW YORK, Stony Brook, NY Graduated in 1998, Ph.D. in Genetics
NATIONAL YANG-MING UNIVERSITY, Taiwan Graduated in 1990, Master of Science in Genetics
NATIONAL TAIWAN UNIVERSITY, Taiwan Graduated in 1988, Bachelor of Science in Botany

Experiences:

MOLECULAR BIOMEDICAL TECHNOLOGY DIVISION, BEL, ITRI, Hsinchu, Taiwan 2/2003 – PRESENT
DIRECTOR OF THE DIVISION (AND PROTEOMICS DEPARTMENT MANAGER) 4/2005 - PRESENT
DEPUTY DIRECTOR OF THE DIVISION (AND PROTEOMICS DEPARTMENT MANAGER) 5/2003 –3/2005

Present Position

Director of Molecular Biomedical Technology Division, BEL, ITRI

Specialty:

Clinical Proteomics, Molecular Epidemiology, Molecular Biology, Human Genetics

Selected Publications and Patents:

PUBLICATIONS 1. (2005) Transactivation of hsp70-1/2 in Geldanamycin-Treated Human Non-Small Cell Lung Cancer H460 Cells: Involvement of Intracellular Calcium and Protein Kinase C. Journal of Cellular Biochemistry, 15; 94 (6): 1199-209.

2. (2005) Feature selection for assisting biomarker discovery in serum with mass spectrometry based proteomics. CCL Technical Journal, Vol.112, p.118-123

3. (2004) Systematic screening autoantibody-based biomarker in blood from patients with liver cirrhosis and cancer. Molecular & Cellular Proteomics. S51. Vol.3, No.10

4. (2004) XPD gene polymorphism and host characteristics in the association with cutaneous malignant risk. British Journal of Cancer, 90(2):497-502.

5. (2003) Genotypic and Phenotypic Characterization of Putative Tumor Susceptibility Gene, *GNMT*, in Liver Cancer. Cancer Research 63 (3): 647-654 (as a cover paper).

PENDING AND GRANTED PATENTS 1.An integrated platform for screening autoantigens (TW (granted), SG (granted), JP (granted), US, EP, CN)

2.Biomarkers for liver diseases and method for using the same (TW, CN, JP,EP,SG US)3.The novel autoantigens associated with diagnosis MG (TW, CN, JP,EP,SG US)

Social Activities and Honors:

Winner of the NIH **F**ellows **A**ward for **R**esearch **E**xcellence in Genetics-Human (FARE 2002)
Member of the American Society of Human Genetics , Cancer Research

A NOVEL AUTOANTIGEN SCREENING PLATFORM AND ITS APPLCATION

Ping-Fu Cheng[1], Pai-Hsiu Lio[2], Tzu-Ling Tseng[3]

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Molecular Biomedical Technology Division, Biomedical Engineering Research Laboratories, Industrial Technology Research Institute

ABSTRACT

A hallmark of autoimmune disease is the production of high affinity autoantibodies direct against self proteins. Autoanibodies produced against body's own cell result in tissue damage and illness. Because of serum autoantibodies often appear long before the onset of clinical symptoms, the ability to detect autoantibodies associated with specific autoimmune disorders quickly and accurately would be enable the use of prophylactic treatment earlier in the course of disease, and may eventually permit immulogical intervention sufficient to prevent the onset of disease entirely. In addition, there is increasing evidences showing that autoimmune responses may be associated with development of human diseases other than typical autoimmune diseases including cancer. The identification of panels of antigens against autoantibodies from patients may have utility in diagnosis and/or immunotherapy against those diseases. Immunoblotting is a method commonly used in detecting autoantigen. But electrophoresis is limited in the separation and identification of specific proteins due to its poor sensitivity and reproducibility in strong acidic and basic condition, or if the protein has extremely large or small molecules or very low expression level, or if the protein is membrane protein. Here, in combination of affinity technology and mass spectrometry, we have developed an integrated proteomics platform to systematically and efficiently identify autoantigens. Furthermore, we have successfully applied this method to identify novel autoantigens for several diseases including Myasthenia Gravis, Autoimmnue Polyglandular, Membrane Glomerulonephritis and Liver Cirrhosis/Cancer. Based on those results, we believe that this method does not only enhance the identification of autoantidoies but also enriches the incidence of antigens. Therefore, the resulting autoantiigens detected by this method are surely disease related and co-exist in the patent samples, which work potentially well as a diagnostic tools.

Session 2

能源科技與永續技術(R101D)

Energy Technology and Sustainable Development

September 25 (Monday).2006

時 間	議 程 內 容	主 講 人
08:30-10:00	中美近代工程技術研討會開幕典禮 Opening Remarks	余俊彥 理事長/ 中國工程師學會
能源科技與永續技術研討會議程表		
10:00-10:30	報到 Registration	
10:30-10:40	召集人致詞 Welcome Remarks	中美雙方召集人
10:40-11:20	SOFC HYBRID TECHNOLOGY FOR ELECTRIC / HYDROGEN CO-PRODUCTION	Dr. Michael S. Hsu/ President, Chairman and Chief Executive Officer of Ztek Corporation
11:20-12:00	Research and Application for Clean Coal Technologies in Taiwan	何無忌 組長/工研院能環所
12:00-13:30	午餐 Lunch	
13:30-14:20	Proton Exchange Membrane Fuel Cell Components, System, and Market Development: Current Status and Future Trends	Oliver S. Yu, Ph.D./ The STARS Group Los Altos, California, U.S.A.
14:20-15:10	An Overview of PEM Fuel Cells Development at ITRI	顏貽乙 副組長/工研院能環所
15:10-15:20	休息 Break	
15:20-16:10	Recent Development in Producing High-Efficiency Flexible Thin-Film Silicon-Based Solar Cells	Hai-Sheng Wu/ Full Professor of Physics at Minnesota State University, Mankato
16:10-17:00	Controlling the silicon to hydrogen bonding configurations and its influence on the photodegradation of a-Si:H solar cells	江雨龍 教授/ 中興大學電機系
17:00-17:30	綜合討論 Panel Discussion	中美雙方主講人

Curriculum Vitae

Name: Michael S. Hsu

Address: 56 Round Hill Road, Lincoln, MA 01773, USA

Phone: (781) 933-8339

Email: mhsu@ztekcorporation.com

Education: Ph.D. in Aeronautics and Astronautics, Massachusetts Institute of Technology

Experience: Senior Scientist, M.I.T. Lincoln Laboratory; Founder of Ztek Corporation

Present Position: President & CEO

Specialty: Alternative energy solutions: Solid Oxide Fuel Cell and Hydrogen Reforming

Selected Publications and Patents:

1. Device for Electric Generation, Heating, Ventilation and Air Condition (EHVAC)
2. High Temperature Electrochemical Converter for Hydrocarbon Fuels
3. Electrochemical Converter Having Optimal Pressure Distribution
4. High Performance Electrochemical System Integration
5. Electrochemical Converter Having Internal Thermal Integration
6. Ultra-High Efficiency Turbine and Fuel Cell Combination
7. Thermally Enhanced Compact Reformer
8. Fuel Cell Power Supply System
9. Pressurized Integrated Electrochemical Converter System
10. Fuel Cell System for Electric Generation, Heating, Cooling and Ventilation
11. Integrated Chemical/Energy Co-production System
12. Fuel Cell Stacks for Ultra-high Efficiency Power Systems
13. Zero/Low Emission and Co-Production Energy Supply Station
14. Hybrid Power System Employing Fluid Regulation Elements for Controlling Various Operational Parameters of the System
15. Multi-Function Energy System Operable as a Fuel Cell, Reformer or Thermal Plant
16. Miniature Vaporizers for use with Chemical and Energy Devices
17. Recharging of Metal-Air Converter for Automotive Propulsion
18. Method of Forming Thin Chromium Components for EC Converter
19. Renewable Energy Operated Hydrogen Production System
20. High Temperature Fuel Cell for Hydrogen, Electric Production and Co-production
21. Expandable Hydrogen Fueling Station and Method of Supplying Hydrogen

SOFC HYBRID TECHNOLOGY FOR ELECTRIC / HYDROGEN CO-PRODUCTION

Michael Hsu, Ph.D.

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ABSTRACT

The paper will discuss Ztek's emerging Hydrogen and Electricity Co-production System (HECP), which combines its high performance steam reforming (HPSR) and solid oxide fuel cell (SOFC) technologies to enable the co-production of hydrogen and electricity on-site with superior operating and environmental performance. The HECP's benefits are threefold: (i) balanced supply and demand of thermal energy between the hydrogen and electricity production to yield unparallel system efficiency; (ii) electricity generation capability to support self-sustaining or minimal grid-dependent hydrogen station operation; and (iii) the ability to meet peak demand by operating at maximum capacity for either power generation or hydrogen production. This "energy station" approach can help mitigate early adaptation risks when hydrogen fuel demand is low through its ability to offer both hydrogen production and electricity generation.

Ztek Corporation has been developing high efficiency hydrogen reforming and fuel cell technologies for over 20 years. The company's systems are now entering pre-commercial field trials. This paper will report on the demonstration activities of Ztek Corporation, including the planned hydrogen fueling station located at a Pacific Gas and Electric service site near the San Francisco International Airport in San Carlos, CA that will support the fuel cell automobile testing by the members of the California Fuel Cell Partnership and the hydrogen fueling station at Marine Base Camp Pendleton for military/commercial dual use, which is a collaborative effort between Ztek and the U.S. Navy.

Additionally, Ztek is conducting a project with the Connecticut Clean Energy Fund to provide a solid oxide fuel cell power and HVAC to Dinosaur State Park in Rocky Hill, CT, and a SOFC/microturbine project to support the electrical needs at a switching station operated by AT&T. Ztek is also developing new markets for the above hybrid technologies outside of North America. These include fuel cells for rail systems in Europe, hybrid power project in Asia and a total energy package with clean water supply for the Middle East.

In 2005, U.S. DOE has elevated the SOFC/Turbine system to a top national priority for integral operation with coal gasification process acknowledging the following unmatched attributes:

- High efficiency approaching 80% vs. today's market best of less than 60%;
- CO2 sequestration ready due to the electrochemical process, facilitating greenhouse gas control as outlined in U.N. Kyoto Protocol;
- Hydrogen and Electricity co-production capability.

Keywords: fuel cell, hydrogen, gas turbine, greenhouse gas control

Curriculum Vitae

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學歷：

國立成功大學航空太空博士	1989
國立成功大學　機械工程碩士	1984
國立成功大學　航空工程學士	1982

經歷：

工研院能源與環境研究所 正研究員	2006-迄今
工研院系統與航太中心　正研究員	2000-2005
中華民國安全與設備協會 理事	2004-迄今
中華民國燃燒學會 理事	2001-迄今
中國航空太空學會 後補理事	2003-迄今
工研院系統與航太中心　企推組/機電組組長	2002-2005
工研院系統與航太中心　動力系統組 副組長/組長	1998-2001
工研院系統與航太中心　引擎部經理	1996-1998
工研院系統與航太中心　研究員	1990-1999
工研院能源與資源研究所　研究員	1989-1990
國立成功大學航空太空研究所　研究助理	1984-1988

現職：工研院能源與環境研究所 產業節能組 組長　2006-迄今

專長領域：燃燒學、旋轉機械、系統工程、流力計算、衛星工程、品質系統、工業節能技術、機電整合

重要成就：
- 國內外論文超過55篇
- 國內外專利20件
- 91年經濟部科技專案創新技術獎
- 88年工研院成果貢獻佳作獎

演講主題：Research and Application for Clean Coal Technologies in Taiwan

RESEARCH AND APPLICATION FOR CLEAN COAL TECHNOLOGIES IN TAIWAN

Heng-Wen Hsu[1], Ching-Lin Shieh[2], Yu-Cheng Chang[3], Wu-Chi Ho[4]

Industrial Technology Research Institute
Bldg. 64, 195, Sec. 4, Chung Hsing Rd., Chutung, Hsinchu, Taiwan 310, R.O.C.

ABSTRACT

Coal is the main source of energy in Taiwan. In 2005 the consumption of coal exceeded sixty million metric tons. This accounted for about 31% of the total energy supply generated by coal, and 77% was consumed in the process of power generation in Taiwan. Cogeneration system was first introduced to Taiwan in the mid of 1970's. Up to this moment, the capacity of all the qualified cogeneration systems in Taiwan is 7,015 MW. And it is expected to be promoted to 800MW in 2010 and 1,000MW in 2020. Industrial Technology Research Institute (ITRI) has successfully demonstrated integrated diagnostic technologies to enhance the thermal efficiencies of two local cogeneration systems. The savings are estimated to be 3,000 KLOE and NTD 10,000,000 annularly.

The Bureau of Energy, Ministry of Economic Affairs (MOEABOE) considered gasification technology for fossil energy to have the most applicable potential; in turn, ITRI was commissioned to execute the first four-year project, called “Application Study of Fossil-fuels Gasification Technology”, from 2002 to 2005. ITRI has constructed completely the first experimental system of pressurized gasifier with a capacity of two metric tons of coal per day in Taiwan and has accomplished testing of gasification characteristics for four kinds of coal and CPC’s petroleum coke. In addition, we have established abilities and experiences for gasification system basic design and syngas quality control technology.

ITRI is being commissioned to execute the second four-year project (2006~2009), called “Development of Gasification and Clean Coal Technologies” by MOEABOE. The whole project goals are: establishment of multi-fuel gasification technology with the study of gasification characteristics for coal and petroleum coke; development of syngas clean up, carbon dioxide capture/separation and syngas conversion technologies; demonstrations of combustion and power generation system of syngas from gasifier and to promote the installation of gasification plant in industrial park.

Curriculum Vitae

Name: Oliver Yu, 余序江

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Phone: 650-922-5588

Email: oliveryu@starstrategygroup.com

Education:

Ph.D. Operations Research, Stanford University
M.S. Statistics, Stanford University
M.S. E.E. Georgia Institute of Technology
B.S. E.E. National Taiwan University

Experience:

2000-present, President, the STARS Group, a premier energy, resource, and technology strategy consulting firm in Los Altos, CA
1989-2000, Director, Energy and Technology Strategies, SRI International, Menlo Park, CA
1974-1989, Manager for Planning Analysis, Electric Power Research Institute, Palo Alto, CA

Present Position: President, the STARS Group, Los Altos, CA

Specialty: Energy, resource, and technology strategy development for large corporations and government agencies.

Selected Publications and Patents: 4 books and over 70 technical papers

Social Activities and Honors:

Fulbright Fellow
Member, Sigma Xi, research honor society and Eta Kappa Nu, EE honor societies
Who's Who in America
Who's Who in Technology Today
American Men and Women of Science
Honorary Fellow, East-West Center, Honolulu
General Chairman of three international conferences and two national meetings
Keynote and invited speaker to over 30 technical conferences

PEM FUEL CELL COMPONENTS, SYSTEM, AND MARKET DEVELOPMENT

Dr. Oliver Yu

President, The STARS Group.
Los Altos, California, U.S.A.

ABSTRACT

In recent years, there have been significant progresses in the technological development of proton exchange membrane fuel cells (PEMFCs). This presentation will review the latest advances in the component and system technologies for PEMFC. It will also discuss potential market development for these technologies as well as their contributions to a environmentally sustainable economic development around the world..

Curriculum Vitae

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最高學歷：國立交通大學機械博士　1998

經歷：

工研院能源與資源研究所 氫能技術組副組長	2005.01-2005.03
工研院能源與資源研究所 所長室特別助理	2005.08-2005.12
工研院能源與資源研究所 燃料電池研究室主任	2003.10-2005.07
工研院能源與環境研究所 研究員	1993.01-迄今
工研院能源與環境研究所 副研究員	1988.07-1992.12

現職：工研院能源與環境研究所 新能源技術組副組長
/氫能源開發與燃料電池應用計畫協同主持人　2006.04-迄今

專長領域：燃料電池、兩相流、機械熱流

重要成就：近五年國內外專利32件
94年工研院研究論文獎
92年工研院個人研究成就獎
87年工研院團體成果獎

演講主題：工研院質子交換膜燃料電池(PEMFC)技術發展簡介

AN OVERVIEW OF PEM FUEL CELLS DEVELOPMENT AT ITRI

Yi-Yie Yan*, Fanghei Tsau, Fa-Lin Chen, Hsin-Sen Chu, Kan-Lin Hsueh

Energy & Environment Research Laboratories
Industrial Technology Research Institute
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Hsinchu, Taiwan, ROC

ABSTRACT

Fuel Cell systems offer the potential for clean, reliable, on-site and potable power generation. Fuel cell systems can be operated to operate in parallel with the power grid, or can be operated as independent energy sources, or to be complement with solar and wind generating systems. They are capable of operating of various on multiple fuels, such as natural gas, propane, and hydrogen. Their energy conversion efficiency is much higher than conventional power generation.

Proton exchange membrane fuel cells have been developing for CHP application at ITRI for 5 years. The low-temperature operating characteristics and fuel flexibility make them ideal for on-site applications. Such a combined heat and power system has been chosen as a technology platform from which key components and system integration technologies have been developed to advance the applications of the proton exchange membrane fuel cell technology. The overall prototype system consists of a fuel cell stack, a natural gas reformer supplying hydrogen-rich reformate gas as fuel to the stack, a power conditioner to convert and invert the electricity generated by the stack for internal and external consumption, and a water and heat management network to provide the oxidizer (air) to and necessary cooling and humidification for the stack. The design and performance evaluation of the stack and its components, the natural gas reformer, and the prototype system were conducted, with a particular focus on system and key components development. In addition, the durability of air-bleeding as a means of anti-CO poisoning was also investigated with a dual catalysts membrane-electrode-assembly in the study.

Being the most important research laboratory in Taiwan, ITRI is on the course to develop PEM fuel cell technologies over wide range of applications, such as multi-kW fuel cell hybrid power system, kW fuel cell UPS system, and sub-kW micro fuel cell for portable power system.

Curriculum Vitae

Name: Hai-Sheng Wu ，吴海生

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507-271-9226 (Cell)

Email: hai-sheng.wu@mnsu.edu

Education: Ph.D. in Physics, Iowa State University, Ames, Iowa 1988

Experience:
Assistant, Associate, and Full Professor of Physics at Minnesota State University, Mankato
Research Associate of Ames National Lab, Ames, Iowa
Visiting Scientist at Iowa State University, Ames, Iowa
Engineering Consultant at Thin Film Technology Corp., North Mankato, Minnesota
Oak Ridge National Lab research experience
NASA research experience at Huntsville, Alabama and at Iowa State University

Present Position: Full Professor of Physics at Minnesota State University, Mankato
- Research Associate of Ames Lab, Ames, Iowa

Specialty:
Amorphous semiconducting thin films; amorphous silicon solar cells;
Organic light emitting devices (OLEDs);
Optical Chemical Sensors and Sensors Array;
Physics teaching at both undergraduate & graduate levels
-

Selected Publications and Patents:
- Wu, H-S., Zhou, Z., Kim, C.K., Li, G., Shinar, J. “Combinatorial fabrication and study of white organic light-emitting devices based on non-doping ultrathin 5, 6, 11, 12 tetraphenylnaphthcene (rubrene) yellowing emitting layer”. In Organic Light-Emitting Materials and Devices IX, (Ed. by Kafafi, A.H.& Lane, P.A.), Proceedings of SPIE **5937**, 59371W-1 toW-8. October, 2005.

J. Shinar and H.-S. Wu. "Effects of deposition conditions on the conductivity and photoconductivity of rf sputtered a-Ge:H and a-$Ge_{1-x}C_x$:H". 100/SPIE Volume 1016 Optical Materials Technology for Energy Efficiency and Solar Energy Conversion, VII (1988).

Two pending patents in China:
High Efficiency of tandem structure a-Si/pc-Si solar cells
Cluster tool of higher efficiency a-Si solar cell production system

Social Activities and Honors:
President of Chinese American Association of Professionals & Academic in Minnesota (CAAPAM)
Minnesota State University, Mankato Solar Car Team Advisor. Ranked 3rd in American Solar Challenge (ASC) 2000 solar car race
Regular member of Physics Show Team at MSU

RECENT DEVELOPMENT IN PRODUCING HIGH-EFFICIENCY FLEXIBLE THIN-FILM SILICON-BASED SOLAR CELLS

Hai-Sheng Wu[1]

1. Department of Physics and Astronomy, Minnesota State University, Mankato, Mankato, Minnesota, USA, email: hai-sheng.wu@mnsu.edu

ABSTRACT

Thin-film solar cell based on hydrogenated amorphous silicon (a-Si:H), together with its hybrid and its alloys as p-i-n junction-type structures are becoming mature and commercially available for mass production. Those solar cells made, in particular, on flexible materials such as stainless steel foil (SSF) and plastic substrates are drawing increasing interests and attention because they are structurally flexible, relatively easy to produce, and can facilitate large area production at low cost. Recent development in mass production system and technology for flexible and lightweight a-Si:H solar cells using reel-to-reel fabrication process are briefly reported. High efficiency of a-Si:H solar cells are reported with the hybrid structure of a-Si:H p-i-n/pc-Si:H p-i-n and tandem cell structure of a-Si:H/a-SiGe:H. Triple junction of a-Si:H and its two alloy layers of a-SiGe:H with different bandgaps and hybrid structure of a-Si:H/nc-Si:H are soon to come out the research lab, and they will be the primary candidates for the next generation of higher efficiency a-Si based solar cells.

Keywords: thin-film solar cells, a-Si solar cells, flexible solar cells, tandem cell structure, hybrid cell structure.

Curriculum Vitae

Name: Yeu-Long Jiang, 江雨龍

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Phone: 04-22840688-223

Email: yljiang@nchu.edu.tw

Education: 清華大學電機工程博士

Experience:
中興大學電機系副教授
能源局太陽光電審查委員
經濟部 SBIR 審查委員
公共工程委員

Present Position: 中興大學電機系副教授
中興大學電機系再生能源研究中心主任

Specialty: Amorphous silicon solar cells, low-temperature polysilicon films, thin-film transistors, UV, visible, or IR photodetectors, light emitting from Si nanostructures, X-ray medical image sensors, thin-film technology, vacuum technology, chemical vapor deposition.

Selected Publications and Patents:

1. Yeu-Long Jiang and Yung-Chih Chang, “Rapid crystallization of a-Si:H films with various silicon-to-hydrogen bonding configurations using rapid energy transfer annealing,” Thin Solid Films, Vol. 500, Iss 1-2, pp. 316-321 (2006). (SCI), (EI)

2. Yeu-Long Jiang, Chi-Lin Chen, Chiung-Wei Lin and Shun-Fa Huang, “Rapid and Efficient Recrystallization and Activation of Implanted Phosphorus Doping in Laser-annealed Polysilicon by Rapid Energy Transfer Annealing,” Jpn. J. Appl. Phys. Vol. 42, No. 12B pp. L1498 - L1500 (2003). (SCI), (EI)

3. Yeu-Long Jiang, Chi-Lin Chen, Chiung-Wei Lin and Shun-Fa Huang, “Fast Grain Growth of Metal-Induced Lateral Crystallization of Amorphous Silicon Using Rapid Energy Transfer Annealing,” Jpn. J. Appl. Phys. Vol. 42, No. 12A, pp. L1416 - L1418 (2003). (SCI), (EI)

4. 江雨龍，"快速能量傳輸回火裝置與方法"，中華民國發明專利第 185198 號。

5. 江雨龍，"選擇性偵測不同顏色光偵測器之位壘結構"，中華民國專利發明申請號第 93133156 號。2005/10/19 核准

CONTROLLING THE SILLICON TO HYDRGEN BONDING CONFIGURATION AND ITS INFLUENCE ON THE PHOTODEGRADATION OF A-SI: H SOLAR CELLS

江兩龍

中興大學電機系，副教授, email: yljiang@nchu.edu.tw

ABSTRACT

In this work, pulse-wave modulation RF power technique is used to deposit a series of a-Si:H films and p-i-n solar cells. The plasma-off time is fixed at 10 ms and the plasma-on time is changed from 50 ms to 5 ms. As the plasma-on time decreasing, the deposition rate, hydrogen content, Si-H_2 bonding configurations (microstructure), and optical bandgap of the a-Si:H films are decreased; the short-circuit current density of the pin solar cell is increased, but the open-circuit voltage and ideal factor are reduced. The photodegradation ratio of fill factor and conversion efficiency of the cell after 96 hours AM1 illumination is also reduced. The degradation ratio of fill factor and conversion efficiency of the cell with the i-layer deposited using 5ms plasma-on time is reduced to 4.4 and 11%, respectively. Pulse-modulation RF power technique can simply and effectively improve and control the photodegradation of a-Si:H solar cell.

Keywords: pulse-wave modulation RF power, a-Si:H, pin solar cell, photodegradation.

Session 3

平面顯示與光電技術(R102)

Flat Panel Display and Optoelectronics

September 25 (Monday).2006

時 間	議 程 內 容	主 講 人
9:00~10:00	Grand Opening	
10:00~10:30	Break	
10:30~10:40	Section#3 Opening Remark	程章林主任 Dr. Alfred Pan
10:40~11:30	RECENT DEVELOPMENTS OF MICRODISPLAYS AND LED/LASER LIGHT SOURCES	Dr. Rong Hsu VP of Asia Operations, SPI
11:30~12:20	DEVELOPMENT OF AUTOSTEREOSCOPIC 3D DISPLAYS	陳政寰教授 清華大學 動力機械系
12:20~13:40	Lunch	
13:40~14:30	FLEXIBLE DISPLAY – MATERIALS AND PROCESSING CHALLENGES	Dr. Alfred Pan Principal Scientist, Emerging Technologies, HP Labs
14:30~15:30	CHALLENGES OF LCD TV TECHNOLOGY	韋忠光副總處長 奇美電子
15:30~15:40	Break	
15:40~16:30	BISTABLE REFLECTIVE DISPLAYS FOR PAPER-LIKE DISPLAYS	Prof. L. C. Chien Liquid Crystal Institute, Kent State University
16:30~17:20	Revolution of the TFT LCD Technology	劉軍廷 副總經理 友達光電 / 科技中心

Curriculum Vitae

Name: Rong Hsu, 徐榮

Address: 10931 Santa Teresa Dr, Cupertino, Ca 95014

Phone: 408-253-3614

Email: ronhsu101@gmail.com

Education:

Ph. D. Material Science, Univ. of Maryland
M.S. Engineering Material, Brown Univ. B.S. Mechanical Engineering, NTU, Taipei.

Experience: >25 years of IC & microdisplay experience.

Present Position: President, SPI-Asia

Specialty: LCOS , microdisplays

Selected Publications and Patents:

Papers: As invited speaker to Taiwan, China, & US for past 12 years.
Patents: Wafer Planarization technology for microdisplays.

Social Activities and Honors:

Intel award for yield improvements.

RECENT DEVELOPMENTS OF MICRODISPLAYS AND LED/LASER LIGHT SOURCES
微顯示器與發光二極體及雷射光源之最新發展

RECENT DEVELOPMENTS OF MICRODISPLAYS AND LED/LASER LIGHT SOURCES

Rong Hsu

VP of Asia Operations, SPI, Sunnyvale, Ca, USA, email: rong_hsu@sp-incorp.com

ABSTRACT

The arrival of HDTV era triggers the explosion of various display technologies. The rapid development of Microdisplay-based projection displays business in recent years has been mainly focused in RPTV & Multimedia front projector areas. Its dominance in front projector area is unquestionable. However, due to the rapid growth of FPD especially LCD industries, the percentage of microdisplay in DTV remains low at about 10% only. There are rapid developments seen for microdisplays in the applications of mobile displays lately. One of the main technology enablers are the LED and laser light sources. This paper will provide an update on the various microdisplay business opportunities in projection display areas.

Keywords: microdisplay, LED, Laser, projectors.

Curriculum Vitae

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Education:
PhD in Engineering (Oct. 1996 – Mar. 2000)
Department of Engineering, University of Cambridge, Cambridge, UK
MSc in Applied Optics (Oct. 1995 – Sep. 1996)
Department of Physics, Imperial College of Science, Technology and Medicine, London, UK
MSc in Mechatronics and Optical Engineering (Oct. 1991 – Sep. 1992)
Department of Mechanical Engineering, Loughborough University of Technology, UK
BSc in Mechanical Engineering (Sep. 1984 – June 1988)
Department of Mechanical Engineering, National Cheng-Kung University, Taiwan, ROC

Experience:
Aug. 2002 – July 2005
Assistant Professor, Department of Electronics Engineering
National Taiwan University of Science and Technology, Taiwan R.O.C.
Apr. 2000 – Aug. 2002
Senior Optical Designer, Creative Display Solutions
Philips Components, Eindhoven, The Netherlands

Present Position:
Aug. 2005 – present Assistant Professor, Department of Power Mechanical Engineering
National Tsing Hua University, Taiwan R.O.C.

Specialty: Micro optics, projection displays, three-dimensional displa

Selected Publications and Patents:

Journal

1. Y Chiu, C-H Chen, J. C. Chiou, W. Fang, H-P D. Shieh, “MEMS-based miniature optical pickup”, IEEE Trans. Magnetics, 41(2), pp. 967-970 (2005). (SCI, EI)

Conference

1. C-F Chen, S-Y Tsai, C-H Chen, H-C Huang, J-Y Huang, “Novel Polarization Conversion System for Liquid Crystal Projector”, presented in OPT(Optics and Photonics Taiwan), Taiwan, 18-19 Dec., 2004
2. S-Y Tsai, C-H Chen, R-Y Tzong, C-C Hsiung, Y-T Lee, “LED illuminated Z-cube light engine”, Digest of Technical Papers SID’05, pp.914-917, 2005

Social Activities and Honors:SID member

DEVELOPMENT OF AUTOSTEREOSCOPIC 3D DISPLAYS

Chen, Cheng-Huan

Assistant Professor, Department of Power Mechanical Engineering
National Tsing Hua University
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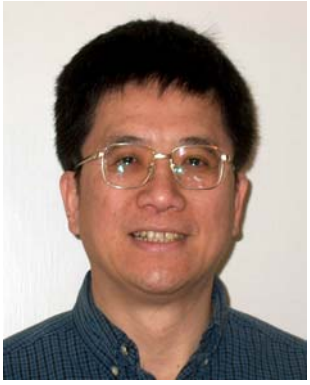
ABSTRACT

Adding depth perception to make a true 3D display is currently a major direction in display technology toward ultimate goal of natural vision. Among several types of true 3D displays, autostereoscopic display has been chosen in most cases for consumer applications, with the consideration on both constrain of available technology and the desired 3D performance in the market. This seminar will start from the fundamental concept of autostereoscopic 3D display, followed by a market research, and survey on the existing technology and product. The major technical issues in autostereoscopic 3D display and the corresponding technical solution will then be discussed. Finally a comment will be given on the future direction for developing autostereoscopic 3D display.

Key words: 3D display, autostereoscopic display

Curriculum Vitae



Name: Alfred Pan, 潘益宗

Address: 1676 Kennard Way, Sunnyvale, CA 94087

Phone: 408-733-5213

Email: alfred.pan@yahoo.com

Education: Ph. D. Materials Engineering, University of Illinois, Urbana-Champaign
M.S. Materials Science, Syracuse University.
B.S. Mechanical Engineering, NTU, Taipei**.**

Experience:

- Thermal ink jet printing (since 1984) and various digital printing technologies, including materials, processing, and architecture, for the applications of printing inks as well as functional materials;;
- IC processing technology;
- Printable semiconductor for flexible electronics;
- Direct methanol fuel cell power sources for portable devices.

Present Position: Principal Scientist, Emerging Technologies, HP Labs, Hewlett-Packard

Specialty: TIJ, flexible display

Selected Publications and Patents:

- "High Performance Nanomaterial-based Inorganic Printed Semiconductor", Digital Fabrication 2005, p180
- 41 US patents

Social Activities and Honors:

- Program chair for Americas for the 19th International Conference on Non-impact Printing in 2003
- Technical Advisor Committees on "Energy" and "Flexible Electronics", ITRI, Taiwan.

FLEXIBLE DISPLAY – MATERIALS AND PROCESSING CHALLENGES

Alfred Pan

Principal Scientist, HP Labs, Hewlett-Packard, Palo Alto, CA, USA,
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ABSTRACT

Flexible display, replacing the fragile and heavy glass component with light weight and robust flexible substrate, has become a goal that has attracted serious attentions from the display industry. However, the challenges from both the processing innovations for countering the run-out issues of flexible substrates, as well as the innovation required for low temperature materials development have rendered the task an elusive goal so far. The requirement of a low-temperature flexible transparent substrate for LCD displays imposes even more demanding challenges for low cost flexible displays. This paper will review the run-out issues and several approaches on processing flexible substrates such as self-aligned scheme, as well as innovations in semiconductor materials, such as solution-based oxide semiconductors that potentially can deliver the low temperature processing in an ambient environment with relatively high performance. This paper will also review the printing means for large area processing of electronic circuit in a flexible display.

Keywords: printed electronics, run-out, reel-to-reel, self-align, low-temp semiconductors.

Curriculum Vitae

Name: Chung-Kuang Wei ,韋忠光

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Industrial Park, Taiwan 74147 R.O.C.

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Education: Ph.D, Department of Photonics, National Chiao Tung University

Experience:
1994 ~ 1998
Electronics Research & Service Organization (ERSO), Industrial Technology Research Institute
1998 ~ now
Chi Mei Optoelectronics Corp.

Present Position:
Deputy Head Director, Technology Development Head Department, CMO

Specialty:
LCD Optics

CHALLENGES OF LCD TV TECHNOLOGY

Chung-Kuang Wei

Technology Development Head Division, Deputy Head Director,
email: ck_wei@cmo.com.tw

ABSTRACT

Recently, the applications of LCD have progressed from notebooks to desktop monitors and then to larger and larger sized panels for TVs. As one of the most promising TV technology candidates, LCD has the advantages of high resolution, light weight, slim form, and low power consumption compared to other flat panel display technologies. As the applications evolve in size and complexity, the displays must also evolve, not only in order to accommodate the new demands of viewing angle ability, brightness, contrast, moving picture quality, and slim form factor, but also to stimulate future demands. There is still much room available in each of these key areas for further research and development to enhance the user's overall viewing experience. In this talk we will point out the challenges of MVA (Multi-domain Vertical Alignment) mode LCD TV technology and discuss the approaches to enhance the performance of MVA mode LCD including wide viewing angle, high transmittance, high contrast, vivid color, better motion image quality, and slim mechanical design.

Key words: MVA, LCD TV

Curriculum Vitae

Name: Liang Chy Chien, 簡良吉

Address: Liquid Crystal Institute, Kent State University, Kent, Ohio 44242

Phone: 330-650-0868

Email: lcchien@lci.kent.edu

Education: Ph.D, 1988, in Polymer Science, Univ. Southern Mississippi

Experience:

Professor	CPIP, Kent State Univ., Kent, Ohio	2000-present
Associate Professor	CPIP, Kent State Univ., Kent, Ohio	1995-2000
Senior Research Fellow	Liquid Crystal Institute, Kent State Univ.	1988-1995
Visiting Professor	Philips Research Laboratories, Eindhoven, NL	2003

Present Position:
Professor and Program Coordinator, Liquid Crystal Institute and Chemical Physics Interdisciplinary Program, Kent State University

Specialty: Liquid Crystal Displays, Electro-Optics

Selected Publications and Patents:

1. Kim, S.H.., L. Komitov, Chien, L.C., "Short pitch cholesteric electro-optical device stabilized by nonuniform polymer network", *Appl. Phys. Lett.*, **86**, 161118/1-161118/3 (2005).
2. "Liquid crystal blazed gratings formed in a single-step throught photo-induced localization of polymer into a prismatic structure," S. H. Kim, L. C. Chien, *Optical Express*, **12**, 1238-1242 (2004).

1. "Pixelized Liquid Crystal Displays Materials," US 6,668,614, 9/16/97, L.C. Chien and J.W. Doane.
2. "Optical compensation film for liquid crystal displays," O. Yaroschuk, J. Kelly, L. Chien, U. Reznikov, US Pat. 6,939,587, 9/6/2005.
3. "Electro-optical devices from polymer-stabilized liquid crystal molecules," L. Komitov; L.C. Chien, S.H. Kim, US. Pat. 7,038,743, 5/2/2006.
4. "Method of making optical compensation film using polymer stablization technique," L.C. Chien, T. Doi, US Pat. 7,090,901, 8/15/2006.

Social Activities and Honors:

1. Associate Editor, IEEE Journal of Display Technology
2. Member of Technical Advisor Committee of "Flat Panel Displays", ITRI, Taiwan.
3. Conference Chair of Displays and Symposium Chair of "Liquid Crystal Materials, Device and Applications XII" Photonic West 2003-2006, San Jose, CA.
4. Symposium Chair, "Emerging Liquid Crystal Technologies," Photonic West 2005, January 2005, San Jose, CA.

BISTABLE REFLECTIVE DISPLAYS FOR PAPER-LIKE DISPLAYS

L. C. Chien

Professor, Liquid Crystal Institute, Kent State University, Kent, Ohio 44242 USA
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ABSTRACT

Many types of bistable reflective displays have been demonstrated so far to target the mobile application market, but there is a far bigger market in electronic books (e-books) and papers (e-papers) which require displays with the characteristics of full color, light weight, low power consumption, high reflectivity and motion picture capability. The conventional flat panel display media took the lead in this emerging display market. The materials used in producing bistable reflective displays include nematic, ferroelectric and cholesteric liquid crystals. Alternate display materials such as electronic liquid powder and electrophoretic ink have been developed and applied to the fabrication of paper-like displays. Furthermore, the microelectro mechanical systems-based displays also emerge as a strong competitor

Bistable displays have two (or more) stable states without field. Once displayed, the information is memorized for a long time, ranging from seconds up to years, depending on the application needs. This intrinsic memory is the main advantage of the bistable devices. It enables to lower the power consumption, especially when the application does not require a frequent update. For some mobile applications, e-books and e-papers for instance, the energy saving can be a decisive improvement, increasing the battery lifetime by orders of magnitude**.**

The electronic books and papers market will continue to grow in a fairly quick speed in the next decade. To ensure as a vital display technology in this market, a display technology has to have a cost-effective production method such as using roll-to-roll continuous manufacturing process. In addition, the motion picture and full color capability are essential elements to guarantee to succeed in the strong competition. This paper will give a through review on the emergence and evolution of bistable reflective display technologies.

Keywords: Bistable, Reflective, Displays, Liquid Crystal, Electrophoretic Ink, Electronic Liquid Powder

Curriculum Vitae

Name: CT Liu, 劉軍廷

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Phone: 886-3-5008800

Email: ct.liu@auo.com

Education: Ph.D

Experience: 12 years in Bell Labs; in AUO since 2002.

Present Position: Vice President of AUO Technology Center

Specialty: Display field

Selected Publications and Patents:
Dr. Liu has published more than 100 papers, owned 20 US patents, and delivered numerous invited talks.

Social Activities and Honors:
He has also been the technical committee of several international conferences.
今年榮獲經濟部第 14 屆產業科技獎--個人成就獎

REVOLUTION OF THE TFT LCD TECHNOLOGY

C.T. Liu, AUO Technology Center, AU Optronics, Hsinchu, Taiwan

ABSTRACT

Since the introduction of TFT LCDs in portable personal computers (notebooks) in the early 1990's, the TFT LCD industry has experienced several waves of technology revolution: (1) product introduction, (2) performance enrichment, (3) power utilization and material utilization, and (4) human-interface functions.

Session 4

奈米與微機電技術(R 201C)

Nano and MEMS Technology

September 25 (Monday).2006

時 間	議 程 內 容	主 講 人
08:30-10:00	中美近代工程技術研討會開幕典禮 Opening Remarks	余俊彥 理事長/中國工程師學會
10:00-10:20	報到 Registration	
10:20-10:30	召集人致詞 Welcome Remarks	中美雙方召集人
10:30-11:20	Semiconductor Quantum-Dot Lasers and Nanophotonics	Prof. Shun-Lien Chuang / Department of Electrical and Computer Engineering, University of Illinois at Urbana-Champaign
11:20-12:10	New Direction in Optical MEMS	Prof. Ming C. Wu / Electrical Engineering & Computer Sciences, University of California, Berkeley
12:10-13:40	午餐 Lunch	
13:40-14:30	Applications of Thick Film Screen Printing and Ink-jet Dispensing Technique to the Development of Biosensor Platform Technology	Prof. Chung-Chiun Liu / Director, Electronics Design Center, CWRU
14:30-15:20	Nanotechnology Enabled Theranostics - A Cross Discipline Approach in Taiwan	謝達斌 醫師/成功大學醫學院
15:20-15:40	休息 Break	
15:40-16:30	Bulk Heterojunction Hybrid Solar Cell	林唯芳 教授/台灣大學
16:30-17:20	Strategies and Research Activities of Organic Photovoltaics in ITRI	丁晴 副組長/工研院材化所
17:20-17:30	綜合討論 Panel Discussion	中美雙方主講人

Curriculum Vitae

Name: Shun Lien CHUANG, 莊順連

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Department of Electrical and Computer Engineering
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Urbana, IL 61801 U.S.A.

Phone: 1-217-333-3359

E-mail: s-chuang@uiuc.edu

Education:

Ph. D. in EECS, MIT, 1983**;** Electrical Engineer Degree in EECS, MIT, 1981;
M.S. in EECS, MIT, 1980; B.S. in EE, National Taiwan University, 1976.

Experience:

Faculty in ECE, University of Illinois at Urbana-Champaign	1983-present
Director, Illinois Program for Photonics and Optoelectronics	2002-present
EPSRC Fellow/Professor, Cavendish Lab., Cambridge Univ., UK.	8/2002- 1/2003
Visiting Professor, Fujitsu Research Laboratory, Japan	7/2000-8/2000
Education Associate, NASA Ames Research Center, CA	6/1999-8/1999
Invited Professor, NTT Basic Research Laboratories, Japan	6/1997-8/1997
Visiting Professor and JSPS Fellow, University of Tokyo	4/1996-5/1996
Senior Visiting Professor (Sabbatical Chair), SONY Research Center	6/1995-8/1995

Present Position:

Professor in Electrical and Computer Engineering, University of Illinois at Urbana-Champaign

Specialty:

Optoelectronics, Semiconductor quantum-well and quantum-dot lasers, photodetectors, Optical modulators, Optical networks

Selected Publications and Patents:

Author of the book, *Physics of Optoelectronic Devices*, New York: Wiley, 1995.
200 journal and 150 conference papers, and three book chapters.

Social Activities and Honors:

IEEE LEOS Distinguished Lecturer Award (2004-2005 and 2005-2006)
Engineering Excellence Award, Optical Society of America (2004)
Fellow of IEEE, Optical Society of America, and American Physical Society.
Fellow, EPSRC, United Kingdom (2002)
Fellow, Japan Society for Promotion of Science (1996)
Cited in the list for Excellence in Teaching many times at UIUC.
Associate, The Center for Advanced Study, UIUC, (1995) (campus honor)
Andersen Consulting Award for Excellence in Advising, UIUC, (1994)

SEMICONDUCTOR QUANTUM-DOT LASERS AND NANOPHOTONICS

SHUN LIEN CHUANG

Professor, Department of Electrical and Computer Engineering, University of Illinois at Urbana-Champaign, Urbana, Illinois, 61801, U.S.A., email: s-chuang@uiuc.edu

ABSTRACT

Since the invention of semiconductor lasers in 1962, significant progress has been made in many applications including optical communications and biophotonics. Most modern semiconductor lasers operate based on quantum mechanical effects. Quantum-well lasers have been developed with impressive performance and novel quantum-dot lasers, a subject of intense research, show a great promise as well. Semiconductor laser sources covering from short (ultraviolet) to very long wavelengths (such as hundreds of micrometers in the terahertz frequency range) have been developed. Novel nanophotonic devices such as micro-cavity quantum-dot lasers, photonic crystal lasers, and waveguides have been under intensive research. These nanophotonic devices utilize the ideas of (a) the confinement of the electrons and holes in quantum dots for enhanced radiative recombination for the generation of photons, and (b) the confinement of photons in a micro-cavity for enhanced spontaneous emission coupling into the lasing mode in order to achieve the ultimate limit of the nanophotonic device performance.

In this talk, I will describe the recent development of strained quantum-well and quantum-dot lasers, and nanophotonic devices. I will present our most recent theoretical and experimental results on a tunneling injection quantum-dot laser, which has potential advantages such as low threshold, high temperature stability, low-chirp, and high-speed performance. Nanophotonic devices, such as photonic crystal waveguides for biophotonic sensors, and photonic crystal lasers using quantum-dot active medium, will then be discussed. Applications to optical buffers using quantum wells and quantum dots for slow light will be presented. Finally, semiconductor quantum-cascade lasers to push the lasing wavelength toward mid-infrared and terahertz (THz) wavelengths for biochemical gas sensing and medical diagnostics will be discussed. The design concepts are based on semiconductor band gap engineering to realize semiconductor multi-layered quantum-well structures, which generate photon emissions as laser sources for infrared and terahertz spectroscopy. The realization of many of these novel semiconductor photonic devices demonstrates impressive progress over the last four decades since the invention of semiconductor lasers

Keywords: Nanophotonics, Semiconductor lasers, Quantum dots, Quantum-cascade lasers

Curriculum Vitae

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Education:

Ph.D. UC Berkeley, Electrical Engineering & Computer Sciences 1988
M.S. UC Berkeley, Electrical Engineering & Computer Sciences 1985
B.S. National Taiwan University, Electrical Engineering 1983

Experience:

2005-Present:	Professor, Electrical Engineering & Computer Sciences, University of California, Berkeley
2005-Present:	Co-Director, Berkeley Sensor and Actuator Sensor (BSAC)
1996-2004:	Professor, UCLA, Electrical Engineering Department
2002-2004:	Vice Chair, Industrial Relations
2001-2004:	Director, Nanofabrication Research Facility
2000-2003:	Field Chair, Photonics and Optoelectronics
1997-2003	Director, RF Photonics MURI (UCLA-Berkeley-MIT-USC)
1997	Co-Founder, OMM (Optical Micro-Machines, Inc.), San Diego, CA
1993-1996:	Associate Professor, UCLA, Electrical Engineering Department.
1988-1992:	Member of Technical Staff, AT&T Bell Laboratories, Murray Hill, NJ
1983-1988:	Research Assistant, Electronics Research Laboratory, UC Berkeley

Present Position:

Professor, Electrical Engineering & Computer Sciences, University of California, Berkeley
Co-Director, Berkeley Sensor and Actuator Sensor (BSAC)

Specialty: MEMS, Optical MEMS, optoelectronics

Selected Publications and Patents:

Dr. Wu has published 415 research papers (136 papers in archival journals, and 279 papers in refereed conferences), and 4 book chapters (with 2 additional in print). He has presented 7 plenary talks and over 50 invited talks in conferences. He has also received 14 US Patents.

Social Activities and Honors:

Fellow, IEEE, 2002
David and Lucille Packard Foundation Fellow, 1992-1997

NEW DIRECTIONS IN OPTICAL MEMS

MING C. WU

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ABSTRACT

Nearly three decades ago, Petersen published a paper on micromechanical spatial light modulator array and another on silicon torsion mirror. Thirty years later, this has become a thriving field known as Optical MEMS (micro-electro-mechanical systems), sometimes also called MOEMS (micro-opto-electro-mechanical systems), with several conferences dedicated to the field. It is a key enabling technology for dynamic processing of optical signals. The first market driver of Optical MEMS was display. The digital micromirror devices (DMD) developed by Texas Instruments are one of the most successful MEMS products. They are now widely used in portable projectors, large-screen TVs, and digital cinemas. Applications of Optical MEMS in telecommunications started in the 1990's. The early efforts have focused on the development of Optical MEMS devices and fabrication technologies. The telecom boom in the late 90's and early 2000's has accelerated maturation of the technology. A wide range of Optical MEMS components were taken from laboratories to reliable products that meet Telcordia qualifications. Though not all commercialization endeavors were successful due to the market downturn, the technology developed is available for new applications in communications and other areas.

In this paper, we will review the recent developments of Optical MEMS technologies and applications. We will focus on the emerging technologies. In the area of telecommunication, the integration of MEMS and planar lightwave circuits promises to reduce the size, cost, and power consumption of optical switches, dense-wavelength-division-multiplexing (DWDM) components, tunable lasers, and spectrometers. Integration with photonic crystals and microresonators can further shrink the footprint and enable monolithic integration of optical systems. Bio-MEMS and large-scale microfluidic circuits, combined with nanotechnology, are receiving increasing interests. We will review the technology platforms for digital fluidics, in which the analyses and reagents are contained in droplets of liquids with fixed volumes. We will discuss a novel approach to actuate digital fluidic circuits by light. This is part of a broad area called optofluidics. Two novel technologies will be described: optoelectrowetting (OEW) for actuating liquid droplets with volumes ranges from micro- to picoliters and optoelectronic tweezers (OET) for trapping, storing, moving, and sorting colloidal particles and biological cells.

Keywords: MEMS, optical MEMS, microfluidics

Curriculum Vitae

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Education:

Cheng-Kung University, Taiwan	emical Engineering	. 1959
California Institute of Technology	emical Engineering	. 1962
Case Western Reserve University	emical Engineering	. 1968
Case western Reserve University	Bioelectroni	Postdoctoral 1968

Experience:

1989-Present	Wallace R. Persons Professor of Sensor Technology & Control
1985-present	Director, Electronics Design Center, CWRU
1978-Present	Professor of Chemical Engineering, CWRU

Specialty: chemical and biological sensors, microfabrication , fuel cells and batteries

Selected Publications and Patents:

1.C.C. Liu; E.O'Connor and K.P. Strohl A multi-channel wireless telemetric micro-system for small animal studies IEEE Sensor Journal ,6 (2006)187-202

2.M.C. Chuang,C.C.Liu and M.C. Yang An electrochemical tyrosinase-immobilized biosensor for albumin-toward a potential protein measurement Sensors and Actuators B : Chemical 114 (2006) 357-363

3.T.R. Ling; Y.Z. Syu; Y.C. Tasi; T.C. Chou, and C.C. Liu. Size-selective recognition of catecholamines by molecular imprinting of silica-alumina gel. Biosensor. Bioelectron.21(2005)901-907

4.L.C.S. Chou; and Liu, C.C.. Development of a molecular imprinting thick film electrochemical sensor for cholesterol detection. Sensors and Actuators, B: Chemical, 110 (2005), 204-208.(plus an additional 188 journal publications and 13 U.S. Patents)

Social Activities and Honors:

Fellow, Electrochemical Society, May, 1997
Fellow, American Institute of Medical and Biological Engineers, March, 1995
Presidential Award for Excellence in Science, Mathematics and Engineering Mentoring (PAESMEN) White House, March 2003
K. T. Li Professorship, National Cheng Kung University, Taiwan, March 2004
Honorary Professorship, National Chiao Tung University, Taiwan, June 2005
Outstanding Alumni Award, National Cheng Kung University, Taiwan, Nov. 1998
Meritorious Service Award, Case Alumni Association, June, 1999
Outstanding Alumni Achievement Award, Chemical Engineering Dept., National Cheng-Kung University, Taiwan, September, 1999
Recipient, Gold Medal, International Meeting on Chemical Sensors, July 1994, Rom

APPLICATIONS OF THICK FILM SCREEN PRINTING AND INK-JET DISPENSING TECHNIQUES IN THE DEVELOPMENT OF BIOSENSOR PLATFORM TECHNOLOGY

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ABSTRACT

Thick-film screen printing and ink-jet dispensing techniques are mature manufacturing processes in the microelectronic industry. However, the applications of these techniques in the development of biosensors have not been fully explored. Particularly, these techniques can be used effectively to produce low-cost, single use disposable biosensors for various applications. Furthermore, the incorporation of nano catalytic particles into these biosensors enhances the selectivity and sensitivity of the biosensor resulting in new applications.

The applications of the screen printing and ink-jet dispensing techniques for the development of the biosensors will be assessed. Enzymatic based biosensors will be used as examples to illustrate this biosensor platform technology. Both the scientific and economic importance of these biosensors will be discussed, and a low-cost, disposable enzymatic blood glucose sensor fabricated by the thick film processes will be used for illustration. The important features of a biosensor including its selectivity and sensitivity will be assessed. In this study, selected catalysts in nano particle form are incorporated into the sensing elements of the biosensor enhancing the sensor performance. In addition to the glucose sensor, other biosensors including a total protein sensor, a cholesterol sensor and others will be used to demonstrate the validity of this biosensor platform technology.

The enhancement of the sensor performance can be obtained using nano-catalytic particles which can be incorporated into the thick film printed biosensors. In addition to the biosensors mentioned, nano-platinum particles are used as a catalyst in the development of a dimethyl ether (DME) sensor for the measurement of mucosal blood flow which is clinically important for the assessment of the functions of a lung. A platinum nano-catalytic particles carbon dioxide thick film sensor also demonstrates excellent sensor performance in terms of selectivity and sensitivity.

Keywords: thick-film printing; glucose sensor; dimethyl ether sensor

Curriculum Vitae

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Education:

1997 DMSc in Oral Biology, Harvard University
1997 Certificate in Oral Pathology and Medicine, Harvard School of Dental Medicine.
1988 DDS, National Yang Ming University

Current position：

Session Chief and Associate Professor, Institute of Oral Medicine, and
Assistant Director, Center for Micro/Nano Science and Technology, National Cheng Kung University

Research Interest: Bionanotechnology, molecular medicine, Oral pathology and medicine.

Awards and Honors:

1. 2005: Best Basic Science Award in 10th International Congress on Oral Cancer, 2005 Apr. (WHO, ICOOC, HATMC, HCS)
2. 2005~: Fellow, The International Academy of Oral Oncology
3. 2005~: 臺灣奈米會刊編輯委員。

Selected Papers：

1. Shieh DB*, Su CH, Chang FY, Wu YN, Su WC, Hwu JR, Chen JH, Yeh CS. Aqueous nickel-nitrilotriacetate modified Fe_3O_4–NH_3^+ nanoparticles for protein purification and cell targeting. Nanotechnology, 2006 Aug; 17(16):4174-4182.
2. Hsiao MT, Chen SF, Shieh DB*, Yeh CS. One-Pot Synthesis of Hollow Au_3Cu_1 Spherical-Like and Biomineral Botallackite $Cu_2(OH)_3Cl$ Flower- Like Architectures Exhibiting Anti-microbial Activity. J. of Physical Chemistry B, 2006 Jan; 110(1), 205-210.
3. Shieh DB*, Chang FY, Su CH, Yeh CS, Wu MT, Tsai CY, Wu CL, Chen DH, Chou CH. Aqueous Dispersions of Magnetite Nanoparticles with NH_3^+-surfaces for magnetic manipulations of biomocules and MRI contrast agents. Biomaterials, 2005 Dec, 26(34), 7183-7191.
4. Chang FY, Su CH, Yang YS, Yeh CS, Tsai CY, Wu CL, Wu MT, Shieh DB*. Characterization of a newly synthesized Fe3O4 nanoparticle aqueous dispersions and its biomedical applications. Biomaterials, 2005 Mar; 26: 729-738.
5. Tai SP, Lee WJ, Shieh DB, Wu PC, Huang HY, Yu CH, Sun CK. In vivo optical biopsy of hamster oral cavity with epi-third-harmonic-generation microscopy, Optics Express, 2006 Jun; 14(13), 6178-6187.
6. Tsai CY, Shiau AL, Cheng PC, Shieh DB, Chen DH, Chou CH, Yeh CS, Wu CL (2004). A biological strategy for fabrication of Au:EGFP nanoparticle conjugates retaining bioactivity. Nano Letters 4,7,1209-1212.

NANOTECHNOLOGY ENABLED THERANOSTICS - A CROSS DISCIPLINE APPROACH IN TAIWAN

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ABSTRACT

Theranostics, a new concept in medicine, is an emerging concept that new technology will ultimately combine diagnosis and therapy in an integrated system, and even better, the same platform. With the rapid advancement of technologies for nanoparticle synthesis, functionalization, and the promotion in the detection sensitivity, a bridge toward theranostic medicine is now under a rapid construction. We have synthesized gold nanorods with controllable aspect ratio that generate specific surface plasmon resonance frequency according to their shape. Through bioconjugation, the nanoparticles were able to recognize tumor gene expression and perform molecular imaging of multiple targets by tunable laser combined with photoacoustic detection. Interestingly, after confirmation of the tumor loci and their gene expression, the tumor cells labeled with gold nanorod antenna could be destroyed simplely by increased laser power to produce very regional hyperthermia that will not significantly affect neighboring cells. In a second example, magnetic nanorods were transformed to become porous inside and coated with polymers for microenvironment controlled drug release. The nanorods were able to produce MRI contrast in T2 and T2* imaging sequence and targeting tumor cells by conjugation with anti-Her2 monoclonal antibody. Thus the same rod served for both molecular imaging of cancer cells expressing Her-2 and targeted drug delivery. A synergistic effect exist in the bionanotechnology development for theranostic in clinic. Nanotechnology through cross discipline integration will become an integral part of tomorrow's biomedical platform and bring up a revolutionary transformation of life science and health care.

Wei-Fang Su,林唯芳

Dr. Su obtained her Ph.D. in 1978 from University of Massachusetts, worked on polypeptide under the supervision of Prof. C. P. Lillya and Prof. W. J. MacKnight. She spent one year at the Materials Research Center of Northwestern University doing postdoctor research on dielectric properties of epoxy resins. Then she was a Fellow Scientist at the Westinghouse Research Center for 16 years. She worked and managed various projects related to materials for electric insulations and electronic devices. She won 6 outstanding researcher awards during her tenure with the Westinghouse. She spent one year as a visiting scholar at the Materials and Devices Laboratory of Mitsubishi Electric Company worked on the nonlinear optical materials. After 25 years abroad, she went back to her homeland Taiwan in order to serve more people in the scientific community. In 1996, she joined the department of Materials Science and Engineering of National Taiwan University as full professor and work on innovative materials.

Her science interests begun in her junior high school. She always fascinated by the interesting properties observed from different materials. That developed her life long interests in studying the relationship of engineering properties, especially electronic, dielectric and thermal properties, to the molecular structures of materials. In more than twenty five years of academic and industrial experience, she has used molecular modeling to design numerous new materials with novel properties. Then she synthesized and fabricated them into composites, optical waveguides, wire insulations, printed wiring boards, and electronic devices. Her latest inventions involve liquid crystalline epoxy resins, solventless high refractive index organic-inorganic hybrid, light emitting diodes fabricated from nanoparticles (one patent in SiO_2 nanoparticles and another patent in CdS nanoparticles), single electron transistor and memory cell fabricated from Au-C60 nanoparticles and nanocomposites. The last four inventions have established her as a world expert in the nanomaterials and nanotechnology. She was awarded as a 2003 Chair of Nanotechnology of Far Eastern Y. Z. Hsu Science & Technology Memorial Foundation (徐有庠先生紀念基金會奈米科技講座). She has published 114 research papers in scientific journals and conference proceedings, written 3 books, awarded 17 US Patents and 6 Taiwan Patents.

BULK HETEROJUNCTION HYBRID SOLAR CELL

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ABSTRACT

Considering the growing concern about energy prices and supply in the world, in addition to concerns about global warming, it is no surprise that there has been an increasing interest in renewable energies. Worldwide solar cell production grew by 33% in 2005, from 1200 to >1600 MW. Bank Sarasin is predicting 3330 MWp cell production by 2010. Organic solar cell has many advantages over the conventional semiconductor solar cell such as the prospect of high throughput, non-vacuum processes using reel-to-reel or spray deposition, very thin and flexible cell with high energy densities. We are developing aromatic based conducting polymer incorporation with nanoparticle to have high efficiency and long term stability solar cells. The MEHPPV-CdSe hybrid was used as our control system. Temperature dependent steady-state and time resolved photoluminescence (PL) experimental studies of MEHPPV-CdSe reveals that the role of nanoparticles not only provides medium for efficient charge separation at the interface but also leads to the increase the effective conjugation length in the polymer. The strategies of enhancing interfacial interactions between polymers and nanoparticles are explored to achieve high efficiency solar cells. We have synthesized a novel hybrid materials of poly(3-hexylthiophene)/D-A linker/TiO_2. Compared with neat P3HT films on TiO_2, the presence of the D-A linker between P3HT and TiO_2 effectively increases the quenching of photoluminescence. The TiO_2 nanorods/MEH-PPV hybrid material is fabricated for solar cell applications via spin coating process. The large interfacial area between the two materials due to high surface to volume ratio of rod shape (1-D) nanocrystals ensures a more efficient charge separation that could potentially improve charge transport in photoactive materials. Power conversion efficiency (η) of 2.2 % under illumination at 565 nm and maximum external quantum efficiency of 24 % is achieved. Patterning nanoparticles in self-assembled block copolymers are under development to increase effective interfacial interactions and reduced transport path between electrodes. Poly (*para*-phenylene)-b-Poly (2-vinyl pyridine) (PPP-PVP) were synthesized by using sequential anionic polymerization. Semiconducting nanoparticles of cadmium sulfide (CdS) was incorporated into PPP-PVP nanostructure using in-situ synthesis of CdS in the PVP domain. Optoelectronic property of the CdS-PPP-PVP showed decreasing in bandgap and quenching in PL as compared with PPP-PVP. The results indicate the material can absorb solar energy more efficiently and increase the charge transport in the solar cell. The project is funded by National Science Council and US Airforce.

Curriculum Vitae

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Education: Ph.D in Chemistry, The University of Iowa

Experience:

June, 2003- Dec. 2005	Deputy Director, Chemical Engineering Division, UCL/ITRI
July, 1999- May, 2003	Manager, Polymerization Catalysis and Engineering Department, UCL/ITRI;
Oct. 1994- July, 1999	Researcher, Polymerization Catalysis and Engineering Department,

Present Position:

Deputy Director, Organic Opto-electronic Materials and Applications Division, MCL/ITRI

Program Leader for "Organic Solid Phase Photovoltaics"

Specialty: organometallic chemistry, precision polymer design and synthesis

Selected Publications and Patents:

1. "Hydrophilic polymer supports grafted by poly(ethylene glycol) derivatives via atom transfer radical polymerization" Chih-Ping Chen, Bao-Tsan Ko, Shin-Lei Lin, Meei-Yu Hsu, Ching Ting, *Polymer* 2006, in print
2. "Nanoblends of Incompatible Polymers by Direct Space-Confined Polymerization" Shu-Hua Chan, Yi-Yang Lin, and Ching Ting, *Macromolecules* 2003, *36*, 8910-8912
3. "Activation Energy and Transition State Determination of Olefin Insertion Process of Metallocene Catalysts by Semi-Empirical Molecular Orbital Calculation" Mu-Jen Young, Chen-Chi M. Ma, and Ching Ting; *Russian Journal of Coordination Chemistry*, 2002, *28(1)*, pp. 27-33.
4. USP 5,684,098
5. USP 5,891,816
6. USP 6,150,529
7. USP 6,228,790
8. USP 6,207,773
9. USP 6,852,810

Social Activities and Honors:

1987-present American Chemical Society

2000 ITRI's Advanced Research Team Award

STRATEGIES AND RESEARCH ACTIVITIES OF ORGANIC PHOTOVOLTAICS IN ITRI

Ching Ting

Deputy Director, Organice Opto-Electronic Materials and Applications Division, Material and Chemical Research Lab., Industrial Technology Research Institute, HsinChu, Taiwan; email: cting@itri.org.tw

ABSTRACT

Photovoltaics is currently experiencing a boom due to the finite supply of fossil fuel and the problems caused by increasingly high CO_2 emission. Solar energy is certainly by all measures the most abundant and steady energy source on earth and photovoltaic technology is thus being increasingly recognized as one of the major alternative energy sources. Recent development has shown that the end-use of this technology is getting diverted from on-grid power generation to possibly off-grid or personal applications. These applications are less leashed by government subsidy program or complicated installation frameworks. They are also directly coined with Asian/Taiwanese industrial strengths and make thus the development of this application driven technologies more locally adaptable than conventional solar cells.

For the past years, ITRI has laid a strong foundation for local solar panel industry and will be followed by helping the sectors to establish module standardization facilities so as to upgrade the industrial competence. The current material shortage associated with Si sources and the high energy payback with the material purification trigger new research directions including more efficient way of energy use for solar cell. For instance, one of the research efforts in ITRI is to secure the silicon source by developing a more cost effective manufacture and/or purification method. As for the next generation solar technology, ITRI has focused efforts on Si thin-film, dye-sensitized solar cell, as well as the polymer hybrid systems. The main applications of these technologies are related to building integrated photovoltaics or personal electronics. In this paper, emphasis will be made on ITRI's organic solar cell systems. Besides technical issues, academic and international collaboration and industrial leverage are essential to speedup the technology realization in the fore-seeable future. Thus, this talk will take polymer hybrid photovoltaic as an example to illustrate the technical bottlenecks, the plausible approaches to tackle these issues, the applications needs/specs, and the network of partnership to ensure a full spectrum of acknowledgements and activities.

Session 5

資源回收再利用(R202)

Environmental Protection & Resource Recycle

September 25 (Monday).2006

時 間	議 程 內 容	主講人
08:30-09:00	報到 Registration	
09:00-10:00	開幕典禮 Opening	
10:00-10:20	Coffee Break	
10:20-10:30	主持人致詞 Welcome	
10:30-11:15	Hazard Control Strategies and Recycle Treatment Policy of Used Dry Batteries	Dr. Don T.L.Tang
11:15-12:00	燃料電池科技與應用	賴秋助計畫經理/工研院材料所儲能材料及技術研究組
12:15-14:00	午餐 Lunch Time	
14:00-14:45	Battery Technologies and Energy Source Materials	Dr. Ker-Chi Chang
14:45-15:30	國內廢鉛蓄電池回收處理體系架構研究與成本分析	張四立教授/臺北大學資源管理研究所
15:30-15:45	Coffee Break	
15:45-16:30	WASTE BATTERY RESOURCES RECYCLING： PROCESS SYSTEMS AND STRATEGIES FOR WASTE LEAD BATTERY RECOVERY AND RECYCLING AND ASSOCIATED COST ANALYSIS	Dr. Robert Lao
16:30-17:15	廢乾電池再利用處理技術探討	張添晉副教授/國立台北科技大學環境規劃與管理研究所
17:15-17:45	綜合討論 Panel Discussion	

Curriculum Vitae

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Education:

B.S. Sanitary Eng., National Taiwan University 1960
M.S. Env. Eng., University of Florida 1968
Ph.D. Env. Eng., University of Iowa 1972
Experience: Department Head, Connell/Metcalf & Eddy, Inc 1977-78
Program Manager, U.S. Environmental Protection Agency (USEPA) 1978-95

Present Position: Science Review Administrator, USEPA

Specialty:

Managing peer review operation in resource recovery, recycle, and reuse, and other environmental areas.

Selected Publications and Patents:

Viable Fee Collection Systems in Solid Waste Management, a paper at 2nd International Conference on Solid Waste Management 2000.
Energy from Waste, Proc. 18th METS.
The Future of Solid and Hazardous Waste Management, Proc. 2nd MTETS.

Social Activities and Honors:

Bronze Medals for Commendable Service, Twice, and Special Achievement Awards in Recognition of High Quality Performance, Three Times at USEPA
General Leader of the National Development Seminar 1992
Vice-Chair of the Organizing Committee from CIE/USA for METS 1994
Overseas Chinese Environmental Engineers and Scientists Association (President 1991, Adviser 1993-Present)
Chinese Institute of Engineers (National Council Member 1990-96, Treasurer 1991)
Member of Chinese-American Professional Association of Metropolitan Washington , DC
Life Member of Water Environment Federation
Life Member of American Water Works Association
Registered Professional Engineer in the States of Florida and Virginia

HAZARD CONTROL STRATEGIES AND RECYCLE TREATMENT POLICY OF USED DRY BATTERIES

Don T. L. Tang

Science Review Administrator, U.S. Environmental Protection Agency, Washington, DC, USA

ABSTRACT

Batteries which are used and disposed of improperly may cause damages to the public health and environments. Batteries may contain mercury, cadmium, lead and other heavy metals. When introduced into the environment through landfill disposal or incineration, these heavy metals make their way into the food chain. The presence of these heavy metals in the food chain presents very serious consequences. Additionally, several heavy metals, such as cadmium, are known carcinogens. To prevent the release of hazardous substances into the environment from the used batteries, two approaches are available to follow. The first is to phase out the use of mercury in batteries. The second is to provide the efficient and cost-effective collection and recycling and proper disposal of used batteries. The batteries which can be recycled can be divided into two groups: those used in vehicles and other engines, and others in consumer products which are generally called dry batteries. The vehicle batteries (acid-lead) generally can be recycled by fee collection at purchase. The dry batteries which contain nickel-cadmium, sealed lead-acid, or lithium-ion require the efficient and cost effective collection and recycling or proper disposal. Once the batteries arrive at the recycling facility, the heavy metals are recovered and the remainder of the products are recycled or discarded safely. In this paper, all aspects of hazard control, recycle and treatment of used dry batteries will be presented, analyzed, and discussed. The labeling with "easy removability" requirements, the organization and management of systems to collect, recycle and dispose of consumer products containing a regulated battery such as cellular phones, laptop computers, cordless power tools, personal computers, video cameras, and portable medical devices will be highlighted.

Keywords: battery, recycling, collection, labeling

Curriculum Vitae

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Education:國立交通大學電子所博士

Experience:
82.9-83.6 ---博士後研究員--國立清華大學物理系
85.7-90.9----工研院研究員
90.10-迄今 --工研院材料所 微小型燃料電池實驗室主任

Present Position:
工研院材化所微小型燃料電池實驗室主任

Specialty:
Fuel Cell System Integration, Solid State Physics, Electrochemistry,

Selected Publications and Patents:
專利：27 件
學術論文：34 篇
技術報告及相關著作：22 篇

Social Activities and Honors:
89 年度工研院團體研究成就銅牌獎
93 年度工研院團體研究成就銀牌獎

燃料電池科技與應用

賴秋助[1],蔡英文[2]

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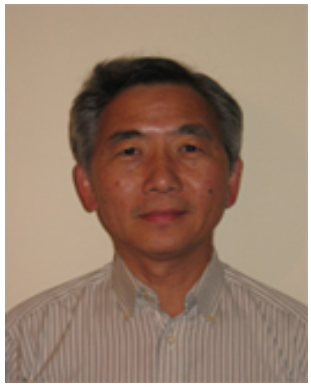
2.工研院材料所微小型燃料電池計畫　研究員, email: MartinYWTsai@itri.org.tw

摘要

近年來因為能源短缺與環境污染的議題發酵，新世代能源-燃料電池逐漸嶄露頭角，被視為高能量轉換效率之能源解決方案，不僅可有效提升能源利用率，亦能達到廢棄物減量之目的。雖然未來商品化過程中，燃料電池將面臨價格競爭力的考驗，但由於小型攜帶式系統應用之成本接受度高，被認為最有機會將燃料電池推向普及化之應用。本文將介紹燃料電池的原理與其可能應用機會，尤其是燃料電池在可攜式電子產品的應用優勢，並針對現行二次電池的使用生態，及對環境面減廢與回收所產生的效應做一基本說明。

關鍵詞: 燃料電池，可攜式電子產品，直接甲醇燃料電池，電池回收

Curriculum Vitae



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Education:

PhD Environmental Engineering, Georgia Institute of Technology, Atlanta, GA
MS Environmental Health Engineering, Northwestern University, Evanston, IL
BS Hydraulics/Civil Engineering, Chung Yuan University, Taiwan

Experience:

Currently a Program Manager in the Office of Environmental Management (EM) at the Department of Energy (DOE). Duties include: serve as a member of the Departmental working group within the Federal Energy Management Program of DOE to implement Energy Policy Act of 2005. Champion the Pollution Prevention Program across the EM/DOE complex; coordinate with the National Academy of Science to identify environmental management issues and provide recommendation for improvement. Other past duties include: program manager in Science and Technology, coordinator of the Environmental Management Advisory Board, and Risk Management Program. Worked for the U.S. Environmental Protection Agency in the Office of Air and Radiation, duties include: develop air quality standards and volatile organic compounds control technologies. In addition to 18 years of federal experience, also have eight years of experience with private sectors: Division Director of CPCT at ITRI (Taiwan), Environmental Manager at ICI Americas, Inc., and Site Manager for two superfund sites at CDM, and senior project engineer at Cooper Industries.

Present Position: Program Manager, Office of Environmental Management, DOE

Specialty:

More than 25 years of experience and knowledge in: environmental, chemistry, civil, health & safety, risk assessment, nuclear, water resources, environmental impact assessment, energy conservation & recovery, sustainable development, renewable energy, hazardous and radioactive wastes, construction, planning, budgeting, contract and personnel management.

Selected Publications and Patents:

more than 60 publications and reports; presented papers at domestic and international (Taiwan) conferences.

Social Activities and Honors:

Member of CAPA, Who's Who in Engineering, Professional Engineer at MD, NC, and MA

BATTERY TECHNOLOGIES AND ENERGY SOURCE MATERIALS

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ABSTRACT

A battery is a device that utilizes electrochemical technology to convert energy source material into electric power for various applications. Based on their application, batteries can be grouped into four categories: vehicle batteries, household batteries, specialty batteries, and other batteries. Each category contains two types: 1. primary cells, disposable or non-rechargeable batteries, and 2. secondary cells, accumulators or rechargeable batteries. The technologies and energy source materials of these four categories differ from each other and each has strong and weak points in its applications.

The worldwide battery industry generated US$48 billion in sales in 2005. The trend in the development of new battery technologies and energy source materials in the US, as well as other nations, is aimed at two major targets: meeting energy policies and environmental regulations. This report provides an overview of the current and future battery technologies and energy source materials.

Keyword: battery, technology, material, energy

Curriculum Vitae

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Doctor of Philosophy, 1986, University of Pennsylvania, USA
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Experience

2006.8-Present	hairman and Professor, Institute of Natural Resources Management, National Taipei University.
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1993.8 – 1996.7	Chairman and Professor, Institute of Natural Resources Management, National Taipei University.
1989.8 – 1993.7	Associate Professor, Institute of Public Policy, National Chung-Hsing University.
1986.9 – 1989.7	Associate Researcher, Chung-Hua Institution for Economic Research

Research Interests:

Energy Modeling; Electricity Market Reform; Energy Efficiency Indicators; CO2 Reduction Policy, Waste Management Policy.

廢鉛蓄電池回收處理體系架構研究與成本分析

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摘要

廢鉛蓄電池的主要來源為工業用電池及汽車用電池，隨著台灣經濟、社會的繁榮進步，工業快速成長、汽機車數量之大幅增加，使得不論是工業用電池或汽車電池的使用量與廢棄量也隨之增加。廢鉛蓄電池由於其主要成份主要為鉛（包括鉛金屬、硫酸鉛、二氧化鉛，約占 70%），而其外殼(塑膠外殼的成分以聚丙烯（PP）、苯烯、丁二烯、苯乙烯共聚體樹脂（ABS）為主，亦有以鋼鐵材質為外殼)及廢硫酸液等廢棄物，若隨意棄置堆積，未妥善回收處理，將造成空氣、土壤或地下水的污染，對環境的損害或人體的健康影響都值得重視。廢鉛蓄電池之回收處理在台灣已行之多年，但是隨著政府資源回收政策方向的轉變及公權力介入程度的深化，參與此物品回收系統中之各成員之角色與互動型態，亦隨之不同。國內廢鉛蓄電池之回收清除處理體系有其特殊性，多年來持續維持一家合法處理廠的狀況，而回收處理率則維持在七成左右。在『廢棄物清理法』的規範下，國內廢鉛蓄電池的回收體系之運作乃在『生產者責任制』的原則下，由鉛蓄電池的製造與進口業者，依環保署『資源回收管理基金管理委員會』(以下簡稱基管會)所訂定之費率，繳交回收清除處理費，作為廢鉛蓄電池回收處理體系運作的財務基礎，而回收處理廠則可依其實際之回收清除處理量，經過第三公正團體稽核認證後，向環保署基管會領取回收清除處理補貼費。本文的重點，即在說明國內廢鉛蓄電池回收處理體系架構的設計與運作實務，以及回收清除處理成本與回收清除處理費率與補貼率的訂定狀況。

Curriculum Vitae

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MS in Chem Eng, University of Utah, 1962
PhD in Chemistry, University of Colorado at Denver, 1966
Post Doctorate: Johns Hopkins University, 1966-1967

Experiences:

Research Associate, National Research Council of Canada, 1967-1969;
Research Chemist, National Health of Canada, 1969-1971
Department of the Environment, Canada, 1971-1997
Section Head, Division Chief, Senior Research Scientist 1989-1991
Sabbatical Leave to Taiwan including adviser to ITRI, EPA, and Adjunct Professor at the Taipei Inst. Of Technology; adjunct Prof. at University of Ottawa, and Carleton University, Canada
Project Researchers at WHO and UNIP
Vice president of ISOTEC (International Society of Toxicological and Analytic Chemists and President of Canadian Chinese Institute of Sciences, Culture and Education

Present Position:

Resident Project Manager, China-Canada Cooperation Project on Cleaner Production (CP); Foreign Expert Member of the Task Force on CP/Circular Economy (CE), China Council in International Cooperation for the Environment and Development (CCICED)

Specialty:

CP, CE, Waste Management, Toxic and Hazardous Chemical Management, and Sustainable Development

Selected Publications and Patents:

Over 40 papers published in open journals on specialized areas

Social Activities and Honors:

Citations from the Prime Minister of Canada on the publication of "Canadian History, Culture and heritage" in Chinese, Recipient of "Outstanding Contribution Award for Foreign Experts" in 2005, State Council, China

WASTE BATTERY RESOURCES RECYCLING：PROCESS SYSTEMS AND STRATEGIES FOR WASTE LEAD BATTERY RECOVERY AND RECYCLING AND ASSOCIATED COST ANALYSIS

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ABSTRACT

Battery, including, lead/acid type, is one of the most important sources for electricity in the modern society. In last fifty years, its consumption rate has been far out that of economic growth worldwide.. While the society is enjoying the pleasure and convenience by the advanced development of battery technology, the volumes of used batteries has increased in an alarming speed. Its disposal has become a heavy burden and threatened to human beings and the environment as large amount of social resources and severe pollution required to deal with the problem which remains to be a focal issue and concern for resources utilization and the environmental protection/pollution prevention.

However waste batteries contain many valuable substances including metals and other reusable/recyclable materials. With proper and reasonable treatment, it will not only resolve the environmental problems but have remarkable economic benefits. This discussion paper will be focused on lead/acid type waste batteries, their current treatment technologies, cost associated with recycling processes, and problems encountered.

Keywords: lead/acid type waste batteries, recycling processes, cost analysis.

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Selected Publications and Patents:

1. On-site Mercury-Contaminated Soils Remediation by Using Thermal Desorption Technology, Journal of Hazardous Materials.
2. The Fate and Management of High Mercury-Containing Lamps from High tech. Industry, Journal of Hazardous Materials.

Social Activities and Honors:

2005 Contribution Award to Environmental Safety, Executive Yuan. R.O.C.

廢乾電池回收再利用處理技術探討

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摘 要

電池可分為不能重複使用之一次電池（乾電池）與可重複充電使用的二次電池（蓄電池），為一種可將化學反應產生的化學能直接轉換為電能的裝置。然因一般電池壽命短則數月，長亦不過數年即會退化無法再用，其所含的汞、鎘、鉛、鋅、錳等有害重金屬成分隨其廢棄而散佈於環境之虞，對自然環境及人體健康潛在甚大之威脅，因此廢電池之處理與管理長期以來即倍受世界各國所重視。

由於目前廢乾電池處理處置均採境外處理，國內目前還沒有經過稽核認證的廢乾電池的處理廠，清除處理業者的廢乾電池分類技術和所用流程也須再精進，透過國外技術以改進國內處理技術，本文將針對國外處理技術進行探討以作為提昇國內廢乾電池回收再利用技術與能力之參考。

關鍵詞：廢乾電池，處理技術，有害重金屬，資源化處理

Session 6

水管理(R101C)

Water Management

September 25 (Monday).2006

時間	議程	講者	主持人
08:00-09:00	報到		
09:00~10:00	開幕典禮(於台北國際會議中心大會堂聯合舉行)		
10:00~10:30	休息		
10:30~10:50	分組主席致詞	－經濟部水利署陳伸賢署長 －台灣自來水公司徐享崑董事長 －水管理分組美方召集人 Dr. Shoou-Yuh Chang	
10:50~11:25	雨洪管理	「洪氾管理制度之探討」 －交通大學防災工程研究中心楊錦釧主任	Dr. Shoou-Yuh Chang
11:25~12:00		"A Near Real-Time Dynamic Tool for Storm Water Management" －Dr. Jy S. Wu	交通大學防災工程研究中心楊錦釧主任
12:00~13:10	午餐		
13:10~13:40	邁向永續發展之整合式水管理	Development an Integrated Water Resources Management System for Taiwan －中興工程顧問公司龔誠山協理	Dr. Shoou-Yuh Chang
13:40~14:10		Integrated Water Management Plans Towards Sustainability: The Taiwan Experience －台灣大學環境工程研究所蔣本基教授	
14:10~14:30		邁向永續發展之整合式水管理 －張建祺博士	台灣大學環境工程研究所蔣本基教授
14:30~15:00		"Ballasted Coagulation Process for Surface Water Treatment" －Dr. Sun-Nan Hong	
15:00~15:20	休息		
15:20~15:50	自來水公共建設現代化整體計畫	自來水公共建設現代化整體計畫 －台灣省自來水公司胡總工程師南澤	Dr. Shoou-Yuh Chang
15:50~16:20		"Public Water Supply Utilities Comprehensive Planning" －Dr. Shoou-Yuh Chang	台灣省自來水公司胡總工程師南澤
16:20~17:10	綜合討論		

備註 1：本研討會可登錄公務人員學習護照之學習紀錄 8 小時

備註 2：本研討會以中文發表

Curriculum Vitae

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Experience:

Director (8/05-present), Natural Hazard Mitigation Research Center, National Chiao Tung University, Taiwan, R.O.C.
Professor (9/90-present), Department of Civil Engineering, National Chiao Tung University, Taiwan, R.O.C.
Department Head (8/96-7/98), Department of Civil Engineering, National Chiao Tung University, Taiwan, R.O.C.
Associate Professor (01/87-8/90)-Department of Civil Engineering, National Chiao Tung University, Taiwan, R.O.C.

Present Position: 國立交通大學土木工程學系教授

Specialty: 1.水利工程 2.輸砂理論 3.環境水利 4.計算水力學 5.生態水利

Selected Publications and Patents:

1. Wu, S.J., Tung, Y.K. and Yang, J.C., "Identification and stochastic generation of representative rainstorm temporal patterns in Hong Kong territory", Stochastic Environment research and risk assessment. (SCI) (accepted)
2. Tsai, T.L. and Yang, J. C., "Modeling rainfall-triggered shallow landslide." Environmental Geology, (SCI, EI)(accepted)
3. Chang, Y. L., Tsai, T. L., Yang, J. C. and Tung, Y. K., "Stochastically Optimal Ground Water Management Considering Land Subsidence", Journal of Water Resources Planning and Management, ASCE. (SCI, EI)(under review)
4. Hsieh, T.Y. and Yang, J.C., "A Two-Dimensional Nonequilibrium Non- cohesive and Cohesive Sediment Transport Model", Journal of Hydraulic Engineering, ASCE. (SCI, EI)(under review)
5. Wu, S.J., Tung, Y.K. and Yang, J.C., "Stochastic generation of hourly rainstorm events", Stochastic Environment research and risk assessment. (SCI) (accepted)
6. Tsai, T.L., Tseng, C.M. and Yang, J.C., "Fractional steps scheme of finite analytic method for advection-diffusion equation", Journal of Engineering Mechanics , ASCE, 131(1), 023-030, 2005. (SCI, EI)
7. Hsieh, T.Y. and Yang, J.C., "Closure to Investigation on the suitability of 2D depth-averaged models for bend-flow simulation." Journal of Hydraulic Engineering, ASCE, 131(6), 2005.

洪氾管理制度之探討

王文祿[1]楊錦釧[2]

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摘要

近年來，由於全球暖化（global warming）效應漸趨明顯，世界各地水患頻仍，洪氾管理（flood management）相關議題遂一再於世界各先進國家引發熱烈討論。睽諸世界各國洪氾管理制度，以美國聯邦透過立法授權成立國家洪災保險計畫（National Flood Insurance Program，NFIP），並以降低洪災保險保費等相關誘因，促使人民與地方政府配合實施洪氾管理，為現今世界上較為先進之洪氾管理制度。然而，去年卡崔娜颶風侵襲墨西哥灣沿岸地區，造成史上最慘重之洪災理賠事件後，NFIP之成效遂受到重大挑戰，美國過去成功經驗亦因而受到質疑。本文以下將就我國洪氾管理相關制度與研究現況，與美國實施洪氾管理現況加以比較，並探討卡崔娜颶風侵襲後對NFIP所造成之影響，以及我國未來「國土復育條例草案」完成立法後洪氾管理制度未來之可能方向。

關鍵詞: 洪氾管理，洪災保險，基準洪水，國土復育條例草案，卡崔娜颶風

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Selected Publications and Patents:

1. Wu, J.S., C. Allan, J. Evett and W. Sauders, Characterization and Pollutant Loading Estimation for Highway Runoff. *J. of Environmental Engineering*, ASCE, 124(7):584-592, 1998.
2. Langley, W., J.S. Wu and C. Chao. Reaction Kinetics of Immobilized Cell Denitrification: I Background and Model Development. *J. of Environmental Engineering*, ASCE, 127(8):682-688, 2001.
3. Wu, J., W. Langley and C. Chao. Reaction Kinetics of Immobilized Cell Denitrification: II Experimental Study. *J. of Environmental Engineering*, ASCE, 127(8):689-697, 2001.
4. Han, J., J.S. Wu, and M. Senior. Artificial Neural Networks for Predicting Flood Stages in Urban Streams. *Hydrological Science and Technology*, 19(1-4):375-385, 2003.
5. Wu, J.S., J. Han, S. Annambhotla and S. Bryan. Artificial Neural Networks for Forecasting Urban Watershed Runoff and Stream Flows. *J. of Hydrologic Engineering*, ASCE. 10(3):216-222, 2005.
6. *Han, J,. J.S. Wu, and C.J. Allan.*. Suspended Sediment Removal by Vegetative Filter Strip treating Highway Runoff. *J. of Environmental Science and Health*. 40:1-13, 2005, 2005.

Social Activities and Honors:
John F. Kennedy Chair in New Technology Professorship awarded through the Fulbright US Program.

A NEAR REAL-TIME DYNAMIC TOOL FOR STORM WATER MANAGEMENT

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ABSTRACT

Floods are among the most frequent and costly natural hazards for many countries. The hydrologic response time of urban and small watersheds could be as small as a few hours; it is therefore essential to operate flood-flow forecast systems on near real-time basis in order to deliver timely warnings of potential localized flooding. Real-time flood forecast systems, in turn, require reliable input of temporal and spatial measurements of precipitation. Rain gages are generally acceptable for making point precipitation measurements. It is not unusual to find insufficient number of gages to poorly represent rainfall variations for the drainage area. On the other hand, weather radar can provide both spatial and temporal measurements that are immediately available at any locations. With proper calibration of precipitation derived from radar observations against rain gage data, the advantageous aspects of each measurement technique can be properly compromised.

The WSR-88D (Weather Surveillance Radar-1988 Doppler) NEXRAD (Next Generation Radar) weather radar network covers the entire area of the U.S. continent. A single high-resolution radar station can monitor an area of 200,000 km^2 with a less than 5-km^2 resolution. A very dense rain gage network will be needed to achieve such a level of coverage that a single radar station can accomplish. The use of NEXRAD data has provided a new challenge for rainfall-runoff modeling, storm water management and, most importantly, near real-time flood prediction. We have completed a study to evaluate the use of NEXRAD data to validate and compare radar-derived rainfall estimates against ground-level measurements. Using the radar-derived rainfall data, we have successfully tested the use of a dynamic learning methodology to perform flood forecasts for two urban streams in North Carolina, USA. In 2003, the National Weather Service initiated a data collection network to electronically collect, archive and distribute the WSR-88D Level II data, enabling users to access the data in near real-time. We have continued our work toward the development of a near real-time precipitation processing tool and a flood forecasting system at local levels.
Initial discussion with Prof. Hwang Shyi-Chyuan of Chienkuo Univeristy, Taiwan, has revealed the potential applications of the near real-time flood forecast system for 城市洪水、山坡地土石 流、農業管理、水資源污染與養殖漁業管理等方面之預警應用.
The presentation will include a general discussion of the NEXRAD radar system and its applications, and recommendations for potential collaborative development of this forecast systems in Taiwan.

Curriculum Vitae

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Experience:

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- 水利署蓄水庫安全分級管理制度規劃。
- 水利署天花湖潰壩安全研究。
- 台電水里壩整體安全評估。
- 水利署農業用水與公共用水專業合作組成區域供水調度機制及組織之可行性探討計畫。
- 翡管局水庫操作系統維護。
- 中水局湖山水庫規劃設計。
- 南水局牡丹水庫安全評估。
- 台雷大觀廠下池壩安全評估。
- 南水局曾文水庫第三次安全評估。
- 台電西寶水力發電設計。
- 水資源局基隆河沖淤調查。
- 水文資訊網整合服務。(一)(二)
- 水利署濁水溪逕流資訊服務。
- 水利署水資源水文循環量測。
- 台北縣塔寮坑溪及鹿角溪人工溼地暨高灘地設施管理系統建置。
- 水利署水利建物檢查安評規範。
- 水利署水利建造物生命週期制度之建立。
- 康寧抽水站新建工程一期。
- 中水局水資源調配管理系統建置計畫。

Present Position: vice president, dept. of hydraulic, Sinotech Engineering Consultant Ltd.
中興工程顧問公司，水利工程部協理

Specialty:

1. 水文
2. 水理
3. 水資源規劃、運用與管理
4. 地下水調查、評估與開發
5. 水庫工程規劃設計
6. 水庫安全評估
7. 攔河堰工程規劃設計
8. 水工結構物規劃設計
9. 防洪工程規劃設計
10. 河川治理工程規劃設計
11. 海事工程規劃設計
12. 港灣工程規劃設計
13. 水力發電工程規劃研究
14. 發電水路規劃設計
15. 發電水路水理分析
16. 核廢料處置工程規劃設計

17. 港埠工程規劃設計
18. 遊憩區開發規劃設計
19. 遊憩區營運與管理
20. 工業區開發規劃設計
21. 工業區營運與管理
22. 海埔地及河川地開發規劃設計
23. 需水量預測
24. 水源評估
25. 地下水污染整治
26. 環境影響評估
27. 環境風險評估
28. 系統分析
29. 工程程式發展

Selected Publications and Patents:

1. "Risk Assessment of New Tsao-Ling Landslide Lake", Engineering Environment, No.9, Sep, 2000, pp. 107~1212.
2. "Assessment of Tsao-Ling Landslide and Landslide Lake", SINO-GEOTECHNICS, Oct, 2000, pp. 33~46
3. Su, K-H & Kung, C-S, "Application of MIKE3 Model on Thermal Outfall", Proceedings of the 11th Hydraulic Engineering Conference of Taiwan, July 5-6, 2000, pp. I-89~I-94 Taipei, Taiwan
4. Kung, C-S, Wang, Y-M, Hsu, F-S, & Yang, P-R, "Automated determining the Thiessen Polygon Network", Proceedings of the 11th Hydraulic Engineering Conference of Taiwan, July 5-6, 2000, pp. L-1~L6 Taipei, Taiwan
5. Hus, S-K, Ferng, D-Z, Shiau, J-T, Kung, C-S & Wu, S-J, "Water Resources Master Plan for Southern Taiwan", Proceedings of the 11th Hydraulic Engineering Conference of Taiwan, July 5-6, 2000, pp. O-1~O6 Taipei, Taiwan

Social Activities and Honors:

1. 中國工程師學會　正級會員
2. 中華民國海下技術協會　會員
3. 中華民國土木水1.　中國工程師學會　正級會員
2. 中華民國海下技術協會　會員
3. 中華民國土木水利學會　正級會員
4. 國際水利研究學會(IAHR)　會員利學會　正級會員

邁向永續發展之整合式水管理

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1. 協理，中興工程顧問有限公司，台北，台灣
2. 工程師，中興工程顧問有限公司，台北，台灣
3. 工程師，中興工程顧問有限公司，台北，台灣
4. 科長，經濟部水資源局水源管理組第四科，台中，台灣

摘要

本文介紹台灣地區發展整合式水資源管理系統，內容包括系統架構、功能及未來願景。此系統建構於網頁架構下，包括整合性資料蒐集系統、即時用水分配及管理系統、調配水決策支援系統、枯旱預警系統及管理資訊系統等功能。此整合性式水資源管理系統可供水資源管理單位每日操作使用，也可用於枯旱時調配用水時決策支援。系統於 2003 年開使發展，預計 2006 年上線使用。在系統使用後，台灣水資源管理工作將邁向系統化、高效率、即時化及朝向永續利用目標前進。

Curriculum Vitae

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Education: Ph.D. Dept. of Civil Engineering, Purdue University

Experience:

1998-present	Advisor, Administration of Environmental Protection
1997-1999	Commissioner, Commission of Sustainable Development, Executive Yuan, Government of the Republic of China
1997-1998	Visiting Professor, Department of Environmental Engineering, University of Delaware
1996-present	Advisor, Department of Science and Technology, Ministry of Education
1987-present	Professor, Graduate Institute of Environmental Engineering, National Taiwan University

Present Position: Professor, Graduate Institute of Environmental Engineering, National Taiwan University

Specialty: physical and chemical treatment, air pollution control design, toxic substance treatment, water and wastewater treatment

Selected Publications and Patents:

1. Chiang, P. C, Y.L. Lin, Chang, E. E. "Establishment and Implementation of Source Water Implementation Plan for Water Treatment Plants in Taiwan." *The Practice Periodical of Hazardous, Toxic, and Radioactive Waste Management*, 2006. (In Press)
2. Hsing H. J., Chiang, P. C., Chang, E. E, Y-S. Li. "Decolorization and Mineralization and toxicity reduction of Tropaeolin O in water by ozonation with UV irradiation". *Ozone: Science & Engineering, 28*(1), 9-16, 2006.
3. Chen Y.H., Chiu C.Y., Chang C.Y., Huang Y.H., Yu Y.H., Chiang P.C., Shie J.L. and Chiou C.S. "Modeling Ozonation Process with Pollutant in a Rotating Packed Bed," *Industrial & Engineering Chemistry Research, 44*(1), 21-29, 2005.

Social Activities and Honors:

2005	Regional Committee, 3rd IWA Leading-Edge Conference & Exhibition on Water & Wastewater Treatment Technologies
2004- Present	President, Chinese Institute of Environmental Engineering
1987- Present	Board of Director, WEF (Water Environment Federation)

INTEGRATED WATER MANAGEMENT PLANS TOWARDS SUSTAINABILITY: THE TAIWAN EXPERIENCE

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1. Professor, Graduate Institute of Environmental Engineering, National Taiwan University, Taipei, Taiwan, ROC
2. Professor, Department of Biochemistry, Taipei Medical University, Taipei, Taiwan, ROC
3. Professor, Department of Civil & Environmental Engineering, University of Delaware, Newark, DE

ABSTRACT

The objective of this paper is intended to present the recent progress on Integrated Water Management Plans towards Sustainability made by the Taiwan Government. Taiwan Agenda 21 suggests that nature conservation, pollution prevention, and environmental planning policies should be implemented by the Local Agenda 21. For instance, promotion of water-reuse policy for ecological industrial park was one of the major missions for Local Agenda 21. Water Safety Plans were also reviewed and revised from the view-point of water quality standards and criteria update, modernization of water treatment infrastructure, watershed administrative system, water treatment plant performance evaluation system, and water supply system security.

Keywords: Integrated Water Management plans, Sustainability, Ecological Industrial Park, Water Safety Plans

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Education:

Ph.D./1988/Civil Engineering/University of Missouri-Rolla, USA
M.S./1981/Civil Engineering/Ohio State University, USA
B.E./1979/Hydraulic Engineering/Tamkang University, Taiwan

Experience:

Civil and structural design for water and wastewater treatment systems and facilities, civil and structural design for buildings and bridges, course teaching in computer science and MBA.

Present Position:

1. Senior Engineer, District of Columbia Water and Sewer Authority
2. Adjunct Professor, University of Maryland, Baltimore County
3. Adjunct Professor, University of Northern Virginia

Specialty:

water and wastewater engineering, structural design, floodplain study, water and sewer system modeling, project management, risk management, remote sensing, geographic information systems, operations research, quantitative methods for business, operations management.

Selected Publications and Patents:

1. Chang, C.-I, Wang, J.., Chang, C. C., Lin, C., "Progressive Coding for Hyperspectral Signature Characterization", *Optical Engineering*, September, 2006.
2. Shammas, N. K., Chang, C. C, and Wang, L. K., "Tertiary Microscreening, ADVANCED PHYSICOCHEMICAL TREATMENT PROCESSES, HANDBOOK OF ENVIRONMENTAL ENGINEERING Series, Humana Press, Inc., Totowa, NJ, USA, 2005.

Social Activities and Honors:

1. Vice Chair, Modern Engineering Technology Seminar, Taipei, Taiwan, 2006.
2. Vice President, Chinese Institute of Engineers – USA/Great New York Chapter, 2006.
3. Member, American Society of Civil Engineers.

4. Member, Water Environment Federation**.**

Curriculum Vitae

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Education:

BS Chemical Engineering, National Taiwan University, 1963
MS, PhD Chemical Engineering, Kansas State University, 1967/1970
MS Sanitary Engineering, University of Rhode Island, 1972

Experience:

Sr. Process Manager, Air Products and Chemicals, Inc., 1973-1992
Vice President, Kruger, Inc. 1992 to present.

Present Position:

Vice President – Engineering, Kruger, Inc/A Veolia Water Company

Specialty:

Water and Wastewater Treatment

Selected Publications and Patents:

More than 50 publications and 8 US Patents

Social Activities and Honors:

President, CIE/The Greater New York Chapter, 1985/1986
Chairman, CIE National Council, 1989
Chairman, SATEC Conference, 1996

DEVELOPMENT WITH BALLASTED COALGULATION PROCESS FOR SURFACE WATER TREATMENT

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ABSTRACT

A compact physical-chemical clarification process has been developed for drinking water and storm water treatment. The process with a trademark of ACTIFLO utilizes microsand to enhance flocculation and settling. The process requires a flocculation time only 4 to 8 minutes and allows upflow rates as high as 150 m/hr (60 gal/ft2/min). The process is very compact in size and can be started up and fully operational in 30 minutes. It can adjust to varying rates of influent flow and turbidity while providing consistent level of performance.

The process has been widely utilized in the US as a cost effective method of pretreatment prior to a final filtration in drinking water application. It also has been utilized for storm water control to achieve 90 and 70 % removals, respectively, on TSS and BOD to reduce sediments and pollution loads on receiving waters.

This paper will discuss process characteristics of the ACTIFLO and its applications in drinking water treatment and storm water management.

KEYWORDS: Ballasted Flocculation, high rate settling, drinking water treatment, Storm water management, ACTIFLO

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Education: 國立成功大學環境工程碩士

Experience:

工務課長(9/90~7/94)：台灣自來水公司第十一區管理處
組長(7/94~2/2000)：台灣自來水公司供水處
副理(2/2000~7/01)：台灣自來水公司工務處
經理(7/01~10/02)：台灣自來水公司工務處
經理(10/02~1/05)：台灣自來水公司第二區管理處
總工程師(1/05~)：台灣自來水公司

Present Position: 台灣自來水公司總工程師

Specialty: 自來水工程、污水工程

自來水公共建設現代化整體計畫

胡南澤

總工程師,台灣自來水公司, email: hunantzer@mail.water.gov.tw

摘要

隨著時代演進，自來水事業之任務由提供「量足」之飲用水，進而提供「質優」之飲用、工業用水及優良之服務品質。易言之，自來水事業之經營，須吻合時代脈動，因應時代需求，與時代共呼吸，方能永續經營。

本計畫係以「公共利益」為依歸，藉助下列五大綱領計畫，涵括 12 項分項計畫，預計執行 10 年，以 96 年至 105 年為期程，期能達到(一)水量之充分供應(二)水質之安全衛生(三)服務品質之提升等目標，該等分項計畫環環相扣，彼此連貫，且須輔以必要配套措施，方可確保美夢成真。

綱領計畫	分項計畫	期程	經費(億元)
全省供水管線連通	供水穩定全省管線連通計畫	96 年~102 年	134
	推動區域連通管備援計畫	96 年~100 年	19
	小計 2 項	—	153
淨水設備現代化	新建現代化淨水場計畫	96 年~103 年	269
	產水設備更新計畫	96 年~105 年	30
	總水量計管理現代化計畫	96 年~103 年	6
	產水高級處理設備計畫	96 年~105 年	328
	小計 4 項	—	633
管線更新	小區管網建置計畫	96 年~105 年	30
	管線更生計畫	96 年~105 年	440
	GIS 建置計畫	96 年~105 年	30
	小計 3 項	—	500
自來水系統監控整合工程計畫		96 年~105 年	45
	小計 1 項	—	45
水源工程	深井工程計畫	96 年~98 年	2
	攔河堰更新工程計畫	96 年	2
	小計 2 項	—	4
合計	共計 12 項	96 年~105 年	1,335

本計畫預期效益：(一)供水能力由 94 年的 1,056 萬 CMD 增加至 105 年的 1,436 萬 CMD(增加 380 萬 CMD)；(二)全省管線連通，供水區域間互通有無，以穩定供水，減少缺水機率；(三)水質符合環保署所訂之「第三階段飲用水水質標準」；(四)漏水率由 94 年的 23.66%降低至 105 年的 18.00%；(五)完成即時資訊系統，即報即修，提升服務品質，增加經營績效。

本公司有信心克服諸多困難，完成任務。畢竟，這是本公司之願景、使命，亦乃本公司「為生民立命」的神聖任務。

關鍵詞: 自來水，公共建設，現代化

Curriculum Vitae

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Education:

B.S., Civil Eng.,National Taiwan University, 1971
M.S., Sanitary Eng., National Taiwan University, 1973
M.S., Environmental Eng., University of North Carolina at Chapel Hill, 1977
Ph.D., Environmental Eng., University of Illinois at Urbana-Champaign, 1981

Experience:

1995 - Pres	DOE Samuel Massie Chair of Excellence Professor in Environmental Engineering, Graduate Coordinator, North Carolina A&T State University
1992 - Pres	Professor, North Carolina A&T State University
1986 - 92	Associate Professor, North Carolina A&T State University
1995 - Pres	Review Panel, Charles A. and Anne Morrow Lindbergh Foundation
1995 - Pres	Member, Guildford County Advisory Board for Environmental Quality
1994 - Pres	Referee, Hong Kong Research Grants Council
2001 – Pres	Regional Editor, The Journal of Solid Waste Technology and Management
1995 – Pres	Review Panel, US Environmental Protection Agency
1994 - 97	Secretary (94-95), Vice President (95-96), President (96-97) N. Piedmont Chapter of Professional Engineers of NC (PENC)

Present Position: Samuel Massie Chair Professor in Environmental Engineering

Specialty: Environmental systems analysis, water supply and waste disposal planning

Selected Publications and Patents:

An Jin and S.Y. Chang, "Reducing Spatially Correlated Uncertainties and Its Applications in Subsurface Transport Models," Environmental Informatics Archives, Volume 2, 2004.

Carrasco, I. J. and S.Y. Chang, "Random Monte Carlo Simulation Analysis and Risk Assessment for Ammonia Concentrations in Wastewater Effluent Disposal," in Stochastic Environmental Research and Risk Assessment, Springer-Verlag, 2005.

Chang, S.Y. and A. Jin, "Kalman Filtering with Regional Noise to Improve Accuracy of Contaminant Transport Models," J. Environmental Engineering, ASCE, 131(6), 2005.

Chang, S.Y., "Accuracy and Uncertainty in Environmental Systems Modeling," Keynote Speech at The 4th Intl. Conf. on Environmental Informatics, Xiamen, July 26-28, 2005.

Social Activities and Honors:

OCEESA Secretary-Treasurer (95), Vice President (96), President (97), CIE-USA National Council Treasurer, 1997, METS 1998, SATEC 1999, 2001

PUBLIC WATER SUPPLY UTILITIES COMPREHENSIVE PLANNING

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ABSTRACT

Safe and dependable water supply is essential in modern societies. Most of the current practices may not be sustainable with respect to economics or environmental protection. This is because price charged for water is much lower than the cost of supply and limited sources of water are not properly assessed and protected. The objective of this paper is to examine the factors that need to be considered and analyzed for the modernization and comprehensive planning of public water supply utilities.

Comprehensive public water supply planning is a complicated process because it is multiobjective and because it involves various levels of decision makers. The discussion in this paper will concentrate on the following: objectives, needs and source water assessment, environmental protection, new and innovative technologies for treatment, distribution and monitoring, regional cooperation, operation and maintenance, and public education and awareness. The objectives can include the provision of safe and adequate amount of water to satisfy domestic and industrial needs, support of sustainable development, and the protection of water resources and environment. A weighting scheme and other multiobjective analysis can be used to assign a weight to each objective and identify new objectives. Water supply needs must be predicted by using models and matched by various sources of water while the new source development must be balanced with water reuse and conservation. A tradeoff analysis can be employed to highlight the tradeoffs among various approaches. Environmental protection ensures the water quality of supply sources and provides sustainable and renewable supplies. To modernize the water supply utilities, new and innovative technologies have to be developed and assessed with a systematic evaluation scheme. Because fragmented water supply management will not render us the efficient and effective use of the valuable resources, regional and comprehensive approach has to be utilized. Regional approach with the cooperation of local, county and regional authorities has to be implemented to have a feasible plan. Furthermore, good operation and maintenance including emergency response to typhoon, flood and spills is required to ensure the success of the plan. On the other hand, lack of stakeholder and community participation may jeopardize the implementation of any plan. It has been shown that community empowerment

and public involvement and educations are essential elements in any successful public project.

Facing the steep increase of the average incremental cost of water supplies, and the limited and deteriorating water resources, a comprehensive and long-term plan is needed to ensure sustainable and affordable water supply utilities. This paper provides discussions and recommendations on the issues and factors that are essential in a comprehensive water supply plan.

Keywords: water supply, sustainable development, planning, multiobjective analysis

Session 7

寬頻通訊與網路整合(R201E)

Broadband Communication and Network System Integration

September 25 (Monday).2006

時　間	議 程 內 容	地點/主講人
08:30~09:00	大會報到	台北國際會議中心大廳
09:00~10:00	大會開幕典禮	台北國際會議中心大廳 3F 大會堂
10:00~10:15	Coffee Break	
10:15~10:30	分組研討會	台北國際會議中心 201E 會議室
	分組主持人：中華電信公司 呂學錦總經理	
	致歡迎詞	US session Chair Yu-cheun Jou(周漁君) 中華電信公司 賀陳旦董事長 工研院資通所 林寶樹 所長
	Session 主持人：中華電信研究所 李炎松所長	
10:30~11:10	(1) IPTV 產業發展與寬頻網路接取的趨勢 The Trend of IPTV Industry Development &Broadband Access	台灣易利信公司　吳傳禎副總經理
11:10~11:50	(2) 電信運作系統的整合 OSS Integration in Telecom Operations	JPMorganChase Dr. Chin-Lian Chen (陳清亮)
11:50~12:30	(3) 數位家庭及數位生活 Digital Home and Digital Life	國立成功大學　　郭耀煌教授
12:30~13:30	午　餐	
	Session 主持人：中華電信研究所 邱武志副所長	
13:30~14:10	(4) 從資訊理論看無線通信接入技術之比較 An Information-Theoretic Comparison of Multiple Access Techniques for Cellular Communications	QUALCOMM Inc,. Dr. Yu-Cheun Jou (周漁君)
14:10~14:50	(5) PKI 技術在資通安全之應用 PKI Security Application	中華電信研究所　　張光耀主任
14:50~15:30	(6) 網際網路多媒體服務 Internet Multi-media service: web 2.0 and mblog	Tarrant County College Associate Professor Woody D. Wu (吳迪)
15:30~15:50	Coffee Break	
15:50~17:00	Panel Discussion	主持人：中華電信公司 呂學錦總經理
	與談人 台灣易利信公司　吳傳禎副總經理 國立成功大學　　郭耀煌教授 中華電信研究所　張光耀主任	QUALCOMM Inc, Dr. Yu-Cheun Jou JPMorganChase Dr. Dr. Chin-Lian Chen Tarrant County College Associate Professor Woody D. Wu (吳迪)
17:00	會議結束	

Curriculum Vitae

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學歷：Florida Institute of Technology 佛州理工大學 工程碩士 (1988)

經歷：

惠普科技 (Hewlett Packard) 經銷 / 區域經理 (1988 – 1992)
惠普科技 (Hewlett Packard) 集團 / 企業用戶經理 (1992-1996)
英國電信 (British Telecom) 臺灣區總經理 (1996 – 2005)
英國電信 (BT Ignite / Strategic Market) 亞太區跨國企業新企客部總經理 (1998-1999)
英國電信 海外投資事業部 (BT Int'l Development) 北亞區經理(1999－2002)
英國電信 電信研究所 (BT Exact / BT Lab) 亞洲合作發展部北亞區經理 (2002-2004)
英國電信 臺灣 / 大陸 台商企業用戶 (BT Group) 區經理 (2004-2005)

現職：臺灣易利信公司 副總經理 (2005 迄今)

IPTV 產業發展與寬頻網路接取的趨勢

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摘要

本文提供了 IPTV 產業與寬頻網路接取的趨勢相關技術，作一個大概性介紹。首先從技術面、策略面、營運面來介紹 IPTV 產業的發展現況。同時也簡單討論目前服務的瓶頸。接著說明目前寬頻網路接取的相關技術與未來趨勢，諸如 VDSL2, FTTX, PON 等技術，同時對未來新趨勢 GPON 作一概況介紹，而個人認為 GPON 的建置將促進 IPTV 產業發展，進而帶動電信產業的轉型。

Curriculum Vitae

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Education:

Ph.D in Operations Research, New York Polytechnic University. 1986

Experience:

PTSM in AT&T 1986-2004, IT Analyst in JPMorganChase 2004-present

Present Position:

JPMorganChase, Information Technology Analyst

Specialty:

Telecom: OSS, Network Management. IT: Architecture/Security/Development. Telecom/Financial: Mathematical Modeling, Optimization.

Selected Publications and Patents: none

Social Activities and Honors: none

OSS INTEGRATION IN TELECOM OPERATIONS

ABSTRACT

The goal of the Operations Support System (OSS) Integration is to provide a better, faster, and cheaper value solution to status customer's requests for service. It is used by the Telecom carriers in operating of the various platforms of communication networks. It provides an OSS platform to support the Inter-Carriers services.

This OSS initiative is achieved by integrating the current legacy OSS with the standard ticketing, fault management, and performance management system. It also incorporates a full process automation capability using a customized business-rules policy management platform.

A prototype OSS Integrator (OSSI) demonstrates the network alarms to correlate with the network configuration and service layout, and presented the results through a simple web-based user interface. This system provides a collaboration framework among network work centers, customer care centers, and network/service engineers. It simplifies the cross-functions interrelation to ensure that the Telecom Operator's customers can always get to the service information they need.

Curriculum Vitae

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台灣師範大學工業教育系學士（1981）

經　歷：

國科會工程處資訊學門(二)召集人（2002/11-2005/12）
成功大學數位生活科技研究中心主任（2000/8-2005/7）
成功大學電腦系統技術研發重點中心主任（1997/8-2000/10）
人工智慧學會理事長（1999/1-2000/12）
中華民國電腦學會常務理事（2006/1-迄今）
軟體工程學會常務理事（2005/6-迄今）
Journal of Internet Technology 主編（2005/1-迄今）

現　職：

成功大學教授（1994/8 迄今）
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數位家庭及數位生活

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摘要

數位生活空間的營造已是近年來相當熱門的主題，不只是學術界重視，也是產業界競相投入資源進行研發的領域，其中以數位家庭的建構最為熱門。基本上，數位生活空間乃是在各式數位家電及感測器設備之上,運用網路及軟體技術提供用戶多樣而且隨手可得的情境感知（context-aware）生活服務所構成。要有效實現數位家庭生活空間的各種情境感知服務，必須有一個整合性的中介軟體平台，而且由於執行每一個情境感知服務時，必須要整合眾多的數位技術以及軟硬體設備來達成。因此，只要其中一個軟體或者硬體環節出現問題，此服務就不能達到使用者及系統開發者的期望。在此論文中，我們介紹中介軟體平台、環境模擬器以及智慧型人機互動相關技術的研發構想，讓系統開發者能夠提高開發數位家庭生活服務系統的效率和品質。此外，為了減少情境感知服務因為不可靠的服務供應者導致無法達到預期的服務水準,我們也提出了信任度評估模式，用來提升執行情境感知服務的成功率。

關鍵詞: 數位生活，數位家庭，情境感知服務，智慧型人機互動技術，中介軟體，信任模式

Curriculum Vitae

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Education:

Ph. D., Electrical Engineering, 1989, University of Southern California
M. S., Electrical Engineering, 1985, University of Southern California
B. S., Electrical Engineering, 1982, National Taiwan University

Experience: Qualcomm, Incorporated

Present Position: Vice President, Technology

Specialty: Wireless communications, CDMA, and coding theory

Selected Publications and Patents: Eight journal and conference papers published. Over 50 U. S. patents issued. Following are a few recent ones.

- "CDMA2000 1xEV-DO Revision A: A Physical Layer and MAC Layer Overview," with N. Bhushan, *et al*, IEEE Communications Magazine, Vol. 44, No. 2, February 2006.
- "Method and Apparatus for Adaptive Power Control in a Wireless Voice and Data Communication System," U.S. Patent Number 6,862,457, issued March 1, 2005.
- "Configuration of Overhead Channels in a Mixed Bandwidth System," U.S. Patent Number 6,925,067, issued August 2, 2005.
- "Method and Apparatus for Acknowledging a Reception of a Data Packet in a CDMA Communication System," U.S. Patent Number 6,934,264, issued August 23, 2005.
- "Method and System for Handoff Between an Asynchronous CDMA Base Station and a Synchronous CDMA Base Station," with Daisuke Terasawa, *et al*, U.S. Patent Number 6,982,971, issued January 3, 2006.

Social Activities and Honors:

- Member of IEEE Communications Society and San Diego Chinese Culture Association.
- Presented at numerous conferences, universities and research institutes.
- Guest Editor of the feature issue on "Emerging Technologies for 3G Cellular Wireless Communications Systems," IEEE Communications Magazine, Vol. 44, No.2, February 2006.
- Guest Editor of the feature issue on "Further Evolution of 3G Radio Access," IEEE Communications Magazine, Vol. 44, No. 3, March 2006.

AN INFORMATION-THEORETIC COMPARISON OF MULTIPLE ACCESS TECHNIQUES FOR CELLULAR COMMUNICATIONS

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ABSTRACT

Code-division multiple access (CDMA) has been the multiple access technique of choice by all major standards for third generation (3G) cellular systems such as CDMA2000 and WCDMA. CDMA systems are typically deployed with frequency reuse of 1. This results in a multi-fold increase in spectral efficiency over older standards such as GSM. In CDMA, multipath effect is mitigated by using rake receiver in both the mobile station and base station. As the processing capability of receiver improves, many commercial products now contain rake receivers that support higher order of receive diversity (for example, 2X in mobile stations and 4X in base stations). This, along with interference cancellation, further increases the capacity of CDMA systems. However, as technology proposals are made for 3G evolution or systems beyond 3G, it seems that orthogonal frequency-division multiple access (OFDMA) is preferred over CDMA. For example, 3GPP and 3GPP2 as well as IEEE 802.16 and IEEE 802.20 working groups have all been considering OFDMA-based air interfaces. In this paper, we will compare the spectral efficiency of CDMA and any orthogonal multiple access scheme from an information theory point of view. Shannon capacity for a CDMA and TDMA reverse link are calculated for cases with and without receive diversity and, for CDMA in particular, with or without interference cancellation. TDMA is chosen here to represent the orthogonal multiple access scheme for simplicity of derivation. However, the capacity results should apply to any other orthogonal multiple access techniques as well.

Keywords: CDMA, OFDMA, 3G, Capacity

Curriculum Vitae

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學　歷：

國立臺灣大學資訊工程研究所博士（1992）
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經　歷：

中華電信研究所客戶服務資訊研究室主任（2000-2006）
中華電信研究所應用科技研究室主任（1997-2000）
中華電信研究所數位信號處理總計畫主持人（1994-1997）
交通部電信研究所數位影像處理計畫主持人（1992-1994）

現　職：

中華電信研究所資通安全技術研究室 主任（2006 年迄今）

PKI 技術在資通安全之應用

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摘要

本文提供了如何利用公開金鑰基礎建設（Public-Key Infrastructure，簡稱PKI）相關技術來確保通資訊安全的一個概略介紹，首先介紹了密碼系統的基本概念，並分析了公開金鑰密碼系統的優點;接著說明為何光有精巧的密碼演算法仍不足以支持公開金鑰密碼系統的正常運作，而需要輔以完善的公開金鑰基礎建設才行，然後本文以我國政府公開金鑰基礎建設來說明PKI之階層式架構；接著，以SSL/TLS為例子，說明PKI技術如何應用於通資訊安全；本文最後，以我國e政府平台為例子，介紹實務上如何利用PKI相關技術加強資通安全的防護，並協助我國在國際重要的電子化政府評比上名列前茅。

關鍵詞: 密碼系統，對稱金鑰，公開金鑰，雜湊函數，數位簽章，數位信封、Public-Key Infrastructure(PKI)，憑證機構，SSL/TLS，單一簽入，授權憑證，Web Services Security

Curriculum Vitae

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Education:

D.M. in Organizational Leadership program, doctoral candidate, University of Phoenix, USA
M.S. in Telecommunications, Southern Methodist University, USA
M.A. in Journalism, University of North Texas, USA
B.A. in Graphic Arts, Chinese Culture University , Taiwan

Experience:

He has 17 years of work experience in the networking, telecommunications, and Internet fields, served as CEO, manager/supervisor/leader, system engineer, standard engineer, patent engineer, designer, tester, quality assurance engineer, customer support engineer, and technical training instructor. He also has 8 years of teaching experience as a professor or an adjunct at several universities for the networking, telecommunications, Internet, and management courses.

Present Position:

Associate Professor, IT and Computer Science Department, Tarrant County College, TX, USA.
CEO, Hightechteam, Inc.

Specialty:

Networking, Telecommunications, Internet, and Organizational Leadership.

Selected Publications and Patents:

-Telephone system with call forwarding apparatus and method, Patent No. 6,442,266.
-Method and apparatus for sending an announcement to caller, Patent No. 6,052,438.
-Processing of emergency calls in wireless communications system with fraud protection, Patent No. 6,038,440.
-Method and apparatus for identifying type of call, Patent No. 6,031,899.
-Enhancement do not disturb subscriber feature within a telecommunications network, Patent No. 5,872,840.

Social Activities and Honors:

Member of IEEE (Institute of Electrical and Electronics Engineers)
Member of CIE (Chinese Institute of Engineers)

IMS (IP MULTIMEDIA SUBSTEM) ARCHITECTURE, PROTOCOLS AND APPLICATIONS

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ABSTRACT

This article presents IMS (IP Multimedia Subsystem) architecture, protocols and applications. IMS is a NGN- and IP-based architecture defined by 3GPP. Originally IMS was designed solely to support the 3G UMTS network. The scope of IMS has been expanded to also support GSM and GRPS in release 5, WLAN in release 6, and PSTN in release 7. CDMA2000 is supported by 3GPP2 standards which include CDMA MMD and 3GPP IMS. IMS entities include CSCF, MGCF, MGW, MRFC, MRFP, BGCF, AS, IBCF and TrGw. The major IMS protocols are SIP, IP, H.248 and DIAMETER. IMS can be used to develop multimedia applications. Some of the applications are MMS, change between voice and video phone call service, and multimedia conference with private room service. Killer applications need to be developed by IMS vendors and service providers to generate profits. Companies such as Skype offer free VoIP calls. This free call challenge should not be overlooked or ignored. The coordination between 3GPP and IETF is needed to modify/expand the IETF protocols, such as SIP, to be effectively used in the IMS architecture. More multimedia services deployment is required to prove IMS's multi-vendor interoperability and revenue-generating capability. These services need to be supported by CSCF, HSS, and AS. Charging by usage instead of by subscription may not be accepted by the customers. It may be a good approach for vendors to not combine the IMS entities due to the flexibility concern. It may be a good approach for carriers to avoid a more challenging service such the IMS-based IP Multimedia TV in this early stage.

Keywords: IMS, 3GPP, UMTS, SIP

Session 8

知識型及數位創意產業管理(R201 F)

Management of Knowledge and Creativity Digital-Based Industries

September 25 (Monday).2006

時 間	議 程 內 容	地點/主講人
08:30~09:00	報到	國際會議中心大廳
09:00~10:00	開幕典禮	國際會議中心大會堂
10:00~10:30	休息	國際會議中心 101A
10:30~10:40	分組召集人致詞	柯志昇博士 資訊工業策進會執行長
		Dr. Lurng-Kuo Liu (RSM,Projects Lead Cell Solutions Department IBM T.J.Watson Research Center,New York)
議題一：「創新資訊服務 應用服務加值」		主持人：龔仁文所長
10:40~11:10	科技化服務發展趨勢與台灣製造服務之發展契機	龔仁文所長 資策會創新應用服務研究所
11:10~11:40	Super-Digital Appliance and Intelligent Information Management	Dr. Lurng-Kuo Liu (IBM T.J. Watson Research Center,New York)
11:40~12:00	議題一 討論	
12:00~13:30	午餐	
議題二：「推動 U 化應用 創造生活價值」		主持人： 高天助處長
13:30~14:00	Moving Toward Ubiquitous Network Society	林劍秋副處長 資策會專案支援處
14:00~14:30	Ubiquitous Network Society Development Environment & Applications	Dr. Jun-Kuan Hsin (Chairman of LINX Communition,Inc,Framingham,MA)
14:30~15:00	優質網路社會基礎法制初探	王郁琦主任 資策會科法中心
15:00~15:20	議題二 討論	
15:20~15:40	休息	
議題三：「推動數位創意 展現知識品質」		主持人：黃國俊 副執行長
15:40~16:10	推動數位創意，展現知識品質	林政緣博士 資策會數位教育研究所
16:10~16:40	Golden Touch – Technologies that Change our lives	Dr. Chris Li (Senior Manager of IT Architect, IBM,US)
16:40~17:10	互動式數位藝術與創意產業之應用與發展	許素朱主任、副教授(國立台北藝術大學藝術與科技中心暨科技藝術研究所)
17:10~17:30	議題三 討論	
17:30~	賦歸	

Curriculum Vitae

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Education:

- 1980-1981 M.S. in Management Sciences, Stevens Institute of Technology, U.S.A.
  管理科學碩士
- 1973-1977 B.S. in Statistics, National Cheng-Kung University, Taiwan
  統計系學士, 國立成功大學

Experience:

- Since 3/2006: VP & General Director, IDEAS, III
  所長，資訊工業策進會創新應用服務研究所
- 8/2003-3/2006: VP & General Director, ACI, III
  所長，資訊工業策進會電子商務研究所
- 4/2001-8/2003: Managing Director, e-Commerce Resources Center(ECRC), III
  主任，資訊工業策進會電子商務應用推廣中心
- 8/1995-4/2001: Director, IT Promotion Division, III
  處長，資訊工業策進會推廣服務處
- 6/1989-8/1995: Director, Planning and Evaluation Office, III
  主任，資訊工業策進會企劃室
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  國際合作組組長，資訊工業策進會產品開發處

Present Position: Vice President and General Director 所長

Social Activities and Honors:

Outstanding I.T. Elite Award (2002) 91 年資訊月傑出資訊人才

科技化服務發展趨勢與台灣製造服務之發展契機

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摘要

服務貿易依其提供模式可分為四類：跨境交付、境外消費、商業設立、自然人流動。其中「跨境交付」是以科技為基礎，藉資訊科技突破國界與障礙，提供遠端服務。目前，國外對科技化服務(IT enabled Services; ITeS)的定義並不一致;觀察全球科技化服務業的運作，可概分為二種模式：模式I：透過IT科技傳遞由人提供的服務；模式II：科技本身就是一種服務。

以政府目前大力推動的產業電子化為例，為協助我國產業由「製造」為導向，轉型為以「服務」為導向之創新資訊應用體系。製造業是台灣在過去三十年所發展出全球最具價值的領域知識，台灣應該利用此一優勢，運用多年之製造知識結合ICT平台，發展可以跨境輸出之製造服務，向全球輸出高附加價值之製造服務。

本論文由科技化服務的角度，分析服務創新與資訊科技整合發展之關鍵議題，並提出以ICT為核心的服務創新思維，並透過平台事業（Platform Business）概念，藉由整合現有的製造平台與服務平台，進而構築新商業模式（Business Model）的戰略訴求。說明如何透過資訊科技強化自身產業競爭力，以及其運用創新資訊應用構築新商業模式的策略。

關鍵詞: 科技化服務，製造服務，ITES

Curriculum Vitae

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Education:

Ph. D. Electrical Engineering, University of Maryland at College Park
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Experience:

IBM T.J. Watson Research Center, 1993-Present

- Intelligent information management for digital media indexing and searching.
- Emerging applications development for Cell Broadband Engine processor- a core for Sony Playstation-3 game console.
- Program Manager for Blue Gene high performance computer project – A high performance computer for protein folding and life science applications.
- Corporate strategies committee in the areas of broadband digital media, and iTV.
- Managed broadband e-business and mobile commerce projects. Developed value-added services on interactive TV.
- Blue Gene/C based SOC IO subsystem development for Fibre Channel data routing.
- Conducted research in vision augmented virtual reality for interactive games and vision enhanced user interaction.
- Designed and developed video codec chip and media processor.
- Conducted research in MPEG-1and MPEG-2 standard-based video compression algorithms for HDTV and set-top box applications. Designed video conferencing system.
-

Present Position: RSM, IBM T.J. Watson Research Center

Specialty: Digital Media, Broadband e-business, High Performance Computing

Selected Publications and Patents:

Published over 30 papers and gave numerous invited talks and hold many patents.

- "Video Analysis and Compression on the STI Cell Broadband Engine Processor," *IEEE International Conference on Multimedia & Expo (ICME 2006).*
- Patent No. US 6,901,561 "Apparatus And Method For Using A Target Based Computer Vision System For User Interaction"
-

Social Activities and Honors:

- Chaired a digital appliance session for SATEC conference twice.
- Served as a Program Chair/Session Chair/ Program Committee in many conferences.
- President, Association of Chinese Schools

SUPER-DIGITAL APPLIANCE AND INTELLIGENT INFORMATION MANAGEMENT

Dr. Lurng-Kuo Liu

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ABSTRACT

The evolving of broadband access and the Internet information has made the Internet as another channel for information access and collaboration. The Internet is becoming more pervasive and seeping into everyday life of many people. It is not only delivering information to users but also collecting information from users. It is driving new designs of devices, applications/services, and support infrastructure.

Digital appliances integrating computer, communication and consumer electronics technologies are an emerging category of devices that provide an alternative way of access to the Internet. With the Internet access and digital processing capabilities, digital appliances require more sophisticated technologies (chip, embedded OS, user interface, etc.) and more computing power than those in conventional appliances. With all these features, vendors will face many challenges in order to design an information appliance that will lead the market. Later this year, millions of homes will get a new super-digital appliance for the living room. Sony's PlayStation 3 is expected to hit the market in November. The new PlayStation 3 is empowered by the Cell Broadband Engine (CBE) processor with supercomputer like performance, which is a result of collaboration between Sony, Toshiba, and IBM known as STI. It will be positioned as an entertainment supercomputer not only doing video gaming but also video editing, photos manipulation, and information processing.

In addition to the innovation features of devices, new types of services are also parts of the market trends that are making new digital appliances possible. Information management is one of the most promising value-add services areas, especially, intelligent information management for unstructured information such as images, video, audio, and rich text. An increasing interest in online multimedia-rich applications such as entertainment, e-commerce, digital photos, music download, distance learning and mobile media has made the growth of digital multimedia content skyrocketed. New features of digital appliance are also driving new forms of interaction with this information, which, in turn, driving the need for more effective methods for indexing, searching, categorizing and organizing this information. Intelligent information management is the emerging market for unstructured information. Intelligent information management solutions based on automatic indexing and searching technologies will play vital role towards realizing full value of digital media assets.

In this presentation, we will look into a few of these innovative technologies for digital appliance and their emerging value-add applications. Especially, we will discuss the core of the entertainment supercomputer PlayStation 3, its features, and the potential intelligent information management services.

Curriculum Vitae

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Experience:
Commissioner, 2004 Taiwan Flower Expo Planning Committee, 2004
Committee Advisor, Taiwan Flower Expo Work Team at ChangHua County, 2003-2004
Sr. Manager, Information Security Service Center, Institute for Information Industry, 2001-2002
Manager, Sr. Manager, IT Promotion Division, Institute for Information Industry, 1987-2000

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Post-Industrial Society
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Facilitating Information Society Five-year Program, Project Manager
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Internet Application Research and Training Program, Co-Lead Chair of the Project
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International Information Technology Expo, Post-planning & Research, Chair, Project Lead
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MOVING TOWARD UBIQUITOUS NETWORK SOCIETY

Lin Chien-Chiu

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ABSTRACT

Many countries around the world have witnessed national competitiveness changes since the Industrial Revolution, the world economy has been evolving from being labor-based to knowledge-based economies. Moving into 21st century, the digital revolution has forged new ways to create knowledge, educate people and disseminate information, it also has restructured the way the world conducts economic and business practices, runs governments and engages politically.

Taiwan's achievements in ICT area has been recognized all over the world, his technology was ranked first in Asia and second in the world in the Global Competitiveness Report 2004-2005 released by the World Economic Forum. Taiwan's efforts to cultivate an e-generation put it on the top of the e-government performance list out of 198 countries surveyed by Brown University in 2005, and at number 14 in terms of "networked readiness" in the Global Information Technology Report 2004-2005. Taiwan also ranked 7th for "digital opportunity index" in the first such survey conducted by the International Telecommunication Union in 2005.

From e-Taiwan to M-Taiwan, and moving forward to the Ubiquitous Network Society, Taiwan not only responses to the "Geneva declaration of principles" of World Summit on the Information Society (WSIS) , which is to "declare our common desire and commitment to build a people-centre, inclusive and development-oriented Information Society, where everyone can create, access, utilize and share information and knowledge, enabling individuals, communities and peoples to achieve their full potential in promoting their sustainable development and improving their quality of life. ", but also builds the information and communication infrastructure that will enable universal, sustainable, and affordable access to ICTs by all; and allows citizens enjoying a safe and trusty living environments.

Keywords: Ubiquitous Network Society , e-Taiwan, network readiness

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Lecture in Computer Communication Graduate Courses, Johns Hopkins University, 1989-1991
Presentation, Investment/Venture Evaluation & Management, Hsin Investment LLC, 1995-present

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Specialty: Telecommunications systems architecture design, analysis & implementation, Open systems implementation, and new business/venture development

Selected Publications and Patents:

"Modeling Concepts and Architecture for Intelligent Transportation System (ITS)," Proceeding of the Winter Simulation Conference 92, 1992

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Social Activities and Honors:
1. Presentation and consult in technical & non-technical communities (church & university)
2.Involvement in GOSIP standard group (Vice-chairman), WDC Chinese Transportation Professional Association, (chairman),
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UBIQUITOUS NETWORK SOCIETY DEVELOPMENT ENVIRONMENT & APPLICATIONS

Dr. Victor Hsin

ABSTRACT

A ubiquitous network society is a society that provides seamlessly connection to anyone with anything at anytime and anywhere and exchanges a wide range of information by mean of access able, affordable and suitable devices and services. In such society people will be able to share knowledge, experience, information easily and therefore to enhance their decision and potential abilities for better quality of life. To achieve this goal, it is essential to provide a sound unified and open development environment. The development environment similar to this concept has been initiated in the pass among US government at federal, state, and local levels such as National information Infrastructure, National Performance Review, Intelligence Transportation System, Ubiquitous Computing and Ubiquitous information infrastructure and etc. The key component of the development environment includes Telecommunication infrastructure, Information technology usage infrastructure and applications to utilize the ubiquitous network.

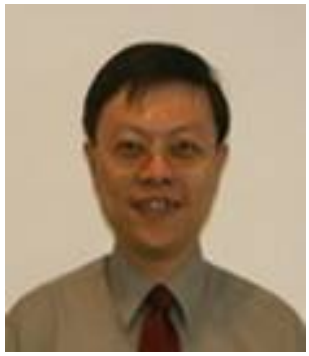
The domain of telecommunications infrastructure includes more than just physical facilities used to transmit, store, process, and display voice, data, images, and video. It encompasses wide range and ever-expanding range of equipment including cameras, scanners, telephones/ cell phones, fax machines, computers, switches, video and audio devices, cable, wire, satellites, optical fiber transmission lines, microwave nets, televisions, monitors, printers, and much more. The innovations and grows of these related end-user applications bring complications as well as opportunities to the telecommunications and related industries. Simply organizing the network through telecommunications infrastructure is not sufficient to promote the active utilization of the network. This requires additional infrastructure that will efficiently provide the functions common to various types of usage. The information technology usage infrastructure includes IT terminals and platforms. The IT terminal is a mobile network access terminal that would satisfy the essential user desire to be better connected the network. For example, the user identification device, RFID tags and sensing device, etc. The platform system, which covers a numbers of highly diverse functions for connect terminals, such as ITS, Payment system etc.

The applications can be roughly divided into three categories: 1. Ubiquitous individual applications, such as e-mail, unified message & communications, personal website. 2. Ubiquitous business applications, such as retail, bank, medical, manufacture, information &

communications technology. 3. Ubiquitous Government/public applications, such as health care, welfare, transportation, environmental and education.

The promotion of the UNS will not only improve the quality of life, but also lead to comprehensive innovation throughout the entire communications and information industries including the related telecommunications, information equipment, platforms, digital content, and knowledge solutions sectors.

Curriculum Vitae



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10/2001-12/2005	世新大學法律系助理教授
08/1997-09/2001	元智大學資訊社會研究所助理教授
04/2005-present	臺北市公眾無線區域網路管理委員會委員
08/2003-present	經濟部商業司『PKI 互通監理委員會』法制組委員
11/2004-12/2005	台北市政府（網路組）市政顧問
10/2003-06/2005	行政院國家資訊通信發展推動小組選聘『電子商務專家』
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1. 王郁琦、劉幼琍，美國與英國數位有線電視之發展與相關政策，收錄於「數位時代的有線電視經營與管理」，正中書局，民國 94 年 12 月，第 235-268 頁。
2. 王郁琦,網際網路交換中心業務於我國電信法上定位之探討，科技法務透析，民國 94 年 6 月，第 22-38 頁。
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（B） 著作專書

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優質網路社會基礎法制初探

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摘要

隨著無所不在（Ubiquitous）之電腦運算技術的發展，台灣正逐漸邁向一個隨處可得資訊化服務的U化社會。所謂的U化社會乃指任何人可在任何時間、任何地點、任何情境下，利用資訊通信裝置、技術與網路進行連結。然而，欲達成U化生活之前提在於構建一個無間隙的資通訊網路環境。無間隙資通訊網路環境的建置，必須考量到目前不同網路間因應匯流（convergence）所帶來的互連規範、競爭政策與新興技術應用等問題。觀諸世界各國為因應無間隙網路的發展趨勢，皆已將其資通訊政策之目標置於形塑一個無間隙的網路社會，而朝向以IP網路為基礎架構，構建一電信與廣播、有線與無線網路匯流，具備高速寬頻、隨處可得的接取環境，藉以提供具備感測應用、安全可靠與即時互動的優質網路服務。為完備U化社會的基礎環境建構，在法制面上必須重新檢視我國目前資通訊相關的法令規範，包括競爭規範、隱私安全、網路匯流與管理等議題。本論文希冀透過前述檢視之過程，研析相關法令與政策可能的調整方向，並研議是否可透過一定法令規範的要求，以確保推動U化生活的政策規劃、相關預算與計畫之實施。

關鍵詞: 資訊社會、網路匯流、基礎建設、無間隙網路社會

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2002 Lin, C. Y. "A Place Where People are Free to Move: Exploring dynamic texture mapping in computer graphic systems", Proceedings of the CAADRIA 2002, 117-122.

2002 Lin, C. Y. "A Digital Procedure of Building Construction", Proceedings of the ICCCBE 2002, 229-234.

2001 Huang, Y. H., Liu, Y. T., Lin, C. Y., Chen, Y. T., and Chiu, Y. C., Oh, S.Y., Kaga, A., and Sasada, T. "The Comparison of Animation, Virtual Reality, and Scenario Scripting in the Design Process", International Journal of Design Computing Vol. 3.

2001 Tang, S. K., Liu, Y. T., Lin, C. Y., Shih, S. C., Chang, C. H., and Chiu, Y. C. "The Visual Harmony between New and Old Materials in the Restoration of Historical Architecture", Proceedings of the CAADRIA 2001, 205-210.

Project Participation:

2004 數創中心合法下載數位音樂計劃
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2004 創意台灣 2050
2002 北美館遠東建築展數位建築區展場設計
2001 新竹市舊城區整體開發及視覺場景劇本動畫
2001 新竹數位藝術館規劃設計
2000 虛擬建築設計營建與管理計畫
2000 新企集團內部之作業流程電腦化
1999 新竹市政府建築夜間照明設計與電腦模擬
1999 新竹市街道設施與夜景整體規劃
1999 數位藝術發源地可行性分析與規劃

推動數位創意，展現知識品質

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摘要

當資訊與通訊科技遇上了藝術與文化創意，數位創意產業就此孕生；工程師、創意人與科技藝術家，將有機會在 21 世紀攜手驗證「科技起源於人性、而實踐於對社會與文化的關懷」這一道既具哲思、又富商機的課題。

西哲海德格半世紀前就闡明，科技不僅是工具，更是「思考與展現模式」。數位創意就是應用數位科技工具，解決人性需求或回應社會現象的創意思考，並能展現知識與生活品質的新領域；數位影音、行動與網路內容與其軟體，電腦動畫與遊戲，數位藝術與典藏，及運用數位工具的設計、廣告與展覽業皆可歸屬之。

「數位創意產業」是我國資通訊科技創新應用中極有潛力的領域，其所能帶動的文化與經濟價值難以小歟；如：加值應用服務、智財授權商品、數位創意展演與觀光、城市行銷與創意外交等。筆者認為，數位創意是一種「數位科技、創新應用」的產業，也是提升資訊化社會品質的關鍵；其目標包括：開發源頭產業、豐富生活品質、萃取東方文化、產業根留台灣、吸引全球投資等層面。

審視數位藝術發展趨勢為例。科技藝術裝置、電子音樂與動畫等數位藝術即是一種新型態的創意思考與展現模式；其所運用的數位科技媒材與介面，則是讓各種訊息與意義能有效呈現、讓互動溝通成為關鍵的工具。從知名數位藝術及數位內容國際展(如：AE Linz, E3, GDC)中的許多產(作)品可發現，數位創意的重點並非科技工具，而是溝通介面與體驗情境的設計策略：對人性需求與人際互動的充份反省、掌握創意生活趨勢，並將創意想像具體化應用在創新科技上，促成觀賞者/使用者與科技工具的互動體驗情境，使人滿足、驚喜或反省。筆者認為，這便是推展數位創意的核心價值，也是研發數位創意產品與服務的商機關鍵。

多年來扮演台灣「資訊化社會推手」的資策會，曾在 2005 年參與籌辦「快感」奧地利電子藝術節(AE Linz)的 25 年大展，並主辦「數位創意產業前瞻經驗分享會」，由奧地利電子藝術中心館長傑弗瑞・史塔克 (Gerfried Stocker) 為台灣傳授數位創意產業成功經營策略，引發廣泛關注，對推動台灣數位創意產業深具指標意義。引申史塔克對電子藝術未來發展的見解，數位創意的未來發展將更仰賴「科學原則、介面發展、文化聯結、日常生活與社群互動」。

另外，台灣也要即早修正數位創意之產(作)品創製與人才培育之方法論、行銷與效益之評估標準。數位創意產業所需的，是有能力帶動台灣數位創意產值

化與產業化、且具備社會批判力的數位創意人；通常他們兼具藝術、工程、社工與設計的跨領域專長；也都需要更直接面對當代人的各種問題與需求，就如科學發明與技術與日俱進一樣，要不斷醞釀反思與解決方案，以促進人與人、人與科技、人與社會的「人性介面」改造；這可說是發展數位創意產業的願景。

因應數位創意產業發展，將數位創意更密切結合於工作、家庭與休閒場域，以提升當代社會品質；同時，更廣泛整合藝文創意與資訊技術，推動科技業的創新應用運動(如：投入數位創意市場情報研究、產官學研合作開發數位創意內容、舉辦國際數位創意商展與博覽會、籌建數位創意園區等作法），以策進科技業的創新轉型與服務業的創意加值，將是資策會及各界菁英團隊的共同關注與期盼。

關鍵詞：數位創意產業，數位創意，數位藝術，數位內容，數位科技，創新應用

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Experience:

- Designed and implemented first of a kind IT solutions to retailers across the globe
- Designed and led a team of architects to implement the largest customer information integration project in the world at the time.
- Designed the technology architecture for The Housing Authority in Hong Kong, the world's largest housing management organization.
- Part of the Nagano Olympics systems performance testing team
- Industry exposure includes public sector, education, financial services, oil and petroleum, retail, and entertainment.

Present Position:

- Senior Manager of IT Architect, IBM, US;
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Specialty: IT solutions architecture

Selected Publications and Patents:

Li, Chris, et al., *High Availability Architectures and Capacity Planning with WebSphere Remote Server v5.1.2.1*, IBM Redbooks

Social Activities and Honors:

- IT Director of CIE, DFW Chapter
- IBM Chairman Award - Teaming with international groups to work on the Olympics project.
- Main tent speaker for the Asia Technology Exhibition in 2002

GOLDEN TOUCH – TECHNOLOGIES THAT CHANGE OUR LIVES

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ABSTRACT

Modern technologies enable the ubiquity of information. We are conditioned to get access to information no matter where we are. Unlike the previous generations, we no longer have to make uninformed decisions. The availability of information empowers us to make faster decisions. The data that used to take months to gather now is just a matter of a few clicks away. Our pace of life is accelerating in an unprecedented speed.

Innovations in RFID, multi-channel integration, biometric, SOA, wireless network, and millions more are turbo charging the engine of our lives. Information has to be where we want it, when we want it and in just the right amount. In other words, it is right at our finger tips. Liken to the well known fable, whatever we touch turns into something we want, just like gold in the story. We got the "Golden Touch." Can you imagine that you can pay for your grocery by the touch of your finger, watch the trailer of a movie by pointing your phone to the poster, get the fashion advice by touching a plain wall, walk into a store with completely no cashier and cash registers? There are too many examples to list them all.

You will see that technologies are changing our lives especially in how we spend our time and money. There will be a revolutionary change in the retail industry. It is already set in motion.

In this presentation, we will look into a few of these innovations around the globe and the applications and technologies that brought about this transformation of our life style.

Keywords: innovation, multi-channel, SOA, biometric

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Ph.D. in Computer Science, National Tsing Hua University, Taiwan, 1992
Dr. Su-Chu Hsu is the Director of the Center for Art and Technology at Taipei National University of the Arts (TNUA), where she is on the faculty. She created and built the Graduate program in Art and Technology and was the first chair. She is known for her work in network art, digital art, digital creative learning, and digital archives. She is a leading proponent for the integration of art and technology in Taiwan.

Dr. Hsu maintains active collaboration at UC Berkeley and its affiliated laboratories, where she spent the 2004-2005 year as part of a sabbatical research visit sponsored by Taiwan's National Science Council. She also spent six months in MIT Media Lab in 1996. Her project "DIGIart@eTaiwan - Manipulating Digital Archives Using Digital Art Techniques" received the 2006 award as the best technology innovation from Taiwan's National Science Council. She consults with the National Digital Archives Program and her projects include "Taiwan Memory Digital Museum", "Historical Photograph/Video Archive Project (Government Information Office) ", "The World of Xuanzang and Silk Road Digital Museum", "Digital Museum of Taiwan's Social and Humanities Video Archive", and "Taiwan Folk Art Digital Museum."

Dr. Hsu's current work focuses on "Future Museums": she built a feedback system for learning that collects information about participant behavior using wireless sensor networks that can be statistically analyzed, and examine the data through a visualization display in another interactive art work exhibited in the museum. In a new project that she directs together with professors at National Taiwan University and National Taipei University of Technology, she is proving her theme that "When Artists And Engineers Work Together, The Result is Something Neither Can Expect." Her projects, supported by the Taiwan National Science Council and Taiwan Ministry of Education include: "eLife - Innovation Application and Technology Development of Digital Life", "SMART - Streamlined Mobile Adaptive Resource Technology", and "Integrating Smart Clothing and Multimedia Feedback for Improving Personal Breathing Habit."

Dr. Hsu has published and lectured widely in the field of technology and art and advises a number of museums and art festivals on new media artworks. She also is involved in the field of Human Rights and has published several books and articles on issues relating to Human Rights. She is an avid traveler and photographer and has visited all seven continents.

互動式數位藝術在創意產業之應用與發展

許素朱 Su-Chu Hsu

主任、副教授, 國立台北藝術大學 藝術與科技中心暨科技藝術研究所
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摘要

「活在創意生活中，人會變得更美麗；活在創意生活中，人會變得更有智慧；活在創意生活中，人會變得更快樂。」這是目前歐美各國民眾所追求的生活品質。在數位資訊時代裡，各國為達到這樣一個理想，紛紛發展「數位創意」新興產業，至今已經創造出龐大的經濟產值，它已是各國不可忽視的一個重要經濟發展方向，此讓我們深刻體會到數位創意產業的時代已到了。本文將先探討互動式數位藝術之發展與回顧，爾後探討互動式數位藝術如何應用在數位創意產業。本文把這幾年「數位創意」產業所流行的應用分為四個領域作探討：互動式廣告、智慧型居家生活、休閒娛樂、未來博物館等領域，並將以實際案例介紹國際上數位創意產業的發展情形。最後，從國際的發展情形，來分析台灣目前在數位創意產業發展所遭遇的問題。期望藉本文之探討，能提供未來台灣在數位藝術創意產業發展方向之參考。

關鍵詞: 數位藝術、數位創意產業、互動式數位藝術、姿勢動作偵測、互動式桌、互動式地板、互動式牆、互動式櫥窗、互動式廣告

Session 9

產業轉型與升級(R203A)

Industrial Transition and Transformation

September 25 (Monday).2006

時 間	議 程 內 容	地點/主講人
08:30~09:00	大會報到	國際會議中心大廳
09:00~10:00	開幕典禮	國際會議中心大會堂
10:00~10:30	分組研討會報到	國際會議中心 203 室
10:30~10:40	分組召集人致詞	
10:40~11:20	「台灣產業的全球佈局策略」	工業總會 蔡副秘書長宏明
11:20~12:00	「培育創新人才，創造經濟價值」	工研院王執行長鳳奎
12:00~13:45	午餐	
13:45-14:25	「21 世紀台灣面對知識經濟發展之挑戰」	馮達旋博士
14:35~15:15	「產業營運總部在全球價值鏈中的角色」	黃肇鑣博士
15:15-15:35	午茶	
15:35-16:15	「加速推動知識型服務業以強化整體產業競爭優勢」	鄭金蓮博士
16:15-16:55	「外商研發中心與台灣的國家創新體系」	中經院陳所長信宏
17:00-17:30	座談會	

Curriculum Vitae

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Education: 國立成功大學工業管理研究所碩士

Experiences:
中華民國全國工業總會貿易發展委員會執行秘書, 副執行秘書 （1996-2000）
中華民國全國工業總會貿易發展委員會副執行秘書（1992-1996）
國家政策研究中心政策研究員（1990-1992）
經濟部國際貿易局科員（1988-1990）

Present Position:
中華民國全國工業總會副秘書長

Specialty:
WTO, Regional Economic Integration (FTA), Cross-Strait's Trade and Investment Relations, and the policy issues on Taiwan economy and Cross-Strait relations.
WTO、APEC、大陸經貿投資政策、兩岸經貿（貿易、投資、境外航運)、產業經濟問題等。

Selected Publications and Patents:
GATT 與 WTO 之規範，五南圖書公司，台北，1995 年。(ISBN 957-11-0999-1)

Social Activities and Honors:
中華港澳之友協會理事

台灣產業的全球佈局策略

蔡宏明[1]

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摘要

本研究介紹台灣產業海外佈局狀況，以及所面臨的挑戰；評估既有佈局之機會、威脅、優勢與劣勢，進而提出台灣產業全球佈局之策略建議。

本研究發現由於中小企業多，缺乏國際化能力，海外布局以成本降低為主要考量，投資不夠多元化，除中國大陸、東南亞之外，對其他地區的布局較陌生。且人才、資金、國際化能力不足，缺乏品牌、行銷能力，投資不易產生綜效等因素使台商全球佈局普遍面對困難。

面對經濟全球化與區域整合範圍的擴大，以及臺灣產業全球化布局之挑戰，政府必須更廣泛地運用全球資源，以協助產業提升競爭力，並進行全球化布局，才能因應產業競爭情勢之發展。

政府對於企業全球市場佈局，有必要提供協助。至於政府應採行的全球市場分工與布局策略，除應評估各個市場在區域自由化過程中的發展目標、市場機會及當地提供的比較利益與政策誘因外，更應思考依據地區別發展機會，於各區域選定重點國家或城市，以作為切入該區域之橋頭堡。

關鍵詞:全球布局；對外投資;對外貿易；自由貿易協定

Curriculum Vitae

Name: Feng-Kwei Wang ,王鳳奎

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Education:

- 1998 PhD, Instruct. Systems Technology, Indiana University - Bloomington, USA
- 1993 MBA, Marketing, Indiana University - Bloomington, USA
- 1989 MS, Computer Science, Indiana University - Bloomington, USA
- 1985 BS, Information Science, Tunghai University, Taiwan

Experience:

- 2004 - present, Executive Director, ITRI College, Industrial Technology Research Institute (ITRI)
- 2005, Associate Professor, School of Information Science & Learning Technology, University of Missouri – Columbia, USA

Present Position:
Executive Director, ITRI College, Industrial Technology Research Institute

Specialty: Corporate Training and Development, Instructional Systems Technology, E-Learning, Knowledge Management

Selected Publications and Patents:

- Wang, F. (2006). Applying case-based reasoning in knowledge management to support organizational performance. Performance Improvement Quarterly. 19(2), 173-188
- Wedman, J. & Wang, F. (2005). Knowledge management in higher education – A knowledge repository approach. Journal of Computing in Higher Education, 17(1), 59-70
- Jonassen, D. H., Wang, F., Strobel, J., & Cernusca, D. (2003). Applications of a Case Library of Technology Integration Stories for Teachers. Journal of Technology and Teacher Education. 11(4), 547-566.

Social Activities and Honors:

- 2003-2004 Graduate Teacher of the Year Award, College of Education, University of Missouri – Columbia
- 2002 High Flyers Teaching Award, College of Education, University of Missouri – Columbia
- 1998 Annual Proffitt Outstanding Dissertation Award, Indiana University – Bloomington

DEVELOPING INNOVATION TALENT FOR ECONOMIC VALUE CREATION

Feng-Kwei Wang, Ph.D.

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ABSTRACT

Nothing including economic value can be created in a vacuum. In all cases, products and services are offered to meet particular needs in particular contexts. There is no value created until customer needs and technical capabilities intersect. Value creation provides innovative solutions to solve customer problems and results in maximal customer benefits through differentiating with competitive offerings. It is the discipline of innovation by relentlessly focusing on creating the highest customer value. It is also the major catalyst for economic growth and industrial development.

Taiwan's industrial development has to shift from a cost-down focus through technology to a value-up focus through differentiation. Taiwan's economy has to transform from "made in Taiwan" to "innovated in Taiwan." Innovation becomes the single most important factor in determining Taiwan's success through the 21st century. Nevertheless, innovation talent is scarce for such a transformation. How to develop such talent becomes an urgent national issue. The nation needs to put more resources into designing and developing programs and environments for fostering such talent.

Keywords: Innovation, Value Creation, Talent Development

Curriculum Vitae

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Education: Ph.D. University of Minnesota

Experience:
M. Russell Wehr Chair Professor of Physics, Drexel University (1990-2000)
Vice President, Science Applications International Corporation (1998-2000)

Present Position: Vice President for Research, University of Texas at Dallas (2001-now)

Specialty: Education policies, nuclear physics, information technologies, mathematical physics, astrophysics physics

Selected Publications and Patents: Feng has published more than 180 scientific papers, edited more than 20 books. Notable papers he published are TDHF EQUATIONS OF MOTION FOR ALGEBRAIC HAMILTONIAN IN A COHERENT STATE REPRESENTATION, D. H. Feng and R. Gilmore, Phys. Lett. 90B, 327 (1980); ON THE VALIDITY OF BOSON MAPPING, D. H. Feng, K.-X. Wang, A.-L. Wang and C.-L. Wu, Phys. Lett. 155B, 203 (1985); DYNAMICAL SYMMETRY BREAKING AND QUANTUM, W.-M. Zhang, C. C. Martens, D. H. Feng and J. M. Yuan, Phys. Rev. Lett. 61, 2167 (1988).
The entire list of publications can be downloaded from http://utdallas.edu/research/archives/FengFullPublicationlist.pdf.
In his capacity as UTD's senior administrator, he had and has written numerous reports, delivered public speeches and congressional testimonials. These can be downloaded from http://www.utdallas.edu/research/vpred/reports.html and http://www.utdallas.edu/research/vpred/speeches.html.

Social Activities and Honors:
In 96, "for (his) outstanding contributions to the understanding of nuclear structure physics, particularly for the applications of the coherent states to physics and nuclear physics," Feng received the accolade Fellow of the American Physical Society. He also received the "friendship award" from Taiwan's Chung Yuan University and is the honorary professor of eleven Chinese universities which included Peking Union Medical College. Feng consulted for three National Laboratories, Los Alamos, Oak Ridge and Brookhaven and UK's Daresbury Laboratory. In 03, he was appointed as honorary Board of Trustee of Nanjing University and in 05, he was elected as a member of CellStar Board of Directors, a $1 Billion annual revenue global handset distribution company.

JUXTAPOSTION OF RESEARCH UNIVERSITIES, QUASI-GOVERNMENT RESEARCH CENTERS AND HIGH-TECH INDUSTRIES: A CHALLENGE FOR TAIWAN'S INTELLECTUAL AND ECONOMIC DEVELOPMENTS IN THE 21ST CENTURY

Da Hsuan Feng[1]

1. Vice President for Research and Economic Development, The University of Texas at Dallas, USA, email: fengd@utdallas.edu

ABSTRACT

Keywords: Intellectual and Economic Developments,

In the last three decades of the 20th century, Taiwan made the transformation from agricultural economy to silicon economy. This transformation had given Taiwan one of the highest living-standards in Asia, if not the world. In the 21st century, with the rapid rise of regional and global challenges and competition, which could come from as far as Ireland, the so-called Celtic-Tiger, this leadership can no longer be taken for granted. In the 20th century, intellectual and economic transformations of Taiwan were largely carried out by admixing returning indigenous highly trained people with local talents. In the 21st century, with transformation all over the globe, especially regionally, this formula may not be sufficient. In this talk, I will outline some of the challenges, as I see it, for Taiwan and made suggestion as to how to overcome them.

Curriculum Vitae

Name: John Chao-Piao Huang ,黃肇鑣

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Home 651-483-0625 Email: jchuang99@yahoo.com
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Education: Executive Management Program, Stanford University
Ph.D.& MSME. Washington State University, Pullman, Wash.
B. S. Mechanical Engineering, National Taiwan University, Taipei, Taiwan

Present Position:
Managing Director of Focus Capital Group (2001-Present) - managing venture capital investments in high tech start-up companies in Silicon Valley, California, related to communication, biotech and media. Serve as Board Directors of Future Dial, Inc.–wireless communication software/hardware co. & other companies.

Experiences & Specialties:
Most professional career (32 years) is with 3M Company in Minnesota, from scientist to become a senior manager. 3M is a highly regarded innovation multi-technology and multi-market global company. The specialty & investment experiences are:
1.Manufacturing Operations & Process Development: Develop environmentally safe chemical processes for large-scale productions. Had two decades of 3M experience in manufacturing management & in major capital investment in USA, Europe (UK, Germany, Italy and France) & Asia (Japan, Taiwan, Singapore, Austria, & China).
2. Value Chain Analysis: Participated in selecting a 3M Asia Technical Center (included Bangkok, Singapore, Taipei and Shanghai). Responsible for a 3M project on technology transfer & manufacturing site search to include factors of value chain, logistic support, workforce training, utility, waste disposal & competitive environment.
3. Industry Technology: a) Thin film coating processes for industrial and healthcare products. b) Energy Control & Optics products for architectural use, for solar energy; c) Digital imaging and printing media in production of printing media & equipment. Led business development for large signs and graphics for display & advertising markets.

Selected Publications and Patents: Granted 2 US patents & published 4-dozen technical papers. Published many Chinese articles as a guest columnist for ***Global Views Monthly*** in Taiwan & ***Oriental Entrepreneurs*** in Shanghai, on Hi Tech business, Innovation, Intellectual Property, Supply chain, Venture investment & Environmental protections.

Social Activities and Honors:
Member of 3M University Relations Committee for faculty grants & scholarships
METS General Chair & Advisor, held in Taipei, Taiwan 2000 to 2006

ELEMENTS OF AN INDUSTRY OPERATION CENTER IN THE GLOBAL VALUE CHAIN

John Chao-Piao Huang

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ABSTRACT

As Asia rises in the 21st century, many US and Europe major corporations are seeking to establish a regional operation center in the area. There are certain necessary conditions and some important conditions in the global value chain to establish a Center. Necessary conditions are elements that an operation center "must have", such as key customer account and/or a large customer base, existing manufacturing facility, ease of travel in the region, efficient logistic and supply chain.

Important conditions in the global value chain are elements that help to make the decision for a Center: such as reliability of utility, cost of real estate, availability of knowledge- based workforce, education and training facilities, grouping effect of a certain technology/industry, information technology infrastructure, local and central government support, access of capital, and industrial waste disposal.

The advantages of Taiwan as a regional operation center may be: the abundance of high quality workforce, the strong central government support and incentive, the strong grouping effect of certain industries, convenience of centrally location in the east Asia, the ability to communicate with Chinese language in China and in many southeast Asian region.

The paper will analyze factors affecting high value added industry and will discuss industries that Taiwan could pursuit as Asian regional operation center. Examples are healthcare services using strong information technology infrastructure, medical devises using digital signal processing and precision optics, precision machinery using creative CNC technology, mobile phone service using experienced design and efficient production.

Curriculum Vitae

Name: Dr. Alice Hsin

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Education:

Ph.D., Operations Research/Econometrics, University of Texas at Austin, 1980
M.S., Economics/MIS, University of Texas at Austin, 1978
B.S., Economics, National Taiwan University, 1974

Experience:

11/88 to 12/94 Chief System Scientist of Planning & Research/Northrop Grumman, responsible for corporate-wide technical advisor in supporting a broad spectrum of large scale complex systems integration projects and programs involving a variety of networking technologies in the Local Area Network (LAN), Metropolitan Area Network (MAN), and Wide Area Network (WAN) capabilities, FDDI, DQDB, ISDN, BISDN, and Gigabits LAN etc. Dr. Hsin has contributed to the major program such as DoD SuperMini, AWIPS90, ULANA II, FBI/ITN, DoD DISN, U.S. Senate Data Communications Networks, NASA, GSA, EPA/RTP, APS/PTO, etc.

9/85-10/88 Vice President of Marketing and Product Strategies for the Institutional Communications Company (ICC)/MFS/MCI responsible for the direction of the first single-mode fiber optics by-pass technologies business venture of an alternative broadband fiber optics network connection for large business, long distance carriers, and government agencies in the greater metropolitan Washington, DC area. The network provided integrated voice, data, and video services on a high quality single-mode optical fiber digital network. Dr. Hsin designed and implemented automated centralized network control system for a unique fiber optics network. This venture became multi-billions dollars business in year 2000.

6/83 - 9/85 Project Leader, Applied Research at the Bell Communications Research Laboratory (Bellcore). Dr. Hsin was responsible for a comprehensive plan to migrate new technologies such as single-mode optical fiber transmission, digital switching, cross-connection systems, remote and broadband switching and intelligent transmission terminals in the future exchange network. Dr. Hsin initiated "Virtual Fiber Networking" proposal and system plan to be prototyped in the exchange network to offer broadband ISDN services. The proposal was viewed as the key to upgrade the existing network to broadband intelligent network by utilizing light wave and synchronous broadband switching technologies (SONET/ATM), #SS7 Common Channel Signaling, and single-mode fiber technologies in the 1990s.

6/79-6/83 Project Chairman for AT&T Bell Telephone Laboratories, responsible for project management, system design and technical consultation to implement the advanced 800 Toll Free Services, and a large-scale data base management tool to permit a dynamic on-line information exchange for multi-billions project management.

STRENGTHEN THE GLOBAL ADVANTAGE OF TAIWAN INDUSTRY COMPETITIVENESS BY PROMOTING KNOWLEDGE-BASED SERVICE BUSINESSES

Dr. Alice Hsin

ABSTRACT

What is meant by knowledge-based economy? What types of knowledge-based service businesses offer Taiwan with global comparative advantages? How is a production process composed? What determines value? Where does commerce take place? What are the basic conditions of the new platform of trade? What is meant by network-economy? How do we measure economic output? What is characterizing a good? What is good performance? What is a competing group? What determines barriers of entry? What about money and payment? What is property? How can I make profit out of my property? What is determining a price? When do I network and when do I compete? What are frictions in markets? What determines a sales strategy? How do supply and demand adjust? How do companies get finance and what are the conditions for a company to grow? When is governmental interference needed? What is determining growth? What are skill requirements for labor markets in Taiwan? How will Taiwan industry transform to knowledge-based economy with winning strategies in the global competitions?!!

This paper will include the following key elements and winning strategies of promoting knowledge-based service businesses in Taiwan:

- Impact of Modern ICT on the positive loop effect of knowledge-based service business creation
- The four major areas of hi-growth and hi-profit of knowledge-based service businesses
- The knowledge-based business market structure and redefinition of industries and competing groups
- The competitive strategy in the knowledge-based service business including pricing behavior, money and payment, product strategy and advertising, market equilibrium and demand forecasting, company finance and the growth of firms, legal tactics and intellectual property, etc.
- The winning strategies of Taiwan labor markets including skill requirements, educations and trainings, worldwide employment demand forecasts, geographical requirements and wage differentials with effective results of business productivity
- Role of organizations with government and private sector guidance in promoting knowledge-based economy

Curriculum Vitae

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Email: shchen@mail.cier.edu.tw

Education:
Ph.D., (ICT Programme), University of Newcastle upon Tyne U.K., 1990-1994

Experience & Present Position
Director and Research Fellow, International Division, Chung-Hua Institution for Economic Research, Taipei (1995-present).

An Editorial Member of the International Journal of Technology and Globalization (Harvard University) (2003-present).

Research Assistant, Centre for Urban and Regional Development Studies, Newcastle University, UK (1993-1995).

Associate Researcher, Industrial Economics Research Center, Industrial Technology Research Institute, Taipei (1987-1989).

Specialty:
Industrial economic、Science and technology policy、Industrial innovation

Selected Publications and Patents:
1. Shin-Horng Chen, Meng-chun Liu, Jia-Zhen Chen and Chun-Hung Kuo (2005), "Raising R&D intensity: A strategy for Taiwan", Asia Pacific Tech Monitor, Vol.22, No.4, July-august, pp.24-37.
2. Shin-Horng Chen, (2004) "Taiwanese IT Firms' offshore R&D in China and the connection with the global innovation network", Research Policy, Vol. 33, pp.337-349.
3. Meng-chun Liu and Shin-Horng Chen (2005), "International R&D deployment and locational advantage: A case study of Taiwan", in Takatoshi Ito and Andrew K. Rose (eds.), International Trade in East Asia, University of Chicago Press: Chicago.
4. Shin-Horng Chen (2004) "Knowledge intensification in Taiwan's IT industry", Tain-jy Chen and Joseph S. Lee (eds.), The New Knowledge Economy of Taiwan, Cheltenham, UK and Northampton MA, USA, Edward Elgar.

THE NATIONAL INNOVATION SYSTEM AND FOREIGN R&D: THE CASE OF TAIWAN

Shin-Horng Chen [1]

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ABSTRACT

R&D internationalization has increasingly involved countries outside the developed world. In addition, there has been a growing trend for countries in East Asia to seek to attract the R&D facilities of multinationals (MNCs). For such countries, they are faced with a fundamental question as to what kinds of impact MNCs' offshore R&D facilities will have on their own countries, especially in terms of technological innovation and industrial development. Set against the above backdrop, this paper sets out to open up the blackbox of the spillover effect regarding foreign R&D by examining the connection between the national innovation system (NIS) and the global R&D strategies of MNCs, with Taiwan being a prime example. The empirical part of the paper draws mainly upon intensive case studies of four high-profile foreign R&D facilities in the IT industry. The way foreign R&D interplays with Taiwan's NIS is examined in terms of the market & technology linkages.

Keywords: National Innovation System, Foreign R&D, R&D internationalization, spillover effect, linkage

Session 10

感染性疾病-.牛海綿狀腦病與人類庫賈氏病(R201 D)

Infectious Disease-BSE and CJD

September 25 (Monday).2006

時 間	議程內容	地點/主講人
08:30~09:00	報到Registration	國際會議中心大廳 Lobby(1 樓)
09:00~10:00	開幕典禮Opening	大會堂Plenary Hall（可由3、4、5 樓進入）
10:00-10:20	Coffee Break	以下會議請至2 樓201D會議室
10:20-10:30	召集人致詞Welcome Remarks	行政院衛生署侯勝茂署長 美國疾病管制局謝文儒博士
Session I： Chair：行政院衛生署 許須美技監		
10:30-11:15	Human Prion Diseases in the United States	美國疾病管制局 謝文儒博士
11:15-12:00	The surveillance system of Creutzfeldt-Jakob disease and human spongiform encephalopathy in Taiwan	新光醫院 邱浩彰副院長
12:00-14:00	午餐（餐盒） Lunch	3樓宴會廳
Session II： Chair：美國疾病管制局 謝文儒博士		
14:00-14:45	Bovine spongiform encephalopathy	台灣大學獸醫學系 賴秀穗教授
14:45-15:30	Mad Cow Disease Surveillance in the United States	美國田納西州農業部 張振東博士
15:30-15:45	Coffee Break	
Session III： Chair：行政院衛生署食品衛生處 蕭東銘處長		
15:45-16:30	Bovine spongiform encephalopathy and chronic wasting disease in the United State: The perspective by diagnostic pathology	美國普渡大學 林滄龍教授
16:30-17:15	Assessment of health risk due to consumption of beef imported from USA	國家衛生研究院 謝顯堂博士
17:15-17:30	Panel Discussion	

Curriculum Vitae

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Education:

Ph.D., Vanderbilt University, 1992
M.P.H., Harvard University, 1987
M.D., Taipei Medical University, 1979

Experience:

Investigation of major outbreaks and emerging infectious diseases
Consultation for studies on unexplained critical illness and death cases Studies of microbial pathogenesis by using experimental animal models

Present Position:

Staff Pathologist/Medical Officer
Infectious Disease Pathology Activity Centers for Disease Control and Prevention (CDC)Atlanta, Georgia, USA

Specialty: Infectious Disease Pathology and Clinical Microbiology

Selected Publications and Patents:

Lynch M, Shieh WJ, Bresee JS, Zaki SR, et al. Intussusception after administration of the rhesus tetravalent rotavirus vaccine (Rotashield): the search for a pathogenic mechanism. Pediatrics. 2006 May;117(5):e827-32.

Fischer M, Bhatnagar J, Guarner J, Shieh WJ, Zaki SR, et al. Fatal toxic shock syndrome associated with Clostridium sordellii after medical abortion. N Engl J Med. 2005 Dec 1;353(22):2352-60.

Shieh WJ, Hsiao CH, Paddock CD, Guarner J, et al. Immunohistochemical, in situ hybridization, and ultrastructural localization of SARS-associated coronavirus in lung of a fatal case of severe acute respiratory syndrome in Taiwan. Hum Pathol. 2005 Mar;36(3):303-9.

Social Activities and Honors: United States and Canadian Academy of PathologyAmerican Society for Microbiology

American Society of Tropical Medicine and Hygiene
Infectious Disease Society of America
2006 NCID James H. Nakano Citation Award
2004 DHHS Secretary's Award for Distinguished Service
2002 DHHS Secretary's Award for Distinguished Service

HUMAN PRION DISEASES IN THE UNITED STATES

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ABSTRACT

Prion diseases, also known as transmissible spongiform encephalopathies (TSEs), are a group of rare progressive neurodegenerative disorders that affect both humans and animals. They are characterized by long incubation periods, spongiform changes in the brain associated with neuronal loss, and invariable fatal outcome. Creutzfeldt-Jacob Disease (CJD) is the most common human prion disease worldwide. Based on the mortality surveillance data, the annual incidence of CJD remained stable at approximately 1 case per million persons in the United States. It usually affects people aged 45–75, and the peak incidence is between ages of 60–65. The risk of classic CJD increases with age; the annual rate is approximately 3.4 cases per million in persons over 50 years of age. The US has reported fewer than 300 cases of CJD per year for the past several years. Classic CJD has been recognized since the early 1920s. Although the majority of CJD cases (about 85%) occur sporadically, a small proportion of patients (5-15%) develop CJD due to inherited mutations of the prion protein gene. Currently, there are over 55 mutations of the prion gene that are known to cause familial CJD (fCJD) and other familial prion diseases in humans, including Gerstmann-Sträussler-Scheinker syndrome (GSS) and fatal familial insomnia (FFI). People suffering from GSS initially develop ataxia followed by progressive dementia. The exact incidence of GSS is unknown but is estimated to be between 1 to 10 per 100 million persons. FFI is characterized clinically by progressive insomnia, dysautonomia, and motor signs. FFI is a very rarae disease – approximately 60 cases have been detected worldwide since 1986. The prion protein can also be transmitted by a variety of procedures and causes iatrogenic CJD (iCJD). These procedures include dural grafts, corneal grafts, electrode implants, use of contaminated neurosurgical instruments, or administration of human growth hormones extracted from the organs of human cadavers. The risk of infection through cadaveric human growth hormone products in the US ceased when the medication was withdrawn in 1985. A variant form of CJD (vCJD) captured worldwide attention in mid-1990s after an outbreak of bovine spongiform encephalopathy (BSE) occurred among cattle in several European countries. Many studies have shown strong evidence to support the hypothesis that the variant form of prion protein was transmitted by consuming the tissues of bovines with BSE. vCJD is distinguished from the classical type by its early onset (usually in the age of 20s) and a predominance of psychiatric and sensory symptoms. To date, only one vCJD patient has been identified as a US resident. This patient was an

immigrant from the United Kingdom and very likely contracted the disease while growing up in her native country during a key exposure period of the UK population to the BSE agent. This unfortunate patient died in 2004 and a full post-mortem examination was performed by US CDC to study the pathologic spectrum of the disease. Recent reports of vCJD transmission via blood products have aroused a serious public health concern because there might be a potentially large number of blood donors with a previous exposure to BSE and are incubating the disease during blood donation. Further studies are needed to elucidate the epidemiology, pathogenesis, and pathophysiology of these prion diseases.

Keywords: Prion, transmissible spongiform encephalopathies, Creutzfeldt-Jacob disease, bovine spongiform encephalopathy.

Curriculum Vitae

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Education:1968-1975 College of Medicine, National Taiwan University

Experience:
1975 M.D
1975 ECFMG 237-862-8
1979 VQE 237-862-8
1983 Board Certified Neurologist (Taipei)
1990 Board Certified Immunologist (Taipei)
1996Board Certified Plasmapheresis Specialist (Taipei)

Present Position:
2004-present:
Deputy Superintendent, Shin-Kong Wu Ho-Su Memorial Hospital
Professor of Medicine, College of Medicine, Fu-Jen Catholic University
Associate Editors of Journal of Clinical Apheresis
2003-present
Associate Editors of Acta Neurologic Taiwanica
2001-present:
WFN National Delegate
Honorary Chief Members Neurogenetic Committee in Center China (Fai-Hai Economic Areas)
China Medical Association, Neurology Member & Editor
2000-present :Audit Member of Taiwan Drug Relief Foundation
1997-present: Editorial Board Members J Formosan Medicine
Audit Member of Bureau of National Health Insurance (BNHI)
1996-present : Honorary Consultant China Japan Friendship Hospital (Beijing)
1989-present: National Taiwan University

Social Activities and Honors:
1978-present: Taiwan Neurological Society
1979-present: Formosan Medical Association
1980-present: Chinese Society of Immunology
1986-1994: New York Academy of Sciences
1988-present: International Society of Neuroimmunology
1990-present: Taiwan Epilepsy Society
1995-present: Formosan Blood Purification Society
1996-present: ISFA
1997-present: Taiwan Stroke Society
1997-2001: ASFA

THE SURVEILLANCE SYSTEM OF CREUTZFELDT-JACOB DISEASE AND HUMAN SPONGIFORM ENCEPHALOPATHY IN TAIWAN

Hou-Chang Chiu, Shun-Sheng Chen

ABSTRACT

Creutzfeldt-Jacob Disease (CJD), one of human transmissible spongiform encephalopathy, occurs universally with an incidence rate of 0.5 to 1.0 per million and has high mortality rate. Since first reported in 1996 in Lancet for the appearance of new variant CJD (nv-CJD)-due to the Bovine Spongiform Encephalopathy (BSE) epidemic in the United Kingdom, an issue of safety of beef-product transportation was attracted international attention. This new type of CJD has enhanced profile of transmissible spongiform encephalopathies as a risk to human health and has already affected public health policy worldwide.

In April 1996, WHO has recommended that national health authorities be notified if any unusual occurrence of CJD is recognized in any other countries Until December 2005, there have 151 cases of nv-CJD in England, 11 in France, one each in Italy, Netherlands, Spain and Canada. In the end of 2003 and early summer in 2005, United States Department of Agriculture had confirmed two BSE incidents in Washington. BSE has also occurred in Ireland, France, Portugal, Switzerland, and Japan.

Therefore, CJD surveillance system in Taiwan has been setup since 1995 at Department of Heath, Executive Yuan. Till end of July 31, 2006, total of 170 cases; including 79 males and 81 females had been confirmed. 92.5 % of cases were beyond 50 years old. No case of nv-CJD has been found. The annual prevalence rate were between 0.38~0.70 per million population from 1994 to 2005. The prevalence rate did not exceed expectation and had no difference compare to the other countries.In additiom to the chinal pressention,EEG.DWI of MRI and CSF 14-3-3 are the most sensitive diagnosis tool,so far, no medication,including Quinacrine,who proved to effective for the treatment of CJD.

Keywords: Creutzfeldt-Jacob disease；new variant form CJD；Surveillance system

Curriculum Vitae

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Experience: Senior researcher and Head of Biological Research Department at Provincial Research Institute for Animal Health

Present Position: Professor at Department of Veterinary Medicine, National Tiawan University

Specialty: Virology, Immunology and Infectious animal diseases

Selected Publications and Patents:

1 Chen, J.R., C.N. Weng, T.Y. Ho, I.C. Cheng and S.S. Lai. 2000. Identification of the copper-zinc superoxide dismutase activity in Mycoplasma hyopneumoniae. Vet Microbiology. 73：301-310.(SCI)

2 Shieh. J.J., C. M. Liang, C.Y. Chen, F. Lee, M.H. Jong, S.S. Lai and S.M. Liang. 2001. Enhancement of the immunity to foot-and-mouth disease virus by DNA priming and protein boosting immunization. Vaccine 19 4002-4010.(SCI)

3 Ho, W.C., Y.S. Shien, B.J. Chen and S.S Lai. 2002. Comparison of Serum Chemistry Values in Inbred Duck (103) white Tsaiya and Its parent stock of Brown Tsaiya Duck. Taiwan Veterinary Journal. 28(4): 260-265

5. Wang C, Huang TS, Huang CC, Chien TU, Jong MH, Lin SY and S S Lai 2004. Characterization of porcine circovirus type 2 in Taiwan J Veterinary Medical Science 66 (5): 469-475 (SCI)

6. Shao-Wen Lai, Jen-Hsou Lin, Shiow-Suey Lai and Ying-Ling Wu.2004. Influence of Ganoderma lucidum on blood biochemistry and immunocompetence in the horse. Am J Chin Med 32(6) 931-940 (SCI)

7. Chu-Hsiang Pan, Ming-Hwa Jong, Tien-Shine Huang, Hsin-Fu Liu, Shih-Yuh Lin[1], Shiow-Suey Lai 2005 Phylogenetic analysis of classical swine fever virus in Taiwan. J Archies Virology (accepted, in press) (SCI)

Patent

專利名稱	獲証國別	專利權期限
本土性豬假性狂犬病病毒 gE 之基因, 其蛋白質,其製備方法與用途 107561	中華民國	88/10/11-103/9/7
本土性豬假性狂犬病毒之基因與基因缺損變異株，及彼等之製法與用途 121448	中華民國	89/10/11～105/11/10

BOVINE SPONGIFORM ENCEPHALOPATHY

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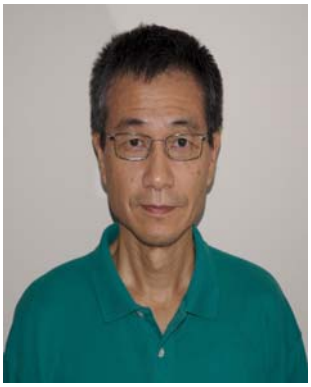
ABSTRACT

BSE is a fatal disease that affects the nervous system of infected cattle. It was originally reported in the United Kingdom (UK) in 1986. The disease is characterized by showing the sponge-like lesions in the brains of affected cattle. It belongs to a group of diseases called transmissible spongiform encephalopathies (TSEs), which also includes human disease called Creutzfeldt-Jacob Disease (CJD). The causative agent is currently considered as a prion, PrP^{res} . A new type of CJD, called variant CJD (vCJD), is accepted as being caused by the same agent that causes BSE in cattle. Susceptible cattle are exposed to BSE when they consume feed that contains specified risk material (SRM) from other infected animals. SRM are tissues that include the brain, trigeminal ganglia, eyes, spinal cord, tonsils and distal ileum, containing the agent that may transmit the disease. Cattle affected with BSE may show symptoms including nervous or aggressive behavior. These symptoms may last for a period up to six months before the animal dies. Since its original diagnosis in the U.K., BSE has been found in 24 countries worldwide, mainly occurred in Europe. As of 30 June 2006, approximately 189,966 cases of BSE have been reported worldwide, with over 184,431 of these in the U.K. The annual number of U.K. BSE cases peaked in 1992 at 37,280 and had declined to 225 in 2005. This reduction has been attributed to the implementation of feed ban in the U.K. and the other countries. Susceptibility of cattle likely vary to the agent that causes BSE. It appears that not all cattle exposed to contaminated feed will develop infectivity. Research and field experience in UK have shown that the majority of animals become infected early in life, usually within their first year. The average incubation period for the disease is four to five years, but this can vary depending on the amount of infectivity the animal was exposed to in its early stages of life. Oral ingestion studies conducted in Europe have demonstrated that a higher dose of infected material could reduce the incubation period. In contrast, an animal exposed to a very low level of infected material could reach more than eight years of age before the disease develops. In 1996, a link was made between the consumption of BSE-infected SRM in beef products and the appearance of the newly identified vCJD in humans, although the knowledge of the disease was very limited. As at 4th August 2006, 112 deaths from definite or 44 probable vCJD and six still alive have been reported since 1995 the first 3 vCJD was identified in UK. Information available to date indicates that humans are likely to be much less susceptible to the disease than cattle. As a result, original projections by public health officials in Great

Britain of worldwide vCJD cases that were in the range of ten million have been significantly reduced. In 2003, the same public health authorities estimated that between 40 and 100 additional international cases of vCJD associated with food consumption may develop over the next 70 years.

Keywords: BSE, vCJD, Prion

Curriculum Vitae



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Education: Ph.D. University of Georgia, 1984
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Experience:

- Laboratory diagnosis of animal viral infectious diseases
- Designated trainer for Tennessee lab testing for National Poultry Improvement

Plan and molecular diagnosis of avian influenza, Newcastle disease, foot-and-mouth disease and classical swine fever

- Laboratory supervision

Present Position:
Head, Immunology, Virology and Molecular Diagnostic Services
Kord Animal Disease Diagnostic Lab
Tennessee Department of Agriculture

Specialty: Laboratory diagnosis of animal viral infectious diseases

Selected Publications and Patents:

- Allison, N., T. Chang, K.E. Steele, and J.K. Hilliard. Fatal Herpes Simplex Infection in a Pygmy African Hedgehog (*Atelerix albiventris).* J Comparative Pathology 126:76-78, 2002.
- Wilson, R.B., M.A. Holscher, T. Chang, and J. R. Hodges. Fatal Herpesvirus Simiae (B Virus) Infection in a Patas Monkey (*Erythrocebus patas).* J Vet Diag Investigation 2:242-244, 1990.
- Chang, J.-D. T., C.S. Eidson, M.J. Dykstra, S.H. Kleven, and O.J. Fletcher. Vaccination Against Marek's Disease and Infectious Bursal Disease. I. Development of a Bivalent Live Vaccine by Co-cultivating Turkey Herpesvirus and Infectious Bursal Disease Vaccine Virus in Chicken Embryo Fibroblast Monolayers. Poultry Science 62:2326-2335, 1983.

Social Activities and Honors:

American Association of Veterinary Laboratory Diagnosticians
American Society of Microbiology
American Association of Avian Pathologists
Association of Veterinary Microbiologists

MAD COW DISEASE SURVEILLANCE IN THE UNITED STATES

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ABSTRACT

Mad cow disease – medically known as bovine spongiform encephalopathy, or BSE – kills brain cells of cattle and leaves spongy holes behind. A review of the regulatory actions of the BSE surveillance in the United States will be provided.

Since 1989 the U. S. government first placed a ban on the importation of live ruminants and most ruminant products from the U.K. and other countries having BSE, the U. S. Department of Agriculture (USDA) has instituted a series of policies to further protect the livestock industry and strengthen the public food safety system against BSE.

The USDA developed a BSE Response Plan, which detailed instructions of actions in the event that BSE is detected in the United States. Active surveillance for BSE has been conducted in the U. S. since 1990. Initially, it was performed by testing brain samples obtained from animals reported as exhibiting central nervous system signs. In 1993, the surveillance was expanded to include samples obtained from non-ambulatory animals. In 2001, the surveillance was again expanded to include samples obtained from animals that had died for unknown reasons.

USDA announced, March 15, 2004, an expanded surveillance for BSE in the U. S., followed the detection of BSE in an imported animal in December 2003. The Enhanced BSE Surveillance Program started June 1, 2004, and wanted to test as many cattle in the targeted high-risk population as possible in a 12-18 month period. This intensive effort was designed to help determine whether BSE is actually present in the U.S. cattle population, and if so, estimate the level of disease.

Epidemiological investigation of the two U. S. BSE cases and an estimate of the prevalence of BSE in the United States will be reported.

Keywords: Mad cow disease, bovine spongiform encephalopathy, surveillance, prevalence.

Curriculum Vitae

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Education: Ph.D., Veterinary Pathology, University of Minnesota, 1987
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D.V.M., Veterinary Medicine, National Taiwan University, 1977

Experience:
Diagnostic pathology concerning veterinary infectious, neoplastic, and toxic diseases in mammalian, avian, and aquatic animal species;
Reasearch emphasizing pathogenesis and immunology/vaccinology of veterinary infectious diseases and animal models of neoplastic diseases

Present Position:
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Diagnostic Pathologist and Head of Avian Section, Animal Disease Diagnostic Laboratory, Purdue University

Specialty: Veterinary Pathology

Selected Publications and Patents (2004-2006)**:**
Secott, T.E., Wu, C.C., Lin, T.L. *Mycobacterium avium* subsp. *paratuberculosis* fibronectin-attachment protein facilitates M Cell targeting and invasion through a fibronectin bridge with host integrins. Infection and Immunity, 72(7): 3724-3732, 2004.
Peters, M.A., Lin, T.L., Wu, C.C. Infectious bursal disease virus recovery from Vero cells transfected with RNA transcripts is enhanced by expression of the structural proteins in trans.
Archives of Virology, 150(11): 2183-2194, 2005.
Loa, C.C., Lin, T.L., Wu, C.C., et al. Comparison of 3' end encoding regions of turkey coronavirus isolates from Indiana, North Carolina, and Minnesota. Intervirology, 49: 230-238, 2006.
Hsieh, M.K., Wu, C.C., Lin, T.L. The effect of co-administration of DNA carrying chicken
interferon-γ gene on protection of chickens against infectious bursal disease by DNA-mediated vaccination. Vaccine, 2006, in press.

Societal Activities and Honors:
Phi Zeta Honor Society (Veterinary Medicine)
Sigma Xi Honor Society (Science)
American Veterinary Medical Association
American Association of Veterinary Laboratory Diagnosticians
International Society for Analytical and Molecular Morphology

BOVINE SPONGIFORM ENCEPHALOPATHY AND CHRONIC WASTING DISEASE IN THE UNITED STATES: THE PERSPECTIVE BY DIAGNOSTIC PATHOLOGY

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ABSTRACT

Both bovine spongiform encephalopathy (BSE) and chronic wasting disease (CWD) are prion diseases of ruminants. The disease is caused by an infectious conformationally changed protease kinase-resistant prion protein that is located on the surface of neuron. Bovine spongiform encephalopathy was first recognized in cattle in the U.K. in 1986. More than 180,000 BSE cases have been reported worldwide since then. Two cases of BSE were confirmed in the U.S.; one from Washington State in December 2003 and the other from Texas in June 2005. The cattle that becomes infected with BSE is by consumption of prion protein (pathologic isoform)-contaminated feed and eventually shows rough haircoat, nervousness, aggression, abnormal posture, incoordination, recumbency, decrease in milk production, and/or emaciated. The most pronounced pathological findings of BSE are bilaterally symmetrical vacuolation of neuronal processes and to a lesser extent, vacuolation of neuronal bodies in the solitary tract nucleus, the spinal tract nucleus of the trigeminal nerve, the gray matter of the obex. Accumulation of prion protein (pathologic isoform) can be seen as intraneuronal, perineuronal, linear, punctate, or particulate deposition by immunohistochemistry (IHC) with antibody to prion protein (pathologic isoform). Chronic wasting disease was first identified as a clinical entity in mule deer in a captive facility in Colorado in 1967. In addition to mule deer, natural infection of CWD occurs in white-tailed deer, black-tailed deer, Rocky Mountain elk, and moose. Chronic wasting disease has been reported in at least 11 states in the U.S. The disease is contagious and spread of CWD by horizontal and indirect routes are considered primary features in transmission of CWD among the cervids. Animals with CWD manifest weight loss, excessive salivation, ataxia, head tremor, esophageal dilatation and regurgitation, hyperexcitability, recumbency, retention of winter haircoat, and/or aspiration pneumonia. Pathologically, neuropil and neuronal vacuolation, similar to that in BSE, in the diencephalon, olfactory cortex, and medulla oblongata (particularly the parasympathetic vagal nucleus in the dorsal medulla oblongata at the obex) of the brain in deer with clinical CWD is more severe than that in elk. Amyloid plaques in the brain are commonly seen in CWD, but rarely in BSE. In addition to brain, deposition of prion protein (pathologic isoform)

revealed by IHC is widely distributed in the lymphoid follicles in CWD, but not in BSE. Such deposition can be observed during CWD incubation period without pathological changes in tissues, making the retropharyngeal lymph nodes and tonsils the sensitive tissues for early detection and surveillance of CWD in the cervids. Although, to date, no scientific evidence has linked BSE in cattle or variant Creutzfeldt-Jakob disease (vCJD) in humans to CWD in deer and elk, the concern of interspecies transmission of CWD exists and can not be overlooked. Therefore, controlling the spread of BSE and CWD in the ruminants is warranted.

Keywords: Bovine spongiform encephalopathy, chronic wasting disease, prion, pathology

Curriculum Vitae

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Education: ScD in Biochemical Engineering (1969) and Certificate in General Toxicology (1979), Massachusetts Institute of Technology, Cambridge, Massachusetts, USA;
B.A. in Agricultural Chemistry (1959), National Taiwan University, Taipei, Taiwan

Experience: Professor and Head of Department of Biology, Hong Kong University of Science and Technology, Clear Water Bay, Kowloon, Hong Kong (1997-2003); Professor and Department Chairman of Environmental Toxicology, University of California at Davis, California, USA (1969-1994)

Present Position:
Investigator and Associate Division Director, Division of Environmental Health and Occupational Medicine, National Health Research Institutes, Zhunan, Taiwan

Specialty: Environmental toxicology, toxicological health risk assessment

Selected Publications and Patents:

Hsieh DPH (2006) A toxicological risk assessment of new variant Creutzfeld-Jakob disease (nv-CJD) in Taiwanese consumers due to ingestion of beef imported from USA. Report submitted to the Department of Health, Republic of China, February 2006.

Hsieh DPH, Chou IC, Wang YC, Wang HJ, Chang LW, Wang SL, Wu KY (2006) Questions on the health risks of high levels of heavy metals found in farm soils in Changhua County. Proceedings of the 14th Symposium of Soil and Groundwater Pollution Control, Taiwan Association of Soil and Groundwater Environmental Protection, 18 January 2006, Taipei, Taiwan.

Li CM, Chu RY, Hsieh DPH (2006) An enhanced LC-MS/MS method for microcystin-LR in lake water. J Mass Spectrom. 41:169-74.

Social Activities and Honors:

Professor Emeritus, Hong Kong University or Science and Technology, Clearwater Bay
Professor Emeritus, University of California at Davis, USA
Member of Selection Committee of the Joint Program of Hong Kong Research Grant Council and Chinese National Science Foundation, 2000-2003
Member of Biology and Medicine Panel, Hong Kong Research Grant Council, 2000-2003

ASSESSMENT OF HEALTH RISK DUE TO CONSUMPTION OF BEEF IMPORTED FROM USA

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ABSTRACT

The discovery of two cases of bovine spongiform encephalopathy (BSE) in the cattle in USA aroused much fear in Taiwan of the beef imported from USA. A tier 1 toxicological risk assessment was performed to estimate the risk level of nv-CJD due to consumption of USA beef. The "toxic endpoint" in this case is nv-CJD and the "hazard" is the infectious specified risk materials (i-SRM) of cattle, and the exposure assessment was to estimate the possible amount of i-SMR ingested by a consumer through consumption of USA beef in ten years. Because in all the animal experiments described in the literature, the toxic tissue used in experiments was the brain homogenate of the bovines with BSE clinical signs, in our assessment work the amount of i-SRM was expressed as its equivalent of the amount of the BSE brain. A linear dose-response curve between the origin and the risk level of BSE of 0.5 at the experimental values of ID_{50} was used to calculate the potency of i-SRM in bovines. This linear model was validated by the negative exponential model describing an infectious disease when the dose of the infectious agent is very small. Using the literature values of ID_{50} for cattle and mice (0.67 g and 6.3 g of BSE brain, respectively) and the cross species dose-equivalence based on body weight to the power of 0.75, the relative infectivity of i-SRM in humans was calculated to be approximately 1/15000 of that in cattle. Thus the potency of i-SRM in humans was taken as 1/15000 of that in bovines. The possible amount of i-SRM ingested by a consumer in fourteen (14) years was estimated taking into account the amount of USA beef consumed, the prevalence of BSE in USA, the portion of SRM in a cleaned carcass, and the failure rates of two laws controlling the flow of i-SRM into the human food chain. The relevance of fourteen years was based on the incubation period of nv-CJD in humans. To deal with the uncertainties in the parameter values used in the calculations, a range of values around each of the parameters and a Monte Carlo simulation method of calculations were used. Our calculations resulted in the risk level of nv-CJD being in the range of 1.41×10^{-10} to 2.34×10^{-9}. The low risk level of nv-CJD anticipated in a consumer in Taiwan eating USA beef for fourteen years under a set of specified importation regulations (boneless meat of cattle under 30 months of age) is corroborated by the observations that both the incidences of BSE and nv-CJD worldwide are declining sharply due to a global effort toward eradication of these diseases.

Keywords: BSE, nv-CJD, USA beef, infectious specified risk materials, risk level

附件三、總結報告

主辦單位

中國工程師學會
Chinese Institute of Engineers

中美經濟合作策進會
ROC-USA Business Council

Sept. 22-27, 2006, Taipei

第21屆近代工程技術暨第28屆中美工商聯合會議

The 2006 Biennial ROC-USA Business Conference and The Modern Engineering & Technology Seminar 2006

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Biotechnology & Medical Technologies

生物科技與醫療技術

壹、前言

世界生技醫藥早已成為全球公認最具潛力的明星產業之一，各國不僅競相推動此一高科技，亞洲其它新興開發國家如新加坡、韓國、中國大陸等，亦相繼建立各自的核心技術平台或優勢條件，台灣的生醫研發與產業發展方向，有何競爭優勢？台灣又有何項利基可與全球生技水準並駕齊驅？

台灣多年來在生技醫藥領域已投入相當資源，成果卻不明顯。基本上，台灣不僅要與亞洲其他國家競爭，更應放眼全球，利用長久以來建立的優越機電技術產業，結合台灣已累積厚實的生技人才資源、快速研發與製作雛型、及試量產的能力，並選定重點領域，方能使台灣的生技產業成功地從創新研發進入國際市場，與國際接軌，躋身全球生技社群。由於生技產業跨越多重領域，競爭激烈且風險甚高，已不是單一機構所能完成的任務，亟需政府繼續扮演主要的推手角色，以下是我們對台灣發展生醫產業的一些建言。

貳、建議

一、策略及法規

1. 整體而言，生醫研發價值鏈包括科學、技術、創新及商品化四個主要環節，台灣相較其它生醫技術較先進的國家，在科學基礎研發與應用研發聯結方面尚有待加強，尤其必須加強基礎研究的原創性及差異性。

2. 選定並積極發展台灣的優勢技術、產品及智慧財產。政府的角色宜整合並串聯各研發單位及業界長處，延攬具生技產業實際營運經驗的管理人才，積極建立數件引領全球生技發展之技術平台。
3. 運用及確定產、學、研各級機構專長及資源，建立一個主導國家生技政策與資源合作機制，尋求合作研發方向的共識，以避免各單位因利益衝突降低合作意願，或因合作環節模式整合不周，減低產出效益。
4. 生醫產業亦不忽視市場行銷的重要性，在整合研發與產業價值鏈之外，亦須重視技術專利蒐尋、國際市場趨勢分析、美國及國際法規的掌握等，才能為生醫產業創造最大的商機。
5. 除參考新加坡在吸引國際生技大廠設立研發中心的經驗之外，並以評估可凸顯台灣的生醫技術、人民生活水準及地理位置的優勢，吸引國際知名生醫企業進駐台灣，作為亞洲營運及研發基地。

二、台灣生技發展的優先領域

1. 藥物研發建議

從全球老年疾病分析，目前全球治療藥物需求最高的疾病包括：心血管疾病、癌症、阿茲海默症、糖尿病、肥胖症、疼痛管理等；因此台灣製藥發展方向，除重點發展區域性特殊疾病如肝病之外，原則上仍應以全球需求市場為依歸。

(1)中草藥新藥開發

傳統的中草藥篩藥模式過於緩慢，應運用目前現今所開發之高通量生物晶片篩選機制，以縮短中草藥新藥研發時程。

雖然歐洲、日本、中國大陸、印度等國家的中草藥研發已有相當成果，是台灣發展中草藥新藥的主要競爭對手，如能建立一套國際承認的平台技術，像工研院正推動的中草藥基源鑑定資料庫成為國際標準，將可帶來中草藥發展的新機會。

(2)類新藥的開發

台灣目前選定的類新藥研發方向，是很正確的，畢竟製藥業是個耗時、投資大、高風險的產業，而台灣過去在學名藥的投入與經驗，已建立相當製藥基礎，如果採以類新藥方式再切入新藥研發市場，近期內可提升台灣製藥產業的新藥研發能量。

事實上，國際新藥市場平均每5個之中大約只有一個屬於真正的新藥，而其它多可歸類為類新藥，例如：莫克(Merck)的Vioxx及輝瑞(Pfizer)的Celebex，屬Cox-2 inhibitor治療痛風藥物，二者化學結構十分類似，亦都創造了極大的市場商機，利用這種模式尋求上市藥物中存有的未被滿足之市場需求，未來亦可突破台灣新藥開發的瓶頸。

2.醫療器材技術與發展的建議

依全球需求市場趨勢來看，心律調整器或人工關節等微型醫療器材項目需求遽增，而台灣過去具有精密機械、製造加工、材料工程、電子電機等深厚技術基礎，加上近年來積極發展的通訊及微小化技術優勢，將可成為台灣進入世界醫材產業的利基項目。

醫療器材的臨床試驗時程幾乎約為新藥的三分之一，大概需要3-4年左右，更重要的是，美國FDA對醫療器材的審核法規要求相對的寬鬆許多，且非侵入性的醫材器具510K審核在台即可完成，能夠使用510K審核機制的產品也是台灣快速發展醫材的重點之一。

(1)建立生物晶片技術整合平台

所謂「生物晶片技術整合平台」，指的是一項可廣泛地運用於相關生物技術開發及應用之核心能力，其應用範疇包括：開發診療用醫療器材、加速新藥篩選與開發、應用於生物感測及蛋白質體、基因體研究等。

因生物晶片具有高通量與高密度的特性，可迅速與精確地獲取試驗結果，且降低成本；雖然目前世界很多生技業者都在從事此一技術研發，甚至也有產品已完成商品上市，但低成本晶片與試驗結果精確度仍未，到達臨床應用的階段。

台灣目前既已具有生物晶片量產技術，可將晶片成本大幅降低至每片美金10元，若再能運用台灣的機械與資訊等技術專長，以加速精確度的提提

升為研發目標，國際競爭力必能倍增，同時也可以利用台灣自行開發的生物晶片為研發工具，加速生技醫藥的研發。

(2)疾病診斷與醫學顯像

台灣的奈米技術已初具規模，建議具體地應用於生技製藥方面，如用奈米粒子結合抗體，偵測腫瘤之位置；另可用奈米粒子結合藥物，以為治療之用，是未來醫療檢測與治療頗具潛力之技術，也可充分利用結合台灣影像分析的技術。

台灣目前積極發展的生物標記研發，如能結合生物感測及治療性的醫療　器材技術，例如美國很多生技公司正進行開發智慧型的糖尿症治療機，是能夠結合血糖偵測及釋放胰島素治療功能的整合型醫療器材。

(3)生物標記與生物感測

台灣優異的臨床醫學及醫學歷史環境，給台灣一個很好的發展生物標記與生物感測基礎。而生物標記的發展，亟需臨床醫師的合作，就台灣而言，適足以提供此一方面的專長需求。

台灣現階段惟略為缺乏的，是產業界生物標的研發經驗，因此建議可借重與國外專家之經驗交流，必能加速台灣在生物標記與生物感測技術的研發。

目前全球一般性診斷用的醫療器材，已臻於成

熟，且趨於飽和，所以建議台灣可以生物標記技術作為切入診斷技術領域的機會，應鎖定特定疾病之生物標記研發，因為此類研發方興未艾，在專利布局及市場規模都有相當大的空間，而且個人化醫療是全球公認的發展方向。

三、擴大國際合作

1. 讓台灣變成世界的一部分：須以國家主導來建立具有實質效益的跨國合作計畫，或能藉由研發人員互換及研發合作內容，以強化或互補彼此生技水準。
2. 建立國際合作新策略：與國際中型或新興具有潛力的生技公司，建立合作計畫。
3. 保持海內外的生技社群互動關係：鼓勵海外人才，與台灣合作研發 （若能配合台灣的重點計畫更佳），一方面訓練本地人才，也可相互了解國內外的新方向。另外也可藉定期舉辦招募活動、多舉辦國際研討會及寄送台灣出版的生技雜誌等，使海外人才了解台灣產業現況。

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能源科技與永續技術

Energy Technology and Sustainable Development

能源科技與永續技術

壹、前言

由於油價不斷上漲，世界各國再次面臨能源危機，紛紛策劃應變方針。煤炭也因此更顯現其成本利基，但淨煤技術必須持續推動，方可保持能源效率及環境保護。

台灣並非產油國家，多元性能源之開發因此特別重要，尤其是發展再生能源，例如，太陽光電與燃料電池等，以能取代石化類能源，且可減少環境污染，是鞏固能源供應之安全與配合全球溫室氣體減少之明智措施。

貳、建議

一、由於煤炭為我國主要的能源，所以淨煤技術為一不可或缺的技術研發項目。一則可提升能源效率，另一則可降低污染排放。

二、透過氣化過程，煤炭可轉化為潔淨的合成氣，合成氣可用為燃料，化學品原料或煉鋼的還原劑。因此，建立煤炭氣化技術可作為發展未來淨煤技術的近程目標。

三、推動於工業區設立集中式煤炭氣化中心，有極佳的經濟誘因，且可增進能源使用效率。

四、由於大型整合式煤炭氣化複循環發電較高的建置成本及較低的可用度，因此建議俟其技術成熟後方考慮引進。從長期來看，結合固態氧化物燃料電池為一值得研發的方向。

五、固態氧化物燃料電池(SOFC)可應用於混合式電力應用，值得電力產業持續參與國際技術之應用，待機引進。

六、從產業發展觀點來看，質子交換膜燃料電池(PEMFC)之應用領域最廣，包括分散式電力的應用、可攜式應用、車輛應用等值得國內發展。

七、台灣燃料電池產業可由關鍵元件之利基產業發展，逐步擴大發展系統應用產業，PEMFC應用面廣，產業容易切入，應加強相關研究發展。

八、太陽光電(Photovoltaic, PV)技術與產品近兩年來受到各國的重視，產品的應用市場的高成長率亦帶動產業發展的利基，目前的PV仍以矽晶太陽電池(Solar Cell)為主，但成本高的因素使其大幅推廣應用的商機仍待努力。

九、非晶矽於塑性基板上的太陽電池，有快速的成長。美國、日本外，中國大陸亦積極尋求外來資源合作，開發非晶矽太陽電池，因此我國宜密切注意其動態。

十、非晶矽太陽電池在轉換效率上有本質上的光引發劣化效應(Staebler Wronsk Effect, SWE)，如何以氫(Hydrogen)來穩定矽的結構，改善薄膜內矽氫結構以減少光劣化的影響是重要的研究課題。

十一、採用雙層結構提升非晶矽薄膜太陽電池效率是目前國際發展重點，為值得積極發展之研究課題。

十二、以目前產業技術而言，薄膜太陽電池(Thin Film)仍然是尚未規格化的產品，因為其效率仍低於矽晶太陽

電池，而且設備投資額亦高，生產良率等問題亦有待突破，如何加強設備及鍍膜技術研發，並且大幅降低製造成本是未來必須努力的目標。

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平面顯示與光電技術

Flat Panel Display and Optoelectronics

平面顯示與光電技術

壹、前言

台灣近年來平面顯示產業成長快速，已躋身於全球一流生產王國之列。但產業界投資龐大，獲利有限；前有日韓之競爭，後有大陸之追趕，面對第九、第十代生產線之投資，低投資回報將益發嚴重。

貳、建議

一、政府應積極獎勵廠商將研發中心與營運總部設在台灣，使具前瞻性與高附加價值之顯示器技術在國內發展，以增加產業效益。

二、政府應積極輔導面板廠商整合，以提高產能效益，並增加國際競爭力。政府不宜輕易修改法令放寬貸款上限，而使社會投資大眾承擔過大風險。

三、政府未來選擇重點產業發展項目時，應以合理獲利為主要考量，不宜只以獲取最大產值為主要目標。

四、台灣應積極國際化，加強科技人員外語交流能力，吸引國外人才，導入技術，並定期選派技術及管理人員出國進修。

五、軟性顯示器是下世代顯示器主力，我們的鄰國韓、日、美及大陸已大量投入研發。政府應有更明確的政策，輔導產、學、研各界迅速投入研發及製造，跟上時代需求，積極開發軟性顯示器技術之產業化，定為未來兩年

之首要任務；包括成立「軟性顯示器聯盟」，由工研院相關單位主導推動，以及增加科專補助計畫。

六、政府應鼓勵廠商與國外廠商合作，並引進先進軟性顯示器技術。

七、政府應整合上、中、下游廠商積極開發軟性顯示器材料、元件、製程技術及製程設備，並開發出自有或超越國外專利之技術。

八、政府應肯定METS 功能，妥善安排適當官員及業界踴躍參加會議，加強交流。

參、總結

政府應積極協助面板廠商提升國際競爭力。為推動前瞻性與差異化之顯示器技術在國內發展，軟性顯示器技術應列為政府重點發展的目標，以防止顯示產業規模大卻利潤薄弱，並達成高附加價值產業根留台灣之最終目的。

肆、小組成員

中方召集人：程章林　博士

美方召集人：潘益宗　博士

徐　榮　博士

陳政寰　博士

韋忠光　博士

簡良吉　博士

劉軍廷　博士

工作人員：陳芳益

吳　凡

奈米與微機電技術

Nano and MEMS Technology

奈米與微機電技術

壹、前言

奈米科技被公認為21世紀最重要的產業技術革命，因為奈米所引發的新特性與現象提供了廣泛的應用契機。先進國家無不爭相投入大量的研發資源，台灣欲取得領先地位，未來發展重點可朝向奈米電子、光電、能源及生醫科技進行跨領域整合，加強奈米基礎與應用科學之研究。為能有效達成前述目標，提出下述建議。

貳、建議

一、發展奈米技術應依循以下三階段：

1. 新奈米材料基礎研究

2. 新應用元件特性研究

3. 系統整合應用研究

這些須要產、官、學、研密切合作，並促進國際交流。

二、加強光電與生醫的整合，發展新奈米光電與微機電元件於生醫檢測或治療之應用。

三、支持奈米技術應用在能源之發展，同時達到開發出替代能源及節能的目的，如太陽能電池、燃料電池、發光二極體等技術。

四、推廣奈米材料(如半導體、金屬及金屬化合物等)於生醫領域，如藥物傳輸、分子顯影等應用。奈米材料對生物的安全性並需評估。

參、結論

台灣欲取得奈米科技領先地位，未來發展重點可朝向奈米電子、光電、能源及生醫科技進行跨領域整合，加強奈米基礎與應用科學之研究。

肆、參與人員

蘇宗粲、莊順連、吳明強、劉炯權、謝達斌、林唯芳、丁　晴、王思昆、王振隆、甘恆全、吳紹坤、宋嘉斌、李存龍、李家宏、李源欽、杜政繁、汪若蕙、林中君、林正軒、林家興、林聖文、邱桂霖、柯朝元、高至鈞、張火成、張明智、張凱程、郭中冕、陳四平、陳培元、曾仕君、黃振進、楊磊明、熊瀛松、蔡信行、賴奕穎、李欽誠、王慧文、林正晃、董玉年、Roy.L.Le Anderson、林莉琦、張復彥、黃士元、李宜萍、黃銘裕、郭榮沛、王先知、李克明、陳慶新、吳營榮、顏淑娟、陸南屏、王秀慧

資源回收再利用

Environment Protection & Resource Recycle

資源回收再利用

壹、前言

資源回收再利用方式已由80年代3R（Reduce減量、Reuse再利用、Recycle回收）理念，延伸為6R（3R加上Refuse拒絕、Research研究及Replace替代），因此減量、資源回收與再利用已成為國際環境發展之主流。我國也順應潮流，對於廢棄物的管理，已由妥善處理導向為「全回收、零廢棄」及永續環境的方向推行。

這幾天在台灣參觀了工研院及國內電池回收廠等，了解台灣資源回收制度與法規已相當完備，技術發展與教育宣導工作也做得很紮實，未來如再強化市場機制的輔導運作，有助於台灣的資源回收再利用成果的提升。本次研討會「資源回收再利用組」即是以電池的回收再利用管理政策與技術為主題進行研討，對於乾電池、鉛蓄電池的回收都有深入的討論與交流，期望能對台灣邁向「資源循環型社會」的目標有所幫助。

貳、建議

一、電池資源之回收雖是困難重重，但也勢在必行，尤其在處理技術，應防止二次污染的發生，尤其具有挑戰性的戰略規則及執行。我政府執行機構已具備良好的法規，能在政策方面輔導廠商，以收管理及資源利用之效能，而達到造福人民保護環境的目的。

二、政府應參考國際間能源及環保政策，擬定適合國內電池業界的特長，訂出短程、中程、及長程研究發展（R&D）目標，編列預算，積極輔導台灣電池工業的成長。國內奈米技術居世界一流水準，宜考慮將nano-technology推廣至nano-battery及nano-material領域。

三、根據世界各國對綠色環境的要求，以及台灣正積極融入世界社會、永續發展以及國際組織的時刻，我國必須提昇對節能降耗，資源重複利用和保護環境的積極性，才能在世界貿易急劇競爭的情形下，求生存求發展。

四、我國發展民生用的燃料電池，以低溫型發展為主，而觸媒以白金系貴金屬為主，極具回收價值，當數量達到一定規模時，回收體系自然可以建立起來。

五、廢鉛蓄電池的回收技術單純，每單位廢電池中粗鉛之回收比例高達70%，因此極易形成一封閉的物質循環體系。目前台灣的廢鉛蓄電池回收率多維持在七成左右，且合格處理場僅有一家，因此，對於體制外的回收處理業者的存在，以及其收購行為對廢鉛蓄電池回收體系運作的影響，乃是必須正視的問題。

六、國際鉛金屬市場行情的變化，牽動國內廢鉛蓄電池的廢料售價與二次鉛的市場價格。建議廢鉛蓄電池的回收清除處理費率與補貼廢率的訂定，應持續追蹤國際鉛金屬價格的漲跌變化，特別是在國際行情低迷時，應密切關注回收率的變化，而當國際行情高漲時，則應精確掌

握國內廢鉛蓄電池的市場價格成本的變化，適度調整相關費率，並輔以積極查緝不符合環保規範之清除處理行為，確保廢鉛蓄電池回收清除處理體系能在最符合成效性的原則下，順利運作。

七、在國外廢乾電池管制主要對象是製造業者、批發商和零售商，消費者常常只是受宣導教育的對象而已。在台灣除垃圾分類可以強制要求民眾分類排出外，亦可以對業者加重責任，其中包括進口的產品。

八、廢乾電池含有Hg、Cd及Pb等重金屬成分，有造成環境污染並危害人體健康之虞，最佳廢乾電池處理之管理境界，可減輕對自然環境及人體健康潛在之威脅，減毒及減量，並參採國外處理技術依據國內適用性加以評估，決定最適回收處理及再利用技術，以達提昇國內廢乾電池回收再利用技術與能力之目標。

九、環保署補助回收商，而容許其自由選擇回收國外處理廠，雖然回收處理要求有相當標準，但常常出現所謂處理商只是中間經手，兩邊得利的現象。雖然資本主義商業表現應以自由為重，但環保署似可在旁協助，以保證我方之利益。

十、當今發展中國家（尤其在亞洲鄰國）對廢棄物回收及利用，尚欠缺政策及有效實施。我國能先事發展出廢棄電池及其它廢電子產品重複利用的方法，推廣至這些發展中國家，不僅可受國際尊重，方便外交，亦可有睦鄰之效，對貿易商亦頗有裨益。

參、參與人員

召 集 人：張國龍

主 持 人：楊慶熙

主 講 人：唐次朗、張克致、勞長春、蔡克勤、張四立、張添晉

工作人員：劉怡焜、洪怡芳

與會人員名單：

編號	姓 名	單 位	職 稱
1	丁一權	永續環保股份有限公司	廠長
2	王文革	彰化縣環保局	技士
3	王興如	普誠環保工程有限公司(台中分公司)	經理
4	何舜琴	環保署廢管處	處長
5	吳郁煌	環保署廢管處	工程員
6	呂仁宙	躍成科技股份有限公司	副總經理
7	宋以仁	環保署廢管處	科長
8	李守謙	環保署廢管處	環境技術師
9	李志怡	環保署基管會	副組長
10	李貞瑩	環保署廢管處	技正
11	李鴻源	環保署廢管處	技正兼組長
12	杜豐生	綠電再生(股)公司	總經理
13	周志儒	高雄第一科技大學環境與安全衛生工程系	系主任
14	林文華	國際超能源科技(股)公司	總經理
15	林玉韻	環境資源研究發展基金會	助理研究員
16	林玉麟	環保署廢管處	稽查督察員
17	林昌文	環保署環境督察總隊台北辦公室	正工程司
18	林政江	經濟部工業局	技士
19	林群超	環境資源研究發展基金會	副研究員
20	邱志鵬	核能研究所	副工程師
21	邱俊雄	環保署廢管處	薦任技士
22	洪榮勳	環保署	專業研究員

編號	姓　名	單　　位	職　稱
23	張木彬	中央大學環境工程研究所	所長
24	莊韻蓉	台中市環保局	課長
25	許明華	環保署廢管處	技正
26	許智倫	環保署廢管處	組長
27	郭益志	環保署廢管處	稽查督察員
28	陳文雅	環境資源研究發展基金會	助理研究員
29	陳宇揚	財團法人台灣產業服務基金會	副理
30	陳孝仲	康城工程顧問公司	工程師
31	陳秀玲	台中市環保局	稽查員
32	陳俊成	淡江大學水資源與環境工程系	系主任
33	陳俊融	環保署毒管處	技士
34	陳峻明	環保署廢管處	高級環境技術師
35	陳健銘	環保署廢管處	工程師
36	陳樺蓁	環保署廢管處	技士
37	傅素貞	彰化縣環保局	技士
38	曾宗瑜	台北縣環保局	技佐
39	費定國	中央大學化學與材料工程系	教授
40	費齊信	環保署基管會	環境技術師
41	黃冠穎	環保署科技顧問室	行政助理
42	黃輝源	環保署中區督察大隊	大隊長
43	黃麗玫	環保署中區督察大隊	稽查督察員
44	楊文雄	環境資源研究發展基金會	副研究員
45	楊慶熙	環保署廢管處	副處長
46	楊慧聆	苗栗縣環保局	約僱人員
47	楊麗貞	環保署毒管處	毒化物管理師
48	鄒　倫	中技社	主任
49	廖彬良	環境資源研究發展基金會	副執行長
50	熊明德	環保署科技顧問室	行政助理
51	劉文馨	永續環保股份有限公司	總經理特助
52	劉偉成	綠園國際股份有限公司	總經理
53	劉清雄	博研燃料電池(股)公司	總經理
54	蔡志昌	台灣湯淺電池(股)公司	課長
55	蔡孟裕	高雄縣環保局	副局長

編號	姓　名	單　　位	職　稱
56	蔡敏行	台灣資源再生協會	理事長
57	鄭宏德	晶淨科技(股)有限公司	總經理
58	鄭清山	高雄市環保局	簡任技正
59	盧曉宜	環保署廢管處	技士
60	謝燕儒	環保署廢管處	簡任技正
61	鍾昀泰	環保署廢管處	工程員
62	藍文忠	中興工程顧問公司	工程師
63	藍得彰	工研院	副研究員
64	顏子修	環保署毒管處	助理毒管師
65	顏振華	經濟部工業局	技正
66	羅瑞玫	苗栗縣環保局	技佐
67	蘇意筠	環保署環境督察總隊	薦任技士
68	吳淑慧	台北科技大學環境工程所	
69	姚凱富	台北科技大學環境工程所	
70	李淑莉	台北科技大學環境工程所	
71	陳俞穎	台北科技大學環境工程所	
72	金珮瑩	台北科技大學環境工程所	
73	王嘉慶	台北科技大學環境工程所	
74	邱俊樺	台北科技大學環境工程所	
75	賴秉鴻	台北科技大學環境工程所	
76	張哲銘	台北科技大學環境工程所	
77	許繼穎	台北科技大學環境工程所	
78	黃致喬	台北科技大學環境工程所	
79	陳碩之	台北科技大學環境工程所	
80	李銘清	台北科技大學環境工程所	
81	吳欲齊	台北科技大學環境工程所	
82	陳育民	台北科技大學環境工程所	
83	陳世育	台北科技大學環境工程所	
84	陶令瑜	美國在台協會商務組	
85	周志儒	高雄第一科技大學環境與安全衛生工程系	系主任
86	彭致和	環保署環境督察總隊	副工程司
87	張雅淳	環保署環境督察總隊白北辦公室	行政助理
88	謝志武	台北市環保局	

水管理

Water Management

水管理

壹、前言

近年來由於天然水文與地文環境受到全球氣候變遷、土地開發型態改變、都市化效應及民國88年921集集大地震及全球氣候暖化水文情勢劇變之衝擊，致使水旱災之頻度增加，災情亦日益加劇外，民國93(2004)年石門水庫原水濁度升高危機，近百萬桃園鄉親生活受到衝擊後，每逢水災，用水供應已成為必然面對之問題。

有鑑於此，為促進永續水資源之發展，提供穩定供應之水資源，本次水管理分組特以「雨洪管理」、「邁向永續發展之整合式水管理」及「自來水公共建設現代化整體計畫」等為主題，透過兩地學者專家熱烈討論與交流，凝聚共識與尋求對策，並加速台美兩國水資源技術交流。

貳、建議

一、建議研訂相關制度，宜漸進式實施雨水管理政策，優先推動非工程措施，例如：

1. 運用雷達建立洪水預警系統。

2. 結合類神經網路技術及傳統水文工程科技，建立各種不同領域之預警系統，應用於河川防洪、城市洪水、山坡地土石流、農業管理、水資源污染及養殖漁業等。

二、為快速有效處理水源之濁度及其他污染物問題，建議採用結合聚合物及細砂之快速沈澱技術，此技術可將雨洪

之污染物集中處理，並兼具用地面積小及操作穩定性高之特性，可取代一般之淨水處理。

三、為達水資源永續發展目標，除建立水資源管理及需求管理政策，及健全之法令外，應尋求適合本土化之措施以解決本土特殊之問題。

四、臺灣水資源課題日益複雜，牽涉層面甚廣，亟需研發關鍵性及本土化技術，促進水資源永續利用。建議政府擬訂整體計畫，編列足夠經費，分年推動。

五、建議政府擬定自來水公共建設整體永續發展計畫，分年推動，並將成本合理反映於水價中。

參、參與人

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3.龔誠山　博士

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5.張建祺　博士

6.洪勝男　博士

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寬頻通訊與網路整合

Broadband Communication and Network System Integration

寬頻通訊與網路整合

壹、前言

當前全球通訊服務是朝向建構先進的「寬頻通訊」基礎設施，在「網路整合」的目標下，促成各式新型態服務的出現—讓任何人、在任何地方、任何時間、透過任何網路與設備，獲得各種訊息服務與多媒體應用。因此，「寬頻通訊與網路整合」牽涉的議題，不僅要建立一個健全的通訊環境，未來更重要是開發創新、使用者需求導向的服務，同時塑造安全可信賴的網路環境，以鼓勵優質網路社會、數位生活的實現。

在全球化競爭的環境，欲推動台灣寬頻環境持續成長、並以數位內容與加值服務帶動整體資通訊及媒體相關產業的發展，有賴產、官、學、研及公協會等各界扮演相輔相成之角色；政府引領主導前瞻性政策的制定，並建立長期性科學與技術發展的環境，學術及研究機構與產業界協同創新，開發新技術、新產品與新服務，以有效整合各種資源，達到提昇國民生活品質及國家競爭力的目標。

貳、建議

為達成以上之目標，本分組有下列六項建議：

一、推廣IPTV服務，帶動相關產業發展

1. IPTV的定位需與傳統電視區隔，個人化與互動式的服務是重點，建議加強這方面的研發。

2. 建議運營商應強調服務／內容的研究與開發，從傳統的追求技術領先優勢思惟轉成兼顧服務與技術。
3. 行動電視有機會成為3G的killer application，可為運營商及終端製造商帶來可觀的商機，建議及早投入。政府亦應儘速完成頻譜規劃。
4. 數位匯流趨勢下，建請政府以積極開放的態度制定相關法規，以確保IPTV產業的健康發展。

二、研發帶動無線通訊產業成長關鍵技術

1. 國內市場規模不大，缺乏完整的產業鏈來主導產業技術標準，建議研發資源應適度聚焦，加強無線通訊產業中關鍵共通元件和技術的研發，像是顯示器、記憶體、電池、多媒體處理器以及終端嵌入應用軟體與加值服務系統技術等等。
2. 行動終端產業趨勢，低階手機將面臨毛利非常薄弱的困境，建議應朝高階及高毛利終端發展，例如以創新服務引導的特製終端（黑莓機）。
3. 建議國內產學研界多參與國際標準會議(3GPP&3GPP2)與重要技術論壇，積極發表技術提案，爭取納入標準，進而扭轉智慧財產權方面的劣勢。

三、建議研發建置新一代電信整合維運系統

1. 建議國內電信公司積極參與國際電信維運領域之活動，掌握新一代電信維運技術，從而降低維運成本，提高用戶滿意度。
2. 建議國內IT產業、設備廠商、與電信公司密切合作，

研發新一代整合性維運支援系統，帶動相關產業的發展，進軍國際市場。

四、制定有利數位家庭與數位生活產業發展的策略

1. 數位家庭及數位生活為國際上頗受重視的科技與產業趨勢，建議政府加速推動相關研發，積極培養系統工程及經營人才，並在e-Taiwan、M-Taiwan和相關國家型計畫下建置示範應用。
2. 所涉及異業整合課題，建議相關產業公協會在政府協助下積極促成。
3. 建議積極發展平台事業（platform business），確立在國際產業的新定位，以利產業和經濟發展。
4. 建議加強使用者需求分析，並確立應用情境易被使用者接受。

五、推廣建立網路環境信賴機制及其應用，提供網路空間與實體世界同樣的權利保障。

1. 以應用導向加速推展電子身分認證服務。(建議設立公務人員與專業證照人員的合併憑證管理中心)
2. 建立多卡合一推動策略，提升我國電子認證的綜合應用，促進相關產業發展。
3. 加速結合密碼與生物特徵技術的電子護照推展，以利與國際接軌。
4. 研擬適用於Web 2.0時代的著作權規範，針對互動、分享概念下所衍生的安全性議題研擬對策。

六、推動邁向下世代電信網路整合服務，發展電信級通訊應

用產業

配合全世界電信網路朝向網際網路多媒體子系統(IMS)發展趨勢，建立IMS服務開發試驗環境，鼓勵從事新世代網路影音多媒體加值服務的創意開發，並建立國內外智慧財產權。

以上建議在政府與民間共同努力推動下，將可適時提供寬頻通信整合網路及服務，並拓展我國資通訊產業的國際競爭力。

參、參與人員

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知識型及數位創意產業管理

Management of Knowledge and Creativity Digital-Based Industries

知識型及數位創意產業管理

壹、前言

在全球邁向知識經濟以及資訊社會的趨勢下，政府推動產業電子化，旨在協助我國產業由「製造」導向，轉型為以「服務」為導向之創新資訊應用推動。而無所不在（Ubiquitous）的網絡建置及其上的加值應用，就更有其必要性及迫切性。同時，在法制面上必須重新檢視我國目前有關競爭規範、隱私安全、網路匯流與管理等與資通訊相關的法令規範，以完備U化社會的基礎環境建構。而在這平台上，數位創意產業的發展，不僅擴大了藝術創意的可能性，也因其具體化的應用在創新科技上，提升了人們生活的舒適與智慧。有鑒於此，本分組就下列三項議題深入探討：

一、如何以創新資訊服務，使應用服務加值。

二、如何推動U化應用，以創意生活價值。

三、如何推動數位創意，以展現知識品質。

貳、建議

一、創新資訊服務，應用服務加值

我國服務業產值佔GDP比重已超過70%，服務業儼然成為我國經濟發展的關鍵與重心。而參考現今各項明顯趨勢，政府必須積極投入以軟體、應用及服務為核心的產業發展。科技化服務或創新資訊服務的發展對台灣產業的未來是非常重要的策略方向，值得輔導、投資及培育。

1. 製造業是台灣在全球唯一獨領群雄的領域，應利用此一優勢，運用多年之製造知識結合科技化服務，以擴大硬體產值及銷售量，而創新服務也能利用現有高科技製造業的全球行銷通路，開拓外銷新局。
2. 我國從製造轉型到服務，政府需從一個更宏觀的視野來思考，並扮演促成、協助、或推動的角色，例如推動產、學、官、研的資源整合，藉以培育結合科技與營運創新模式的服務專業人才。同時，為能更深入的了解相關議題（如文化、管理、組織變革），亦可以向其他具有類似經驗的國家（如新加坡），公司（如IBM、HP）學習。
3. 選擇國內具競爭潛力之服務業優先推動，如通訊、金融、流通、製造等服務業之領導廠商應該積極投入全球市場，尤其是行動通訊業更為迫切；同時亦必須考量到全球競爭力與市場差異化等重要因素。
4. 專業分工是服務業朝全球化發展必走的方向，我國應加速科技化服務之基礎建設ICT平台之建置，以協助產業發展各項創新科技化服務給全世界。
5. 政府需有相關基礎建設、環境法制等配套措施及規劃。例如培育延攬相關科技化服務專業人才、建置網路寬頻、法令鬆綁（如規劃創新服務需同時考量頻譜的配置）、投資模式（如協助早期種子資金的取得）、產業優惠條例（如租稅減免、小型與創業公司的研發補助）、以服務基礎建設（如無線台北、

M-Taiwan）的創新服務。

二、推動U化應用，創造生活價值

台灣下一階段的發展方向－「優質網路社會」（ubiquitous network society），是建構在「e-Taiwan」與「M-Taiwan」等計畫的基礎上，配合「數位匯流」與「無所不在網路」的發展，以及「隨手可得的e化服務」應用趨勢，建設感知網路（sensor network），將有線網路、大哥大網路、無線網路、無線電視網路、有線電視網路、數位廣播網路及電線通訊網路（PLC, Power Line Communication）等不同網路，匯流成台灣下世代的高速網路。因此，在策略上，建議規劃推動符合民眾需求（Demand）的生活關鍵應用，加速優質網路與發展環境的整備，進而解決社會經濟發展議題，帶動科技化服務的發展。建議具體措施如下：

1. 規劃推動符合民眾需求的生活關鍵應用（Life Enhancing Application），初步規劃推動食醫住行育樂六大生活領域關鍵應用。例如食品生產履歷、緊急醫療資訊服務、優質社區安全防護等，亦應考量整體配套措施（如緊急醫護人員之素質提升等），以建設台灣成為世界U化應用櫥窗。
2. 積極整備基礎網路建設，包括：(1)加速高速寬頻網路建設；(2)加速無線寬頻所需頻譜之開放；(3)推動感測環境測試；(4)促進資通訊網路與數位廣播匯流；(5)建構公平競爭環境；(6)建構優質網路城

市，並清楚勾勒出我國整體寬頻電信政策，以實現下世代網路數位匯流等。

3. 完備優質網路社會發展環境方面，應先全面檢視相關法規，包括：(1)確立推動「優質網路社會基本法」立法與相關法規修法方向；(2)建立優質網路社會資通安全與信賴機制；(3)提供創造、流通及運用數位內容之環境；(4)持續積極推動縮減數位落差，創造公平的數位機會；(5)提升全民資訊素養、培育下世代網路所需之創新、科技與服務人才；(6)推動國際合作，厚植柔性國力，行銷台灣等。

三、推動數位創意，展現知識品質

「活在創意生活中，人會變得更美麗；活在創意生活中，人會變得更有智慧；活在創意生活中，人會變得更快樂。」為目前歐美各國民眾所追求的生活品質。在數位資訊時代裡，各國為達到這樣一個理想，紛紛發展「數位創意」的新興產業，它賣的並非只是具象的產品，而是科技與藝術結合的「創意」結晶，把互動式媒體科技結合數位藝術創作，讓創意發生我們的日常生活中的公共場域或大型活動中，如捷運站、博物館、商圈大樓、娛樂場所、博覽會、奧運等場域與活動。「數位創意」產業的發展不但擴大了藝術設計的可能性，也提升了科技媒體應用的廣度，更提高人們生活的舒適度與智慧度。並有以下幾項建議：

1. 建議政府鼓勵與補助成立科技與藝術領域兼顧的跨領

域系所，並從大學部開始著手，以培育數位創意及創意創業人才，促進數位創意產業的扎根，提升就業機會，協助傳統產業創新轉型或升級。

2. 籌建國家級數位創意機構／園區，提供產業推動與服務的資源整合平台；並籌設產學研合作委員會，研究調查數位創意發展趨勢，及具有全球市場利基與在地文化特殊性的新興事業產品項目。
3. 鼓勵開發台灣的數位創意「原創」。我國目前有幾家從事互動式數位藝術的創意公司，但所遇問題多為技術上的無法突破，以及技術上、在創意上抄襲國外的作品。建議政府應積極推廣智財相關活動，及舉辦以「原創」發想之系列競賽。同時，並促成更多、更廣泛研討數位創意與其產業發展的意涵、範圍、特色、獲利模式、產值與價值的國際活動舉辦及前瞻論述發表。
4. 政府應投入相關創意研發的經費。這幾年創意產業口號不斷的被喊起，但大部分之經費都用在辦活動與推廣上，鮮少用於研發上。台灣目前在數位創意產業所缺乏的是數位媒體科技與數位藝術「整合」的研發經驗與實力。而這些皆需一步一腳印慢慢耕耘與累積的。因此，建議政府能多投資此方面的研究開發經驗。
5. 讓科技與藝術做一結合。在國際上一件大型的互動式數位藝術作品，作者一列出猶如一部電影製作，需

分別列出各領域的參與執行者。跨領域結合，是國際上一件大型互動式數位藝術作品的成功要件。但台灣環境中科技與藝術跨領域結合仍是彼此間有點水土不服。因此建議政府在相關徵求計畫書中，應將跨領域合作列為篩選條件之一。

參、參與人員

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IBM T.J. Watson Research Center 劉龍國 博士

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16	林開南	台灣電視事業股份有限公司	主任
17	陳韻如	尼爾森行銷研究顧問	經理
18	李效傑	全虹企業股份有限公司	協理
19	李志明	西班牙對外銀行	首席代表
20	廖敏如	西班牙對外銀行	副代表
21	鄭煒煌	亞洲信託投資股份有限公司	董事長
22	鄭正元	東元電機股份有限公司	所長
23	江清水	東吳大學	主任
24	蔡文信	金源貿易股份有限公司	董事長
25	李宜萍	哈佛企業管理顧問股份有限公司	主編
26	耿慶蕙	美國新墨西哥州政府駐華辦事處	代表
27	陳啟雄	飛利浦(中國)投資有限公司	總經理
28	仲偉庭	財經新聞報	主編
29	林雅芳	國立台灣藝術大學	專案總監
30	許素朱	國立台灣藝術大學	主任
31	孫貴章	探網科技股份有限公司	總經理
32	吳賢智	啟皇實業有限公司	總經理特別助理

編號	姓　名	公　　司	職　　稱
33	張恆誠	頂順機械股份有限公司	總經理
34	陳金冰	博暉科技股份有限公司	協理
35	黃士元	華鴻創投集團	投資協理
36	張常昌	新光人壽保險股份有限公司	專案主任
37	吳毅倫	經濟日報	記者
38	賴杉桂	經濟部中小企業處	處長
39	李欣哲	經濟部能源局	副主任
40	柯志昇	資訊工業策進會	執行長
41	黃國俊	資訊工業策進會	副執行長
42	龔仁文	資訊工業策進會	所長
43	李漢超	資訊工業策進會	主任
44	徐志浩	資訊工業策進會	組長
45	林明松	資訊工業策進會	經理
46	黃繼弘	資訊工業策進會	經理
47	孫明照	資訊工業策進會	經理
48	江志浩	資訊工業策進會	副組長
49	黃柏蔚	資訊工業策進會	工程師
50	蘇頌凱	資訊工業策進會	工程師
51	陳奇佐	資訊工業策進會	工程師
52	金繼昭	資訊工業策進會	工程師
53	江瑞民	資訊工業策進會	工程師
54	陳冠宇	資訊工業策進會	工程師
55	郭建邦	資訊工業策進會	工程師
56	黃俊誌	資訊工業策進會	工程師
57	楊展岳	資訊工業策進會	副工程師
58	梁家豪	資訊工業策進會	副工程師
59	莊順斌	資訊工業策進會	副工程師
60	周芝安	資訊工業策進會	規劃師
61	陳巧盈	資訊工業策進會	副規劃師
62	陳　琪	資訊工業策進會	副規劃師
63	侯麗惠	資訊工業策進會	
64	王心文	資訊工業策進會	
65	鄭婷芸	資訊工業策進會	

編號	姓　名	公　　司	職　　稱
66	陳建國	資訊工業策進會	處長
67	吳文玲	資訊工業策進會	主任
68	吳顯東	資訊工業策進會	副主任
69	高天助	資訊工業策進會	處長
70	林劍秋	資訊工業策進會	副處長
71	陳榮安	資訊工業策進會	顧問
72	蔡義昌	資訊工業策進會	主任
73	黃宗達	資訊工業策進會	副主任
74	王郁琦	資訊工業策進會	主任
75	顧振豪	資訊工業策進會	專案經理
76	江瑩華	網奕資訊科技股份有限公司	行銷企劃經理
77	曲　銘	銘泰股份有限公司	董事長
78	張秀萱	歐斯特科技股份有限公司	國際事務專員

產業轉型與升級

Industrial Transition and Transformation

產業轉型與升級

壹、前言

隨著國際經貿活動的日益頻繁，全球自由化、國際化的加速推動以及科技創新的日新月異，台灣的產業發展已面臨空前未有的挑戰，面對國內外政經環境的瞬息萬變，國際競爭壓力也愈顯激烈，未來我國產業應持續升級及改善產業發展環境，同時兼顧量的成長與質的提升，強化創新研發設計、運籌行銷，建立台灣特有之競爭優勢，將台灣產業定位為提供高附加價值產品及優質服務。本分組研討會以「台灣產業的全球佈局策略」、「培育創新人才，創造經濟價值」、「21世紀台灣面對知識經濟發展之挑戰」、「產業營運總部在全球價值鏈中的角色」、「加速推動知識型服務業以強化整體產業競爭優勢」、「外商研發中心與台灣的國家創新體系」等六大議題，深入探討台灣產業如何持續轉型與升級，以因應全球競爭，並提出具體可行之產業發展策略，希冀對於台灣產業未來發展具有實質貢獻。

貳、共同結論

一、人才國際化：為避免產業人才inbreeding（在內部繁衍），應鼓勵國際科技人才的開放交流，包括來自中國大陸與東歐等國家，以促進台灣產業人才之國際觀。

二、科專補助商業化：評審委員應由產業界主導且具企業經驗，以避免科專研發經費由大學壟斷，而不管實際需要

與研發計畫執行績效，並應重視商業化的可行性。

三、建教合作企業化：大學必須與一般企業建立互助雙贏關係，落實並發展育成中心的功能，關於大學教授升等之評量項目，應考量專利成就等實績，不應只考慮論文數量。

四、善用人脈關係：仿效美籍印裔之人脈關係，促成印度成為IT產業外包的重鎮，台灣應善用海外華人之人脈，將海外之資源引進台灣，同時增加跨國企業outsource到台灣商機的來源。

五、全力推展知識型服務產業：促進產業升級，追求高利潤，高成長的高附加價值產業，例如: Converged、devices / services、Music Video、New Media Devices、Games & Gambling、Paid Content、Messaging、Location-Based Services、Cameras、Community、ETC--PAGE 5、Search、Advertising、Payments、Enterprise Productivity、Telematics、Battery Life、Other Connected Devices、Enabling Platforms & Infrastructure Services、Browsers on Mobile Devices。

六、為提升台灣知識型服務產業之國際競爭力，應結合台灣IT人才與國際知識型服務產業，組成策略聯盟進行在職訓練，線上學習、與終生學習，增進台灣在知識型服務產業國際投資的成效與優勢。

參、建議

一、台灣產業的全球佈局策略（蔡宏明）

1.政府應提供全球區域貿易協定相關經貿規範資訊之整合平台，以提供企業有關資訊（區域國家商品與服務業貿易障礙撤除有關的條文、原產地規定、標準檢驗和相互認證等規定），且責成各駐外單位與當地創業投資公司聯繫，以瞭解當地具潛力之投資機會，爭取商機。

2.政府可以推動台灣的加工出口區與海外地主國工業區之合作，建立共同關稅領域，讓物品及原料流動為零關稅。基於大部分的廠商對於海外運輸有需求，政府可考慮在海運以及航空上給予優惠，以協助建立便捷運輸機制。

3.政府應協助發展共同品牌，例如選定紡織成衣、陶瓷、小家電、食品、手工具機、小五金、運動器材等領域，再透過整體支援系統（如專業經理人、資訊平台、低利貸款、商機的媒合等）協助，促成中小企業發展共同品牌。

二、培育創新人才，創造經濟價值（王鳳奎）

1.創新是全球知識經濟一個國家最重要的競爭力，更是產業轉型及升級的關鍵，台灣可以效法美國的“National Innovation Initiative”，整體檢視並發展國家的創新能力。

2.現行的產業人才發展政策及措施並未針對創新人才的

培育有所因應，政府應投入特別的資源為創新人才發展一套有別傳統人才培訓的體系

3. 台灣企業98%為中小企業，中小企業的領導人的創新能力是台灣產業轉型的主力，政府應加強對中小企業主創新能力的培育

三、21世紀台灣面對知識經濟發展之挑戰（馮達旋）

1. 人才國際化: 為避免產業人才inbreeding（在內部繁衍），應鼓勵國際科技人才的開放交流，包括來自中國大陸與東歐等國家，以促進台灣產業人才之國際觀。

2. 科專補助商業化：評審委員應由產業界主導且具企業經驗，以避免科專研發經費由大學壟斷，而不管實際需要與研發計畫執行績效，並應重視商業化的可行性。

四、產業營運總部在全球價值鏈中的角色（黃肇鏕）

1. 建教合作企業化:大學必須與一般企業建立互助雙贏關係，落實並發展育成中心的功能，關於大學教授升等之評量項目，應考量專利成就等實績，不應只考慮論文數量。

2. 善用人脈關係:仿效美籍印裔之人脈關係，促成印度成為IT產業外包的重鎮，台灣應善用海外華人之人脈，將海外之資源引進台灣，同時增加跨國企業outsource到台灣商機的來源。

五、加速推動知識型服務業以強化整體產業競爭優勢（鄭金

蓮）

1. 全力推展知識型服務產業:促進產業升級，追求高利潤，高成長的高附加價值產業，例如: Converged、devices / services、Music Video、New Media Devices、Games & Gambling、Paid Content、Messaging、Location-Based Services、Cameras、Community、ETC--PAGE 5、Search、Advertising、Payments、Enterprise Productivity、Telematics、Battery Life、Other Connected Devices、Enabling Platforms & Infrastructure Services、Browsers on Mobile Devices。
2. 為提升台灣知識型服務產業之國際競爭力，應結合台灣IT人才與國際知識型服務產業，組成策略聯盟進行在職訓練，線上學習、與終生學習，增進台灣在知識型服務產業國際投資的成效與優勢。

三、外商研發中心與台灣的國家創新體系（陳信宏）

1. 外商企業已日漸注重研究與發展，全球佈局為已成為趨勢，政府應提供優惠措施，鼓勵外商來台設立研發中心。
2. 政府及產業界皆應提高對於研究發展的經費預算，以將台灣產業轉型為創新研發中心。

參、參加者名單

召集人：經濟部工業局　陳局長昭義（沈副局長榮津代）

講　員：中華民國全國工業總會　蔡副秘書長宏明

工研院產業學院　王執行長鳳奎

馮博士達旋

黃博士肇鑣

鄭博士金蓮

中華經濟研究院　陳所長信宏

（依照演講順序排列）

參加者：

代　表	服　務　單　位	現　職
呂芳福	台灣區棉布印染整理工業同業公會	常務理事
簡瑛雪	台灣區棉布印染整理工業同業公會	總幹事
陳偉望	永光化學工業(股)公司	總經理
曹德風	佳格食品股份有限公司	董事長
郭義松	康定股份有限公司	總經理
劉禎氣	長榮航太科技股份有限公司	總經理
李適彰	漢翔航空工業	主任
李宗璜	漢翔航空工業	副處長
胡榮斌	中山科學研究院	上校技監
勇興台	京華工程顧問公司	副董事長
江誠榮	大毅技術工程股份有限公司	董事長
葉清來	宏遠興業股份有限公司	總經理
林盛文	複成企業股份有限公司	董事長
蕭火綿	三福產業股份有限公司	董事長
單　驥	國立中央大學產業經濟研究所	教授
王銘正	國立中央大學經濟系	副教授
林育中	萬國電腦公司	資深顧問
林美雪	經濟部中小企業處	主任秘書
李國貞	經濟部工業局	組長
陳慧英	經濟部工業局	專門委員
黃郁瑩	經濟部工業局	科長

代　表	服　　務　　單　　位	現　職
胡貝蒂	經濟部工業局	科長
施榮明	經濟部工業局	研究員
翟大陸	經濟部工業局	科長
劉乃元	經濟部工業局	技正
羅世藩	經濟部工業局	技士
張禮屏	經濟部工業局	
吳美樺	經濟部工業局	
林洋導	經濟部工業局	
陳安琪	經濟部工業局	
文國相	經濟部工業局	
吳欣蕙	國立中央大學	
劉怡伶	國立中央大學	
陳怡如	國立中央大學	

感染性疾病

Infectious Disease

感染性疾病

壹、前言

人類prion（變異性蛋白）疾病是一種罕見的漸進性、傳染性神經系統病變。90年代中期在英國和歐洲出現的變異性庫賈氏病(variant CJD)證明和牛的海綿狀腦病變(俗稱狂牛病)有密切的關係，感染途徑很可能是經由受狂牛病污染的食用牛肉產品而來。這次研討會的主題即針對人類和動物的prion疾病在診斷、監測、與風險評估上的探討。

貳、建議

一、衛生署在重新開放美國牛肉進口的決策程序，合乎科學的健全評估及公聽會的溝通。在其他食品安全的決策，也應比照相同的執行程序。

二、台灣在人畜共通傳染病上應加強衛生署和農委會的合作，以促進防治的效益。

三、行政院農委會家畜衛生試驗所在狂牛症的監測及診斷上已進行多年，成效斐然，已達國際水平，但外界並不熟悉。由於該所工作量負擔頗大，在人力及財力上應多予支援。

四、除了人畜共通傳染病之外，家畜衛生試驗所仍應以獸醫疾病最高診斷中心為其主要任務。

五、衛生署應加強訓練臨床醫師及病理醫師在新興傳染病（例如狂牛症、禽流感）的認識以提高其診斷能力。

六、病理解剖在診斷新興傳染病有相當的重要性，除了解剖室的設立，應增加人力及相關硬體設備。

參、總結

基於食品安全，消費者權益，公共衛生及經濟衝擊的考量，狂牛病與牛肉消費的關係成為一個重要的民生健康和社會經濟的議題。這次研討會，中美雙方專家在狂牛病的診斷、監測及風險評估上所提出的報告，除了有助於釐清相關的疑慮外，其建議並可作為將來相關議題施政之參考。

肆、小組成員

中方召集人：侯勝茂　署長

美方召集人：謝文儒　博士

謝顯堂　博士

賴秀穗　博士

張振東　博士

邱浩彰　醫師

林滄龍　博士