

## History of Chinese Science, Technology, and Medicine Colloquium HIEA 170/270

UCSD Spring 1999  
HSS 3086  
W 11:15-2:15

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In this course students will examine Chinese history through writings on Nature, the Heavens, the Earth, and the Human Body. The focus will be on the traditional Chinese sciences: astronomy, medicine, alchemy, geomancy, as well as a range of technological knowledge. Students will read selections from Joseph Needham's *Science and Civilization of China* as a foundation and examine other scholars' perspectives on the Chinese sciences as well as on Needham's interpretations. Students will also analyze Chinese primary texts in English translation relevant to different scientific disciplines. Students should finish the course not only with an understanding of the content of sciences in traditional China, but also how to think about them historically, systematically, and critically.

### Required Texts:

*The Shorter Science and Civilization in China*, vols. 1 & 2. An abridgement by Colin A. Ronan of Joseph Needham's original text. Cambridge, England: Cambridge University Press, 1978 and 1981. Covers vols. 1-3, and part of 4 of SCC.

*The Shambhala Guide to Taoism: A complete introduction to the history, philosophy, and practice of an ancient Chinese spiritual tradition.* By Eva Wong. Boston/London: Shambhala Press, 1997.

*Chinese Technology in the Seventeenth Century: T'ien-Kung K'ai-wu.* By Sung Ying-hsing. preface date 1637. Translated from the Chinese and Annotated by E-tu Zen Sun and Shiou-chuan Sun. Mineola, New York: Dover Publications, 1997. Reprint of 1966 edition.

*Science in Traditional China.* By Joseph Needham. Hong Kong: Hong Kong University Press and Cambridge, Mass.: Harvard University Press, 1981.

The books are available at Groundworks bookstore in the old student center. The reader will be available in the second class or through Postal Plus, 452-9933, 4130 La Jolla Village Dr. (next to The Marriott). All books and the reader are also on reserve at Geisel.

### Requirements:

Two in-class presentations with a group of 3-4 other students	20%
Class attendance and participation	20%
Four 1-2 page responses to the readings over the course of the quarter	20%
Final paper or project following the guidelines provided	40%

Please come to each class with a question about the reading.

### Guidelines for in-class presentation:

Present to your peers your understanding of Chinese science (includes science, medicine, and technology) by answering the following four questions:

- 1) How did the Chinese think “scientifically” about the heavens, the earth, the human body, etc. Explain how the Chinese understood astronomy, mathematics, alchemy, etc.
- 2) How do we know the Chinese thought that way and not another? Namely, what sources have scholars had to rely on to assess whatever subject you are reporting on related to Chinese science? And what contributions have these scholars made to improve our understanding of Chinese science?
- 3) Why do you and other scholars believe the Chinese thought that way? What social, political, economic, and cultural factors, for example, contributed to their ways of thinking about the subject related to Chinese science you are reporting on?
- 4) And what limitations exist to our understanding of the history of Chinese science? For example, how are we and the scholars who write on Chinese science limited because of lack of primary materials, limited choice of sources, or biased interpretations of extant sources related to the field you are presenting to the class?

**Guidelines for five weekly responses:**

These responses can include the two weeks you present to the class and should be no longer than 2 pages. In your response to the reading you are expected to cover five aspects of one of the books or readings in the reader required for the week: 1) What assumptions did you have on the topic before you read the source? 2) What arguments did the author make that challenged your assumptions and, if different, what general argument did the author present? 3) What kinds of evidence did the author use to support these arguments? 4) What contributions did the author say he or she made to our understanding of Chinese science? Were you convinced or not? 5) And in what ways do you think the author’s arguments are limited? In other words, what more do you think could be done from where the author left off?

**Guidelines for paper or project:**

For this assignment you are expected to engage more deeply into an area related to Chinese science that interests you. You may collaborate with other students on a project to present the last day of class or do your own. You may choose one of the following approaches, or talk with me if you have another idea.

1. Research paper: Write a 10-15 page paper on any topic related to Chinese science. It may be longer if you want to use it to fulfill a college writing requirement, or if more than one person is writing it.
2. A comparative book review: Write the same length of paper, or more to fulfill a writing requirement, comparing two or more books on one topic related to Chinese science. Please follow the same guidelines established for the reading responses.
3. Art project: Do an art project or make a model of something related to Chinese science.
4. Creative writing project: Write a play, fiction, or fake historical text that follows or is inspired by the secondary and primary sources read in class on Chinese science.
5. Field work: Write a report on a contemporary manifestation of the ways of thinking about nature, the heavens, the human body, etc. we have studied. You could visit an acupuncture clinic, for example, or interview people who continue to believe in ways related to the history of Chinese science.
6. Translation project: Translate and annotate a text related to Chinese science.
7. Perform a short play, demonstration, or other presentation to the class to illustrate an important aspect of or way of thinking in Chinese science.

Week 1	March 31	General Orientations to the History of Chinese Science
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Introduction and discussion of *China, The Genius That Was*.

Week 2	April 7	Needham's <i>Science and Civilization in China</i>
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Read:

Needham/Ronan, *Shorter Science and Civilization in China*, vol. 1, chs. 1-10, 1-190.

Timothy Brooks, "The Sinology of Joseph Needham," *Modern China*, 340-347.

Peter Richards, "Builder of Bridges," *Cambridge Alumni Magazine*, 15-18.

Questions: How does Needham frame his questions about science and civilization in China? What led him to write a history of Chinese science? How does his scientific background inform his interpretation of the major philosophical schools of China?

Week 3	April 14	Taoism, the "Naturalists," and Fundamental Concepts
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Read:

Needham/Ronan, *Shorter Science and Civilization in China*, v. 1, chs. 11-16, 191-306.

Nathan Sivin, "The Myth of the Naturalists," 1-33.

Nathan Sivin, "Taoism and Science," 1-58.

Questions: How does Needham portray the Taoists? What does he mean by the pseudo-sciences, the skeptical tradition, Chinese naturalism, human laws and the laws of Nature? How does Sivin differ from Needham's views? How does Sivin portray the Taoists? What does he mean by the myth of the naturalists? How does his views of the relationship between Taoism and science differ from those of Needham?

Week 4	April 21	Mathematics
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Read:

Needham/Ronan, *Shorter Science and Civilization in China*, vol. 2, ch. 1, 1-66.

Chen Cheng-yih, "Chen Zi's Formula and the Chong-Cha Method," 139-150, in his *Early Chinese Work in Natural Science*. Hong Kong University Press 1996.

Chen Cheng-yih, "A Comparative Study of Early Chinese and Greek Work on the Concept of Limit," 3-44, in his ed. volume *Science and Technology in Chinese Civilization*. Singapore: World Scientific, 1987.

Christopher Cullen, "The *Zhoubi* and its contents," 67-137, in his *Astronomy and mathematics in ancient China*.

Questions: What is a magic square, counting rods, the abacus, the Pythagorean Theorem, and Pi? What does Needham argue about Chinese mathematics? How do Chen and Cullen differ from Needham? What evidence do they use? How would you characterize Chinese mathematics based on reading Needham, Chen, and Cullen?

Week 5	April 28	The Heavens and Time
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Read:

Needham/Ronan, *Shorter Science and Civilization in China*, v. 2, ch. 2-3, 67-236.  
Chen, "Early Chinese Work on Astronomy," 113-125.  
Shigeru Nakayama, "Characteristics of Chinese Astrology," 442-452.  
Nathan Sivin, "Chinese Conceptions of Time," 82-92.  
Needham, "Attitudes toward Time and Change as Compared with Europe," 107-132, in his *Science in Traditional China*.

Questions: What are gnomons, armillary sphere, equatorial torquetums, sexagenary cycles, TLV mirrors, sundials, and clepsydras? How did the Chinese think about the heavens? How did they divide astronomy? Why? How did the Chinese conceptualize time according to Needham and Sivin? Are their views similar or different? In what ways?

Week 6	May 5	The Earth
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Read:

Needham/Ronan, *Shorter Science and Civilization in China*, v. 2, chs 4-6, 237-387.  
Chen Cheng-yih, "Early Chinese Work on the Physics of Motion," 1-13.  
Richard Smith, "The Ways of Wind and Water," *Fortune-Tellers*, 131-172.  
Selections from Sung Ying-hsing, *Chinese Technology*, chs 5, 7-8, 10-11, 14 and 18 on "Salt," "Ceramics," "Casting," "Hammer forging," "Calcination of stones," "Metals," and "Pearls and gems."

Questions: How did the Chinese organize their geography? What are typography, cartography, and cosmography according to Needham? What is a seismograph? How did it work? What does Chen mean by the "physics of motion"? What was geomancy? How do the chapters in Sung compare with Needham, Chen, and Smith?

Week 7	May 12	The Body
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Read: Eva Wong, *Taoism*, entire book if you can, but focus on chs. 1-6, 10, 13.  
Nathan Sivin, "Chinese Alchemy and the Manipulation of Time," 109-121.  
Nathan Sivin, "Research on the History of Chinese Alchemy," 1-16.  
Needham, "Comparative Macrobiotics," 57-84 in his *Science in Traditional China*. 1981.

Questions: What are the main schools of Taoism according to Wong? What is internal alchemy and what were its goals? What are elixirs of immortality, cauldrons, cinnabar, and fire phasing? How do Sivin's views on alchemy differ from Wong's understanding of alchemical Taoism and Needham's views in his comparative macrobiotics?

Week 8	May 19	Healing
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Read: Needham, “The History and Rationale of Acupuncture and Moxibustion,” 85-107 in his *Science in Traditional China*. 1981.

Nathan Sivin, “State, Cosmos, and Body in the Last Three Centuries,” 5-37.

Nathan Sivin, “Emotional Counter-Therapy,” 1-19.

Chapters 1-9 from *Huangdi neijing:suwen* [Inner Canon of the Yellow Emperor], 1-41.

Questions: How do acupuncture, moxibustion, and emotional counter-therapy work according to the Chinese sources available to us? How does Needham explain the efficacy of acupuncture and moxibustion? How does Sivin relate medical knowledge to politics, the state, and views of the cosmos? How does Needham’s approach to Chinese medicine differ from Sivin’s analysis? What do we learn from the founding text of Chinese medicine, the Inner Canon, about Chinese views of the relation between the state, cosmos, and the human body?

Week 9	May 26	Doing
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Read: Sung, *Chinese Technology*. Read the remaining chs. 1-4, 6, 9, 12-13, 15-17.

Francesca Bray, “Technology and Culture in Chinese History: An Introduction,” 13-17.

Needham, “The Epic of Gunpowder and Firearms, Developing from Alchemy,” 27-56, in his *Science in Traditional China*.

Questions: What is the history of gunpowder? What are bombards, firelances, crossbows, naphtha, saltpeter, and the bird pistol? How does technology figure differently in Sung, Bray, and Needham? Why the differences? How would you define technology?

Week 10	June 2	Historiography and Class Presentations
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Read:

Joseph Needham “Science and China’s Influence on the World,” 234-308. 1964.

Nathan Sivin, “Science and Medicine in Chinese History,” 164-196. 1990.

Questions: Using Needham and Sivin, discuss how the study of the history of Chinese science has changed in the 26 years between Needham’s contribution to *The Legacy of China* in 1964 and Sivin’s article for the *Heritage of China* of 1990? Why do you think the field has change the way it has and how do you see it changing in the future? What questions have not yet been answered and have not yet been asked?

Finals Week	June 11	Paper or Written Project due by noon.
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Week 3		Taoism, the “Naturalists,” and Fundamental Concepts
Nathan Sivin, “The Myth of the Naturalists,” 1-33, <i>Science in Ancient China: Researches and reflections</i> . England: Ashgate Variorum, 1995.		
Nathan Sivin, “Taoism and Science,” 1-58, <i>Medicine, Philosophy and Religion in Ancient China: Researches and reflections</i> . England: Ashgate Variorum, 1995.		
Week 4	April 21	Mathematics
Chen Cheng-yih, “Chen Zi’s Formula and the Chong-Cha Method,” 139-165, in his <i>Early Chinese Work in Natural Science</i> . Hong Kong University Press 1996.		
Chen Cheng-yih, “A Comparative Study of Early Chinese and Greek Work on the Concept of Limit,” 3-44, in his ed. volume <i>Science and Technology in Chinese Civilization</i> . Singapore: World Scientific, 1987.		
Christopher Cullen, “The <i>Zhoubi</i> and its contents,” 67-73, “Translation,” 171-81, <i>Astronomy and mathematics in ancient China</i> , Cambridge Univ. Press, 1996.		
Week 5	April 28	The Heavens and Time
Chen, “Early Chinese Work on Astronomy,” 113-125, <i>Early Chinese Work in Natural Science</i> .		
Shigeru Nakayama, “Characteristics of Chinese Astrology,” <i>ISIS</i> v. 57, 1966: 442-452.		
Nathan Sivin, “Chinese Conceptions of Time,” 82-92, <i>Science in Ancient China</i> . 1995.		
Week 6	May 5	The Earth
Chen, “Early Chinese Work on the Physics of Motion,” 1-17, in his <i>Early Chinese Work in Natural Science</i> . Hong Kong University Press 1996.		
Richard Smith, “The Ways of Wind and Water,” 131-172, <i>Fortune-Tellers &amp; Philosophers: Divination in Traditional Chinese Society</i> . Westview Press, 1991.		
Week 7	May 12	The Body
Nathan Sivin, “Chinese Alchemy and the Manipulation of Time,” 109-121, <i>Science &amp; Technology in East Asia</i> . New York: Science History Publications, 1977.		
Nathan Sivin, “Research on the History of Chinese Alchemy,” 1-16, <i>Medicine</i> . 1995.		
Week 8	May 19	Healing
Nathan Sivin, “State, Cosmos, and Body in the Last Three Centuries,” <i>Harvard Journal of Asiatic Studies</i> 55, 1 (June 1995):5-37.		
Nathan Sivin, “Emotional Counter-Therapy,” 1-19, in his <i>Medicine</i> . 1995.		
<i>The Yellow Emperor’s Classic of Medicine: A New Translation of the Neijing suwen with Commentary</i> . Chs 1-9, 1-41, trans. by Ni Maoshing. Boston: Shambhala, 1995.		
Week 9	May 26	Doing
Francesca Bray, “Technology and Culture in Chinese History: An Introduction,” <i>Chinese Science</i> , “A Festschrift for Nathan Sivin, Part 1,” n. 12 (1995): 3-17.		
Week 10	June 2	Historiography and Class Presentations
Joseph Needham “Science and China’s Influence on the World,” 234-308, in Ramond Dawson, ed., <i>The Legacy of China</i> . Boston: Cheng & Tsui Company, 1990 Reprint of 1964 ed.		
Nathan Sivin, “Science and Medicine in Chinese History,” 164-196, in Paul S. Ropp, ed., <i>Heritage of China: Contemporary Perspectives on Chinese Civilization</i> . Berkeley: University of California Press, 1990.		