

國立清華大學通識核心課程大綱

科號		組別		學分	3	人數限制	
上課時間				教室			
科目中文名稱	當代科學文明						
科目英文名稱	Contemporary Scientific Civilization						
任課教師	王榮麟						
擋修科目	無			擋修分數			
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							
三、參考書籍	1. 相關科學家或科學學派之經典著作(選讀)。 2. 相關自然哲學家或科學哲學家的著作(選讀)。 3. 其它參考資料於課堂上視情況提供。						

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.) <i>World Philosophy: essay-reviews of 225 major works</i>. Salem Press, 1982. ("The Way of Truth and The Way of Opinion", "The Paradoxes of Zeno", "Anaxagoras: Fragments", "Democritus: Fragments") Aristotle, <i>Metaphysics</i>, Complete Collected Papers, vol. II, p. 1679, the first paragraph. Andrew Pyle, <i>Atomism and Its Critics</i>, pp. 83-110. Christopher Ray, <i>Time, Space, and Philosophy</i>, 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, <i>Physics</i>, I: (8)-(9), III: (1), IV: (1), (5), VII: (1). Aristotle, <i>Metaphysics</i>, XII: (2). Aristotle, <i>On Generation and Corruption</i>, I : (3)-(4). Jonathan Barnes, <i>The Cambridge Companion to Aristotle</i>, 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, <i>Posterior Analytics</i>, I: (2), (3), (6), (13). John Losee, <i>A Historical Introduction to the Philosophy of Science</i>, pp. 4-13. B. Brody, "Towards an Aristotelian Theory of Scientific Explanation", in <i>Philosophy of Science</i>, 39, pp. 20-31. Wilson, <i>The Logic and Methodology of Science in Early Modern Thought: Seven Studies</i>, pp. 18-64. Jonathan Barnes, <i>The Cambridge Companion to Aristotle</i>, pp. 27-65, pp. 109-139. Timothy McCarthy, "Discussion on an Aristotelian Model of Scientific Explanation", in <i>Philosophy of Science</i>, 44, pp.159-166. David Ross, <i>Aristotle</i>, II: pp. 21-64, III: pp. 65-116. David Ross, <i>Aristotle's Prior and Posterior Analytics</i>, Introduction, pp. 47-74. Garrett Thomson and Marshall Missner, <i>On Aristotle</i>, pp. 29-69. Jonathan Barnes, <i>Aristotle</i>, Ch. 6, 7, 8, 10, 11, 12. Ilpo Halonen & Jaakko Hintikka, "Aristotelian Explanations" in <i>Studies in History and Philosophy of Science</i>, 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, <i>On the Revolution of Heavenly Spheres</i>, 序言, pp. 1-2.

	Pierre Duhem, <i>To Save the Phenomena. An Essay on the Idea of Physical Theory from Plato to Copernicus</i> Goddu, A., 1990, "The Realism that Duhem Rejected in Copernicus," <i>Syntheses</i> 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, <i>Dialogue Concerning the Two Chief World Systems, Ptolemaic and Copernican</i>. University of California Press, 1967. Thomas S. Kuhn, <i>The Structure of Scientific Revolutions</i>. 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, <i>Two New Sciences</i>. Wall & Thompson, 1989, pp. 165-167. Robert E. Butts & Joseph C. Pitt (eds.) <i>New Perspectives on Galileo</i>. Reidel Publishing Co., 1978. Gower, Barry, <i>Scientific Method</i>, 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, <i>Principles of Philosophy</i>, Ch. 2-4. E.J. Dijksterhuis, <i>The Mechanization of the World Picture. Pythagoras to Newton</i>. Princeton University Press, 1986, pp. 403-417. Richard S. Westfall, <i>The Construction of Modern Science. Mechanism and Mechanics</i>. Cambridge University Press, 1977, Ch. 2. Hatfield, Gary, <i>Descartes and the Meditations</i>, 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, <i>The Principia: Mathematical Principles of Natural Philosophy</i>, University of California Press, 1999, Ch. 2, pp.. 51-55 and General Schloium pp. 614-615. Thayer, H. S (ed.), 1953, <i>Newton's Philosophy of Nature</i>, pp. 5-8. I. Bernard Cohen, <i>The Newtonian Revolution: with Illustrations of the Transformation of Scientific Ideas</i>, Cambridge University Press, 1980. John Losee, <i>A Historical Introduction to the Philosophy of Science</i>, 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, <i>The Structure of Science: Problems in the Logic of Scientific Explanation</i>, Hackett, 1979, Chap.11. Lawrence Sklar, <i>Philosophy of Physics</i>, Westview Press, 1992,
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	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, <i>On the Origin of Species</i>, 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," <i>Philosophy of Science</i> 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, <i>The Ascent of Science</i>, Ch. 22, pp. 268-281. Salmon et. al. (eds), <i>Introduction to the Philosophy of Science</i>, Ch. 7, pp. 269-309. Peter Machamer & Michael Silberstein (eds.), <i>The Blackwell Guide to the Philosophy of Science</i>, Ch. 11. Philip Kitcher, <i>The Advancement of Science</i>, 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, <i>Relativity, the Special and the General Theory: A Popular Exposition</i>, Crown Publishers, 1961, pp. 14-17, 21-31, 35-36, 50-59, 65-67, 94-95. Lawrence Sklar, <i>Philosophy of Physics</i>, Westview Press, 1992, Chap.2. Lawrence Sklar, <i>Space, Time, and Spacetime</i>, University of California Press, 1974, Chap.3. Christopher Ray, <i>Time, Space, and Philosophy</i>, Ch. 4-7. Peter Machamer & Michael Silberstein (eds.), <i>The Blackwell Guide to the Philosophy of Science</i>, 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, <i>Physics and Philosophy: The Revolution in Modern Science</i>, Harper, 1958, Ch. 5. Niels Bohr, <i>Atomic Physics and Human Knowledge</i>, Wiley, 1958, Chap.4. Richard P. Feynman, <i>The Character of Physical Law</i>, MIT Press, 1967, Lecture 6. Lawrence Sklar, <i>Philosophy of Physics</i>, 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.) <i>The Philosophy of Science</i>, MIT Press,
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	1993, pp. 501-516. 14. 經濟學是實證的科學嗎？ Friedman, M., 1953, "The Methodology of Positive Economics," <i>Essays in Positive Economics</i>, Chicago: University of Chicago Press, pp. 3-43. Rosenberg, A., 1983, "If Economics isn't Science, What Is It?" <i>Philosophical Forum</i>, vol. 14, pp. 296-314. Godfrey-Smith, Peter, 2003, <i>Theory and Reality: An Introduction to the Philosophy of Science</i>, 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," <i>British Journal of Philosophy of Science</i>, vol. 8, pp. 104-117. Kincaid, Harold, 1986, "Reduction, Explanation, and Individualism," <i>Philosophy of Science</i>, vol. 53, pp. 492-513. Rosenberg, A., <i>Philosophy of Social Science</i>, Ch. 5. Ryan, A., <i>Philosophy of Social Science</i>, Ch. 8.
六、成績考核	課堂表現 20%；分組報告 30%；期中、期末考 50%。
七、講義位址 http://	