通識核心課程 95（一）課程大綱

科　　號	GE110101	組別		學分	3	人數限制	
科目中文名稱	**當代科學文明**			教室			
科目英文名稱	Contemporary Scientific Civilization						
任 課 教 師	王榮麟						
上 課 時 間	星期二 14:10-17:10						

一、 課程說明：

本課程的目的在於從哲學的角度來理解「科學」到底是什麼東西。從哲學的角度來理解科學，有別於從歷史的角度、心理學的角度、或是社會學的角度來進行的理解。我們發問的問題並不是像「Einstein 之所以能夠構作出狹義相對論，是否受到了他第一任妻子的啟發？」也不是像「為何 Newton 不親自與 Leibniz 論戰，而要透過 Clarke 的代筆？」或是諸如「為何史達林統治下的蘇聯生物學家拒絕接受 Mendel 的遺傳學？」等等的問題。從哲學的角度來探討科學究竟為何，所提出的問題是：科學家在進行思考推理時，所仰賴的推論方式為何？當科學家給出一個現象的說明時，這樣的說明是如何進行的？科學果真得以揭露隱於經驗現象背後的實在嗎？科學知識是普遍必然成立的知識嗎？後繼的理論一定比先前的理論更好或更真嗎？如何檢驗科學理論是否成立？如何評判科學理論的優劣？時間與空間究竟是什麼樣的一種東西？它們能獨立於物體和事件而存在嗎？我們的世界究竟是決定論式的還是非決定論式的？那適屬於科學所處理的生成變動現象究竟如何可能？鑒於上述這些哲學問題在探討時或有過度抽象之虞，本課程在設計時，設法進到具體的歷史脈絡當中，以那些對於當代科學文明之塑造起著重大影響的科學家、科學學派的思想為題材，不僅反省有關科學的哲學問題，同時也突顯該思想當中所蘊含的哲學意義。

簡言之，本課程旨在以哲學議題作為討論主軸，兼以探討塑造當代科學文明的重要思想傳承，以自然思想之經典作為閱讀材料，目的在於提供一套反省科學文明之特色的基本架構，也同時希望與當代議題做密切關連，期望同學們未來能夠獨立地對現代科技生活做更進一步的反思。

二、 指定用書：

無

三、 參考書籍：

1. 相關科學家或科學學派之經典著作。（作為同學們進一步深入研讀的參考，並不要求同學們仔細研讀）

2. 相關自然哲學家或科學哲學家的著作。（作為同學們進一步深入研讀的參考，並不要求同學們仔細研讀）
3. 上課時所發放的講義。

四、 教學方式：

講演與討論。
分組報告、期中考和期末考。

五、 教學進度：

1. 感官所見的生成變動現象如何可能？——伊利亞學派的挑戰和希臘原子論的回應

Frank N. Magill (ed.) *World Philosophy: essay-reviews of 225 major works*. Salem Press, 1982.（"The Way of Truth and The Way of Opinion", "The Paradoxes of Zeno", "Anaxagoras: Fragments", "Democritus: Fragments"）

Aristotle, *Metaphysics*, *Complete Collected Papers*, vol. II, p. 1679, the first paragraph.

Andrew Pyle, *Atomism and Its Critics*, pp. 83-110.

Christopher Ray, *Time, Space, and Philosophy*, pp. 5-23.

2. 亞里斯多德如何說明變動的現象？——「形質論」、「潛能實現說」與亞里斯多德的宇宙論

Aristotle, *Physics*, I: (8)-(9), III: (1), IV: (1), (5), VII: (1).

Aristotle, *Metaphysics*, XII: (2).

Aristotle, *On Generation and Corruption*, I :(3)-(4).

Jonathan Barnes, *The Cambridge Companion to Aristotle*, Ch. 5, pp. 140-167.

3. 科學推論和科學說明如何進行？——亞里斯多德的科學方法論

Aristotle, *Posterior Analytics*, I: (2), (3), (6), (13).

John Losee, *A Historical Introduction to the Philosophy of Science*, pp. 4-13.

B. Brody, "Towards an Aristotelian Theory of Scientific Explanation", in *Philosophy of Science*, 39, pp. 20-31.

Wilson, *The Logic and Methodology of Science in Early Modern Thought*: *Seven Studies*, pp. 18-64.

Jonathan Barnes, *The Cambridge Companion to Aristotle*, pp. 27-65, pp. 109-139.

Timothy McCarthy, "Discussion on an Aristotelian Model of Scientific Explanation", in *Philosophy of Science*, 44, pp.159-166.

David Ross, *Aristotle*, II: pp. 21-64, III: pp. 65-116.

David Ross, *Aristotle's Prior and Posterior Analytics*, Introduction, pp. 47-74.
Garrett Thomson and Marshall Missner, *On Aristotle*, pp. 29-69.
Jonathan Barnes, *Aristotle*, Ch. 6, 7, 8, 10, 11, 12.
Ilpo Halonen & Jaakko Hintikka, "Aristotelian Explanations" in *Studies in History and Philosophy of Science*, 31, No.1, pp. 125-136.

4. 科學旨在保全現象或是揭露實在？——從希臘的天文學到哥白尼的日心地動說

Copernicus, *On the Revolution of Heavenly Spheres*, 序言, pp. 1-2.
Pierre Duhem, *To Save the Phenomena. An Essay on the Idea of Physical Theory from Plato to Copernicus*
Goddu, A., 1990, "The Realism that Duhem Rejected in Copernicus," *Syntheses* 83, pp. 310-315.

5. 科學進展的方式是連續的還是斷裂的？科學典範彼此之間是不可共量的嗎？——伽利略與近代科學的興起

Galileo Galilei, *Dialogue Concerning the Two Chief World Systems, Ptolemaic and Copernican*. University of California Press, 1967.
Thomas S. Kuhn, *The Structure of Scientific Revolutions*. University of Chicago Press, 1996, Ch. 9, 10, 11.
Drake, "Physics and Tradition before Galileo" in ,Ch. 1.

6. 近代科學是嚴格證明的知識嗎？——伽利略的科學觀

Galileo Galilei, *Two New Sciences*. Wall & Thompson, 1989, pp. 165-167.
Robert E. Butts & Joseph C. Pitt (eds.) *New Perspectives on Galileo*. Reidel Publishing Co., 1978.
Gower, Barry, *Scientific Method*, Ch. 2.
McMullin, "The Conception of Science in Galileo's Work,"
Wisan, "Galeleo's Scientific Method: A Reexamination,"

7. 大自然有如一部機器嗎？——笛卡爾與大自然的機械化

Descartes, *Principles of Philosophy*, Ch. 2-4.
E.J. Dijksterhuis, *The Mechanization of the World Picture. Pythagoras to Newton*. Princeton University Press, 1986, pp. 403-417.
Richard S. Westfall, *The Construction of Modern Science. Mechanism and Mechanics*. Cambridge University Press, 1977, Ch. 2.
Hatfield, Gary, *Descartes and the Meditations*, pp. 302-307.
8. 構作物理理論的方法為何？——物理理論之典範：牛頓與《自然哲學的數學

原理》

Newton, *The Principia: Mathematical Principles of Natural Philosophy*, University of California Press, 1999, Ch. 2, pp..
51-55 and General Schloium pp. 614-615.

Thayer, H. S (ed.), 1953, *Newton's Philosophy of Nature*, pp. 5-8.

I. Bernard Cohen, *The Newtonian Revolution: with Illustrations of the Transformation of Scientific Ideas*, Cambridge University Press, 1980.

John Losee, *A Historical Introduction to the Philosophy of Science*, Ch. 8, pp. 72-85.

9. 理論之間的化約如何進行？——從熱力學到統計力學

Ernest Nagel, *The Structure of Science: Problems in the Logic of Scientific Explanation*, Hackett, 1979, Chap.11.

Lawrence Sklar, *Philosophy of Physics*, Westview Press, 1992, Chap.3.

10. 如何評判科學理論的優劣？——達爾文的演化論具有哪些理論優點？

Charles Darwin, *On the Origin of Species*, Harvard University Press, 1964, Ch. 15, pp. 529-559.

Lloyd, Elisabeth A., 1983, "The Nature of Darwin's Support for the Theory of Natural Selection," *Philosophy of Science* 50, pp. 112-129.

Kuhn, Thomas S., 1977, "Objectivity, Value Judgment, and Theory Choice."

11. 生物學與物理學是不是採用相同的研究方法與說明模式？

Silver, B, *The Ascent of Science*, Ch. 22, pp. 268-281.

Salmon et. al. (eds), *Introduction to the Philosophy of Science*, Ch. 7, pp. 269-309.

Peter Machamer & Michael Silberstein (eds.), *The Blackwell Guide to the Philosophy of Science*, Ch. 11.

Philip Kitcher, *The Advancement of Science*, Ch. 2.

12. 時間和空間到底是什麼樣的一種東西？它們能獨立於物體和事件而存在嗎？時空是絕對的或是相對的？平直的或是彎曲的？——愛因斯坦的狹義相對論和廣義相對論

Albert Einstein, *Relativity, the Special and the General Theory: A Popular Exposition*, Crown Publishers, 1961, pp. 14-17, 21-31, 35-36, 50-59, 65-67, 94-95.

Lawrence Sklar, *Philosophy of Physics*, Westview Press, 1992, Chap.2.

Lawrence Sklar, *Space, Time, and Spacetime*, University of California Press, 1974, Chap.3.

Christopher Ray, *Time, Space, and Philosophy*, Ch. 4-7.

Peter Machamer & Michael Silberstein (eds.), *The Blackwell Guide to the Philosophy*

of Science, Ch. 9.

13. 上帝玩骰子嗎？當沒有人在看時，月亮還在那裡嗎？——量子力學的衝擊：決定論或非決定論？有獨立於觀察之外的客觀實在嗎？

Werner Heisenberg, *Physics and Philosophy: The Revolution in Modern Science*, Harper, 1958, Ch. 5.

Niels Bohr, *Atomic Physics and Human Knowledge*, Wiley, 1958, Chap.4.

Richard P. Feynman, *The Character of Physical Law*, MIT. Press, 1967, Lecture 6.

Lawrence Sklar, *Philosophy of Physics*, Westview Press, 1992, Ch. 4.

N. David Mermin, "Is The Moon There When Nobody Looks? Reality and the Quantum Theory", in R. Boyd, P. Gasper & J.D. Trout (eds.) *The Philosophy of Science*, MIT Press, 1993, pp. 501-516.

14. 經濟學是實證的科學嗎？

Friedman, M., 1953, "The Methodology of Positive Economics," *Essays in Positive Economics*, Chicago: University of Chicago Press, pp. 3-43.

Rosenberg, A., 1983, "If Economics isn't Science, What Is It?" *Philosophical Forum*, vol. 14, pp. 296-314.

Godfrey-Smith, Peter, 2003, *Theory and Reality: An Introduction to the Philosophy of Science*, Chicago: University of Chicago Press, Ch. 4, pp.57-74.

15. 總體現象是由個體行為造成的嗎？

Watkins, J. W. N., 1957, "Historical Explanation in the Social Sciences," *British Journal of Philosophy of Science*, vol. 8, pp. 104-117.

Kincaid, Harold, 1986, "Reduction, Explanation, and Individualism," *Philosophy of Science*, vol. 53, pp. 492-513.

Rosenberg, A., *Philosophy of Social Science*, Ch. 5.

Ryan, A., *Philosophy of Social Science*, Ch. 8.

六、 成績考核：