



华中科技大学数学中心

Center for Mathematical Sciences

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Workshop on Modern Computational  
Mathematics

--Celebrating Vincent J. Ervin' 60<sup>th</sup> Birthday

*July 3, 2018*

*Center for Mathematical Sciences,*

*Huazhong University of Science and Technology (HUST)*

*Wuhan, China*

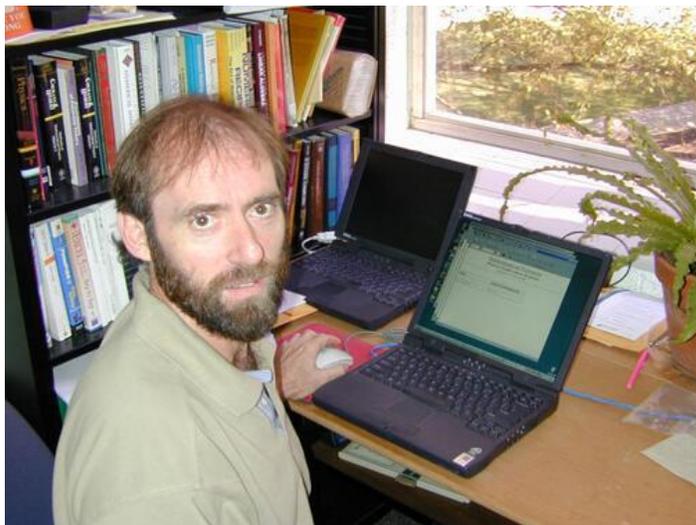


## Professor Vincent J. Ervin

Professor Vincent J. Ervin was born on June 28, 1958 in Australia. He was awarded a PhD in Georgia Institute of Technology, in 1984. He is the Professor of Department of Mathematical Sciences at Clemson University. He is the member Society of Industrial and Applied Mathematicians (SIAM) and Society of Industrial and Applied Mathematicians-Southeast Atlantic Section (SIAM-SEAS).

Professor Vincent J. Ervin is one of the outstanding mathematicians in the area of computing science. His research interests are numerical analysis, computational mathematics and partial differential equations.

Professor Vincent J. Ervin has published more than seventy scientific papers, three books: “A Maple Primer for Multivariable Calculus – Instructor’s Accompaniment”, “A Maple Primer for Multivariable Calculus” and “An Introduction to the Spectral Method”, and has awarded numerous NSF grants for research.





## PROGRAM OVERVIEW

Time	July 3 (Tuesday)
8:50-9:00	Opening ceremony
9:00-9:30	Jinqiao Duan
9:30-10:00	Ke Yin
10:00-10:30	Xiaobo Yin
10:30-11:00	Vincent J. Ervin
11:00-11:30	Ju Ming

**Organier:**

Jinqiao Duan (duan@iit.edu)

**Place for Workshop:**

813 Room, Enming Building, Center for Mathematical Sciences,  
Huazhong University of Science and Technology, Luoyu Road, Wuhan,  
Hubei Province, China

**Contact:**

Miss Wei Zhang 182-0271-1796



# PROGRAM

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## **Jinqiao Duan (Huazhong University of Science and Technology)**

**Title: Computing deterministic quantities for stochastic dynamics**

**Abstract:** The speaker will overview recent progress in computing deterministic quantities or indexes that carry stochastic dynamic information.

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## **Ke Yin (Huazhong University of Science and Technology)**

**Title: A Multi-grid Approach for Multiscale Total Variation Models**

**Abstract:** We propose a novel multi-grid method for solving total variation models. This type of models arises frequently in image processing tasks such as de-noising and segmentation. It is usually proposed as minimizing a nonlinear functional containing a total variation term, and the computational domain is either rectangle in 2D or rectangular cuboid in 3D. A usual multi-level decomposition of the domain is performed over the whole domain. The resulted subdomains are marked by four colors (in 2D case) in the interlacing formation, such that subdomains of the same color are non-overlapping. At each level, the solution for the minimizer of the nonlinear functional is updated in parallel on the subdomains of the same color, while the solution on each subdomain is updated by the same constant. This process is carried out in a Gauss-Seidel manner over the four colors for a few iterations. Unlike the usually multi-grid method that loops over all levels in V-cycle or W-cycles, the proposed approach sequentially updates the solution from coarsest level to finest, and repeat the procedure until convergence. The numerical tests demonstrate the linear scalability of the proposed algorithm and shows a potential for improvement in parallel computing.

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## **Xiaobo Yin (Central China Normal University)**

**Title: Numerical schemes for nonlocal problems with L2 integrable kernels**

**Abstract:** The solution is likely to be discontinuous across the boundary for nonlocal integral equations with L2 integrable kernels. At this time, it is improper if the continuous finite element method was used. If discontinuous Galerkin method is used the number of unknowns increase compare to continuous FEM.



In this talk, we introduce two new numerical schemes to solve nonlocal integral equations with  $L^2$  integrable kernels. The first one can only be used for 1d problem, and the second could be applied for any dimensional case. Both of the two schemes have the optimal convergence order and has the unknowns comparable to continuous FEM. Numerical experiments validate the corresponding numerical analysis.

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### **Vincent J.Ervin (Clemson University)**

**Title: Regularity of the solution to the 1-d fractional diffusion equation**

**Abstract:** Unlike the usual diffusion equation, even with smooth data, the solution of fractional order diffusion equations may exhibit a lack of regularity. In this presentation we will discuss the regularity of the solution to 1-d steady state fractional diffusion equation.

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### **Ju Ming (Huazhong University of Science and Technology)**

**Title:**

**Abstract:**

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## Chu culture

Chu was the name of a state and a clan. The Chu people believed that their ancestors were, in terms of age, Gao Yang, or Emperor Zhuan Xu, Lao Tong and Zhu Rong, and Yu Xiong. In the early Western Zhou Dynasty, Xiong Yi was made the monarch of Chu. After that, Chu State lasted about 800 years until it was conquered by Qin in 223 BC.

During the 800 years, the daring and innovative Chu people created a rich and profound culture, which is embodied by relics unearthed in the former territory of Chu. It is such relics that the Exhibition of Chu Culture presents to show a full picture of the splendid material and ideological culture of the Chu people

From the reign of Xiong Yi onwards, the Chu people had been making hard efforts to develop their society and economy. In the Spring and Autumn Period, King Zhuang made Chu one of the most powerful states in China. In the Warring States Period, Chu surpassed any other feudal state in the number of states it destroyed and the expansion of its territory. Such feats are attested to by the sword of Gou Jian, the king of Yue, and the spear of Fu Chai, the king of Wu, which were unearthed from Chu tombs.

Chu bronze articles form an important part of the Chinese bronze culture. Though it originated from the Central Plains, it displayed distinct local flavors. Chu, which possessed copper mines at Mt. Tonglin Daye and other places, achieved a high level in mining, smelting and casting.

The elegant and magnificent lacquered article is one of the highlights of Chu culture, embodying its special charm with original shapes, elaborate patterns, rich colors, and profound spiritual meanings. They had been well preserved thanks to the high groundwater level in the South.

China preceded any other country in the world in terms of raising silkworms, filature, and making silk fabrics. As confirmed by archeological findings, silk weaving had already been well developed in Chu by the Spring and Autumn Period and the Warring States Period. Chu silk fabrics and embroidery are marked by a rich variety, exquisite decorative designs, and bright colors. Major decorative patterns are legendary birds and animals. Among them, patterns of dragons and phoenixes come in the greatest variety of forms; they are graceful, majestic and mysterious.



### **Chime-bells from the Tomb of Marquis Yi of the Zeng State**

Early Warring States. Unearthed from the Tomb of Marquis Yi of the Zeng State in Hubei Suixian County in 1978. Length:784cm,Height: 265cm. Set on a curving shaped Copper-and-wood frame, the whole 65 pieces of chime bells is arranged in eight groups and three layers, the biggest of which is as high as 152.3 cm and as heavy as 203.6 kg. Every piece of the chime bell can ... while the whole set covers... The discovery of the chime bell set has i rewritten the history of world music.



### **The sword of Goujian**

Late Spring and Autumn Period. Unearthed from Jiangling Wangshan No. 1 Tomb in Hubei in 1965. Length: 55.7cm, Width: 4.6cm. The blade of the sword is ribbed and decorated with black diamond pattern. Close to the hilt is the bird seal inscriptions —— Sword of Goujian, King of Yue. The front side of the blade is set with blue glaze while the reverse side is set with turquoise.



### **Blue and White plum vase of the four loves in Yuan Dynasty**

Yuan Dynasty. Unearthed from King Yingjing's Tomb in Chongxiang city in 2006.

Height: 38.7cm,

Surfacediameter: 6.4cm,

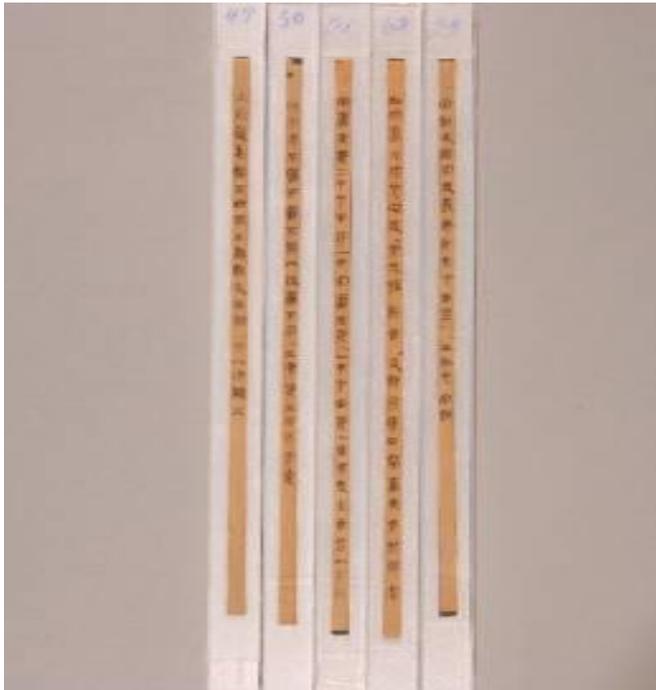
Bottom diameter: 13cm.

The stories of four ancients and their favorites are painted on the belly of the vase, which are respectively Wang Xizhi loves the orchid, Tao Yuanming loves the orchid, Zhou Dunyi loves the lotus and Lin Jing loves plum blossom and the crane.



### **Human skull fossils from Yunxian County**

Western Hubei is one of the important areas of the ancient human fossil discovery. In 1989 and 1990, the Hubei institute of Cultural Relics has discovered in Yunxian county two human skull fossils, which are determined as homo erectus of about 1 million years ago.



### **Qin bamboo slips from Shuihudi, Yunmeng(The Qin Dynasty)**

A total of over 1,150 Qin bamboo slips were unearthed at Shuihudi, Yunmeng County, Hubei in 1975. The characters are written in ink and Qin official script. The contents include a variety of texts, such as Chronicle, Yu Shu, Xiao L, Eighteen Qin Laws, Miscellaneous Laws of Qin, Questions and Answers on Law, Feng Zhen Shi, The Way of Serving the Government and Rishu. Qin bamboo slips from Shuihudi are mainly legal documents. They have greatly enriched our knowledge about Qin laws, and are important for studying the history of Chinese legal system.



### **Round dressing case with colored phoenix design (The Qin Dynasty)**

The case is made of wood, with the body shaped by bending. There is a galloping phoenix painted at the center of the lid.

The lacquered article was one of the greatest inventions in ancient China, and one of the most characteristic of ancient Chinese cultural relics. Hubei is rich in lacquered article relics mainly because of the abundance in varnish trees and high ground water level.



### Jade Pendant

Middle and late Warring States  
Period (about 2320 years ago)

Unearthed from Jiuliandun No. 1  
Tomb

Dragon-shaped

Length: 10cm, Width: 2.3cm,  
Thickness: 0.45cm

## Yellow Crane Tower



Wuhan, aka Riverside City, is home to ethereal mountains and crystal lakes. Yet Yellow Crane Tower is the local tourism's centerpiece. It has perched atop Snake Mountain for millennia and centuries, with white clouds wafting around and the Yangtze River surging below. This picturesque edifice vies for historic prestige with Yueyang Tower and Prince Teng Pavilion in Southern China.



## East Lake Greenway



As one of national center city, Wuhan has a beautiful east lake with 33 square kilometers of water. Today, there are nearly 102 kilometers of east lake green road between the lake and the mountain, turning the east lake into a city "ecological green heart" where citizens are close to nature. The East Lake Greenway is connected with the five major scenic spots of the east lake: Mo hill, the listening to wave, the white horse, the falling goose and the blowing flute. They are divided into seven main green roads: listening road, lake road, white horse road, country road, forest road, Mo hill road and lake hill road. The natural beauty of The East Lake Greenway is fully relying on the eight natural features of the east lake mountain, forest, pool, garden, island, embankment, field and bay. Excellent historical buildings, celebrities and other cultural landscapes are interspersed among the East Lake Greenway, and the East Lake Greenway has become the longest 5A grade urban core area around the greenway in China. Besides that, the East Lake greenway is surrounded by universities and scientific institutions. They are Wuhan's technological innovation and intelligence intensive areas.



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## Center for Mathematical Sciences

**Huazhong University of Science and Technology, Wuhan, China**

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Center for Mathematical Sciences, at Huazhong University of Science and Technology, Wuhan, China, is a mathematical research and education institution. Its mission is to promote interactions between mathematics and other disciplines, and to connect branches of mathematics. The Center fulfills its mission by conducting select research and educational activities, including short courses, workshops, mini-workshops, and topic conferences.

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