題目：中國五大領先

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摘要：

中國歷史悠久，除了科技上的四大發明（造紙術、活字印刷、火藥、指南針），還有文化上的五大領先。五大領先：管子的「萬物水做」先於泰勒斯、孔子的「平民教育」先於柏拉圖、蘇軾的「現代主義」先於塞尚、朱載堉的「十二等比律」先於史蒂文（Simon Stevin）、蔡元培的「通識教育」先於科南特（James Conant）。五大領先跨二千多年文理，涉科學（含音樂樂律）、教育、藝術三領域，都因當時後繼乏人，沒能在國內承傳下來，讓西方後來居上。事實上，明朝朱載堉是墨子後中國最重要的科學家，發明瞭調樂器音律的「十二等比律」（亦稱「十二平均律」），目前用於全球 95% 的樂器（包括鋼琴）。本報告詳述五大領先的來龍去脈及其後繼乏人的原因。簡單地說：以前是個人成，大環境（政府）不成。以前是傳播困難，好東西不少；目前相反。

林磊介紹：人文學者與物理學家，美國加州聖何塞州立大學榮休教授，中國科學院與中國科學技術協會客座教授。香港大學（一等榮譽）學士、英屬哥倫比亞大學碩士、哥倫比亞大學博士。除美國外，林磊曾在歐洲（比利時、西德）、北京（中科院物理所，1978-1983）工作；前 30 年做自然科學（物理、化學、複雜系統），後 20 年做人文學（文史哲）；發明瞭碗形液晶（1982）、活性行走（1992）和兩門新的學科：歷史物理學（2002）、人科（2007）；已出版 180 多篇論文和 27 本書，包括《Nonlinear Physics for Beginners》（1998）、《Arts》（2111）和《Humanities, Science, Scimat》（2024）；國際液晶學會創立者（1990），中國液晶學會共同創辦人（1980），Science Matters（World Scientific 出版社）和 Partially Ordered Systems（Springer 出版社）兩英文叢書的創立者與主編。

Curriculum Vitae

Name: Lui Lam

Address: Department of Physics and Astronomy, San Jose State University, San Jose, CA 95192-0106, USA.
Email: lui2002lam@yahoo.com

Education:

- University of Hong Kong -- B.S. in physics & mathematics (First Class Honor), 1965.
- University of British Columbia (Vancouver, B.C., Canada) -- M.S. in physics, 1968.
- Columbia University (New York, N.Y., USA) -- M.A. in physics, 1969; Ph.D. in physics, 1973.
  [Ph.D. thesis advisors: P.M. Platzman (Bell Labs., Murray Hill) and J.M. Luttinger (Columbia University).]

Career/Employment:

San Jose State University	Professor	1987-present
China Research Institute for Science Popularization	Guest Professor	2001- present
Hong Kong University of Science and Technology	Visiting Professor	1996
Los Alamos Natl. Lab., Center for Nonlinear Studies	Collaborator	1990-1992
IBM, Almaden Research Center	Visiting Faculty	1990-1991
University of California, Santa Cruz	Research Associate	1989-1991
Academia Sinica, Institute of Physics (Beijing)	Guest Professor	1984- present
City University of New York	Associate Prof. & Adjunct Prof.	1984-1987
Academia Sinica, Institute of Physics (Beijing)	Assoc. Research Fellow; Assoc. Head of Theoretical Physics Group	1978-1983
Universite Paris-Sud (France)	Visiting Scientist	1980, 1982
Northwestern University (Evanston, IL, USA)	Visiting Scientist	1979
Universitat des Saarlandes (Germany)	Research Scientist	1976-1977
Universitaire Instelling Antwerpen (Belgium)	Research Scientist	1975-1976
City College of City University of New York	Research Associate	1972-1975
Bell Laboratory (Murry Hill, N.J., USA)	Consultant	1970
Columbia University	Research Assistant	1968-1972

Specialty: Science Matters, nonlinear & complex systems, histophysics, pattern formation, liquid crystals, and science education. [Originator of Scimat (Science Matters) (2007/2008), Histophysics (2002), Active Walks (1992), Bowlic Liquid Crystals (1982, 1987), two book series *Science Matters* (World Scientific) and *Partially Ordered Systems* (Springer), and the International Liquid Crystal Society (1990).]

Professional Services:

- **International Science Matters Committee**—**Founder, coordinator**, 2007-
- Foundation For the Future, Seattle—Consulting Scholar, 2002-
- American Physical Society California Section—member of Steering Committee, Program Committee and Nominating Committee, 2000-
- *Physics* (a magazine/journal published by the Chinese Physical Society) – Editorial Board member, 1999-

- **International Liquid Crystal Society – Initiator/Organizer**, Board of Directors member, Chair of Conference Committee, 1990-1994.
- SJSU Woodward Conference Proceedings Series (published by Springer-Verlag) -- Founder and Coeditor, 1988-
- **International Book Series *Partially Ordered Systems*** (published by Springer-Verlag) **— Founder; Coeditor, 1987-1999; Editor-in-Chief, 1999-**
- *Liquid Crystals* (an international journal, Taylor and Francis) -- **Editorial Board member**, 1986-1990.
- The Planning and Steering Committee for International Liquid Crystal Conferences -- Elected Member, 1984-1990.
- *Molecular Crystals and Liquid Crystals* (an international journal, Gordon and Breach) -- Associate Editor, 1981-1993
- **Chinese Liquid Crystal Society—Cofounder**, Vice-President, Secretary General, 1980-1983.

Major International Conferences Organized:

- Cochair, *Bettering Humanity: Secular Historical Movements*, Cascais, 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.
- Member, Steering Committee, *Workshop on Modeling Complex Systems*, Reno, Nevada, November 20-21, 2002.
- 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
- Cochair, *First International Conference on Complex Systems in Computational Physics*, Buenos Aires, **Argentina**, October 18-22, 1993.
- 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.
- Codirector, ***Winter School on Nonlinear Physics***, San Jose, California, Jan. 1990 (other codirector: M. Nauenburg).
- Cochair, *Nonlinear Structures in Physical Systems: Pattern Formation, Chaos and Waves,* San Jose, Nov. 1989.
- Chair, *Optics and Applications of Liquid Crystals*, **Symposium of APS March Meeting**, San Louis, March 1989.

Selected Papers (from over 180 published):

1. L. Lam et al, Europhys. Lett. **91**, 68004 (2010). "Bilinear Effect in Complex Systems."
2. L. Lam, Int. J. Bifurcation and Chaos **15**, 2317 (2005). "Active Walks: The First Twelve Years (Part I)."
3. L. Lam, Mod. Phys. Lett. B **16**, 1163 (2002). "Histophysics: A New Discipline."
4. L. Lam, in *Defect Structure, Morphology and Properties of Deposits,* edited by H. Merchant (The Minerals, Metals & Materials Society, 1995). "Electrodeposition Pattern Formation: An Overview."

5. L. Lam, Chaos Solitons Fractals **5**, 2463 (1995). "Solitons in Liquid Crystals: Recent Developments."
6. L. Lam (Lin Lei), Mol. Cryst. Liq. Cryst. **146**, 41 (1987) [Wuli **16**, 195 (1987)]. "Bowlic Liquid Crystals."
7. R. Ribotta, A. Joets and L. Lam (Lin Lei), Phys. Rev. Lett. **56**, 1595 (1986). "Oblique Roll Instability in an Electroconvective Anisotropic Fluid."
8. L. Lam (Lin Lei) et al, Phys. Rev. Lett. **49**, 1335 (1982). "Soliton Propagation in Liquid Crystals."
9. L. Lam (Lin Lei), Phys. Rev. Lett. **43**, 1603 (1979). "Nematic-Isotropic Transitions in Liquid Crystals."
10. L. Lam and P.M. Platzman, Phys. Rev. B **9**, 5122 (1974). "Momentum Density and Compton Profile of the Inhomogeneous Interacting Electronic System. I. Formalism".

Books:

Textbook

1. *Introduction to Nonlinear Physics*, L. Lam, ed. (Springer, 1997). [Reprinted in China by Beijing World Publishing Corporation, 1999.]
2. *Nonlinear Physics for Beginners*, L. Lam (World Scientific, 1998).

Research Monograph

3. *Solitons in Liquid Crystals*, L. Lam and J. Prost, eds. (Springer, 1992).
4. *Liquid Crystalline and Mesomorphic Polymers*, V. Shibaev and L. Lam, eds. (Springer, 1994).
5. *Science Matters: Humanities as Complex Systems*, M. Burguete and L. Lam, eds. (World Scientific, 2008)
6. *Arts: A Science Matter*, M. Burguete and L. Lam, eds. (World Scientific, 2011).
7. *人科: 作为复杂系统的人文科学*, M. Burguete and L. Lam, eds.; trans. Chen Yu and Fang Meiqi (China Renmin University Press, Beijing, 2013).
8. *All About Science: Philosophy, History, Sociology & Communications*, M. Burguete and L. Lam, eds. (World Scientific, 2014).
9. *Ciência Humana: Uma Perspectiva Unificada em Humanidades e Ciências*, M. Burguete and L. Lam, eds. (Instituto Rocha Cabral, 2015).

Proceedings

10. *Wave Phenomena: Theoretical, Computational, and Practical Aspects*, L. Lam and H. Morris, eds. (Springer, 1989).
11. *Nonlinear Structures in Physical Systems: Pattern Formation, Chaos, and Waves,* L. Lam and H. Morris, eds. (Springer, 1990).
12. *Nonlinear Dynamical Structures in Simple and Complex Liquids*, Proceedings of NATO Advanced Research Workshop (Vol. 64, No. 5/6 of Journal of Statistical Physics), L. Lam, F. Dowell, H. Brand and G. Ahlers, eds. (Plenum, 1991).
13. *Modeling Complex Phenomena*, L. Lam and V. Naroditsky, eds. (Springer, 1992).
14. *Novel Laser Sources and Applications*, J. Becker, A. Tam, J. Gruber and L. Lam, eds. (SPIE, 1994).
15. *Complex Systems in Computational Physics* (Vol. 6 of Chaos Solitons Fractals), G. Marshall and L. Lam, eds. (North Holland, 1995).

Popular Science

16. *This Pale Blue Dot: Science, History, God*, L. Lam (Tamkang University Press, Tamsui, 2004).

Science and Society Seminars (given in colleges and high schools):

- When Life's Tape is Replayed
- Understanding the Real World
- Does God Exist?

- What Happened to My New Book?—The Birth of a Possible Research Project
- Chien-Shiung Wu: The First Woman President of the American Physical Society
- How Scientific is the Scientific Method?
- God, Science, Scientists

History and Highlights of Research:

Part I: Student Years (1965-72)

1965-66, at UBC, Vancouver, Canada—theoretical research on pion production, under supervision of Eric Vogt (paper #1).

1966-72, at Columbia U, New York City—Self study of exact solutions of Dirac and Klein-Gordon particles in external fields (paper #2-5); theoretical study of **Compton profiles**, under supervision of Phil Platzman and in collaboration with experimentalist, Peter Eisenberger (both of Bell Labs, Murray Hill) (paper #6-11, 23). The work of this Ph.D. thesis results in "**Lam-Platzman correlation correction**" and "Lam-Platzman theorem," as they are quoted in the Compton scattering literature.

Part II: Postdoctoral Years (1972-77)

1972-75, at City College of City University of New York, New York City—Postdoc of Melvin Lax. Developed the **dissipation function formulation** of the hydrodynamics and irreversible thermodynamics of **complex materials** (paper #16-18, 22). When this deductive approach is applied to nematic and cholesteric liquid crystals, the usual Ericksen-Leslie equations are recovered. Yet, for more complicated materials such as the biaxial nematics and other materials, this is the preferred approach that gives directly the simplest description—with the Onsager reciprocal relations and the required space and time symmetries built in, and the material symmetries easily incorporated from the beginning.

1975-77, in Belgium and West Germany—worked on phase transition of models (paper #12-15) and a new theory of superionic conductors (paper #19-21).

Part III: Beijing Years (1978-83)

1978-83, in Institute of Physics, Chinese Academy of Sciences, Beijing—worked earnestly in liquid crystals. Produced **two papers in Phys. Rev. Lett**. One paper helps to clarify the isotropic-nematic phase transition (1979, paper #22). The other paper discusses propagating solitons in uniform shearing nematics (1982, paper #48)—the first **soliton** paper on this system . (The 1979 paper was in fact the first PRL paper coming from China.) This soliton work generated much interest in the field, led to more than ten papers from our group, generated three M.S. theses and one Ph.D. thesis (by Shu Chanq-Qing) under my supervision in the Institute. Our and other peoples' work on solitons in liquid crystals are summarized in my book *Solitons in Liquid Crystals* (Springer 1992).

In 1982, I predicted the existence of a new type of liquid crystals, which I called **bowlics** (paper #41). Bowlics was synthesized three years later in Europe, and subsequently studied by people around the world. A Ph.D. thesis on bowlics won the Glenn Brown Award from the International Liquid Crystal Society in 1996. Bowlics could be ferroelectric and have interesting properties and novel applications. [A summary up to 1994 is given in Chapter 10 of my book, *Liquid Crytalline and Mesomorphic Polymers* (Springer 1994).]

During my Beijing years, I single-handedly established the Liquid Crystal Group in China, supervised five graduate students, resulting in five M.S. theses and one Ph.D. thesis. The Ph.D. thesis by Shu Chang-Qing was formally the first and only Ph.D. thesis in the field of liquid crystals in China at that time.

Part IV: CUNY Years (1984-87)

1984-87, at City University of New York, New York City—I started my teaching career. Published a paper in **Phys. Rev. Lett.** on the experimental study of new instabilities in the **electroconvection** of nematic liquid crystals (1986, paper # 70). This paper helped to attract others working on simple liquids to enter the fruitful field of pattern formation in liquid crystals, which is still going on strongly today.

Part V: SJSU Years (1987-now)

In 1987, my first year at the San Jose State university, I established the Nonlinear Physics Group in the physics department. Undergraduate and graduate students joined the group, under my supervision, produced many novel results in the last 13 years. Our research was supported by the Research Corporation and the National Science Foundation. Our work covers four areas: pattern formation, complex systems, liquid crystals, and science education. [A selected list of publications can be found in Appendix A2 of my book, *Nonlinear Physics for Beginners* (World Scientific, 1998).] Some highlights:

Pattern Formation

- First group in the world to generate and study **surface filamentary patterns** in thin cells containing air, liquid, or liquid crystals (paper # 100, 121).
- Our experimental research on electrodeposit pattern formation has been profiled in San Jose Mercury News, Oct. 14, 1990.
- Our experimental pattern formation result was featured in the "San Jose State University, School of Science Brochure, Fall 1990."
- One student project, "Instabilities of finite water columns," **won the Allied-Signal Award** of the Society of Physics Students.
- We **discovered multiple morphological changes** in electrodeposit patterns--which was included in a poster by the American Physical Society in the Centenary Celebration, in Atlanta, Georgia, March 1999.
- Studied granular flow in the presence of electric fields (paper # 147-149,151).

Liquid Crystals

- I **predicted the existence of bowlic liquid crystal polymers** in 1987, and more generally in 1988 (paper #85), which was successfully synthesized by a group in the East Coast in 1999.

Science Education

- **Established and taught two new graduate courses**: Nonlinear Physics, and Nonlinear Systems; a new upper-division course: The Real World; and a **new general-education course** for incoming freshmen of any major: The Real World (2002).
- Published two **textbooks** on nonlinear physics—*Nonlinear Physics for Beginners* for undergraduates and *Introduction to Nonlinear Physics* for graduate students. The latter is called "probably the best introductory textbook on nonlinear science I have recently seen," in a review appeared in *Pure and Applied Geophysics*.
- **Established a public lecture series, "God, Science, Scientists**," Dec. 1999. (Charles Townes, Nobelist and inventor of laser, was the third speaker on Feb. 12, 2001.)
- Integrated popular science books into regular college physics teaching [see my abstract in Am. Phys. Soc. Bull. **45**(1), 117 (2000), which was highlighted in *APS News*, March 2000, p.3; paper #150]
- Volunteered and encouraged students to volunteer as tutors at the brand new high school in downtown San Jose, Downtown College Preparatory, 2000.

- Considered by the "**Foundation For the Future**" at Bellevue, WA, to be one of "the world's most prominent thinkers"; invited to their "Humanity 3000" seminar, August 2001, to give a keynote lecture on "Modeling History and Predicting the Future: The Active Walk Approach"; was the only physicist invited, among 23 "experts" from around the world (paper # 154).
- Established a public lecture series, "**Science and Art**," May 2001.
- Invited by SETI (Search for Extraterrestrial Intelligence) to give a talk on "A Science-and-Art Interstellar Message: The Self-Similar Sierpinski Gasket" at the workshop in Paris, March 18, 2002 (paper #155).

Complex Systems

- We invented the **Active Walk** theory/paradigm for complex systems (1992, paper #108), which is now being used by the Canadians in modeling oil recovery, a Harvard Medical School Fellow in modeling tumor growth, the Germans in modeling ant swarms and pedestrian traffic, and the Taiwanese in pattern formation (for reviews, see paper #114, 120, 131, 143, 156). We now focus on the application of AW on humanities and human history. A summary of active walk research worldwide in the first 12 years is published as two review articles (paper #158 and 164), which are highlighted on the cover of the journal in color pictures.
- Started a new discipline **Histophysics** in 2002, which applies physics methods to human history—the study of a many-body system consisting of *Homo Sapiens*—active walk is used to model a number of histories in economic, evolutionary, and social systems (paper # 152, 154); obtained new quantitative laws in the distribution of dynasty lifetimes in China (paper #164, 169, 171).
- Started the new multidiscipline called **Science Matters** (scimat) in 2008 (paper #166, 167), which treats all human-dependent matter as part of science. The first three steps in the "International SciMat Program," initiated and coordinated by Lam, have been accomplished:

  1. A biennial international conference series on SciMat was established. [First conf. *Science Matters: A Unified Perspective* (2007); 2nd conf. *Arts & Science: Humanities as Complex Systems* (2009); 3rd conf. *All About Science: Philosophy, History, Sociology and Communication* (2011); 4th conf. *Humanities as Science Matters* (2014), all were held in Portugal.]
  2. An international SciMat committee (ISMC) was formed in 2007, consisting of 17 prominent scholars in humanities and science from Europe, China and USA (including a Nobelist and the President of the European Academy of Science Arts Letters).
  3. An international book series on SciMat was established--the *Science Matters Series* by the renowned international publisher, World Scientific, based in Singapore, UK, USA and China. [First book: *Science Matters: Humanities as Complex Systems* (2008); 2nd book: *Arts: A Science Matter* (2010); 3rd book: *All About Science: Philosophy, History, Sociology & Communication* (2014), all edited by M. Burguete and L. Lam.]

  The next steps in this international scimat program: publish a general-education textbook (in final stage, to appear 2017); establish 100 scimat centers around the world; establish the International Science Matters Society; publish an international journal on scimat. (**Scimat website**: www.sjsu.edu/people/lui.lam/scimat)