HONG KONG MATHEMATICAL SOCIETY
香港數學學會 HKMS

Newsletter

2010 HKMS Best Thesis Award

We are pleased to announce the winners of the 2010 HKMS Best Thesis Award:

Guanghui HU, Hong Kong Baptist University
Huihui ZENG, The Chinese University of Hong Kong

Prof. Zhouping XIN (ZENG's supervisor), Prof. Tao Tang (HU's supervisor), Guanghui HU (BU, 2010 HKMS Best Thesis Winner), Prof. Ngai-Ming Mok (Chairman of the Selection Committee) (from left to right)

The supervisor of HU is Prof. Tao TANG and the supervisor of ZENG is Prof. Zhouping XIN. The Award Presentation Ceremony took place during the Annual General Meeting held on 27 March 2010, at The Chinese University of Hong Kong.

Photographs of the HKMS Best Thesis Award winners and their supervisors are available at *http://www.hkms.org.hk/?page_id=350*

Selection Committee members for this year's HKMS Best Thesis Award are:
Prof. Ngai-Ming Mok (The University of Hong Kong)
Prof. Tong Yang (City University of Hong Kong)
Dr. Wai-Ki Ching (The University of Hong Kong)
Dr. Min Yan (Hong Kong University of Science and Technology)

Available at

http://www.hkms.org.hk/

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Prof. Jian-Shu Li, HKUST
(Past President)

In this issue

HKMS Annual Conference

The Society's 2010 Annual General Meeting was held on 27 March 2010, 2:00-6:10pm at The Chinese University of Hong Kong. The above speakers presented their recent research results in the annual meeting.

The Annual General Meeting was held at 3:40pm. Members from the Chinese University of Hong Kong, Hong Kong Baptist University, Hong Kong Polytechnic University, University of Hong Kong, City University of Hong Kong, and Chu Hai College of Higher Education attended the Annual Meeting.

In the annual meeting, the HKMS Best Thesis Awards are presented.

Prof. Tao Tang, President of HKMS, chaired the Annual General Meeting

Plenary Speakers:

Plenary Lecture by TODOROV, Andrey Nikolov (UC Santa Cruz & CUHK)
Title: Applications if the Solution of Calabi Conjecture to Algebraic Geometry

The invited speakers and the titles of this year's Annual Conference are listed below:

Applied Mathematics Session

1. LI, Aobing, City University of Hong Kong
Title: Some Fully Nonlinear PDEs on the manifolds with boundaries

2. YIU, Cedric Ka-Fai, Hong Kong Polytechnic University
Title: Optimal Portfolios with a VaR constraint

3. WANG, Chunpeng, Jilin University & Chinese University of Hong Kong
Title: Continuous Subsonic-Sonic Flows in a Convergent Nozzle

Pure Mathematics Session

1. HUANG, Jing-Song, The Hong Kong University of Science & Technology
Title: Dirac Operators and Lie Algebra Cohomology

2. CHANG, Huai Liang, The Hong Kong University of Science & Technology
Title: On genus one Gromov Witten invariant of Quintic threefold

3. NG, Patrick Tuen Wai, University of Hong Kong
Title: Finding exact meromorphic solutions of the Falkner-Skan differential equation

Plenary Lecture by SHAO, Qi-Man (HKUST)
Title: Limit Theory: From Deterministic Normalization to Self-normalization

香港數學學會2010年度會議, 已於3月27日下午二時至六時十分, 在香港中文大學舉行。以上的講者正在演說他們最新的研究結果。

下午3時四十分, 來自香港中文大學、香港浸會大學、香港理工大學、香港大學、香港城市大學及珠海學院的會員出席是次年度會議。

【香港數學學會最佳論文獎】亦同時在會議中頒發。

New Faculty Members

PolyU

Ng Chi Tim (Timothy)
Lecturer, Department of Applied Mathematics
Ph.D. The Chinese University of Hong Kong

Chi Tim, Ng has received his Ph.D. in Statistics (2007) under the title "Statistical inference for FIGARCH and related models" at Chinese University of Hong Kong. After graduation, he has worked at Seoul National University (Korea) and University of British Columbia (Canada) as a post-doc researcher. His current research interests include time series analysis, option pricing theory, and stochastic calculus.

Raymond Nung-Sing SZE
Lecturer, Department of Applied Mathematics
Ph.D. The Univsersity of Hong Kong

Raymond obtained his PhD in Mathematics from HKU under the supervision of Dr. J.T. Chan and Prof. C.K. Li in 2005. He was a Visiting Scholar in Auburn University (2006) and a Postdoctoral Fellow in University of Connecticut (2006 - 2009). Raymond's current research interests lie in the area of quantum computation and quantum information, specifically the related mathematical problems in matrix and operator theory. Other topics of interests include sensitivity analysis in nonnegative matrix theory and preserver problems.

HKUST

Huai-Liang CHANG
Assistant Professor, Department of Mathematics
Ph.D. Stanford University

Research interests:
Deformation theory by derived methods; virtual fundamental class in Gromov Witten theory and Donaldson Thomas theory

Shing Yu LEUNG
Assistant Professor, Department of Mathematics
Ph.D. University of California, Los Angeles

Research interests:
Numerical methods for partial differential equations
Scientific computing

CityU

Prof. Mourad ISMAIL
Chair Professor, Department of Mathematics
Ph.D. University of Alberta, Canada

Professor Mourad Ismail's research has been in Special Functions and Orthogonal Polynomials and their applications to Analysis, Probability, Combinatorics, and Integrable Systems. He is also interested in Approximation Theory, especially Asymptotics and Moment Problems. He was involved in the development and study of several new families of orthogonal polynomials.

Professor Ismail published over 230 papers, edited 7 books and authored one book, Classical and Quantum Orthogonal Polynomials in One Variable, published by Cambridge University Press in 2005, paperback edition 2009.

Professor Ismail was a Leverhulme research fellow at Imperial College, London, and was awarded a University South Florida Presidential Excellence Award and the Theodore and Venette Askounes-Ashford Distinguished Scholar Award from University of South Florida. He is listed among the highly cited scholars. He is a fellow of the Institute of Physics and of the European Society of Computational Mathematics in Science and Engineering.

Professor Ismail is on the editorial board of the Encyclopedia of Mathematics, a series of books published by Cambridge University Press, and serves on the editorial boards of several journals including Constructive Approximation, Journal of Approximation Theory, the Ramanujan Journal, and Journal of Physics A.

Dr. Qingshuo SONG
Assistant Professor, Department of Mathematics
Ph.D. Wayne State University, USA

Dr. Qingshuo Song's research interests include stochastic control theory, and its applications in mathematical finance and engineering. Dr. Qingshuo Song received his BSc from Nankai University, MA and PhD from Wayne State University. Prior to joining City University of Hong Kong, Dr. Qingshuo Song had been working with University of Michigan and University of Southern California.
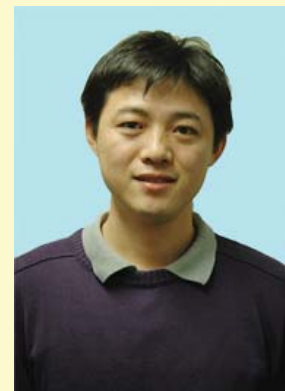
註冊成為「新數站」成員，進入網上的數學大家庭

http://www.hkms-nss.net

「新數站」啟動儀式

香港浸會大學數學系聯同香港數學學會及香港浸會大學數學系舊生會，與香港數理教育學會合作籌劃的免費新高中數學學習平台「新數站」，於今天（二零一零年一月三十日）正式啟用，並假香港浸會大學舉行啟動儀式。在場嘉賓包括香港數學學會常務秘書長暨香港浸會大學教務長唐創時博士、教育局首席教育主任(新高中)關兆錦博士、香港浸會大學理學院院長黃偉國教授、香港浸會大學數學系曾維新教授、教育局總課程發展主任(數學)李柏良先生、香港浸會大學數學系舊生會會長薛君爵先生、香港數理教育學會代表伍達洋先生及香港教育圖書公司出版總監黃燕如博士。唐創時博士及關兆錦博士均在典禮開始時致辭。唐博士表示，新高中的課程能否達至為香港培訓人才的目的，實有賴教育局官員、前線老師、各教育團體及大學等，多方面的配合。「新數站」正好提供了一個平台，給各方面交換教學心得及分享教材。關博士則認為「新數站」讓中學生透過現今的資訊科技，在互聯網上學習數學，可提升他們對數學的興趣。
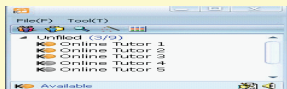
「新數站」統籌陳偉康博士表示，自新高中推行後，數學科成為了全港學生在中學文憑考試中必須應考的核心科目之一，其成績將直接影響同學升讀大學的機會。由於所有學生都必須修讀數學科，課堂中的學習差異必然擴大。建立「新數站」的目的，就是為全港中學生提供一個免費的互動學習平台，讓同學們能夠在課堂以外，透過互聯網跟同學、老師及由浸大數學系本科生充當的「新數專員」，繼續交流及討論數學。同學還可在網站中，免費取得學習數學的相關資料，及收看專為他們錄製的數學教學短片。

「新數站」豐富內容包括：

即時網上通訊 (MS-K)
- 與老師及同學廿四小時保持緊密聯繫

新數專員
- 線上輔導教學
- 即時解答數學難題

新數站 Wiki-數學字典 (資料來源：課程發展處)
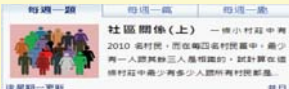- 在這裡查看不同數學字詞的解釋

DV 教室
- 可上載數學問題至 DV 教室
- 實戰數學、趣味數學、數學教材

教學短片
- 提供不同數學題目的相關教學短片

每週一題、每週一篇、每週一趣
- 每週更新的內容，給同學更多資訊及帶領他們走進精彩的數學世界，並有鍛鍊腦筋的機會

論壇分享
- 學術交流、討論數學

師生空間 (Blog)
- 建立你的個人空間分享學習經驗

玩鑽數學
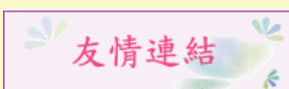- 龍校長每天在星島日報上發表的數學文章

大哉言數
- 名言、謎題、金句、故事、歷史、遊戲、數學家 ...應有盡有

數學遊戲
- 新數站製作的數學遊戲

網上友情連結
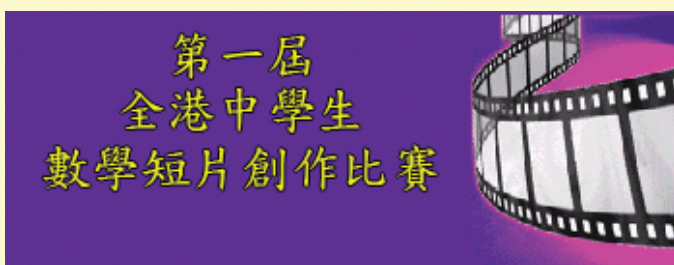- 教材分享、數學網頁、數學教師 Blog、數學刊物、數學比賽、數學遊戲、數學教育團體資料

中學生統計習作比賽
- 得獎作品集

網上教學資源
- 必修部分
- 延伸部分單元一(微積分與統計)
- 延伸部分單元二(代數與微積分)
- 教育局課程發展處課程資源
- 其他網上資源

在「新數站」的啟動儀式中，大會亦同時進行了全港首個由大學及數學教育團體合辦的「全港中學生數學短片創作比賽」的頒獎典禮。該比賽讓全港中學生發揮無限創意，將數學內容作不一樣的演繹。參賽同學以現時青年人最常用的表達方式，製作短片介紹數學概念，題材包括尋找斐波那契數列的起源、在生死一刹間拆解幾何炸彈、扮演「天皇」教數學等，也有同學以拯救特務Ｇ為題，智破著名的蒙提霍爾問題。拍攝手法既具故事性，亦能把數學理論深入淺出，給包括數學教授、教育局官員及中學校長在內的評判團留下深刻印象。比賽分高級及初級兩組，共有30間中學派出67隊同學，合共超過260名學生報名參加。每組均設有冠、亞、季軍及多個優異獎項。在正式頒獎前，李柏良先生代表評判團，向在場同學闡述評判的意見，讓同學日後的學習能更進一步。而是次比賽的高及初級組的冠軍分別由仁濟醫院王華湘中學及保良局何蔭棠中學的同學奪得。參賽作品已上載至「新數站」，讓全港學生及老師分享成果。

初級組冠軍　　保良局何蔭棠中學

高級組冠軍　　仁濟醫院王華湘中學

全港中學生數學短片創作比賽 (獲獎名單)

初級組

冠軍	保良局何蔭棠中學	科學記數法
亞軍	順德聯誼總會翁祐中學	變換
季軍	仁濟醫院王華湘中學	魔幻方格
優異獎	香港中文大學校友會聯會張煊昌中學	捕捉斐波那契
	伊利沙伯中學舊生會中學	三角學在生活中的應用
	真光女書院	Everyone loves Maths 微積分篇
	順德聯誼總會鄭裕彤中學	數學易數學廣告
	港大同學會書院	Happy Rap-py Maths
	沙田蘇浙公學	Coordinates Geometry
	沙田蘇浙公學	Pythagoras' Theorem

高級組

冠軍	仁濟醫院王華湘中學	圓疑
亞軍	伊利沙伯中學舊生會中學	斐波那契數列
季軍	新法書院	黃金機會
優異獎	羅定邦中學	一擇千金
	佛教黃允畋中學	揩紙
	循道衛理聯合教會李惠利中學	二元一次的咀咒
	樂善堂余近卿中學	六合彩的迷思
	伊利沙伯中學舊生會中學	Imaginary Dream
	香港培正中學	Quadratic formula song
	伊利沙伯中學舊生會中學	KING sir 教數學

新高中數學科
學習內容與方法及應試技巧之扼要點提

聖公會李福慶中學 數學科主任 楊定邦老師

楊定邦老師
與同學合照

甲. 修讀內容

學生可用以下其中一種模式修讀：

1. 只讀必修部分
2. 修讀必修部分及選讀延伸單元一（微積分與統計）
3. 修讀必修部分及選讀延伸單元二（代數與微積分）

乙. 學習方法

1.必修部分：

數學為新高中學制的核心科目，所有同學都要修讀必修部份。必修部份分為「基礎課題」和「非基礎課題」。能力稍遜的學生應首先集中精神應付「基礎課題」，務求在這部份取得滿意成績。數學的課題往往一環扣一環，某個課題學習得不好，便會影響到其他課題。由於學習年期變為三年，同學必須定期「溫故知新」，才能鞏固數學基礎。

2.延伸單元：

延伸課程是為對數學有興趣和具備足夠程度、可因修讀更多進階數學而受益的同學提供多一個選擇。延伸課程分為兩個獨立單元：單元一（微積分與統計）及單元二：（代數與微積分）。單元一強調數學的應用，提供微積分與統計的直觀概念及相關之基本技能。而單元二強調數學的理解，提供更高深的數學知識及理順同學將來學習涉及較多數學知識的學科。

延伸單元的內容較必修部份深入。同學必須養成每天做數的習慣，多練習是必須的，每天平均要做十多題數而平均需要個多小時。學生必須不視數學練習為煩悶或痛苦的「差事」；反之，要欣賞數學之影響力及美感，並享受解題成功時的滿足感。並且，需要多培養敏銳觀察及運用邏輯思考去處理一些涉及數個課題之結構性題目。多與同學互相討論，分享想法，集思廣益。而上課時必定要留心，努力記下一些思考流程和解難技巧。以上種種，皆是有效之學習方法及心得。

丙. 延伸單元一（微積分與統計）和延伸單元二（代數與微積分）

1.學習目的：

－ 為日後研習數學打下良好基礎，預備升學及進修。
－ 學習對較高級數學概念之理解及應用。
－ 培養分析及靈活的應變和解難能力。
－ 訓練高階及抽象思維。

2.學習範圍：

－ 延伸單元一：「高等統計」、「進階概率」、「正態分佈」、「點及區間估計」、「微積分」、「二項、幾何及泊松分佈」
－ 延伸單元二：「高等代數」、「三角」、「向量」、「微積分」、「矩陣」、「綫性方程組」

3.學習條件：

－ 數學基礎良好。
－ 不怕符號化表達。
－ 有耐性，因一道難題可花上一至二小時也解決不了。
－ 喜歡從征服數學難題獲取之成功感。
－ 主動多找習題做，並有系統地記下筆記。
－ 學習敏銳觸覺、靈活思考，因問題可千變萬化。

4.升學前景：

－ 大部份大學裡的工程學系、理學院及其他熱門之學系如精算系、風險管理系、計量財務系等，均要求同學先修讀延伸單元一或延伸單元二，方可報讀。
－ 商科組同學欲於新高中修讀延伸單元一，該科之微積分部分，可視為高等數學之增潤版，故對數學有興趣及基礎較佳之商科組同學，建議選修延伸單元一為佳。
－ 在新高中課程中，物理及化學皆需要應用微積分去解決部份問題，所以數學延伸單元一或二可說是學習物理及化學的重要工具。

丁. 應試技巧

－ 多注意常犯錯誤（common mistakes），因為同學於作業、測驗或考試時曾犯的錯誤，大多再會重犯。故要多加留意，避免在公開試時再犯同一錯誤。
－ 須要釐清概念，因為定義不清，題目便不明。
－ 須要多留意結構性問題之上下關聯。
－ 在學習及鍛鍊習題時，往往有多種不同方法去解題。建議同學在應付公開試中，運用平常練習時掌握得最好之方法作答。
－ 應付多項選擇題（MC）時，可用排除法去選擇最合適之答案。（因為處理多項選擇題與問答題之技巧，是截然不同的。）
－ 同學切記不可忽略初中時（JS1-JS3）的數學知識，因為「基礎部分」是建基於初中的數學技巧。

祁力群：張量研究的兩點心得

（香港理工大學應用數學系）

祁力群教授現任香港理工大學應用數學系首席教授和系主任。

2009年5月，我到意大利西西里島Erice參加國際變分分析會議。在來意大利開會之前，我在張量計算的幾個方向已展開研究。5月14日，會議上的朋友們出去旅遊了。我因多次來過這裏，許多地方已去過，因此，就忙裏偷閒，在旅店安靜的房間裏，面對窗外的藍天白雲和地中海，將這些方面的研究寫出來，整理思路，與朋友們交流心得，為自己的研究方向定位，也為進一步的研究鋪陣新局，去挖掘更多的成果。

2008年12月，在香港理工大學，我組織了計算多項式優化和多重線性代數的工作會議，北京大學的張恭慶院士、斯坦福大學的葉蔭宇教授、東京工學院的小島政和教授等與會。會上張恭慶院士作了將Perron-Frobenius的定理從非負矩陣全面推廣到非負張量的報告。加州大學伯克利分校的林力行報告了一個奇特的現象，秩為r(r大於1)的一般張量或對稱張量集都不是閉的，而秩為r的非負張量集卻是閉的。這引起了我和香港浸會大學吳國寶教授、澳大利亞Curtin科技大學周廣路博士對非負張量的注意。我們撰文指出，非負張量最大特徵值在多重馬爾可夫鏈研究上有用，其計算求解效果也非常好，不像一般或對稱張量特徵值計算總是NP-Hard。（這篇文章將在SIAM矩陣分析雜誌上發表。）今年2月，中科院數學與系統科學研究院馬志明院士來訪，我們討論這可能在PageRank裏還會有應用。我想，非負張量可能是張量研究中奇特的一塊。這必然和多變量概率理論密切相關聯，因為概率必須是非負的。非負張量必將自成一局，是個值得研究的新分支。

從2007年開始，我和香港大學吳學奎教授等合作，對擴散陡度張量成像技術進行了研究，在應用數學和醫療工程的學術雜誌上發表了六七篇文章。磁共振擴散張量成像技術已在醫療上普遍使用。擴散張量是個二階張量。其空間擴散係數成一個橢球球面，橢球之主軸即為主特徵向量方向，恰與人體器官如腦部神經纖維走向吻合，而橢球面其它兩個軸即次特徵向量方向則垂直於纖維走向。但在多神經纖維交叉時，二階張量的橢球面就無法吻合多纖維走向了。擴散陡度張量成像則是在成像公式上加了一個四階陡度張量修正項，以彌補二階張量之不足。張量的分量是隨坐標轉動而變化的，不能直接應用，只有不隨坐標轉動而變化的不變量，如特徵值，才可用為診療判斷參數。因為我在2005年提出了高階張量特徵值的概念，從而吳學奎教授的研究組和我建立了聯繫並開展了合作研究。我們將高階張量特徵值理論用於擴散陡度張量成像的研究，因為是不變量，自然具有成像參考價值。吳學奎教授是一個具有物理背景的研究者，他希望能知道陡度張量特徵向量方向的物理意義。但四階陡度張量項在這個模型中只是二階擴散張量項的一個修正項，它的特徵向量方向是不可能有其獨立的物理意義的。因此，這方面的研究在2008年下半年就有點停步不前了。

今年2月，偶然在Google上發現我2005年高階張量特徵值的文章被另外兩個醫療工程研究者引用。比較奇怪的是，為何他們不引用我們用於醫療成像的六七篇文章，卻要引用我2005年的數學文章，這有點奇怪。我因而決定和我的助手喻高航博士對醫療影像文獻來個系統的研究。我們隨之發現，在後擴散張量成像研究中，較多的醫療工程研究者是用一個高階擴散張量直接代替那個二階擴散張量。一個高階擴散張量的擴散係數形成一個多刺的凸面。這些凸刺就可和高纖維走向吻合，而這些凸刺恰為我所提出的高階張量的特徵向量方向。這就解釋了上面的疑問。

知道了這個問題的原因，但又從何處入手開展新的研究呢？在醫療工程上，所有的擴散係數必須是非負的，否則就沒有意義。這意味著這些向量的特徵向量是非負的，即這些張量是半正定的。工程數據總有噪音，並不能使原始數據自然產生出的張量是半正定的。對於二階張量，如果產生了負特徵值，可強迫其為0。而對於高階張量，就沒有這樣明顯容易的辦法，於是我們提出

了一個半正定擴散張量成像方法，在原有模型上加上一個半正定約束，使得產生的擴散張量無論是二階或高階，均為半正定的。這個約束是個凸錐約束，也可用我提出的高階張量最小特徵值函數非負來表示。由於醫療上的張量均為三維張量，最小特徵值均易計算。這個模型是一個凸規劃，可以計算求解。喻高航博士為這個模型進行了計算，並加上了腦部成像彩圖。

在醫療成像研究上的這個發現使我很高興。4月份，葉蔭宇教授來訪。我和他也進行了討論，葉蔭宇教授指出，這是個錐線性規劃。原來，凸優化的一個重大進展，就是將線性規劃推廣到錐線性規劃，包括半正定規劃和二階錐規劃。而我們這個半正定擴散張量成像模型，即是一個錐線性規劃的新品種。我們將它稱為空間張量規劃，這裏的空間張量，是指物理上實際存在的物理量。它們只有三維，因而有別於統計或數據分析中產生的高維張量。半正定空間張量是可以多項式時間判別的，半正定高維張量的判別卻是NP-Hard的，這是很大的不同。

在5月13日Erice會上我作了半正定擴散張量成像和空間張量規劃的報告，受到與會者的好評和興趣。美國的Rockafellar教授又幫我解決了最小特徵值函數的次微分構造問題。我隨即將空間張量錐的對偶錐內點判斷問題向Rockafellar教授提出。Rockafellar教授是世界上凸分析和變分分析的頂級權威。我希望他能幫助解決這個問題。錐線性規劃的提出者之一Nesterov教授對我的報告自然有興趣。而意大利的Gianessi教授等就鼓勵我將空間張量規劃的研究進一步深入、擴大。作為錐線性規劃的一個新模型。另一方面，我和葉蔭宇教授對計算多項式的優化也在進一步研究。在5月13日的會上，我的博士生張新珍報告了她和我及葉蔭宇教授一起合作的三階多項式函數球面優化研究，這個工作也和Nesterov教授的研究密切相關。我和我的助手淩晨博士、張新珍目前正和奧地利的Bomze教授合作，研究單純形上的多項式優化問題。

再一方面，我和香港城市大學戴暉暉教授、南京師範大學韓德仁博士對固體力學中彈性張量橢球性的問題也在進一步深入地研究。最近，我們的一篇文章剛被"彈性"雜志接受，這也是我在固體力學的雜誌上發表的第一篇文章。現在，我正和戴暉暉教授運用我們在其它領域研究中取得的技術對這個問題進行深入的研究。回到香港，又看到一個羅馬尼亞學者的文章，這篇文章探討了我提出的高階張量特徵值的一些性質。這個學者是研究幾何的，對我的工作有所呼應，是對我工作的另一個肯定。

小結這一段的研究，有兩點心得：一是應用數學研究工作者要系統地研究一個或幾個應用領域中的課題，從中提出具有強烈應用背景的應用數學新方向、新課題，並作出有意義的創造性成果。這次在後擴散張量成像研究中提出半正定擴散張量成像方法，再晉升為空間張量規劃，就是這樣做的。

下面希望對多重馬爾可夫鏈的研究或PageRank和固體力學彈性理論的研究也下這樣的功夫。二是應用數學研究工作者要努力找到"可處理的"(tractable)新界線，並努力將有重大應用價值的課題包含其中， 而不是強攻"不可處理的"(intractable)課題，否則，研究結果將一無所得。這個"可處理的"新界線，會將人們的知識大大向前推進。Nemerovski和Nesterov將線性規劃推廣到錐線性規劃，包括了半正定規劃和二階錐規劃。我將光滑非線性方程組牛頓算法推廣到半光滑非線性方程組牛頓算法，包括了非線性互補問題和變分不等式轉換成的非線性方程組，都是這樣的例子。原來對張量計算不加區分的研究，進展就不好。現在要將矩陣計算推廣到非負張量計算和空間張量計算，這將會有重要的應用背景。

將這兩點心得寫出來，以後再來檢驗，也許對後來者會有用處。

誠信的危機：學術出版的現狀
Integrity Under Attack: The State of Scholarly Publishing

By Douglas N. Arnold, President of SIAM 美國工業與應用數學會主席

作者簡介：

Douglas N. Arnold在布朗大學獲得學士學位, 之後在芝加哥大學獲得碩士及博士學位。他是美國工業與應用數學會的主席以及明尼蘇達大學"McKnight Presidential"數學教授。

Scientific journals are surely important. They provide the most effective means for disseminating and archiving scientific results, and so are a key part of an enterprise on which our health, security, and prosperity ultimately depend. Publications are used by universities, funding agencies, and others as a primary measure of research productivity and impact. They play a decisive role in hiring, promotion, and salary decisions, and in the ranking of departments, institutions, even nations. With big rewards tied to publication, it is not surprising that some people engage in unethical behavior, abuse, and downright fraud. Still, when I started to look at the issues more closely, I was appalled by what I found. In this column, I give a few troubling examples of misconduct by authors and by journals in applied mathematics. One conclusion I draw is that common bibliometrics—such as the impact factor for journals and citation counts for authors—are easily manipulated not only in theory, but also in practice, and that their use in ranking and judging should be curtailed.

SIAM places great value on scholarly publishing, of course, and we are taking strong actions to ensure the integrity of our own publications and to protect our authors from theft of their work. But we are still struggling to decide just what actions we should take. So I invite the thoughts of members of the SIAM community. If you have witnessed troubling incidents in journal publication, let me know. Do you think such incidents are on the rise? Should SIAM be doing more? Should we look beyond our own publications and authors?

Author misconduct—most obviously verbatim plagiarism, but also more subtle appropriation of ideas and duplicate publication—has always been with us. At SIAM, however, our impression is that the problem is becoming far more common. Perhaps even more disturbing is journal misconduct, carried out by publishers and editors, often with an evident profit motive. One example is a sloppy or sham peer review process designed to produce the impression of a serious scholarly journal without the substance. Another is the deliberate manipulation of citation statistics in order to raise the impact factor or other journal bibliometrics.

A recent case involving SIAM brings in both author and journal misconduct. A paper published in a SIAM journal in 2008 was plagiarized essentially verbatim from a preprint version posted by the authors on the web. A copied version of the paper appeared in the International Journal of Statistics and Systems in the same year with different title and authors. SIAM's publisher, vice president for publications, executive director, and I undertook a full investigation, which required nearly six months. The case got messier and more disturbing week by week. I decided that our final report on it should be made fully public; it is available on the web, where you can read the details.1

Meanwhile, here are some of the sad conclusions. Based on the papers that we reviewed, we determined that the suspect authors had committed plagiarism in this and various other cases. At least four articles published under their names in four different journals are essentially verbatim copies of the articles of other authors, and we have reason to believe that there are other cases as well. The journal publisher, Research India Publications, publishes nearly 50 journals, many related to applied mathematics, but did not respond to our inquiries about the plagiarized article. We contacted the editor-in-chief listed on the journal web page, but he himself has been unable to contact the journal! After learning about this incident from us, he submitted his resignation to the journal but has received no response from the publisher; his name, along with those of numerous other distinguished mathematicians, remains on the journal website.

Rumors of editor and journal misconduct have dominated the highly publicized case of the applied math journal Chaos, Solitons and Fractals (CSF), published by Elsevier. As reported in a 2008 article in Nature,[2] "Five of the 36 papers in the December issue of Chaos, Solitons and Fractals alone were written by its editor-in-chief, Mohamed El Naschie. And the year to date has seen nearly 60 papers written by him appear in the journal." In fact, of the 400 papers by El Naschie indexed in Web of Science, 307 were published in CSF while he was editor-in-chief. This extremely high rate of selfpublication by the editor-in-chief led to charges that normal standards of peer-review were not upheld at CSF; it has also had a large effect on the journal's impact factor. (Thomson Reuters calculates the impact factor of a journal in a given year as C/A, where A is the number of articles published in the journal in the preceding two years, and C is the number of citations to those articles from articles indexed in the Thomson Reuters database and published in the given year.) El Naschie's papers in CSF make 4992 citations, about 2000 of which are to papers published in CSF, largely his own. In 2007, of the 65 journals in the Thomson Reuters category "Mathematics, Interdisciplinary Applications," CSF was ranked number 2.

Another journal whose high impact factor raises eyebrows is the International Journal of Nonlinear Science and Numerical Simulation (IJNSNS), founded in 2000 and published by Freund Publishing House. For the past three years, IJNSNS has had the highest impact factor in the category "Mathematics, Applied." There are a variety of connections between IJNSNS and CSF. For example, Ji-Huan He, the founder and editor-in-chief of IJNSNS, is an editor of CSF, and El Naschie is one of the two co-editors of IJNSNS; both publish copiously, not only in their own journals but also in each other's, and they cite each other frequently.

Let me describe another element that contributes to IJNSNS's high impact factor. The Institute of Physics (IOP) publishes Journal of Physics: Conference Series (JPCS). Conference organizers pay to have proceedings of their conferences published in JPCS, and, in the words of IOP, "JPCS asks Conference Organisers to handle the peer review of all papers." Neither the brochure nor the website for JPCS lists an editorial board, nor does either describe any process for judging the quality of the conferences. Nonetheless, Thomson Reuters counts citations from JPCS in calculating impact factors. One of the 49 volumes of JPCS in 2008 was the proceedings of a conference organized by IJNSNS editor-in-chief He at his home campus, Shanghai Donghua University. This one volume contained 221 papers, with 366 references to papers in IJNSNS and 353 references to He. To give you an idea of the effect of this, had IJNSNS not received a single citation in 2008 beyond the ones in this conference proceedings, it would still have been assigned a larger impact factor than any SIAM journal except for SIAM Review.

Another example of journal misconduct was revealed with an element of comedy. In "'CRAP' paper accepted for publication," published online in June in Science News, senior editor Janet Raloff[3] described an experiment in which Cornell graduate student Philip Davis and a friend used a computer described an experiment in which Cornell graduate student Philip Davis and a friend used a computer program, SCIgen, to generate a random document; the grammar and vocabulary were those of a computer science research paper, but the document was completely free of meaningful content. (The paper opens, "Compact symmetries and compilers have garnered tremendous interest from both futurists and biologists in the last several years. The flaw of this type of solution, however, is that DHTs can be made empathic, large-scale, and extensible." Four pages later, it concludes, "We expect to see many futurists move to studying Trifling

Thamyn in the very near future." Indeed!) The paper was submitted to The Open Information Science Journal (TOISCIJ), published by Bentham Science, a publisher of more than 200 open-access scientific journals (many of which, according to the publisher's website, have high impact factors). Although the paper was submitted under pseudonyms and with the give-away affiliation Center for Research in Applied Phrenology, or CRAP, Davis was notified four months later that the "submitted article has been accepted for publication after peer-reviewing process in TOISCIJ." Following the open-access model, the publisher told the authors that the paper would be published as soon as they sent a check for $800. (They declined to do so.)

The cases I have recounted are appalling, but clear-cut. Perhaps even more dangerous are the less obvious cases: publishers who do not do away with peer review, but who adjust it according to nonscientific factors; journals that may not engage in wide-scale and systematic self-citation, but that apply subtle pressures on authors and editors to adjust citations in favor of the journal, rather than based on scholarly grounds; authors who may not steal text verbatim, but who lift ideas without giving proper credit. These are much harder to measure and adjudicate. What do you think? Are such practices significantly distorting the scientific literature or enterprise? Do you have a story of such dubious practices to tell?

One conclusion that I am ready to draw is that we need to back away from the use of bibliometrics like the impact factor in judging scientific quality. It has long been noted that what the impact factor measures is not well correlated with the quality of a journal, and even much less with the scientific quality of the papers appearing in it or of the authors of those papers. In our field, the 2008 IMU-ICIAM-IMS report Citation Statistics4 made that case eloquently. Less emphasized has been that these metrics are open to gaming, and are in fact being gamed; in some cases they are likely a better indicator of the unscrupulousness of the authors, editors, or publishers than of the quality of their work. Frequently, I hear of technical solutions, proposed in the hope that an adjustment to the formula—for example, increasing the time frame for the impact factor from 2 to 5 years, or excluding self-citations— will solve the problem. Such remedies, in my opinion, are doomed to failure. The numbers of citations to mathematical articles are small integers, with excellent papers often drawing lifetime totals of only tens or hundreds of citations, and such numbers are easily manufactured. What one editor can do in one journal by self-citation, a pair of editors can do with two journals without self-citation. Counting can never replace expert opinion.

What can we, as concerned scientists, do? Of course, the first step is to look to ourselves: As scientists, we should place great emphasis on scientific integrity, in what we write and what we review. Ask yourself some questions before lending your name to a journal as an editor. Does that journal hew to high standards of peer review? Does it have clear policies and mechanisms for enforcing them? Is its output a useful addition to the sprawling scientific literature? We also need to educate others, not only our students, but also our colleagues and administrators and managers. The next time you are in a situation where a publication count, or a citation number, or an impact factor is brought in as a measure of quality, raise an objection. Let people know how easily these can be, and are being, manipulated. We need to look at the papers themselves, the nature of the citations, and the quality of the journals. I look forward to learning from the experiences and thoughts of the SIAM community. You can reach me at president@siam.org.

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注：原文刊登於2009年12月出版的《SIAM News》第42卷第10期"Integrity Under Attack: The State of Scholarly Publishing"，並可在以下連結找到http://umn.edu/~arnold/siam-columns/integrity-under-attack.pdf 。

Book Review *Dynamic Asset Pricing Theory* by Xun Li

Dynamic Asset Pricing Theory, Third Edition. By Darrell Duffie (publisher: Princeton University Press, year of publication: 2001, number of pages: 465, price: USD 95.00, ISBN number: 9780691090221, Is this in a lecture series, Princeton Series in Finance)
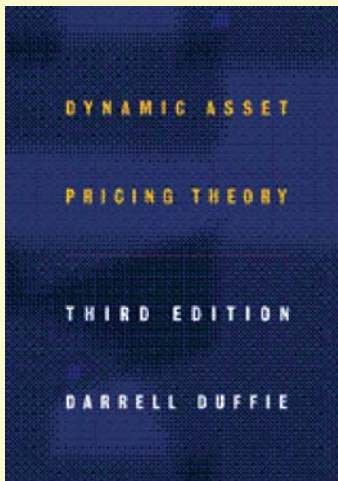
This is a thoroughly updated edition of Dynamic Asset Pricing Theory, the standard text for PhD students on the theory of asset pricing and portfolio selection. This book provides the most elegant and coherent synthesis of finance theory, in a complete markets and frictionless settings. The asset pricing results are based on the three increasingly restrictive assumptions: absence of arbitrage, single-agent optimality, and equilibrium. These results are unified with two key concepts, state prices and martingales. Technicalities are given relatively little emphasis on mathematical rigor or on the general equilibrium, so as to draw connections between these concepts and to make plain the similarities between discrete and continuous-time models.

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The discussion of discrete-time models is clear and to the point, though there are other texts that also provide good treatments of this material, their own aims and themes. It bridges the gap between arbitrage models on one hand, and models based on consumption, optimization/dynamic programming and general equilibrium on the other hand. Absence of arbitrage guarantees the existence of a stochastic discount factor, or pricing kernel. Optimality implies that the stochastic discount factor must be equal to the investors' intertemporal marginal rate of substitution. There is no discussion of utility theory, mean-variance analysis, the Arbitrage Pricing Theory, or related topics ordinarily covered in a first course in security markets. But the readers will find some advantage in having yet another perspective.

The main focus of the theory is in the treatment of continuous-time models, which constitutes roughly two-thirds of the book. The risk-neutral pricing approach is used consistently throughout. The relation between risk-neutral pricing and partial differential equations is explained via what we call Feynman-Kac solutions (probabilistic solutions) of parabolic partial differential equations. It includes the Black-Scholes model, American options, forwards and futures, and term structure models. The Black-Scholes model is developed several different ways: the fundamental partial differential equation is derived from the replicating strategy, and the risk-neutral method is applied, using Girsanov's theorem and martingale representation. There are sections on affine factor models and the Heath-Jarrow-Morton model, and at least a brief description of many others that have appeared, as well as abstract definitions of common term-structure derivatives.

The continuous-time equilibrium theory in the book consists of the use of martingale representation to implement Arrow-Debreu equilibrium in complete securities markets and consumption-based capital asset pricing model. As seems appropriate for a text of this type, the question of existence of equilibrium is not addressed. The chapter no valuation of corporate securities studies from models based on the capital structure of the corporation to models based on an assumed process for the default arrival intensity. The chapter on numerical methods includes discussion of binomial models and convergence to continuous-time models, Monte Carlo simulation, and finite-difference methods for solving partial differential equations. A series of brief appendices reviews the necessary mathematical concepts such as probability theory, stochastic integrals, stochastic differential equations, and the fundamental Feynman-Kac solution of partial differential equations.

Book Review   *Mathematics and Politics*   by Tuen Wai Ng

Mathematics and Politics: Strategy, Voting, Power, and Proof by Alan D. Taylor and Allison M. Pacelli, Springer; 2nd edition (2008), 364 pages, |ISBN: 0387776435, $40 (paperback).
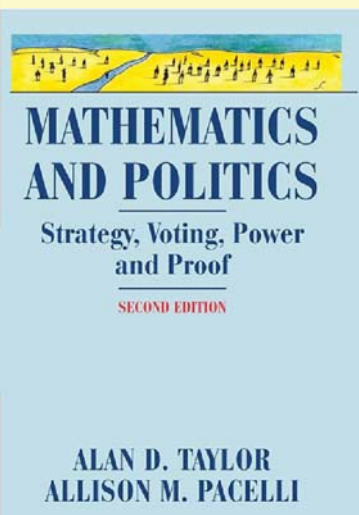
A few years ago, when I was asked to supervise three Form 6 students for the Summer Science Institute of The University of Hong Kong, I decided to ask these students to read the first edition of the book under review (which was solely written by the first author Alan D. Taylor). After reading and presenting a few chapters of this book, the students were then asked to do a project on computing various power indices of the political parties in the Hong Kong Legislative Council (LegCo). One of the main reasons for choosing this book is that even though the book assumes no prior knowledge of either college-level mathematics or political science, it does include numerous logical arguments that the students need to master. Since then I have been using this book to teach a broadening course and supervise some undergraduates for a project course.
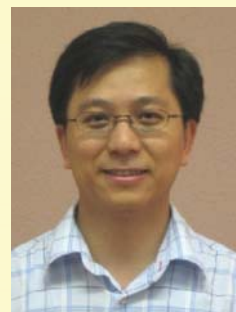
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The first edition of the book (published in 1995) contained the following five main topics: escalation, conflict, yes-no voting, political power and social choice. The second edition has an additional author Allison M. Pacelli who was a former undergraduate student of the first author and the author of the answer book of the first edition. The second edition has completely reorganized the ordering of these five topics and it also includes one extra topic: fairness.

In the second edition, the authors now first introduced the problem on social choice (i.e. is there an "ideal" voting system?) in Chapter 1 and come back to this problem again in Chapter 7. It is a wise change as this topic has been beautifully presented in the first edition and it contains perhaps the most interesting and surprising result (i.e. Arrow's Impossibility Theorem) covered in this book. The second edition also contains the Gibbard-Scatterthwaite Theorem related to the manipulability of social choice procedures. Here, I would like to point out that there is no indication in both editions that the version of Arrow's Impossibility presented is not quite the same as Arrow's original one. An accessible account which is close to Arrow's original version can be found in T.W. Körner's book [4].

The part on yes-no voting (Chapters 2 and 8) contains a discussion on the complexity of voting systems. In a yes-no voting system, each voter either responds with a vote of "yes" or "no". The system also specifies exactly which collections of "yes" votes yield passage of the motion at hand and these collections are called winning coalitions. Standard examples of yes-no voting system are n-person weighted games in which each player has a weight w_i and a collection of players S is a winning coalition if and only if $\sum_{i \in S} w_i \geq q$ where q is the quota. However, not every yes-no voting system can be considered as an n-person weighted game and the authors spend sometime in figuring out the necessary and sufficient condition for a yes-no voting system to be an n-person weighted game. The authors then show that each yes-no voting system can be considered as the intersection of m weighted games and m will be then defined as the dimension of the yes-no voting system. Using this definition, the usual unicameral system in which the bills will be passed by a simple majority vote of the members is a one dimensional voting system. Bicameral legislatures require a concurrent majority to pass legislation are two dimensional voting systems. In page 196 of the first edition, the first author, Alan D. Taylor mentioned that he

did not know any real-world voting system of dimension 3 or higher. Such a real-world voting system of dimension 3 was first provided by J. Freixas in 2004. He showed in [2] that the dimension of the European Union Council under the Nice rules (since 2005) is 3. It seems to me that both authors are not aware of J. Freixas's work as they ask in page 255 of the second edition again if such higher dimensional voting systems exist. Recently, it was proved in [1] that the voting system of LegCo (since 1998) is also of dimension 3. It is because the voting system used in LegCo is sometimes unicameral and sometimes bicameral, depending on whether the bill is proposed by the government of the Hong Kong Special Administrative Region (HKSAR).

The part on power indices (Chapter 3 and Chapter 9) covers a number of power indices and many detailed computations of them. The first power index considered is the Shapley-Shubik Index which is a special case of Shapley value. Since there is no mention of Shapley value in this book, the reader can refer to Ein-Ya Gura and Michael B. Maschler's book [3] for a very nice treatment of it.

Chapter 4 and 11 on conflict can be served as an introduction to game theory. The material covered in this part is quite standard. The part on escalation (Chapter 6 and 12) starts with a detailed analysis of the so-called the dollar auction which involves an auctioneer who volunteers to auction off a dollar bill with the following rule: the dollar goes to the highest bidder, who pays the amount he bids, but the second-highest bidder also must pay the highest amount that he bid, but gets nothing in return. Quite often, the game ends up with two players who continue to bid the value up well beyond the dollar, and the auctioneer therefore can make a profit of it. This game can be used to explain the apparent irrationality behind the arms race of the 1980s. The dollar auction is an example of mechanism design, a branch of game theory in which one designs certain game structures or incentive schemes in order to obtain the desired outcome. Another example of mechanism design considered in Chapter 6 and 12 is the Vickrey auction in which everyone submits a sealed bid. The one who made the highest bid wins and pays the second highest bid. Vickrey proved in 1961 the Revenue Equivalence Theorem which says that the expected price paid to the auctioneer is the same in a first-price sealed bid auction, English auction, Dutch auction and a second first-price sealed-bid auction.

The part on fairness (Chapters 5 and 11) is new to the second edition. It studies two fairness problems: apportionment and fair division. For example, according to the United States Constitution, the number of congressional representatives per state should be assigned according to the state's population. A naive allocation of seats to states leads to an allocation in which the number of congressional representatives for a state is not a whole number and therefore such an allocation is impossible to implement. In Chapter 5, a number of solutions have been proposed and studied. The authors then proposed a number of reasonably fair criteria that an apportionment method should satisfy. The authors also prove a weaker version of the impossibility theorem of Balinski and Young which says that such an apportionment method does not exist.

In conclusion, the authors have succeeded in writing a beautiful book which can be used to teach humanities and social sciences major the beauty of deductive mathematics. It is also a book very suitable for a reading or project course.
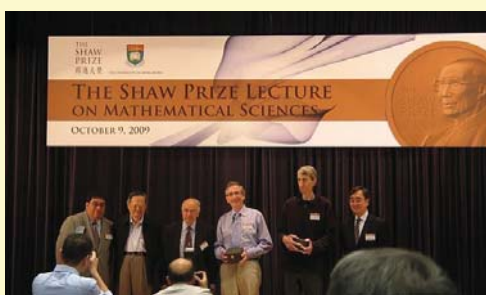
References:

1. Wai-Shun Cheung and Tuen-Wai Ng, A Three-Dimensional Voting System in Hong Kong, preprint.

2. J. Freixas, The dimension for the European Union Council under the Nice rules, European Journal of Operational Research, Volume 156, Issue 2 (2004),415-419.

3. Ein-Ya Gura and Michael B. Maschler, Insights into Game Theory, Cambridge University Press, 2008.

4. T.W. Körner, Naive Decision Making : Mathematics Applied to the Social World, Cambridge University Press, 2008.

Mathematics Conferences in 2009-2010

The 3rd Workshop on Industrial Applications (CityU, 7-11 December, 2009)

The Shaw Prize Lecture on Mathematical Sciences (HKU, 9 October 2009)

Hong Kong Virtual Institute for Imaging Sciences and Applications (VIISA) Inauguration Symposium (HKBU, 9 November, 2009)

The Third International Conference on Structured Matrices and Tensors (HKBU, PolyU & CU, 19-22 January 2010)

Workshop on Teaching and Learning Calculus in High Schools (HKBU, 5 March 2010)

Past Events:

University	Conference	Date
HKU	Workshop on Complex Geometry (Support from HKMS) *http://hkumath.hku.hk/~imr/records0809/WCG-09Aug4-6/2009Complex%20Geometry_1stAnn.htm*	4-6 August 2009 Venue: HKU
HKU	The Shaw Prize Lecture on Mathematical Sciences *http://www.hku.hk/science/news/publiclecture/shawprize2009/index.html*	9 October 2009 Venue: HKU
HKBU	Hong Kong Virtual Institute for Imaging Sciences and Applications (VIISA) Inauguration Symposium *http://www.math.hkbu.edu.hk/viisa09/*	9 November 2009 Venue: HKBU
HKU	Conference on Number Theory *http://hkumath.hku.hk/MathWWW/event/file/Programme.pdf*	23 November 2009 Venue: HKU
CityU	The Third Winter School on Applied Mathematics *http://www6.cityu.edu.hk/ma/ws2009*	1-11 December 2009 Venue: CityU
HKBU	Workshop on High Dimensional Modeling and Algorithm *http://www.math.hkbu.edu.hk/HDMA09/*	2 December 2009 Venue: HKBU
CityU	The 3rd Workshop on Industrial Applications *http://www6.cityu.edu.hk/rcms/WIA2009/*	7-11 December 2009 Venue: CityU
CU & CityU	The Seventh East Asia Conference on PDEs *http://www.math.cuhk.edu.hk/eacpde7/*	13-18 December 2009 Venue: CU & CityU
HKU	Workshop on Quantum Information Science *http://hkumath.hku.hk/MathWWW/event/file/Quantum10b.htm*	7-8 January 2010 Venue: HKU
HKBU, PolyU & CU	The Third International Conference on Structured Matrices and Tensors *http://www.math.hkbu.edu.hk/icsmt2010/*	19-22 January 2010 Venue: HKBU, PolyU & CU
HKBU	Workshop on Teaching and Learning Calculus in High Schools *http://www.math.hkbu.edu.hk/TLCHS/*	5 March 2010 Venue: HKBU
CU & Kyoto University	Joint Workshop on Analysis and Geometry of Fractals and Metric Measure Spaces (Support from HKMS) *http://www.ims.cuhk.edu.hk/conference/20100320/index.htm*	20-21 March 2010 Venue: CU

Forthcoming Events:

University	Conference	Date
CU	International Workshop on Inverse Problems (Support from HKMS) *http://www.ims.cuhk.edu.hk/conference/iwip2010/*	23-24 April 2010 Venue: CU
UST	East Asian Post Graduate Workshop on Soft Matter *http://pgworkshop.ust.hk/*	28-30 April 2010 Venue: UST
CityU	International Conference on Applied Mathematics *http://www6.cityu.edu.hk/rcms/WBP/int_conf.html*	7-11 June 2010 Venue: CityU
CityU	The 4th Winter School on Applied Mathematics *http://www6.cityu.edu.hk/ma/ws2010/*	30 November- 10 December 2010 Venue: CityU
CityU	International Conference on Inverse Problems (Support from HKMS) *http://www6.cityu.edu.hk/ma/icip2010/*	13-17 December 2010 Venue: CityU
PolyU	International Conference on Applied Statistics and Financial Mathematics *http://www.polyu.edu.hk/ama/events/conference/ASFM2010/*	16-18 December 2010 Venue: PolyU

2010-11 HKMS Best Thesis Award
Call for Submission

The purpose of Hong Kong Mathematical Society Best Thesis Award is to recognize outstanding PhD or MPhil theses in the fields of mathematics and statistics. All submissions will go through a formal evaluation process by a panel of established scholars of the Society.

Submissions will be judged on the following criteria:
- Significance of results
- Originality of work
- Clarity of presentation
- Quality of writing

Eligible of the Award are postgraduate students who have obtained or will obtain their PhD or MPhil degrees in the fields of mathematics or statistics from any local university. Their Principal Supervisors must be regular faculty staff of any local university to be eligible to nominate his/her students. The theses should be submitted to the respective universities *between 1 February 2009 and 31 January 2011.*

Potential candidates are required to submit:
1. a curriculum vitae with a list of his/her publications (no more than two pages)
2. a full thesis written in English
3. a letter of nomination from his/her Principal Supervisor that:
   i.   verifies his/her eligibility for the Award
   ii. describes and evaluates the thesis' contribution to the literature and the student's role in the scholarship

Each recipient of the Best Thesis Award will receive an official certificate and a cash prize. Up to three awards will be made avaliable each year.
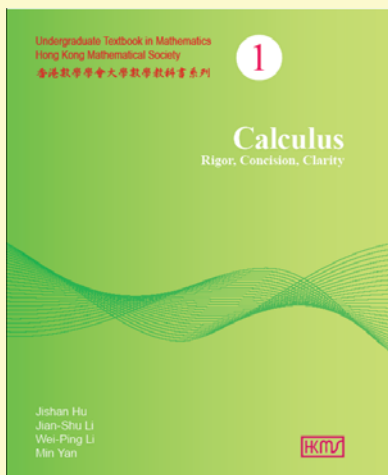
Application Deadline:
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Submissions must be received no later than 20 February 2011 to be considered for the Award. All theses must be submitted, in soft copy, to <*hkms@hkms.org.hk*> .

Message from Board of HKMS

Title: Calculus:
Rigor, Concision, Clarity

Authors: Jishan Hu, Jian-Shu Li
Wei-Ping Li, Min Yan
The Hong Kong University of Science & Technology

Publishing undergraduate and graduate textbooks in Mathematics is a recent initiative of Hong Kong Mathematical Society (HKMS). The rationale behind this project is to encourage and support colleagues and scholars to publish their own teaching materials so that they can be used by more students associated with our Society. Our aim is to offer high quality textbooks at reasonable prices and to increase the visibility of HKMS to others in the field.

We are delighted to have the great support from our colleagues Jishan Hu, Jian-Shu Li, Wei-Ping Li and Min Yan of the Hong Kong University of Science and Technology (HKUST), who have contributed this present book: the first book of our Undergraduate Textbook Series. The book has been used for quite some years for undergraduate students at HKUST as their textbook. It is expected that students from other universities will find the book useful for their study. It may also serve as supplementary materials for undergraduate students.

With the success of launching this meaningful project, HKMS will continue to publish high-quality and original textbooks in Mathematics on both undergraduate and graduate levels.

We welcome colleagues to share their lecture notes with our students. HKMS will provide necessary support for copy editing. For any publication proposal or questions, please contact us at hkms@hkms.org.hk.

Hong Kong Mathematical Society
April, 2010

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我們將會以合理的售價，為我們的學生提供受歡迎的教材。

有興趣的作者，請電郵至 hkms@hkms.org.hk，聯絡我們。