

# 國家理論科學研究中心 會議

The logo for the National Center for Theoretical Sciences Mathematics Division (NCTS). It features the letters "NCTS" in a bold, orange, sans-serif font. A small globe icon is integrated into the letter "C".

National Center  
for Theoretical Sciences  
Mathematics Division



2018 NCTS Young Dynamics Day

Organizers:

Jung-Chao Ban (National Dong Hwa University)

Kuo-Chang Chen (National Tsing Hua University)

Cheng-Hsiung Hsu (National Central University)

Tzi-Sheng Yang (Tunghai University)

活動日期：2018年2月23日(五)

活動地點：東海大學應用數學系

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## 一、研討會背景與目的 (Main Theme)：

本會議每年由理論中心主辦的 Young Dynamics Day。該會議主要目的是提供一個平台給國內年輕的動態系統學者互相交流及討論彼此工作的機會，同時也讓資深學者更清楚年輕學者的研究取向。

有別於其他研討會，該會議特色是演講內容不拘形式並鼓勵接受邀請的年輕講員不必要報告已成熟的理論及工作，取而代之是傾向支持會議演講者報告自己即將開始或未來有興趣的研究題目；此做法用意是希望年輕動態系統學者將自己未來有興趣的研究工作及方向適度分享給國內同行，並在此平台下促成未來彼此實質合作的機會。

最後若該會議參與者有一致的研究興趣及取向，該方向也將是本中心動態系統領域之後活動推動的主要依據及參考。

## 二、會議之演講者：

- 謝世峰 (國立臺灣師範大學)
- 蔡亞倫 (國立中興大學)
- 林英杰 (國立高雄大學)
- 周世偉 (國立中央大學)
- 陳俞碩 (國立中央大學)
- 楊其儒 (汕頭大學)

## 三、會議之預期成果：

會議預期成果相信是在此平台催化下各位年輕學者能夠充分討論、交換意見以提高研究視野並增加未來共同合作的可能性。

#### 四、會議議程表

時間	內容
10:00 – 10:10	開幕
10:10 – 11:00	謝世峰 (師範大學) 主持人：陳國璋 (清華大學)
11:10 – 12:00	蔡亞倫 (中興大學) 主持人：許正雄 (中央大學)
	午餐
13:30 – 14:20	林英杰 (高雄大學) 主持人：班榮超 (東華大學)
	點心及討論時間
14:50-15:40	陳俞碩 (淡江大學) 主持人：張志鴻 (高雄大學)
15:50 – 16:40	周世偉 (中央大學) 主持人：陳怡全 (中研院)
16:50 – 17:40	楊其儒 (汕頭大學) 主持人：楊智烜 (東海大學)
18:00 –	晚宴

## 五、專題演講主題及摘要

講者	謝世峰
演講 題目	Structure-Preserving Flows of Symplectic Matrix Pairs
摘要	<p>We construct a nonlinear differential equation of matrix pairs that is invariant (the in a class of symplectic matrix pairs. Its solution also preserves invariant subspaces on the whole orbit (the Eigenvector-Preserving Property). Such a flow is called a structure-preserving flow and is governed by a Riccati differential equation (RDE) for some suitable Hamiltonian matrix. In addition, Radon's lemma leads to an explicit form of this equation. Therefore, blow-ups for the structure-preserving flows may happen at a finite <math>t</math>. To continue, we then utilize the Grassmann manifolds to extend the domain of the structure-preserving flow to the whole <math>\mathbb{R}</math> subtracting some isolated points. On the other hand, the Structure-Preserving Doubling Algorithm (SDA) is an efficient numerical method for solving algebraic Riccati equations and nonlinear matrix equations. In conjunction with the structure-preserving flow, we consider the two special classes of symplectic pairs corresponding algorithms SDA-1 and SDA-2. It is shown that at <math>t=2^{k-1}, k \in \mathbb{Z}</math> this flow passes through the iterates generated by SDA-1 and SDA-2, respectively. Therefore, the SDA and its corresponding structure-preserving flow have identical asymptotic behaviors, including the stability, instability, periodicity, and quasi-periodicity of the dynamics.</p>

講者	蔡亞倫
演講 題目	Solving central configuration problems with elimination methods?
摘要	<p>In this talk, I will first introduce the problems of central configuration and its generalization, balanced configurations. Second, I will present some elimination methods such as resultant, groebner basis, and Wu's method and compare some of their advantages or disadvantages with others. I expect to explore the possibility of solving more central/balanced configuration problems with those elimination methods.</p>

講者	林英杰
演講 題目	Global solutions to the compressible Euler equations in transonic nozzle flows
摘要	<p>We consider the Cauchy problems for the compressible Euler equations in a variable area duct, subject to the initial data near the sonic states. An asymptotic expansion of solutions for Riemann problems is found in the series consisting of the classical Riemann solvers and the perturbations solving the linearized system of equations around solvers. We develop a generalized Glimm method to establish the existence results. The stability of the scheme is resulted from the estimates of interaction among classical elementary waves and the perturbations. When the method is applied to the problems, the limit of approximate solutions serves as a BV entropy solution in the case that the duct is expanding.</p>



講者	周世偉
演講 題目	Some Results on Space Science and Medical Image-Data Processing
摘要	<p>In this talk, I will present my recent results in Space sciences, medical image processing and data-modeling.</p> <p>The global well-posedness of Fanno-Rayleigh flows is obtained by a new version of generalized Glimm scheme (GGS) and the improvement of Liu-Yang method. A new MacCormack's scheme is constructed for the numerical simulations. The global existence of entropy solutions of hydrodynamic escape model, which is one of the most important topics in astrophysics, is also established by GGS and the estimated of Knudsen and Mach number.</p> <p>In the applied of mathematics, we use the technique of data analysis and signals processing for the applications of several treatments in medical sciences.</p> <p>We plan in the future to implement mechanical learning processes for space sciences and medical image processing of the views.</p> <p>The use of a norm structure for recognizing more general space image also belongs to our future plan.</p>

講者	陳俞碩
演講 題目	Existence and Instability of Traveling Pulses of Keller-Segel System with Nonlinear Chemical Gradients and Small Diffusions
摘要	<p>In this paper, we consider a generalized model of 2_2 Keller-Segel system with nonlinear chemical gradient and small cell diffusion. The existence of the traveling pulses for such equations is established by the methods of geometric singular perturbation (GSP in short) and trapping regions from dynamical systems theory. By the technique of GSP, we show that the necessary condition for the existence of traveling pulses is that their limiting profiles with vanishing diffusion can only consist of the slow flows on the critical manifold of the corresponding algebraic-differential system. We also consider the linear instability of these pulses by the spectral analysis of the linearized operators.</p>

講者	楊其儒
演講 題目	Standing Waves in near-parallel vortex filaments
摘要	<p>In this talk, we consider the model for <math>n</math> almost parallel vortex filaments in a 3 dimensional fluid which takes in consideration the interaction between different filaments and an approximation for the self-induction. We will apply Nash-Moser theorem to prove the existence of periodic standing waves.</p>