Ching-Kong Chao

Chair Professor
Department of Mechanical Engineering
National Taiwan University of Science and Technology
43 keelung Road, Section 4, Taipei, Taiwan
ckchao@mail.ntust.edu.tw

個人簡介

申請人近五年 (2016-2021) 總共發表或已接受 SCI 期刊論文 29 篇、中華民國新型發明專利 8 件、科技部及產學計畫經費總計約 2 千 7 百萬元。研究領域涵蓋多數異質問題之解析解、焦電材料熱彈電場偶合之破壞力學解析、脊椎及長骨植入物之數值分析與生物力學測試、熱障塗層系統中之裂紋破壞分析、以及極薄電磁鋼片軋延製程分析。申請人尤其在熱彈性力學領域之學術表現已廣受國際熱應力學會高度肯定:包括受邀舉辦第七屆國際熱應力學術研討會、多次受邀擔任國際重要研討會之 keynote speaker、擔任 Journal of Thermal Stresses 常務編輯以及接受國際知名出版社 Spinger 邀請撰寫熱應力百科全書(Encyclopedia of Themal Stresses)。在生醫科學方面已發表多篇論文於國際重要期刊，其中發表於 Journal of Orthopaedic Research 論文 Increase of pullout strength of spinal pedicle screws with conical core: Biomechanical tests and finite element analyses 被引用次數高達 199 次。近年連續取得美國新型發明專利，其中可調式人工脊椎之椎體支架專利已有多家國際醫療器材公司正在洽談技轉事宜，並獲得第九屆傑出學研技術國家新創獎。在光學微透鏡陣列模仁之研究，其中發表於 Journal of Micromechanics and Microengineering 論文 High fill-factor microlens array mold insert fabrication using a thermal reflow process 被引用次數高達 170 次。申請人亦積極參與國際學術活動包括擔任 6 項不同國內外學術期刊之 Associate editor、舉辦 2007 年及 2010 年國際學術研討會、參與台俄學術交流計畫等。由於申請人在學術上之優異表現，獲選 Fellow of Trinity College, University of Oxford, UK、Fellow of Society of Theoretical and Applied Mechanics, ROC、國立中興大學講座教授、成大航太所傑出校友，以及孫方鐸力學獎。申請人在產學合作方面參與科技部產學大聯盟與中鋼合作執行五年五億產學計畫中執行「中鋼極薄電磁鋼片軋延與退火技術」，成功利用應變能密度方法進行熱裂破壞含缺陷空孔的預測，將高產值之矽鋼胚由 320 分鐘加熱時間，縮短至 240 分

鐘仍不會發生破裂，提升約 25% 的產能並達到節能減碳的製程效果。在研究團隊指導學生論文方面，參加 2017、2018 力學學會學生論文競賽獲得優等獎，以及榮獲 2017、2019 中國工程期刊最佳論文獎。除了研究與服務外，申請人在教學方面亦有不遺餘力之表現，曾多次獲得機械系優良教師。

(一) 基本資料：

Citizenship: Taiwan, ROC

Education:

B.S.	National Cheng Kung University - Mechanical Engineering (1974-1978)
M.S.	National Taiwan University - Mechanical Engineering (1978-1980)
Ph.D.	Lehigh University - Mechanical Engineering (1982-1987)

Position held:

1980 – 1982 :	Second Lieutenant Engineering Officer, The Combined Military Service, Taiwan
1987 – 1992 :	Associate Professor of Department of Mechanical Engineering, National Taiwan Institute of Technology
1992 – 2006 :	Professor of Department of Mechanical Engineering, NTUST
2006 – present :	Chair Professor of Department of Mechanical Engineering, NTUST
2007 – present :	Executive Committee of International Congress of Thermal Stresses
2009 – 20010 :	Visiting Professor at Department of Engineering Science, Fellow of Trinity College, University of Oxford, UK
2010 – 2013 :	Chair Professor of Graduate Institute of Precision Engineering, NCHU
2010 – present :	Executive Committee of International Congress of Mesomechanics
2008 – present :	Executive Committee of Asian Conference on Mechanics of Functional Materials and Structures

Editorial Board of Journals

1995 – present:	Member of the Editorial Board of Journal of Mechanics
2002 – 2008 :	Subject Editor of the Journal of the Chinese Institute of Engineers
2005 –2015:	Member of the Editorial Board of Journal of Aeronautics, Astronautics and Aviation
2008 – present :	Member of the Editorial Board of Journal of Thermal Stresses
2008 – present :	Member of the Editorial Board of Journal of Theoretical and Applied Multiscale Mechanics
2011 – present:	Member of the Editorial Board of Indian Journal of Theoretical Physics
2013 – present:	Member of the Editorial Board of Journal of Mechanical Engineering and Sciences

Organizer of Conferences

2007	General Chair of the 7th International Congress on Thermal Stresses (ICTS), Taipei, Taiwan
2008	Member of the Executive Committee of ACMFMS, Matsue, Japan
2009	Member of the Executive Committee of ICTS, Illinois, USA
2010	General Chair of the 12th International Conference on Mesomechanics, Taipei, Taiwan

Keynote speaker of Conferences:

2008/11/1	"Thermal Stresses in a Viscoelastic Trimaterial" delivered at the 1th International Conference on Mechanics of Functional Materials and Structures (ACMFMS 2008), Shimane University, Japan
2009/6/1	"Heterogeneous Problems in Plane Thermoelasticity" delivered at the 8th International Congress on Thermal Stresses (ICTS), University of Illinois at Urbana-Champaign, USA
2009/6/26	"Damage Evaluation of Cladding Integrity for Spent Fuel in Interim Storage" delivered at Mesomechanics 2009, Oxford University, UK
2013/5/25	"Solutions of a Crack Interacting with Tri-Material Composite in Plane Elasticity" delivered at ICCES'13: International Conference on Computational & Experimental Engineering and Sciences, Seattle, USA

Invited speaker of Conferences and Lectures

2007/10/27	"Creep Crack Growth on Spent Fuel Zircaloy Cladding in Interim Storage" delivered at the Department of Engineering Science, East China University of Science and Technology, Shanghai, China.
2008/10/30	"Multiple Inclusion Problems in Antiplane Elasticity" delivered at Department of Mechanical Enineering, Shizuoka University, Japan.
2009/4/10	"Finite Element Analysis for the Treatment of Proximal Femur Fracture" delivered at International Conference ICCES09, Phuket, Tailand.
2009/9/16	"Interaction of Singularities with Interfaces in Plane Elastostatics" delivered at the Department of Civil Engineering, University of Bologna, Italy.
2009/11/2	"Analytical Solutions for Heterogeneous Problems in Solid Mechanics", University of Oxford, UK.
2010/4/12	"Multiple Layered Media Problems in Plane Elasticity" delivered at Institute of Applied Mechanics, Zhejiang University, China.
2011/11/18	"Thermal Stresses in Heterogeneous Solids" delivered at College of Civil Engineering, Shenzhen University, China.
2013/10/23	"Analytical Solutions to Some Crack Problems in Multiple Layered Media in Plane Elasticity", China Agricultural University, Bejing,

China.

2014/10/14	"Crack Problems in Heterogeneous Solids", Osaka Institute of Technology, Osaka, Japan.
2019/7/1	"Complex Variable Methods in Engineering Problems", Xian Jiaotong University, Xian, China
2019/11/11	"Complex Variable Methods in Crack Problems", Kyutech Institute of Technology, Kyutech, Japan.

Memberships in Scientific and Professional Societies

Member	Sigma Xi.
Fellow	Society of Theoretical and Applied Mechanics, Republic of China.

Awards

1995-1996	Outstanding Research Awards, National Science Council, ROC
1998-1999	Outstanding Research Awards, National Science Council, ROC
2000-2001	Outstanding Research Awards, National Science Council, ROC
2002-2005	Distinguished Research Fellow, National Science Council, ROC
2005-2008	Distinguished Research Fellow, National Science Council, ROC
2006	Best Paper Award for Society of Surgery of the Hand, ROC
2008	Best Paper Award for Society of Surgery of the Spine, ROC
2012	The 9th National Innovation Award, Taipei, Taiwan
2014	ANSYS Hall of Fame Competition, Hall of Fame Finalists
2015	孫方鐸教授力學獎
2017	Best Paper Award 2017 for JCIE
2019	Best Paper Award 2019 for JCIE

Books

2007	Proceedings of The Seventh International Congress on Thermal Stresses, June 4-7, 2007, Taipei, ISBN: 978-986-00-9556-2
2009	Optimization Design of Pedicle Screw, Lambert Academic Publishing ISBN: 978-3-8383-3104-1
2010	Multiscaling of Synthetic and Natural Systems with Self-Adaptive Capability, ISBN: 978-986-02-3909-6
2013	Complex Variable Methods in Thermal Stresses, Encyclopedia of Thermal Stresses, Springer Publishing ISBN: 978-94-007-2738-1

Research interests:

Theoretical analysis and computation for multiple interface problems; contact problems; Biomechanical analysis for pull-out strength and fatigue life of pedicle screws, external fixator; Rapid thermal processing for the wafer; Fabrication of microlens arrays; Failure analysis of spent fuel zirconium cladding; Failure analysis of metal sheet in high temperature; Microcrack Propagation Induced by Dynamic Infiltration of Calcium-Magnesium-Alumino-Silicate in Columnar Structures for Thermal Barrier Coatings

(二) 近五年重要研究成果說明 ：

近五年內主要研究成果說明將分學術研究與工程應用兩大項分述如下:

(A) 學術研究:

A-1 ***<u>平面多數異質問題:</u>*** 藉由解析連續技巧(*Analytical Continuation*)及配合 *Alternating Technique* 推導出含任意數目圓形環狀異質(Cylindrically layered media)或層狀異質(Plane layered media)之 closed form 級數解，此級數解之收斂性極佳。至於裂紋與多數異質之交互行為可藉由基本解與積分方程式之建立再配合數值計算求解。另外亦可藉由 Laurent series 表示法及 Airy‘s stress function 疊代法求得含任意數目圓形異質之通解，再利用 purterbation technique 求解任意階次之應力函數。

A-2 ***<u>含裂紋之多邊形塗層孔洞之熱彈性問題</u>***: 含裂紋之多邊形塗層孔洞問題在已知文獻中很少出現，主要原因在於處理裂紋接近界面時會發生數值不易收斂現象。多邊形塗層孔洞包括三角形、四角形以及非均勻厚度塗層孔洞。藉由保角轉換技巧，可將以上不同多邊形塗層孔洞映射至形狀為同心圓塗層孔洞。基於解析連續與交替技巧並利用保角轉換技巧，可解得含裂紋之多邊形塗層孔洞問題之快速收斂級數解。藉由已推導格林函數之積分表示式及裂紋表面邊界條件，可進一步求得裂紋端點之應力強度因子。

A-3 ***<u>熱障塗層系統中之裂紋破壞分析:</u>*** 近年來 TBC (Thermal barrier coating)技術受到廣泛重視，已被廣泛應用於燃氣輪機及航空發動機葉片之防護作用。TBC 服役過程受到機械負

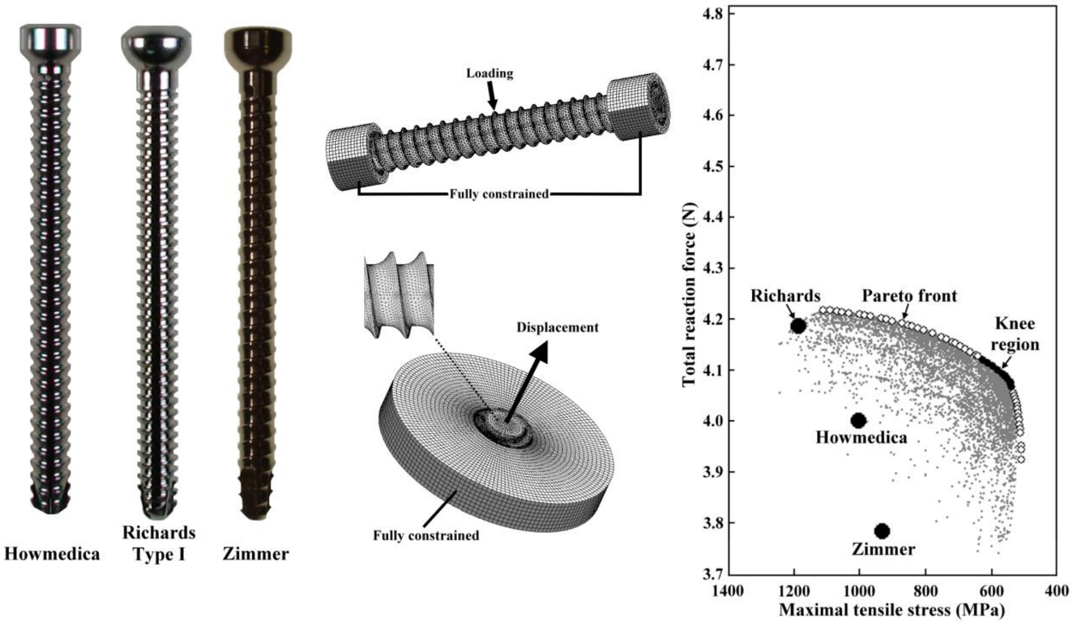
載，環境負載及高溫氣流作用下，同時各材料組件間的熱失配，黏結層高溫氧化等造成塗層內部和介面處之裂紋引發，最終導致塗層剝落。一般薄膜/基底結構中，薄膜與基底具有不同的熱膨脹係數，在熱循環載荷作用下薄膜結構常處於拉伸或壓縮力狀態，繼而造成表面裂紋及介面裂紋。本研究所建立之數學模式可解釋塗層破壞機制並建立可靠的疲勞壽命預測。

A-4 ***<u>股骨鎖定內釘之理論分析與生物力學測試:</u>*** 鎖定內釘已廣泛地應用於股骨骨折，但鎖定螺絲仍常有破壞情形發生，特別是遠端骨折。本研究分別採用理論分析與生物力學測試來探討內釘皮質骨接觸對鎖定內釘應力之影響，經研究結果發現內釘皮質骨在無接觸情形下之螺絲應力遠超過內釘皮質骨在接觸情形下之螺絲應力，且其局部應力大小與骨折位置、鎖定螺絲間之相對距離有關，此結果與實驗所得完全一致。

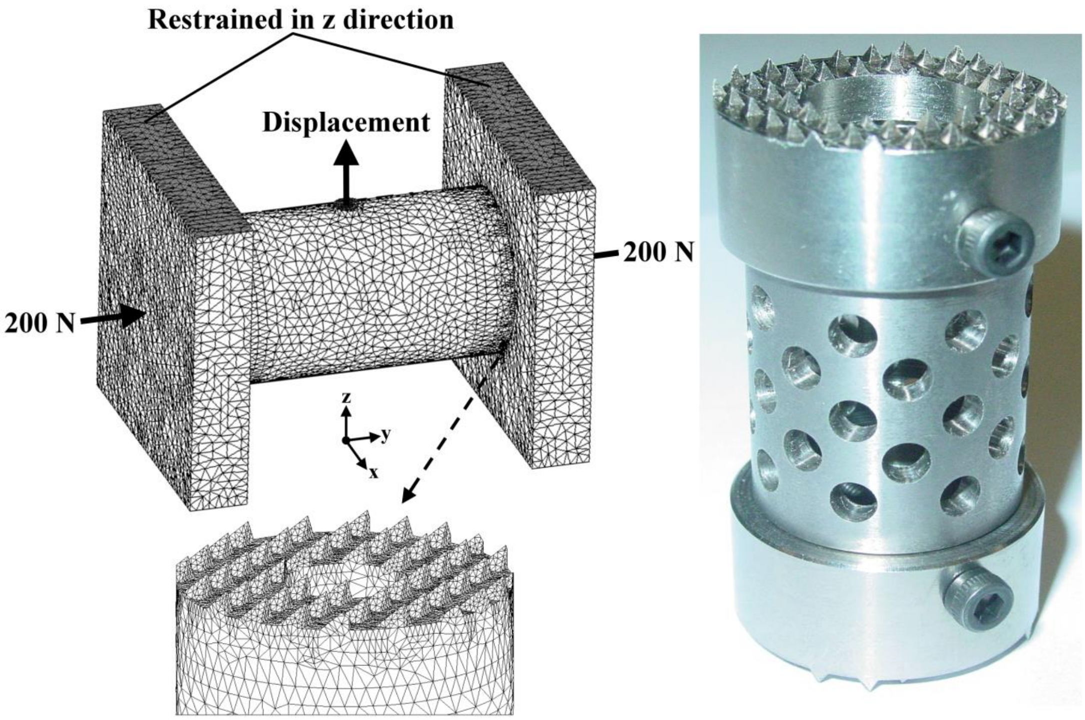
A-5 ***<u>焦電材料熱彈電場偶合之破壞力學解析:</u>*** 探討鐵電材料直接將熱能轉化為電能通過數值分析，結構設計和外部施加電場來提高鐵電材料的電感應和材料能量轉換效率。鐵電材料是焦電材料的一個子類。焦電材料可將與時間相關之溫度變化直接轉換成電能，其能量轉換方式可被分為線性，和非線性。目前已經有多種材料被考慮及測試，包括陶瓷，單晶和聚合物。每種材料都可以在居里溫度附近範圍內運行。總括而言，這項研究所提出的數值分析、結構設計以及奧森循環有助於提高與評估鐵電材料於廢熱回收的能量轉換效率與使用壽命。

(B)　工程應用:

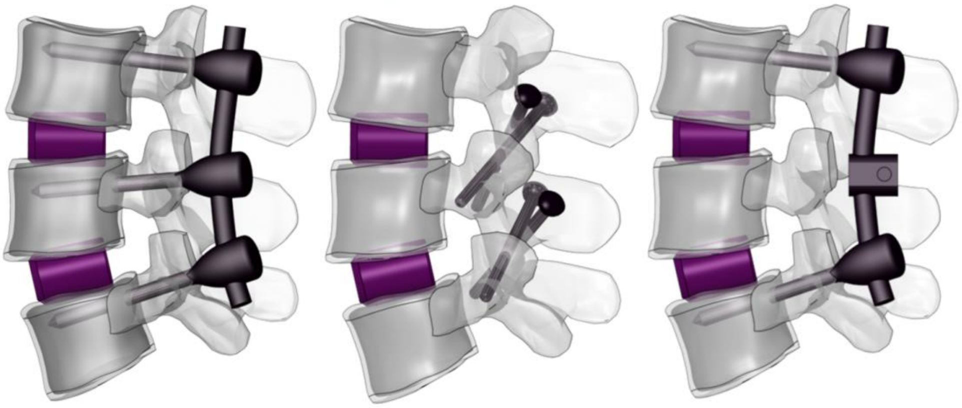
B-1 ***<u>脛骨鎖定螺絲之最佳化設計:</u>*** 脛骨螺絲在臨床應用時會有破斷或鬆脫的問題，本研究建立三維非線性有限元素模型來模擬螺絲破斷與鬆脫，以多變數回歸分析建立目標函數，最後以遺傳演算法搜尋最佳的脛骨螺絲設計，本研究之最佳化結果已改進市售產品設計不佳的問題。



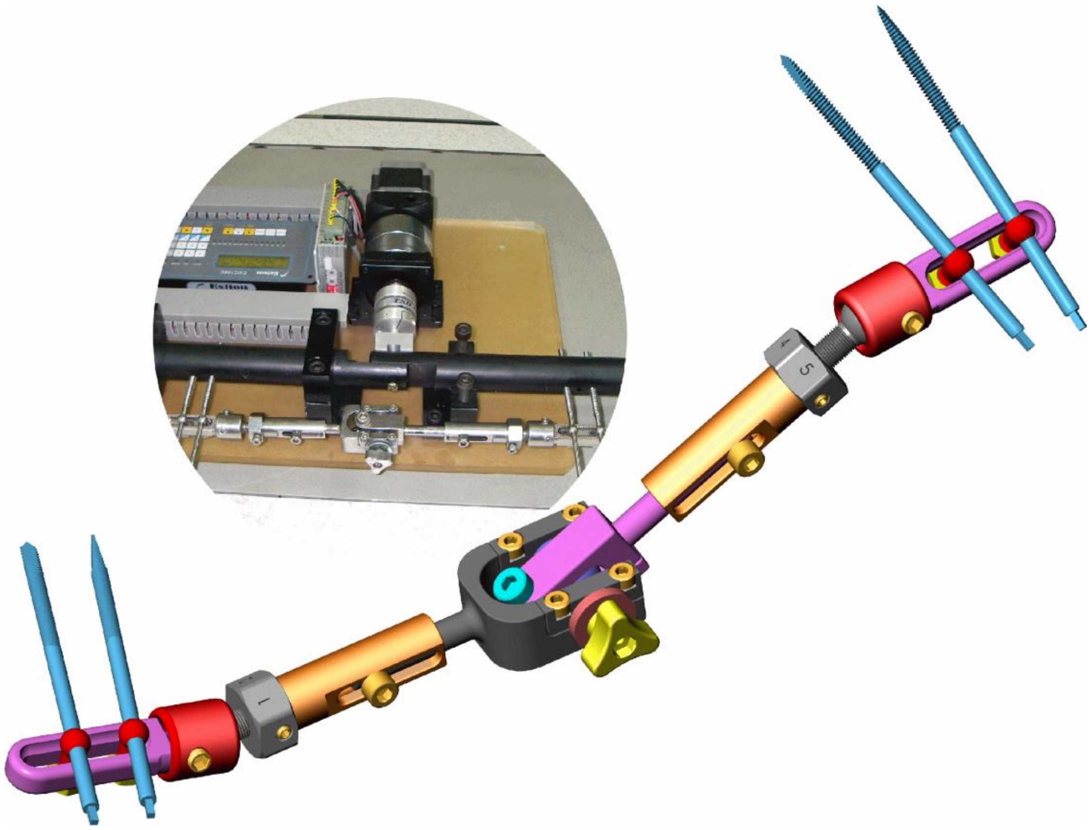
B-2 ***<u>脊椎支撐器之齒型參數化分析</u>*:** 不佳的齒型設計會導致骨折固定失敗，本研究使用有限元素為基底的田口方法，進行脊椎支撐器的齒型參數化分析，本研究之參數化分析結果可提昇研發設計的時效，同時給予臨床醫師選用相關植入物的參考依據。



B-3 ***<u>腰椎椎籠於不同後方內固定器之生物力學評估:</u>*** 後方骨融合術已被廣用於治療腰椎椎間盤病變，但仍有許多術後的併發症，本研究使用有限元素法評估腰椎椎籠於不同後方內固定器的性能，此力學模式可有效的評估椎籠之臨床應用性能，以避免實際應用時所產生的失效破壞。



B-4 ***<u>具關節動態牽引功能之骨外固定器:</u>*** 為了讓外固定器能配合肘關節進行彎曲伸直運動，開發出具有動態牽引技術之骨外固定器，運用齊次轉換矩陣及動作分析來確認骨外固定器之軸心對位功能。本研究成果與概念未來也可運用在其他如膝與踝等具有鉸鏈功能之關節。

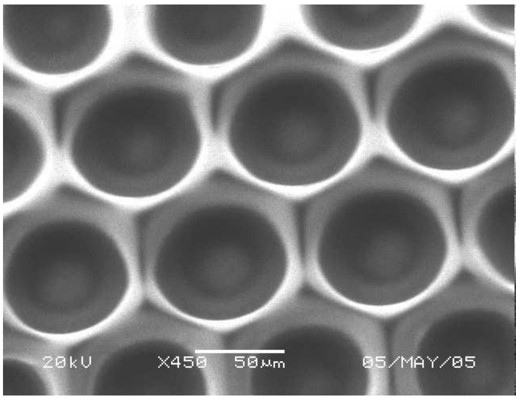


B-5 ***<u>微光學元件製作之研究:</u>*** 微透鏡陣列、光波導、光纖透鏡為光通訊與光訊號處理系統內重要的微光學元件之一，此些元件透過積體電路製造方式製作，製作過程中均須以複雜程序製作完成，能以縮短製作過程，則可降低製作成本。

1.微透鏡陣列與模仁製作研究：本研究經由理論分析提出一新近接曝光轉印法來製作微透鏡陣列與光阻模仁，此方法較以往製作節省製作程序，可降低大量生產之微透鏡陣列製作成本。

2.新型平躺半圓錐光波導元件製作研究：本研究經由理論分析提出一新微光波導結構製作方法，可節省製作具有雙錐型光波導結構時間，此結構可達到高光纖耦合率。

3. 橢圓微透鏡光纖之研究：本研究為設計一橢圓微透鏡光纖，藉由田口品質工程法與光學軟體分析模擬出適合光訊號耦合之橢圓微透鏡尺寸。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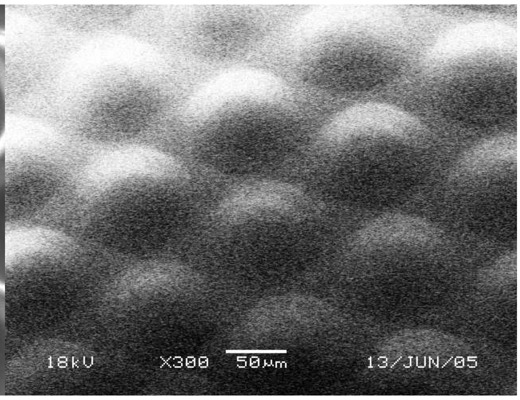
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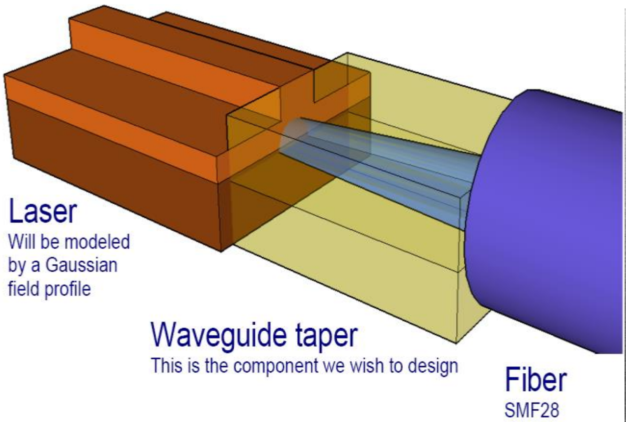
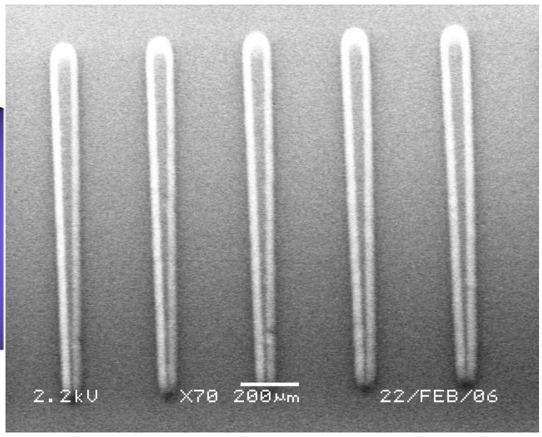
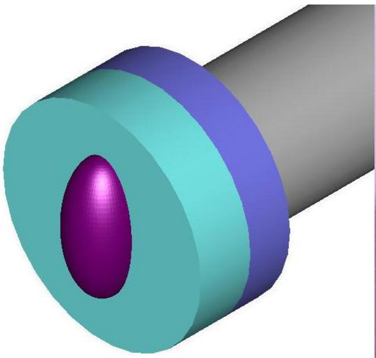
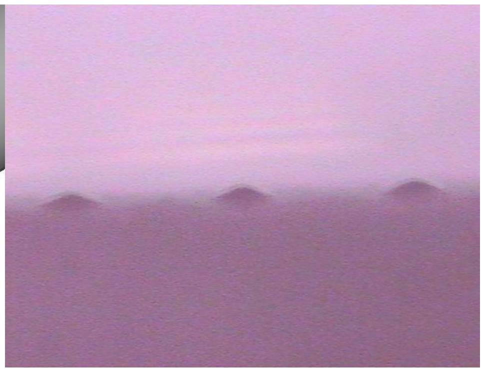

Laser
Will be modeled
by a Gaussian
field profile
Waveguide taper
This is the component we wish to design
Fiber
SMF28

2.2kV X70 200µm 22/FEB/06



(三) 著作目錄：

(A) Refereed Papers

[A-1] Sih*, G. C. and Chao, C. K., 1984, "Size Effect of Cylindrical Specimens with Fatigue Cracks", *Journal of Theoretical and Applied Fracture Mechanics*, 1(3), pp. 239-247.

[A-2] Sih*, G. C. and Chao, C. K., 1984, "Failure Initiation in Unnotched Specimens Subjected to Monotonic and Cyclic Loading", *Journal of Theoretical and Applied Fracture Mechanics*, 2(1), pp. 67-73.

[A-3] Sih*, G. C. and Chao, C. K., 1984, "Influence of Load Amplitude and Uniaxial Tensile Properties on Fatigue Crack Growth", *Journal of Theoretical and Applied Fracture Mechanics*, 2(3), pp. 247-257.

[A-4] Sih*, G. C. and Chao, C. K., 1986, "Static and Fatigue Behavior of Metal Cylinders with Enhanced Surface Property", *Journal of Theoretical and Applied Fracture Mechanics*, 5(1), pp. 39-45.

[A-5] Chao*, C. K., 1986, "Stability of Cracks Interacting in Fibers", *Advanced Composite Materials and Structures*, edited by G. C. Sih and S. E. Hsu, VNU Science Press, The Netherlands, pp. 365-374.

[A-6] Sih*, G. C., Lieu, F. L. and Chao, C. K., 1987, "Thermal/Mechanical Damage of 6061-T6 Aluminum Tensile Specimen", *Journal of Theoretical and Applied Fracture Mechanics*, 7(2), pp. 67-78.

[A-7] Sih*, G. C. and Chao, C. K., 1989, "Fatigue Failure Initiation Analysis of Wing/Fuselage Bolt Assembly", *Journal of Theoretical and Applied Fracture Mechanics*, 11(2), pp. 109-120.

[A-8] Sih*, G. C. and Chao, C. K., 1989, "Scaling of Size/Time/Temperature-Part 1: Progressive Damage in Uniaxial Tensile Specimen", *Journal of Theoretical and Applied Fracture Mechanics*, 12(2), pp. 93-108.

[A-9] Sih*, G. C. and Chao, C. K., 1989, "Scaling of Size/Time/Temperature-Part 2: Progressive Damage in Uniaxial Compressive Specimen", *Journal of Theoretical and Applied Fracture Mechanics*, 12(2), pp. 109-119.

[A-10] Chao*, C. K. and Lin, S. Y., 1990, "Failure Stability of a Cracked Layer between Dissimilar Materials", *Journal of Theoretical and Applied Fracture Mechanics*, 13(1), pp. 59-68. (NSC 78-0401-E011-04)

[A-11] Sih*, G. C., Chao, C. K., Hwu, Y. J. and Hsu, C. T., 1990, "Spring Back in Cold Metal Forming of AOO-H Steel: Non-Homogeneous Defermation", *Journal of Theoretical and Applied Fracture Mechanics*, 14(2), pp. 81-99. (NSC 78-0401-E011-03)

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(C) Patents

系所	教師	所屬計畫案	專利名稱	區域	專利類型	進度狀況	作者順序	申請日期/生效日期	終止日期	發照機構	證書字號	技術移轉或授權
機械	趙振綱	1	手肘關節之調節裝置(Adjusted intrumentation of elbow joints)		新型	已核准	2	中華民國94年2月1日	中華民國102年8月28日	中華民國	M256157	
機械	趙振綱	2	內視鏡切割刀結構(Structure of endoscopic cutter)		新型	已核准	3	中華民國92年12月21日	中華民國104年4月21日	中華民國	00567830	
機械	趙振綱	3	骨關節之外部固定器(External fixator of bone joints)		新型	已核准	4	中華民國94年2月1日	中華民國102年8月28日	中華民國	M274083	
機	趙	4	內視鏡切割刀		新型	已	3	中華	中華民國	中華	M287664	

械	振綱		結構改良 (Structural improvement of endoscopic cutter)			核准		民國95年2月21日	103年9月9日	民國		
機械	趙振綱	5	微創板機指手術刀結構 (Strucrure of Trigger Finger Cutter for Minimally Invasive Surgery)		新型	已核准	2	中華民國95年12月11日	中華民國104年6月9日	中華民國	M302351	
機械	趙振綱	6	橫躺半圓錐形光波導之製法 (Manufacturing method of a horizontal hemi-frustum optical waveguide)		新型	已核准	3	中華民國96年9月11日	中華民國116年3月15日	中華民國	I 274920	
機械	趙振綱	7	人工脊椎之椎體支架 (Vertebral spacer for artificial vertebrae)		新型	已核准	1	中華民國96年3月1日	中華民國115年2月23日	中華民國	M318405	
機械	趙振綱	8	骨骼外部固定裝置 (External skeleton fixation device)		新型	已核准	3	中華民國96年9月1日	中華民國105年9月18日	中華民國	M317848	
機械	趙振	9	用於脊椎之骨板固定器 (Spine fixation		新型	已核	1	中華民	中華民國106	中華民	M332468	

	綱		plate system)			准		國97年5月21日	年12月17日	國		
機械	趙振綱	10	模組化骨融合錐籠 (Modularized lumbar interbody fusion cage)		新型	已核准	1	中華民國97年6月11日	中華民國107年1月16日	中華民國	M333884	
機械	趙振綱	11	具提高骨融合效率之脊椎板狀固定器 (Vertebral fixation plate assembly)		新型	已核准	1	中華民國97年6月11日	中華民國107年1月16日	中華民國	M333885	
機械	趙振綱	12	可調式人工脊椎之椎體支架（Adjustable vertebral spacer for artificial vertebrae）		新型	已核准	1	中華民國97年6月11日	中華民國118年11月10日	美國	United States Patent 8,034,111	
機械	趙振綱	13	具提高骨融合效率之脊椎板狀固定器（Anterior lateral spins cage-plate fixation device and technique）		新型	已核准	1	中華民國101年6月11日	中華民國107年1月16日	美國	United States Patent 8,034,111	
機械	趙振綱	14	具提高骨融合效率之脊椎板狀固定器		新型	已核准	1	中華民	中華民國118	美國	United States Patent 8,142,434	

			(Vertebral fixation plate assembly)					國101年6月11日	年11月10日			
機械	趙振綱	15	應用於太陽能板之聚光薄膜及其製造方法		發明	已核准	2	中華民國101年6月11日	中華民國118年11月10日	中華民國	I462317	
機械	趙振綱	16	散熱裝置		新型	已核准	1	中華民國104年1月1日	中華民國113年4月10日	中華民國	M493234	
機械	趙振綱	17	非電力致動式的液體攪拌設備		發明	已核准	4	中華民國104年9月21日	中華民國122年10月2日	中華民國	I500449	
機械	趙振綱	18	多相驅動幫浦		新型	已核准	3	中華民國104年11月1日	中華民國114年5月21日	中華民國	M511548	

機械	趙振綱	19	微透鏡結構及其製造方法		新型	已核准	2	中華民國104年11月1日	中華民國122年12月18日	中華民國	I506301	
機械	趙振綱	20	連動於第一轉動構件之壓電發電機構及轉子系統		發明	已核准	2	中華民國106年2月1日	中華民國125年2月25日	中華民國	I569570	
機械	趙振綱	21	蒸鍍設備		發明	已核准	3	中華民國105年11月1日	中華民國123年4月10日	中華民國	I555861	
機械	趙振綱	22	多段式車門開啟裝置		發明	已核准	4	中華民國105年11月21日	中華民國124年1月14日	中華民國	1558903	
機械	趙振綱	23	能產生不同振動頻率的壓電材料構件及探頭結構		發明	已核准	2	中華民國106年7月21日	中華民國125年8月7日	中華民國	I592657	

機械	趙振綱	24	多相驅動幫浦		發明	已核准	3	中華民國106年1月11日	中華民國124年5月11日	中華民國	I565876	
機械	趙振綱	25	車輛氣體動力系統		新型	已核准	4	中華民國105年11月21日	中華民國113年4月30日	中華民國	M532394	
機械	趙振綱	26	削鉛筆機的刀具壽命檢測裝置		發明	已核准	4	中華民國106年8月11日	中華民國125年6月27日	中華民國	I595234	
機械	趙振綱	27	凸形圖案的著色輔助裝置及其操作方法		發明	已核准	3	中華民國106年11月21日	中華民國125年5月3日	中華民國	I605956	

註:1.專利類型:請填發明專利、新型專利、新式樣專利

2.進度狀況:請填申請中、已核准或無等

(D) Sponsored Research Projects

產業界計畫

No.	Title	Duty 擔任工作	Period	Amount	Source

編號	計　畫　名　稱		起迄年月	金　額	計畫來源
001	焊道殘留應力有限元素分析	主持人	80.07~81.06	50.0萬	原委會核能研究所
002	高速衝擊下之彈心／鋼靶破壞損傷評估（Ⅱ）	主持人	82.01~82.12	190.9萬	國防科技學術合作協調小組
003	高速衝擊下之彈心/鋼靶破壞損傷評估（Ⅲ）	主持人	84.07~85.06	67.7萬	國防科技學術合作協調小組
004	用過燃料中期貯存護套裂紋成長分析模式之建立	主持人	86.07~86.06	43.2萬	原委會核能研究所
005	戰車炮彈自動裝填系統之概念設計	主持人	86.07~87.06	80.0萬	聯勤總部202廠
006	作戰環境下戰車炮彈自動裝填系統之設計	主持人	87.06~88.05	66.0萬	聯勤總部202廠
007	用過燃料中期貯存護套裂紋成之長分析模式之建立	主持人	87.07~88.06	41.7萬	原委會核能研究所
008	用過燃料中期貯存護套承受應力腐蝕破壞模式之建立	主持人	88.02~88.07	32.0萬	原委會核能研究所
009	用過核燃料護套劣模式建立	主持人	101.01~1018.12	50.7萬	原委會核能研究所
010	電壓器外殼之應力分析	主持人	102.05~103.01	32.0萬	華城電機股份有限公司
011	PCB 板對 IC 電路測試應力與應變分析之研究	主持人	103.01~103.06	40.0萬	國際測試系統股份有限公司
012	燃料丸與護套機械作用:氫化鋯效應(第一年)	主持人	109.01~109.12	30.0萬	原委會核能研究所
013	燃料丸與護套機械作用:氫化鋯效應(第二年)	主持人	110.01~110.12	40.0萬	原委會核能研究所
014	FRAPCON-3 程式燃料行為分析驗證	主持人	111.01~111.12	40.5萬	原委會核能研究所
015	次世代鋼及綠色製程產品創新應用產學合作計畫	主持人	102.08~103.07	119.1萬	中國鋼鐵股份有限公司
016	高燃耗用過核子燃料行為保守分析技術建立	主持人	103.01~103.12	35.6萬	原委會核能研究所
017	成功大學轉撥-前瞻技術產學合作計畫-次世代鋼及其綠色製程與產品創新應用產學	主持人	104.08~105.07	175.0萬	中國鋼鐵股份有限公司
018	成功大學轉撥-前瞻技術產學合作計畫-次世代鋼及其綠色製程與產品創新應用產學	主持人	105.08~106.07	175.0萬	中國鋼鐵股份有限公司
019	結構衝擊與振動分析計畫	主持人	108.10~109.	70.0萬	康舒科技股

			09		份有限公司
020	電源供應器及其電子零件安置之結構動態分析	主持人	110.01~110.12	210.0萬	康舒科技股份有限公司
統計				1589 萬 3 千	

科技部(國科會)計畫

No. 編號	Title 計 畫 名 稱	Duty 擔任工作	Period 起迄年月	Amount 金額	Source 計畫來源
001	複合材質之破壞穩定性分析	主持人	77.08~78.07	15.1萬	國科會
002	非等向性有限裂紋板受機械載荷與熱載荷之解析	主持人	79.02~80.01	20.9萬	國科會
003	含裂紋纖維性複合材料破壞與穩定分析	主持人	80.02~81.01	21.9萬	國科會
004	異性有限裂紋板之破壞穩定分析	主持人	81.02~82.01	24.6萬	國科會
005	相異材質結合面上含圓弧形裂紋之熱度力分析	主持人	81.08~82.07	21.9萬	國科會
006	含界面裂紋異質非等向性體之濕熱應力解析	主持人	82.08~83.07	20.9萬	國科會
007	相異材質結合面上含圓弧形嵌入物之彈性與熱彈性問題之正解	主持人	83.02~83.07	13.7萬	國科會
008	相異材質結合面上含圓弧形嵌入物之彈性與熱彈性問題之正解	主持人	83.08~84.07	19.6萬	國科會
009	渦輪引擎葉片裂縫對振動影響之研究	主持人	84.02~84.07	12.2萬	國科會
010	熱彈性圓形異質體與各型裂紋交互作用之研究	主持人	84.08~85.07	27.3萬	國科會
011	高速衝擊下之彈心/鋼靶破壞損傷評估	主持人	84.07~85.06	67.7萬	國科會
012	含多數圓形異質之平面熱彈性問題解析	主持人	85.08~86.07	28.2萬	國科會
013	含多數壓電異質智慧型材料之電彈力學解析	主持人	86.08~87.07	35.1萬	國科會
014	點熱源作用下之環狀體之熱彈性問題解析	主持人	87.08~88.07	40.2萬	國科會
015	含橢圓孔洞或剛體之異向性無窮板承受點熱源作用之解析	主持人	88.08~89.07	46.9萬	國科會
016	晶圓在 RTP 爐中快速冷卻下之破壞分析(1/2)	主持人	89.08~90.07	50.0萬	國科會
017	晶圓在 RTP 爐中快速冷卻下之破壞分析(2/2)	主持人	90.08~91.07	51.0萬	國科會
018	含任意形狀異質熱彈性問題之解析解(1/2)	主持人	90.08~91.07	53.5萬	國科會
019	多孔黏彈性材質與硬質間界面破壞機制	主持人	91.08~92.07	124.2萬	國科會

	之探討(1/3)				
020	含任意形狀一直熱彈性問題之解析解(2/2)	主持人	91.08~92.07	53.6萬	國科會
021	多孔黏彈性材質與硬質間界面破壞機制之探討(2/3)	主持人	92.08~93.07	124.2萬	國科會
022	含裂紋薄層之黏彈半平面問題之探討(1/2)	主持人	92.08~93.07	90.3萬	國科會
023	多孔黏彈性材質與硬質間界面破壞機制之探討(3/3)	主持人	93.08~94.07	125.5萬	國科會
024	含裂紋薄層之黏彈半平面問題之探討(2/2)	主持人	93.08~94.07	74.4萬	國科會
025	含多層平面或圓柱形異質之熱彈性與黏彈性問題解析(1/3)	主持人	94.08~95.07	86.4萬	國科會
026	植入物與多孔性非線性材質骨界面之破壞力學問題的探討(1/3)	主持人	94.08~95.07	143.2萬	國科會
027	含多層平面或圓柱形異質之熱彈性與黏彈性問題解析(2/3)	主持人	95.08~96.07	88.7萬	國科會
028	植入物與多孔性非線性材質骨界面之破壞力學問題的探討(2/3)	主持人	95.08~96.07	129.5萬	國科會
029	含多層平面或圓柱形異質之熱彈性與黏彈性問題解析(3/3)	主持人	96.08~97.07	88.7萬	國科會
030	植入物與多孔性非線性材質骨界面之破壞力學問題的探討(3/3)	主持人	96.08~97.07	112.2萬	國科會
031	承受不同外力下人體骨骼系統之靜態與動態模擬	主持人	96.08~97.07	38.7萬	國科會
032	承受不同外力下人體骨骼系統之靜態與動態模擬	主持人	97.08~98.07	38.7萬	國科會
033	裂縫與直線或橢圓形界面之熱黏彈性交互作用之研究	主持人	97.08~98.07	300.0萬	國科會
034	新型骨植入物之破壞分析	主持人	97.08~98.07	470.2萬	國科會
035	承受不同外力下人體骨骼系統之靜態與動態模擬	主持人	98.08~99.07	38.7萬	國科會
036	裂縫與直線或橢圓形界面之熱黏彈性交互作用之研究 2/3	主持人	98.08~99.07	99.6萬	國科會
037	新型骨植入物之破壞分析 2/3	主持人	98.08~99.07	161.9萬	國科會
038	裂縫與直線或橢圓形界面之熱黏彈性交互作用之研究 3/3	主持人	99.08~100.07	99.6萬	國科會
039	新型骨植入物之破壞分析 3/3	主持人	99.08~100.07	150.4萬	國科會
040	台俄國合計畫：利用分段導數黏彈模型分析人體肌骨力學系統之衝擊反應(1/3)	主持人	99.08~100.07	70.0萬	國科會
041	台俄國合計畫：利用分段導數黏彈模型分析人體肌骨力學系統之衝擊反應(1/3)	主持人	100.08~101.07	70.0萬	國科會
042	含任意方向曲線裂縫功能梯度材料之彈性破壞分析	主持人	100.08~101.07	74.4萬	國科會

043	含任意形狀異質多層材料之破壞力學解析	主持人	100.08~101.07	66.4萬	國科會
044	含任意方向曲線裂縫功能梯度材料之彈性破壞分析	主持人	101.08~102.07	74.4萬	科技部
045	含任意形狀異質多層材料之破壞力學解析	主持人	101.08~102.07	66.4萬	科技部
046	(趙振綱)台俄國合計畫：利用分段導數黏彈模型分析人體肌骨力學系統之衝擊反應(3/3)	主持人	101.08~102.07	70.0萬	科技部
047	含任意方向曲線裂縫功能梯度材料之彈性破壞分析	主持人	102.08~103.07	74.4萬	科技部
048	含任意形狀異質多層材料之破壞力學解析	主持人	102.08~103.07	66.4萬	科技部
049	成功大學轉撥-前瞻技術產學合作計畫-次世代鋼及其綠色製程與產品創新應用產學	主持人	102.08~103.07	70.9萬	科技部
050	裂縫穿越曲面異質界面之熱黏彈性交互作用 1/3	主持人	103.08~104.07	122.2萬	科技部
051	裂縫穿越直線異質多層界面之熱黏彈性交互作用 1/3	主持人	103.08~104.07	92.7萬	科技部
052	成功大學轉撥-前瞻技術產學合作計畫-次世代鋼及其綠色製程與產品創新應用產學	主持人	103.08~104.07	84.9萬	科技部
053	成功大學轉撥-前瞻技術產學合作計畫-次世代鋼及其綠色製程與產品創新應用產學	主持人	103.08~104.07	388.8萬	科技部
054	成功大學轉撥-光學式全血生物晶片及凝血儀之開發與醫學應用-光學式全血生物晶片	主持人	103.02~104.01	43.6萬	科技部
055	裂縫穿越曲面異質界面之熱黏彈性交互作用 2/3	主持人	104.08~105.07	122.2萬	科技部
056	裂縫穿越直線異質多層界面之熱黏彈性交互作用 2/3	主持人	104.08~105.07	92.7萬	科技部
057	成功大學轉撥-前瞻技術產學合作計畫-次世代鋼及其綠色製程與產品創新應用產學	主持人	104.08~105.07	366.2萬	科技部
058	裂縫穿越曲面異質界面之熱黏彈性交互作用 3/3	主持人	105.08~106.07	122.2萬	科技部
059	裂縫穿越直線異質多層界面之熱黏彈性交互作用 3/3	主持人	105.08~106.07	92.7萬	科技部
060	成功大學轉撥-前瞻技術產學合作計畫-次世代鋼及其綠色製程與產品創新應用產學	主持人	105.08~106.07	366.2萬	科技部
061	含多數圓形異質承受點熱源作用下之熱	主持人	106.08~107.0	108.1萬	科技部

	黏彈破壞力學解析		7		
062	承受剛體衝擊下熱黏彈性體之破壞分析	主持人	106.08~107.07	96.1萬	科技部
063	含多數圓形異質承受點熱源作用下之熱黏彈破壞力學解析(2/3)	主持人	107.08~108.07	114.1萬	科技部
064	承受剛體衝擊下熱黏彈性體之破壞分析(2/3)	主持人	107.08~108.07	96.1萬	科技部
065	含多數圓形異質承受點熱源作用下之熱黏彈破壞力學解析(2/3)	主持人	108.08~109.07	114.1萬	科技部
066	承受剛體衝擊下熱黏彈性體之破壞分析(2/3)	主持人	108.08~109.07	96.1萬	科技部
067	焦電材料熱彈電場偶合之破壞力學解析	主持人	109.08~110.07	125.2萬	科技部
068	含裂紋之多邊形塗層孔洞之熱黏彈性破壞解析	主持人	109.08~110.07	107.2萬	科技部
統計				6668 萬 3 佰	

四 、 研發成果智慧財產權及其應用績效獎金

1. 內視鏡切割刀結構: 腕隧道是由腕骨和纖維組織所形成的，通常位於手腕的掌面。由於骨是凹形的，頂部有環腕韌帶蓋住，成為隧道。在隧道中，有正中神經、屈指肌群及屈拇長肌的肌腱通過，當覆蓋過緊、肌腱發炎或其它因素壓迫到隧道中間的正中神經，即造成腕隧道症候群。

罹患腕隧道症候群的患者，手常發麻不已，半夜酸痛到驚醒過來，有人不惜吃安眠藥助眠。一般腕隧道症以右手偏多，好發於家庭主婦、勞工階級，他們手中的橫韌帶發炎緊縮，壓迫到神經上，一般人常做復健，可惜治療效果有限。腕隧道症候群患者，依照傳統的手術，傷口要切十公分長，使用此發明新技術改良切割刀，只要開兩公分小傷口，用新式安全切割刀，將壓迫在神經上面的橫腕韌帶切開，使神經的壓迫得以減輕，改善症狀，六分鐘的手術就可完成，此將大大提升醫療品質。

目前此切割刀改良將有助於提升國內自行研發能力與成果，發展出適於國人使用之切割刀且結構簡單易於生產與製造，進一步發展拋棄式切割刀，以便於門診中即可進行手術。現

已與廠商積極配合量產，期望能在價格合理下，提供國人高效率之醫療品質。

2. 手肘關節之調節裝置: 第二代的新型肘關節外固定器設計，如*圖 1 所示*，採用同一代設計之對稱型設計，由兩組骨釘夾鉗 (pin clamp)、球接頭(ball-and-socket joint)、伸縮套筒（telescoping tube)、及兩根以鉸鏈關節連接之 U 型連桿（u-bar）所構成，整組外固定器共有 17 個元件。

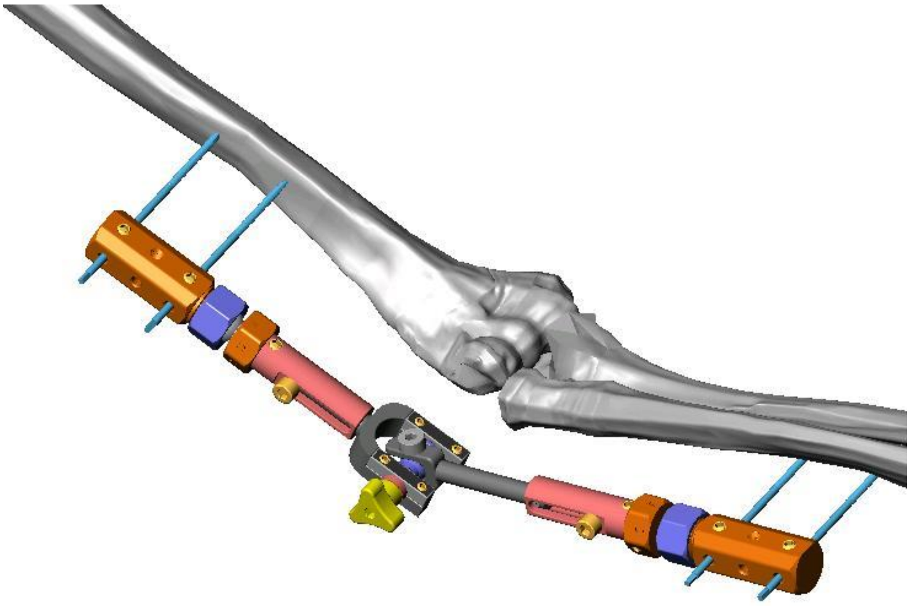


圖 1 第二代肘關節外固定器

一、軸心對位功能（hinge-alignment function）

此項功能在設計上與一代設計的差異不大，唯一的差異是改變外固定器中間鉸鏈關節的形式如*圖 2* 示，此設計的優點在於外固定器以兩組鉸鏈關節形式相互連接，使得整組外固定器多了側向的自由度，這是因為考慮到肘關節有內翻（varus）及外翻（valgus）的現象，此自由度剛好可以彌補一代設計的不足。另外，值得注意的是，這類的外固定器在施打骨釘時為了避免去傷到重要的神經及韌帶，對於骨釘的施打位置，外固定器必須具有更多的自由度，因此二代設計中多出的自由度也能讓骨釘施打更具有彈性。

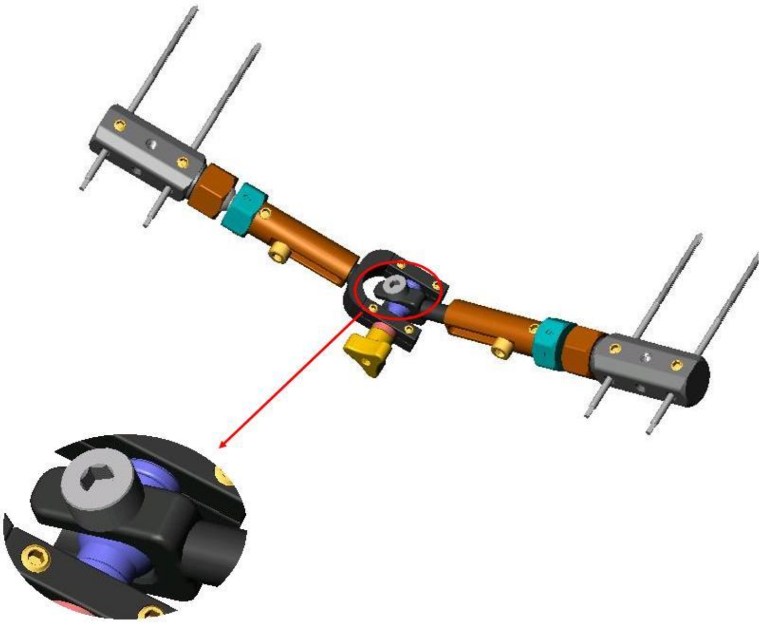


圖 2 第二代設計之雙鉸鏈關節

二、關節拉伸功能（arthroplasty-distracting function）

如同一代設計，二代設計一樣將拉伸機構裝於外固定器兩端，分別拉動肱骨或尺骨來達到對稱拉伸關節的目的，一代設計是以推動伸縮套筒為當作拉伸機構，拉伸一定距離後再利用鎖固螺絲鎖緊，而二代設計則是利用轉動拉伸裝置，控制球頭（ball head）的伸長與縮短，同樣可以做到關節拉伸，如*圖 3* 示。二代設計的優點在於利用螺紋進給的方式能精確控制關節拉伸量，以及較為簡單的手術技巧，二代設計的伸縮距離為 11 mm，也符合文獻中提到的關節拉伸量。

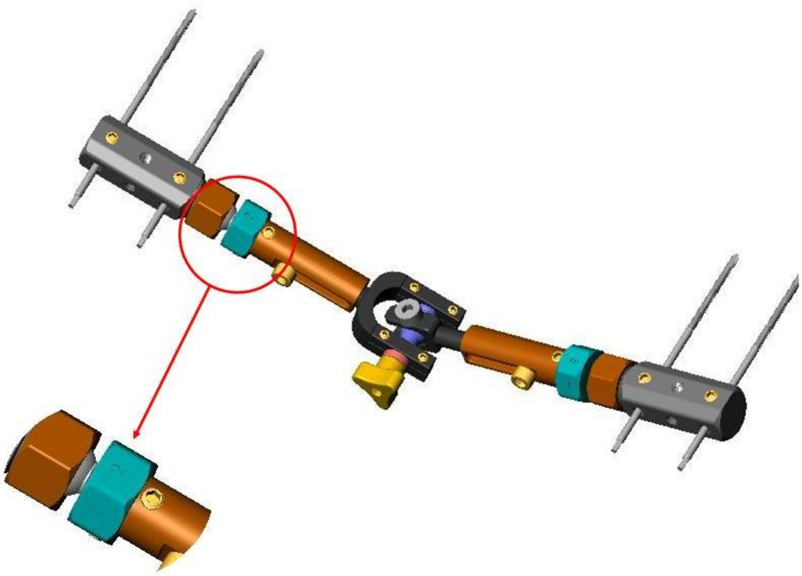


圖 3 第二代設計之拉伸機構

三、術後復健功能（rehabilitation-training function）

如同一代設計概念，此功能目的是希望提供肘關節在主動式活動下的活動阻力，針對這項功能所設計的二代阻力裝置，如*圖 4 所*示。一代設計在兩伸縮套筒上加掛一組彈簧，透過彈簧力提供肘關節活動阻力，而二代設計則透過一個手動鎖柄調整施加在外固定器鉸鏈關節的摩擦阻力，隨著阻力的大小，患者必須施加相當的力量才能讓肘關節活動，藉此達到主動式活動阻力的目的，此設計的優點在於阻力大小可以方便調整，且肘關節在彎曲或伸直時都能提供阻力，改善了一代設計採用彈簧的缺點。

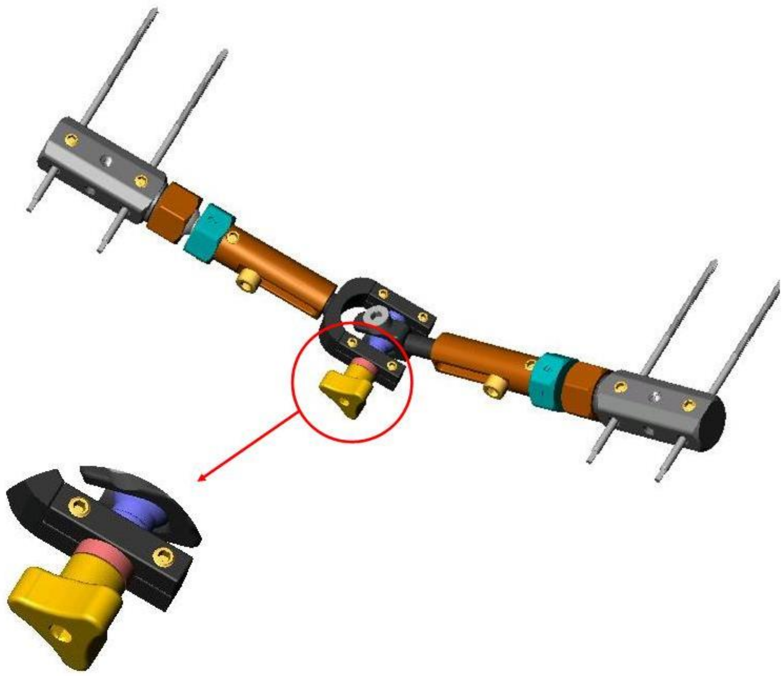
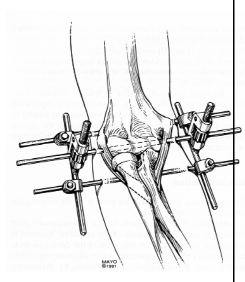
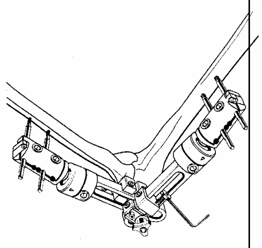
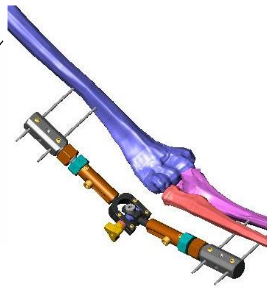


圖 4 第二代設計之阻力裝置

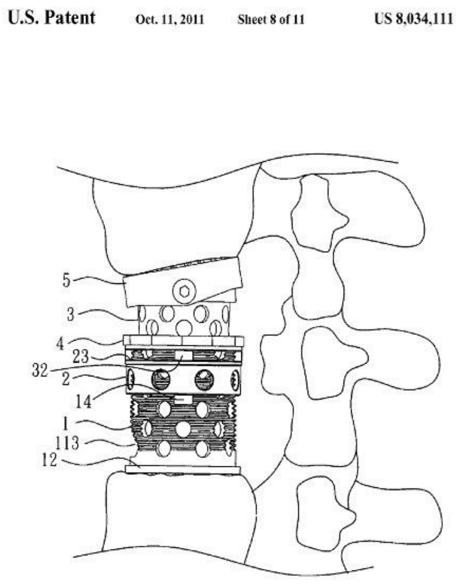
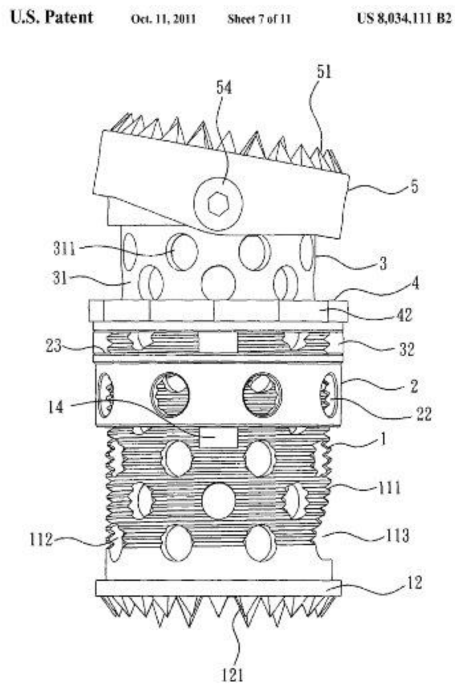
與其他廠牌骨外固定器之比較

				
	Mayo	Compass	Orthofix	2nd New-designed
Arthroplasty distracting	One-side	One-side	Both-side	Both-side
Hinge Alignment	Fluoroscopy	Fluoroscopy	Fluoroscopy	Elbow motion
Active-training	Invariable	Invariable	Invariable	Variable (Resistance device)
Passive-training	CPM	CPM	CPM	CPM

此第二代的新型肘關節外固定器設計取得中華民國新型專利(C-3)，並完成技術轉移授權廠商。

3. 可調式人工脊椎之椎體支架:

專利名稱：ADJUSTABLE VERTEBRAL SPACER FOR VERTEBRAL RRCONTRUCTION
美國專利案號：8,034,111
發明人：Chao, C. K., Hsu, W. H., Hsu, C.C., Hsu, H.C., Lu, L.M., Tsai, Y.H., Shih, K.S.
簡介:本發明是一種人工脊椎之椎體支架，方便醫師依不同脊椎高度可以調整椎體支架高度。

圖　式	說　明
	1. 本發明是一種人工脊椎之椎體支架，係以手術植入方式替代原有脊椎之椎體 2. 組成包括：一管狀本體，其周緣開設複數個圓孔，內部形成一管狀空間，並於兩端分別突伸複數個尖刺，本體中間有螺紋，中段開設四個（或以上）滑槽孔，以供調整高度。
	3.一可調整上方支撐端蓋，係相對套接於本體上方端，支撐端蓋之軸向蓋片對應於各尖刺位置開設一穿孔，以供其穿出，且該蓋片開設至少一骨融合孔，並於其外表面突設複數個棘刺，而該蓋片徑向之蓋環底部周緣開設至少二（或四個以上）長條形調整凸緣，其以結合件穿越，藉以微調該椎體高度，且該蓋片外表面突伸之複數個尖刺及棘刺則具有防滑脫之功能者，最後以螺帽調整高度，螺帽上方有棘輪槽防止高度下滑功能，螺帽徑向外緣有數個孔洞，以利用工具旋轉調整高度。

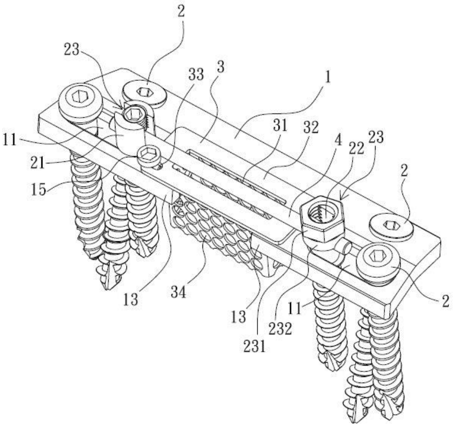
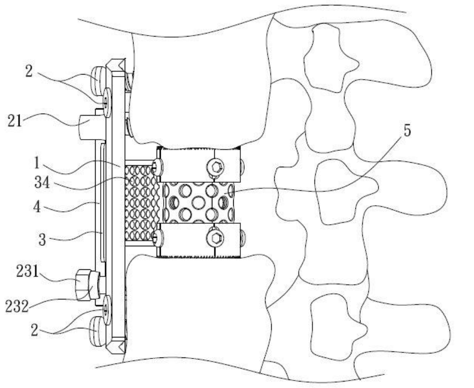
4. 具提高骨融合效率之脊椎板狀固定器:

專利名稱：VERTEBRAL PLATE-LIKE FIXATION THAT IMPROVES BONE INFUSION EFFICIENCY

美國專利案號：已核准通知（申請案號：12/190981）

發明人：<u>Chao, C. K.</u>,**<u>Hsu, W. H.,</u>** Hsu, H.C.,Hsu, C.C., Tsai, Y.H.

專利簡介：本發明重建脊椎或椎體置換手術所採用之脊椎板狀固定器，發明的特點是增加方形籠體，可以『提高骨融合效率』之脊椎板狀固定器。

圖　式	說 明
	1. 本發明是具提高骨融合效率之脊椎板狀固定器（如左圖），其係以手術植入方式連接於脊椎所切除部位之上、下椎體之間，用以固定於該切除部位的前方或側方。 2. 包括：一本體板（1），其開具複數個固定孔/槽，該本體板中段位置開設一鏤空孔；複數個骨螺絲（2、3），係穿越所選定之固定孔/槽；一中空籠體，係套接並固定於鏤空孔，其具有一槽內空間，該槽內空間周圍壁面開設複數個骨融合孔，其係作為骨融合及骨骼生長之用。
	3.該籠體係以骨融合方式與一人工脊椎椎體支架（5）連結，進而獲致能有效避免脊椎椎體下陷、防止該人工脊椎椎體支架滑脫，又可達到提高骨融合的效率。