

## Lui Lam's Academic Life in Last 30 Years (1987-2017)

Prof. Lui Lam, since his employment in 1987, has done many important things in serving SJSU and CSU, and the professions he engaged in internationally. In particular,

### 1. Research Achievements in Physics (and Chemistry and Humanities)

Lam has published **186 papers** (113 of them at SJSU, 20 with SJSU student coauthors) and **16 books**. Highlights of Lam's research:

#### Bowlic Liquid Crystals

After Lam **invented** in 1982 a new type of liquid crystals (LCs) called **Bowlic** (*monomers*)—one of three existing types of LCs in the world (**Fig. 1**)—in 1987, the first year he was at SJSU, he went on to invent *bowlic polymers*.

- Both bowlic monomers and polymers were synthesized by others, confirming Lam's predictions.
- Today, bowlic is an important topic in LC research with interesting applications.
- The word "bowlic" created by Lam is routinely used by others in their LC papers and is recognized officially by the International Union of Pure and Applied Chemistry (IUPAC) and in *Handbook of Liquid Crystals*.
- In view of its importance, the editor of *Liquid Crystals Today*, the official magazine of the International Liquid Crystal Society, has recently invited Lam to write a review on bowlics [1].



Fig. 1. Three types of liquid crystals in the world. Bowlic, the 3<sup>rd</sup> type, was invented by Lam.

#### Active Walks

The second **invention** by Lam (in 1992) at SJSU is **Active Walks**—a new paradigm for self-organization and pattern formation in simple and complex systems, **developed completely with SJSU students** (see Sec. 4). In an AW, the walker (an agent) changes the deformable landscape as it walks and is influenced by the changed landscape in choosing its next step. It has been applied successfully to various biological, chemical and physical systems from the natural sciences, to economics from social science and to history in the humanities [2]. In particular, Canadians used it to model oil recovery. Germans used it to model pedestrian traffic [3] which was developed into a subfield in physics, applicable in crowd control that saves lives from rampage.

#### Histophysics

**Histophysics** is the new discipline **initiated** by Lam in 2002 that uses physics methods to study history. It shows human history to be a science, too, confirming the historian Robin Collingwood (1889-1943). Different scientific approaches/techniques to do history, apart from the usual narrative approach, are introduced with examples. Among other things, we discovered the second *quantitative* law in history and the first one with *predictive power* as well as a general phenomenon in complex systems called **Bilinear Effect** [4].

#### Arts

People's understanding of what art is (often associated with aesthetics) crumbled in 1917 with the appearance of Marcel Duchamp's *Fountain*. The art question was thus an unsolved problem for 2,400 years since Plato. In 2011, Lam proposed a **new interpretation** of the **origin and nature of arts** which is most reasonable [5].

## 2. Professional activities based at SJSU

Soon after arriving SJSU, Lam helped to organize the first three of the **Woodward Conference series**. He also got Springer, a world-renowned international publisher, to **publish free the conference proceedings**, with a SJSU conference logo printed on the book cover (Fig. 2). The 3 proceedings were published in 1988, 1990 and 1992, respectively. It helped to propagate the name of SJSU worldwide and help our graduates to find jobs.

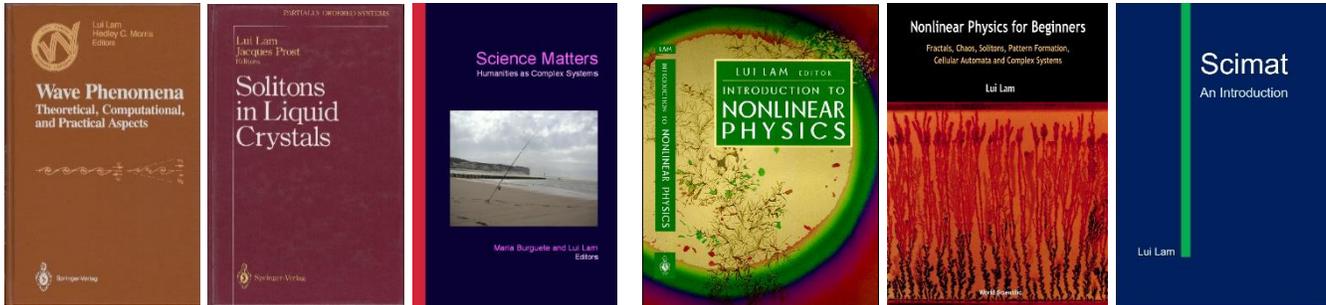


Fig. 2. Left to right: Three book series founded and edited by Lam [first book of Woodward Conference (Springer), Partially Ordered Systems (Springer), Science Matters (World Scientific)], and Lam's three textbooks (Springer 1997; World Scientific 1998, 20xx).

Starting 1987, Lam contacted liquid crystal researchers in the West and established a **Liquid Crystal conference series called "LC West"** at SJSU. The first two conferences were held in 1988 and 1989, respectively, with James Ferguson (an inventor of twisted nematic cell, the technology behind today's liquid crystal displays) and Ron Shen (professor at UC Berkeley) as co-organizers and participants; the local industries that participated include IBM Almaden, Greyhawk Systems, Taliq Corp., Lockheed M&S, and National Semiconductors as well as Stanford University. It put our dept's liquid crystal group (led by Lam) on the map and helped our students to go to grad schools and find jobs in the LC industry.

Starting 1988, Lam set up a **Nonlinear Science conference series** at SJSU, to make contact with nonlinear scientists in Bay area and to highlight research done by our own students. The first three conferences were held in 1988, 1990 and 1994, respectively. Speakers included Michael Nauenberg, the renowned physicist from UC Santa Cruz. It helped Lam to organize the **Winter School in Nonlinear Physics** in Jan. 1990, held at SJSU and UCSC, which led to the first graduate text *Introduction to Nonlinear Physics* (edited by Lam, Springer, 1997) in the world (see Sec. 7).

In the early 1990s, together with Profs. John Gruber and Joe Becker, Lam helped found the dept's **Institute for Modern Optics**. He cochaired the inaugurating conference on "Novel Laser Sources and Applications" in Nov. 1993. Lam also succeeded in getting the SPIE Optical Engineering Press to publish the proceedings free. He also got Andrew Tam, a renowned APS fellow at IBM Almaden to join our dept. as an adjunct professor and coedit the proceedings. These activities exposed our students to optics advancements and helped them to find jobs in this area.

In Dec. 1999, Lam got outside funding to establish the public lecture series, **God, Science, Scientists**, at SJSU. The series explores the relationships between science and religion but more importantly, as a vehicle to popularize science to the laypeople. Speakers include the famous Charles Townes (Nobel laureate and inventor of laser) and Michael Shermer (monthly columnist of *Scientific American*, author of famous popular science books, and publisher of *Skeptic* magazine). The series always had a full house and was attended by SJSU's vice president.

## 3. Established 3 book series

Apart from the **Woodward** series, Lam has established two other important international book series (Fig. 2): In 1978, Lam founded the **Partially Ordered Systems Series** published by Springer, with Lam as the Editor-in-Chief. It was the first series on what now called soft matter (LC, colloids, granular matter, etc.) in the world and remains the top series of choice by liquid crystal scientists over the world. The first book *Solitons in Liquid Crystals* (1992) was edited by Lam and Jacques Prost, a top scholar in the field and student of the French Nobel laureate Pierre de Gennes. Fifteen books have been published so far.

In 2008, Lam founded the **Science Matters Series** published by World Scientific, with Lam being the sole Editor. It is the first series in the world that focuses on the relationships between the humanities and science. Three books have been published so far (in 2008, 2011 and 2014, respectively).

## 4. New Courses, Textbooks Published and Students

Lam has produced **three textbooks** (Fig. 2). First two are based on **two new nonlinear physics courses** he created and taught at SJSU soon after 1987 (3<sup>rd</sup> one see Sec. 8). They were the first ones of its kind in the market when it were published. An Indian professor (R. Ganapathy, Sastra U.) wrote:

I take this opportunity to thank you as I have been very much benefited from your books *Nonlinear Physics for Beginners* and *Introduction to Nonlinear Physics*...I am very much influenced by your valuable contribution to nonlinear science. That has given me the inspiration for me to tie up with Verdant (www.verdanttelemetry.com), a small scale industry dealing with airborne antennas, based at Cochin, Kerala, India. They were impressed by the nonlinear antenna technology concept that I had put forward and have given me an opportunity to collaborate with them. In this regard, I would like to know more about your brain child **active walk problem**.

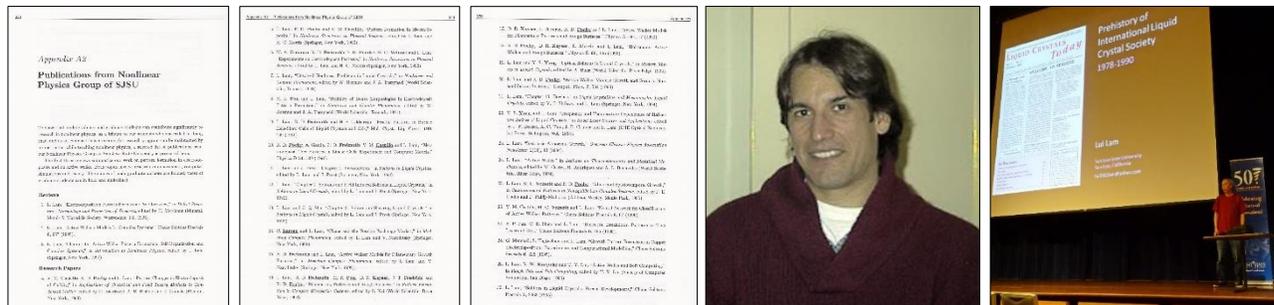


Fig. 3. *Left to right*: List of 31 papers with student coauthors in 18 of them, from NPB book; grad student Rocco Pochy (*top*), and undergrad Vincent Trung (*bottom*) as summer intern at MIT (2017); Lam's talk on ILCS at Kent, Ohio (2016).

Lam trained about 30 students in research at SJSU. Some undergrads went on to graduate programs, including two women students who got PhDs at **Stanford** and **UCSB**. A student stood out: **Rocco Pochy** (Fig. 3), who published 9 papers with me in 1990-1996, went on to found an international company, Lighthouse Worldwide Solutions (www.golighthouse.com), with over 200 employees worldwide. In his words (email):

The Nonlinear Physics courses I took from Dr. Lam has helped me in other fields (Neural Networks and Electronics) over twenty years later. In working with Dr. Lam on several research projects, when publishing papers in *Physica D*, I found that Dr. Lam put the students first. He always put his name last to give the students credit for the work performed, helping us get the recognition as we develop the experience in the fields of study. It was an honor to help development tools to educate others in the field of nonlinear physics. I was able to create programs that were include in textbooks on non-linear physics. The research we did together (Active Walker Models) was still being cited 24 years after its initial publication.

Thank you for creating an environment to allow me to follow my passion in physics and being able to apply it to other fields of science and technology.

## 5. Editor of international journals

Lam had served as editors of important international journals:

- *Liquid Crystals* (an international journal, Taylor and Francis) -- Editorial Board member, 1986-1990.
- *Molecular Crystals and Liquid Crystals* (an international journal, Gordon and Breach) – Associate Editor, 1981-1993.
- *Physics* (a magazine/journal published by the Chinese Physical Society) – Editorial Board member, 1999-now.
- *Studies on Science Popularization* (a journal published by China's CAST) – Editorial Board member, 2006-now.

Note that LC and MCLC are the *only* two international journals on liquid crystals.

## 6. Conferences Organized, Conference Series Created and International Outreach

As an established scientist with international fames, Lam had helped organized numerous important international conferences around the world, which helped to make SJSU famous and our students to find jobs and going to grad schools. Some are highlighted here:

### In Portugal

- Cochair, *Bettering Humanity: Historical Secular Movements*, Lisbon, Portugal, Oct. 25-27, 2017.
- Cochair, *All About Science: Philosophy, History, Sociology & Communication*, Lisbon, Portugal, Nov. 21-23, 2011.
- Cochair, *Arts and Science*, Estoril, Portugal, Oct. 5-7, 2009.
- Cochair, *First International Conference on Science Matters: A Unified Perspective*, Ericeira, **Portugal**, May 28-30, 2007.

### In China

- Cochair, *International Conference on Pattern Formation and Self-Organization in Nonlinear Complex Systems*, **Beijing, China**, June 11-15, 2001
- International Advisory Committee member, *International Conference on Science Communication*, Beijing, China, November 5-9, 2000.
- Cochair, *Workshop on Soft Matter*, Beijing, China, June 19-28, 2000

### In Argentina

- Cochair, *First International Conference on Complex Systems in Computational Physics*, Buenos Aires, **Argentina**, October 18-22, 1993.

### In USA

- Member, Steering Committee, *Workshop on Modeling Complex Systems*, **Reno**, Nevada, November 20-21, 2002.
- Cochair, *Novel Laser Sources and Applications*, San Jose, California, Nov. 12-13, 1993.
- Cochair, *Modeling Complex Phenomena*, **San Jose**, California, April 12-13, 1991.
- **Director**, *Nonlinear Dynamical Structures in Simple and Complex Liquids*, **NATO Advanced Research Workshop**, Los Alamos, New Mexico, June 1990 (Codirectors: G. Ahlers and F. Dowell).
- Chair, *Instabilities and Propagating Patterns in Soft Condensed Matter*, **Symposium of APS March Meeting**, Anaheim, California, March 1990.
- Chair, *Optics and Applications of Liquid Crystals*, **Symposium of APS March Meeting**, San Louis, March 1989.

More importantly, a unique biennial series, the **International Science Matters Conference Series**, was established by Lam in 2007. Five conferences had been held so far in Portugal (see above); each resulting in a book, with 3 coedited by Lam and published by World Scientific.

Lam is Guest Professor at Chinese Academy of Sciences and China Association of Science and Technology (only one holding such two positions in history); visits China every summer and winter; collaborates with scholars at Institute of Physics, CAS, Peking U. and Tsinghua U.

## **7. Established the International Liquid Crystal Society**

In his **first 3 years at SJSU (1987-1990)**, Lam established the International Liquid Crystal Society (ILCS)—the only LC society of its kind in the world with about 900 members from 43 countries/territories on 6 continents. Lam's success and unique leadership is recognized officially in 2016 by the ILCS in their magazine, *Liquid Crystals Today* (<http://dx.doi.org/10.1080/1358314X.2016.1151994>).

On Aug. 1, 2016, Lam was invited by the International LC Conference 2016 (ILCS's official series) at Kent, Ohio, to present the story (**Fig. 3**). The Homepage of the conference ([www.lcnet.kent.edu/conference/23/index.php](http://www.lcnet.kent.edu/conference/23/index.php)) says:

### **Special Talk: Prehistory of International Liquid Crystal Society, 1978-1990**

Did you know that the International Liquid Crystal Society (ILCS) is a legal entity incorporated in Ohio, USA and is celebrating its 25th Anniversary this year? Professor **Lui Lam** talks about how the idea of ILCS was conceived and brought to existence in Special Talk, 13:00-13:40 August 1. Ballroom. Attendance requires registration to the Conference. ([more details](#))

That is, this effort from SJSU is considered important by the liquid crystal profession/community. More details of Lam's effort can be found in Chapter 10 in *All About Science* (World Scientific, 2014) and [6].

## **8. Created a new multidiscipline (Scimat) and cofounded the Scimat Program—an international movement for bettering humanity**

In 2006/2007, Lam created a new multidiscipline called **Scimat** (Science Matters) that deals with the science of humans. It aims to raise the scientific level of the humanities by encouraging interaction between humanists and scientists. Lam is the cofounder and coordinator of the International Science Matters Committee (with Nobel

laureate) since 2007. The **Scimat Program** has also established a biennial international scimat conference series and *three* scimat book series (see: [www.sjsu.edu/people/lui.lam/scimat](http://www.sjsu.edu/people/lui.lam/scimat)). It is in the process of pushing a new general-education course *Humanities, Science, Scimat* (Fig. 2) for all undergrads in all universities (already test taught twice in China), and setting up 100 scimat centers around the world. All for a better world. (See 2017 conference poster “Bettering Humanity” at [www.scimat-2015.com](http://www.scimat-2015.com).) Apart from Bowlics, Active Walks and the ILCS, the scimat movement could be Lam’s most important contribution to the academic world (and humanity) for years to come.

**In short**, among other things, Lam has

- Invented bowlic liquid crystals, active walk, and histophysics (physics of history); contributed to art studies
- Established 4 conference series (*Woodward, LC West, Nonlinear Science* at SJSU and *Scimat* internationally)
- Cofounded a research institute at SJSU
- Helped organized numerous international conferences
- Served as editor in *all* liquid crystal journals
- Established 3 book series
- Published 3 textbooks (after created and taught two new nonlinear physics courses) and helped students in research, publishing papers, and finding jobs
- Founded an international learning society (the ILCS)
- Invented a new multidiscipline (scimat) and cofounded an international movement in bettering humanity

Through these efforts, Lam has helped to put SJSU and CSU on the world map, academically speaking, and helped our students in going to grad schools and getting jobs, apart from connecting them to new and exciting academic developments.

**References:** [1] L. Wang, D. Huang, L. Lam and Z. Cheng, “**Bowlics**: History, advances and applications,” *Liquid Crystals Today* **26**(4), 85 (2017). [2] L. Lam, “**Active Walks**: First twelve years,” *Int. J. Bifurcations and Chaos* **15**, 2317 (2005); **16**, 239, (2006). [3] D. Helbing et al, “Modelling the evolution of human trail systems,” *Nature* **388**, 47 (1997); “**Active walker model** for the formation of human and animal trail systems,” *Phys. Rev. E* **56**, 2527 (1997). [4] L. Lam et al, “**Bilinear Effect** in Complex Systems,” *Europhysics Letters* **91**, 68004 (2010). [5] L. Lam, “**Arts**: A Science Matter,” in *Arts*, eds. M Burguete and L. Lam (World Scientific, 2011). [6] L. Lam, “Prehistory of the **International Liquid Crystal Society**: A personal account,” *Molecular Crystals and Liquid Crystals* **647**, 351 (2017).