Selling Experiment:
Public Experimental Lecturing in London, 1705-1728

by

Stephen David Snobelen
B.A., University of Victoria, 1993

A Thesis Submitted in Partial Fulfilment of the
Requirements for the Degree of

MASTER OF ARTS

in the Department of History

We accept this thesis as conforming
to the required standard

[redacted]

Dr. Paul B. Wood, Supervisor (Department of History)

[redacted]

Dr. John Money, Departmental Member (Department of History)

[redacted]

Dr. Thomas R. Cleary, Outside Member (Department of English)

[redacted]

Dr. Gordon D. Fulton, External Examiner (Department of English)

University of Victoria

Supervisor: Dr. Paul B. Wood

ABSTRACT

This thesis examines the careers of the early eighteenth century experimental lecturers Francis Hauksbee, Sr. (*c.* 1666-1713), Francis Hauksbee, Jr. (1688-1763), William Whiston (1667-1752), John Theophilus Desaguliers (1683-1744), and the lecturers of the Little Tower Street Academy. These lecturers presented Boylean air pump experiments, demonstrations of Newtonian mechanics and other replications of experiments. Using primarily a survey of newspaper advertisements, along with course syllabi, the development of public courses of "experimental philosophy" is tracked for the period 1705-1728. Along with a reconstruction of lecturing patterns, this thesis concentrates on several comparative and analytic themes, including the competitive strategies of the lecturers; issues of income potential and patronage, and the social locations of public experimental activity. This thesis is a contribution to research for this period on 1) the commercialization and popularization of science, 2) scientific entrepreneurship, 3) scientific pedagogy and 4) scientific spectacle.

Examiners:

[redacted]

Dr. Paul B. Wood, Supervisor (Department of History)

[redacted]

Dr. John Money, Departmental Member (Department of History)

[redacted]

Dr. Thomas R. Cleary, Outside Member (Department of English)

[redacted]

Dr. Gordon D. Fulton, External Examiner (Department of English)

CONTENTS

ACKNOWLEDGEMENTS

During the course of this project I have incurred many debts, and I will do my best to acknowledge them here. First, I would like to thank my Supervisor, Professor Paul B. Wood, for his direction, advice and encouragement. His background knowledge and professionalism in the History of Science were greatly appreciated. I was also happy to have on my committee Professor John Money, a second scholar with expertise in the area of my research, whom I also thank. Additionally, I wish to thank the other two members of my committee, Professors Thomas R. Cleary and Gordon D. Fulton, for their helpful comments and advice. Professor Larry Stewart of the Department of History at the University of Saskatchewan (Saskatoon, Canada) provided me with very useful advice on my survey work, and also directed me to several quite helpful sources of information. Dr. Alan Q. Morton, Senior Curator (Modern Physics) at the Science Museum in London, has been equally helpful, kindly supplying both advice and answers to questions. I am also grateful to Professor Steven Shapin of the University of California (San Diego), who offered me comments on the transmission of experimental skills via printed media. Professor James Dybikowski of the University of British Columbia, who knows my interest in William Whiston, on several occasions provided me with valuable sources for details of Whiston's life and career. To all these gentlemen I offer my sincere thanks.

The research on which this thesis is based was carried out at the University of Victoria; the University of British Columbia in Vancouver; the University of Toronto; the British Library; Dr. Williams's Library; Clare College Fellows' Library in Cambridge; Trinity College Fellows' Library in Cambridge; the University of Cambridge Library; the Bodleian Library; and the Leicestershire Public Record Office. Librarians from these institutions greatly facilitated my research, and I would especially like to acknowledge the assistance of the staff at the Inter-Library Loan Office at the University of Victoria, the staff of Photographic Services at the Bodleian Library, and Dr. Roger Schofield of Clare College, who granted me access to the excellent collection of *Whistoniana* at the normally restricted Clare College Fellow's Library. I would also like to acknowledge the receipt of a travel grant from the University of Victoria Department of History, which was directed towards my travel and study in Great Britain during the summer of 1994.

I also would like to acknowledge the assistance and hospitality of a number of my personal friends. I would like to thank Dr. Simon Alderson of Trinity College, Cambridge and Professor Richard Palmer (then of Clare College, Cambridge now Professor in the Department of Physics and Space Research at the University of Birmingham) for helping me to obtain access to restricted collections in the Fellows' libraries at their institutions. I would also like to thank Paul Hughes of Windsor, England; John and Sheila Ramsden of London, England; John and Susan Adey of Cambridge, England; Paul and Lisa Bernard of Rugby, England; Kevin and Sashi Skinner of Vancouver and John Mannell of Toronto for their much appreciated hospitality while I was carrying out research. Finally, I would like to thank the two who have made the greatest sacrifices. First, my wife Julia, who has patiently supported me and who missed me (and *vice versa*!) for a month while I was away in England working on Whiston and several other projects, and part-time throughout the course of my studies at the Master's level. Second, our daughter Jerusha, who has recently brought to our lives so much light, joy and hope for the future.

For Jerusha Verity Snobelen
Born to us when this project, like her, was in its infancy

Εὐχαριστῶ τῶ θεῷ μου ἐπὶ πάσῃ τῇ μνείᾳ σοῦ
Philippians 1:3

The Learned World is now almost generally convinc'd, that instead of amusing themselves with *Vain Hypotheses*, which seem to differ little from *Romances*, there's no other way of *Improving* NATURAL PHILOSOPHY, but by *Demonstrations* and *Conclusions*, founded upon *Experiments* judiciously and accurately made.

By this course, after many Ages had pass'd, with little or no Progress in the *True Knowledge* of the *Nature of Things*, greater Advances have been made within the compass of a small Number of Years, than was easily to be imagin'd, that the most Sagacious Men, with their Greatest Industry, could ever have been capable of attaining to.

Francis Hauksbee, Sr.
Physico-Mechanical Experiments, 2nd ed. (1719)

As in Mathematicks, so in Natural Philosophy, the Investigation of difficult Things by the Method of Analysis, ought ever to precede the Method of Composition. This Analysis consists in making Experiments and Observations, and in drawing general Conclusions from them by Induction, and admitting of no Objections against the Conclusions, but such as are taken from Experiments, or other certain Truths. For Hypotheses are not to be regarded in experimental Philosophy.

Isaac Newton
From the 31st Query of the *Opticks*, 4th ed. (1730)

1. INTRODUCTION: CONTEXT, SOURCES, METHODOLOGY AND PARAMETERS OF THIS STUDY

1.1 The Context: Early Eighteenth-Century Science and Commercial London

In the wake of the establishment of the Royal Society, the experimental work of Robert Boyle and Robert Hooke, and the physical and mathematical discoveries published in Isaac Newton's *Principia Mathematica*, a scientific culture began to emerge in Restoration England. Yet this new scientific culture was not immediately accepted by all, or even most, in that country. Instead, this new culture remained for many years the domain of a small, elite group. The Royal Society was an exclusive club, the experiments of Boyle and Hooke were hardly public, and when Newton's *Principia* was published in 1687 it was an intellectually closed book to all but a handful of natural philosophers and mathematicians. Natural philosophers and intellectuals on the continent were more aware of the scientific activities of the Fellows of the Royal Society, than were the London neighbours of Gresham College, where the Society first met. Still, this scientific and experimental culture began to spread, first making its way into the university curricula (and thus producing graduates with scientific training),[1] and finally bursting into the expanding commercial public sphere in a significant way during the early years of the eighteenth century. Natural and experimental philosophy increasingly came to be a subject of interest within the polite culture of the coffee houses, as well as a commodity of a consuming society and the beneficiary of aristocratic and royal patronage. Two of the most important means whereby the public became aware of natural and experimental philosophy were through the medium of the science textbook,[2] and the public performance of experiment in scientific lecture courses. It is the latter phenomenon that will be the subject of this thesis.

---

[1]On this see John Gascoigne, "A Reappraisal of the Role of the Universities in the Scientific Revolution," in *Reappraisals of the Scientific Revolution*, ed. David C. Lindberg and Robert S. Westman (Cambridge: Cambridge University Press, 1990), pp. 207-60. Given that several of the experimental lecturers treated in this study were trained at either Oxford or Cambridge, Gascoigne's general argument will find support in this study.

[2]See George S. Rousseau, "Science Books and Their Readers in the Eighteenth Century," in *Books and Their Readers in Eighteenth Century England*, ed. Isabel Rivers (Leicester: Leicester University Press, 1982), pp. 323-41.

The rise of public scientific lecturing in London in the last years of the seventeenth century and the first decade of the eighteenth century will be the first main focus of this study, with a special emphasis on the experimental lecture courses of Francis Hauksbee, Sr. (*c.*1666-1713) and James Hodgson (1672-1755). Having introduced the foundational work of these early public lecturers, I will then move on to the chief subject of this thesis: an assessment of the social, cultural, commercial and intellectual characteristics of experimental lecturing in the period 1712-1728, along with an account and analysis of professionalization and standardization in the courses of the later members of the first generation of experimental lecturers.[3] These include Francis Hauksbee, Jr. (1688-1763), William Whiston (1667-1752), John Theophilus Desaguliers (1683-1744), and the various lecturers of the Little Tower Street Academy. A special focus will be placed on the lecturing career of William Whiston.[4] As it is not possible to provide a full coverage of every figure dealt with in a study of this size, this special focus will allow a more detailed analysis of one lecturer within the context of a general treatment of lecturers in this period.

The first generation of experimental lecturers are important because they begin and continue the trend towards professionalization and standardization in lecture courses, and because they provide a bridge between the earliest lecturers and the career lecturers of the second generation (mid- to late-eighteenth century) such as Erasmus King, Stephen

---

[3]I use the term "experimental lecturers" to distinguish the mechanical and experimental lecturers from lecturers on chemistry, mathematics, medicine and anatomy (although there was some overlap in subject matter in some courses). Only the former group will be studied in detail in this paper, with the latter referred to occasionally for comparison and analogous developments.

[4]I have a number of reasons for focusing on Whiston. First, Whiston's scientific career is the subject of a larger study in which I am involved, and thus I am able to present here the results of some of that more detailed research. Additionally, this project has grown out of my research on Whiston to include other experimental lectures of the same period. Thus, most of my earlier research, including that carried out at various institutions in England, focused almost exclusively on Whiston. Second, the main part of Whiston's public experimental lecturing career (1712-1728) fits into the periodization of this thesis (1705-1728). This allows for a detailed reconstruction of his entire career. Third, Whiston's main competitor for much of this period, Desaguliers, already receives excellent coverage in Larry Stewart's recent research (cited below). Finally, it is my belief that Whiston has not received the scholarly attention his historical importance merits.

Demainbray, Benjamin Martin and James Ferguson.[5] The public lecturers can be viewed as scientific entrepreneurs, educators, entertainers and popularizers of science, and we will examine the social and intellectual background of these scientific practitioners. Another important consideration is the issue of how the nature of science changed in the process of mediating its presentation in theoretical and abstract books like the *Principia* to popular audiences more interested in the spectacular and practical aspects of the new science. As we will see, the popularization of science involved a lot more than simply making Newton public. Also, since scientific lecturing *qua* public experimental lecturing was a new role in the early eighteenth century, it will be important to evaluate how these men presented themselves to their potential audience, the ways in which they articulated their function within the world of science, and their strategies in carving out a niche for themselves in the developing commercial world of early eighteenth-century London.[6] Finally, it is hoped that this study will demonstrate the importance of the popularizing role played by these scientific entrepreneurs.

1.2 Previous Studies

The characteristics and functions of eighteenth-century experimental lecturing began to be

---

[5]James Ferguson himself affirms this by acknowledging that "The method of teaching and laying the foundation of physics, by public courses of experiments, was first undertaken in this kingdom, I believe, by Dr. John Keill, and since improved and enlarged by Mr. Hauksbee, Dr. Desaguliers, Mr. Whiston, [and] Mr. Cotes . . ." Ferguson, in David Brewster, ed., *Ferguson's Lectures*, 2nd ed., (1806), 1: xxi-xxii, cited in A.E. Musson and Eric Robinson, *Science and Technology in the Industrial Revolution* (Manchester: Manchester University Press, 1969), p. 102. It is not clear whether Ferguson is referring to Francis Hauksbee, Sr., or to his nephew of the same name.

[6]When new roles are being created, attention must be paid to the element of conscious self-fashioning implicit in the construction of the new roles and functions. The insight of Stephen Greenblatt, although focused on the sixteenth and early seventeenth century, is particularly helpful here. Greenblatt discusses the creations of self during times of change and disruption in English society, when old forms were being replaced by new ones—as yet untried—the period of the Reformation being a chief example. (See Stephen Greenblatt, *Renaissance Self-Fashioning: From More to Shakespeare* [Chicago: University of Chicago Press, 1980]). The period under consideration in this paper is also one of change in England—albeit for different reasons. An increasingly commercial society was developing, consisting more and more of trade, stocks, insurance, exchange of commodities, advertising and a flourishing press. This, combined with an irresistible trend towards pluralism (in the religious and secular spheres), was opening up completely new roles and career opportunities for entrepreneurs—many of them still tentative and without guaranteed outcomes.

outlined and clarified in various studies dating from the 1950s.[7] Although the earlier investigations were usually tentative and brief, some did begin to use a crucial form of evidence: lecture advertisements placed in newspapers and literary journals. However, most of these studies appear not to have relied on a systematic approach to the accumulation of evidence from such notices and, on the whole, newspaper advertisements remained under-exploited in the earlier works as a source for the careers of experimental and other scientific lecturers. The recent work of Alan Q. Morton, Larry Stewart, John R. Millburn and others, by relying on much more extensive and systematic research on lecture advertisements and other primary source materials, has given us more detailed and sophisticated accounts of the work of these early lecturers.[8] Their work and findings will help provide points of

---

[7]Some of the earlier studies include Nicholas A. Hans, *New Trends in Education in the Eighteenth Century* (London: Routledge & Kegan Paul, 1951), pp. 136-50; E.G.A. Taylor, *Mathematical Practitioners of Tudor and Stuart England* (Cambridge: Cambridge University Press, 1954), passim (cited hereinafter as *MPTS*); eadem, *Mathematical Practitioners of Hanoverian England* (Cambridge: Cambridge University Press, 1966), passim (cited hereinafter as *MPH*); Michael Brook, "Dr Warwick's Chemistry Lectures and the Scientific Audience in Sheffield (1799-1801)," *Annals of Science* 11 (1953): 224-37; F.W. Gibbs, "Itinerant Lecturers in Natural Philosophy," *Ambix* 6 (1960): 111-17; Margaret E. Rowbottom, "The Teaching of Experimental Philosophy in England, 1700-1730," *Actes du XI^e Congres International d'Histoire des Sciences* 4 (1965): 46-53; Musson and Robinson, *Science and Technology*, pp. 25-6, 34-42, 51-9; F.G.J. Robinson, "A Philosophic War: An Episode in Eighteenth-Century Scientific Lecturing in North-East England," *Transactions of the Architectural and Archaeological Society of Durham and Northumberland* 2 (1970): 101-9. Of the above studies, Brook, Rowbottom and F.G.J. Robinson directly cite newspaper advertisements, while others such as Taylor show evidence that newspaper advertisements were consulted, but do not in any case provide references.

[8]The most recent publications are the articles by Patricia Fara, Larry Stewart, Paul Weindling, Alan Q. Morton, Jane Wess and Roy Porter, which appeared in the March 1995 (volume 28, part 1) issue of *The British Journal for the History of Science*, guest edited by Alan Q. Morton (these articles are listed in full in the Bibliography of this thesis). Also, forthcoming in the June 1995 (volume 28, part 2) issue of *BJHS* are Stephen Pumfrey,"Who Did the Work? Experimental Philosophers and Public Demonstrators in Augustan England," and Simon Schaffer," The Show That Never Ends: Perpetual Motion in the Early 18th Century." The other recent publications are Alan Q. Morton and Jane V. Wess, *Public & Private Science: The King George III Collection* (Oxford: Oxford University Press, 1993), pp. 39-87; Morton, "Men and Machines in Mid-18th Century London," *Transactions—Newcomen Society for the Study of the History of Engineering and Technology* 65 (1993-4): 47-56; idem, "Lectures on Natural Philosophy in London, 1750-1765: S.C.T. Demainbray (1710-1782) and the 'Inattention' of His Countrymen," *British Journal for the History of Science* 23(4) (1990): 411-34; Simon Schaffer, "The Consuming Flame: Electrical Showmen and Tory Mystics in the World of Goods," in *Consumption and the World of Goods*, ed. John Brewer and Roy Porter (London: Routledge, 1993), pp. 489-526; Larry Stewart, *The Rise of Public Science: Rhetoric, Technology, and Natural Philosophy in Newtonian Britain, 1660-1750* (Cambridge: Cambridge University Press, 1992), passim; idem, "Public Lectures and Private Patronage in Newtonian England," *Isis* 77 (1986): 47-58; John R. Millburn, "James Ferguson's Lecture Tour of the English Midlands 1771," *Annals of Science* 40 (1985): 397-415; idem, "The London Evening Courses of Benjamin Martin and James Ferguson, Eighteenth-Century Lecturers on Experimental Philosophy," *Annals of Science* 40 (1983): 437-55; idem, *Benjamin Martin: Author, Instrument-*

comparison and contrast with this present study. Several historians of science have also recently explored the role of science within popular culture in eighteenth-century Britain and, in so doing, have increased our awareness of the social aspects of the popularization and commercialization of science in this period.[9] This helps provide a context within which the activities of the lecturers can be assessed and understood. Also of great benefit is the work of Steven Shapin, Simon Schaffer and others on the "siting of knowledge production" and the social aspects of experiment.[10] Their work has opened up new ways of looking at science and experiment as a social phenomenon. We will utilize the findings and insights of some of these recent studies as we explore the popularization of science and the social locations

---

maker and "Country Showman" (Leyden: Noordhoff International Publications, 1976); idem, in collaboration with Henry C. King, *Wheelwright of the Heavens: The Life & Work of James Ferguson, FRS* (London: Vade-Mecum, 1988) and John H. Appleby, "Erasmus King: Eighteenth-Century Experimental Philosopher," *Annals of Science* 47 (1990): 375-392. For the later eighteenth century, see also Susan C. Lawrence, "Entrepreneurs and Private Enterprise: The Development of Medical Lecturing in London, 1775-1820," *Bulletin of the History of Medicine* 62 (1988): 171-92 and Ian Inkster, "The Public Lecture as an Instrument of Science Education for Adults—The Case of Great Britain, c. 1750-1850," *Paedagogia Historica* 20 (1980): 80-107. Among the more recent general accounts are John L. Heilbron, *Electricity in the 17th and 18th Centuries: A Study of Early Modern Physics* (Berkeley: University of California Press, 1979), pp. 158-166 (Heilbron's study includes material on scientific lecturing in seventeenth- and eighteenth-century France); J.N. Hays, "The London Lecturing Empire, 1800-50," in *Metropolis and Province: Science in British Culture, 1780-1850*, ed. Ian Inkster and Jack Morrell (London: Hutchinson, 1983), pp. 91-119 and Margaret C. Jacob, *The Cultural Meaning of the Scientific Revolution* (Philadelphia: Temple University Press, 1988), pp. 141-61.

[9]See Roger Cooter and Stephen Pumfrey, "Separate Spheres and Public Places: Reflections on the History of Science Popularization and Science in Popular Culture," *History of Science* 32(3) (September 1994): 237-67; Morton and Wess, *Public & Private Science*; Stewart, *Public Science*; idem, "The Selling of Newton: Science and Technology in Early Eighteenth-Century England," *Journal of British Studies* 25 (April 1986): 178-92; Jan Golinski, *Science as Public Culture: Chemistry and Enlightenment in Britain, 1760-1820* (Cambridge: Cambridge University Press, 1992); John Money, "Joseph Priestley in Cultural Context: Philosophic Spectacle, Popular Belief and Popular Politics in Eighteenth-Century Birmingham," *Enlightenment and Dissent* 7 (1988): 57-81 and 8 (1989): 69-89; Roy Porter, Simon Schaffer, Jim Bennet and Olivia Brown, *Science and Profit in 18th-Century London* (Cambridge: Whipple Museum of the History of Science, 1985); Simon Schaffer, "Natural Philosophy and Public Spectacle in the Eighteenth Century," *History of Science* 21 (1983): 1-43; Roy Porter, "Science, Provincial Culture and Public Opinion in Enlightenment England," *British Journal for Eighteenth-Century Studies* 3 (1980): 20-46; Steven Shapin, "The Audience for Science in Eighteenth Century Edinburgh," *History of Science* 12 (1974): 95-121.

[10]See particularly Shapin's recent *A Social History of Truth: Civility and Science in Seventeenth-Century England* (Chicago: University of Chicago Press, 1994) and Shapin and Schaffer's seminal *Leviathan and the Air-Pump: Hobbes, Boyle and the Experimental Life* (Princeton: Princeton University Press, 1985). Also helpful is Marie Boas Hall, *Promoting Experimental Learning: Experiment and the Royal Society 1660-1727* (Cambridge: Cambridge University Press, 1991); David Gooding, Trevor Pinch and Schaffer, eds., *The Uses of Experiment: Studies in the Natural Sciences* (Cambridge: Cambridge University Press, 1989) and Shapin, "The House of Experiment in Seventeenth-Century England," *Isis* 79 (1988): 373-404.

of experiment in the activities and strategies of the first generation of experimental lecturers.

1.3 Sources and Methodology of This Study

Since most science lecturers regularly advertised details of their courses in the various London newspapers and magazines (which were steadily increasing in number during this period), it is clear that the only way to provide a consistent and detailed account of the careers and patterns of the lecturers is to go back to the original advertisements placed for the courses. In the absence of extensive autobiographical accounts, lecture advertisements are clearly the most valuable source in a study of scientific lecturing in this period.[11] Moreover, in order to avoid the limited and impressionistic accounts of much of the past research, and to provide a comprehensive reconstruction of lecture dates from which extrapolations about lecturing patterns can be drawn, a broad survey of newspaper advertisements is needed. For the period of the first generation of lecturers in the years 1705-1728, the best source is the *Daily Courant*. There are a number of reasons for this choice. The *Daily Courant* was the first London daily newspaper (until the introduction of the *Daily Post* in October 1719); its entire run (1702-1735) spans the main period of our study, with a substantial overlap before and after, and this paper was the advertiser of choice among lecturers from its inception until the mid-1720s.[12] Thus, this study is based largely on an extensive and full survey of the *Daily Courant*, along with cross-references to other contemporary papers.[13] Furthermore, as the advertisements contain important information

---

[11]Whiston, who was the only lecturer to produce a full size autobiography, provides very limited information on his lecturing career. Still, even the information he does supply is quite helpful and will be used later in this study.

[12]Helpful background information on the steadily increasing publication of newspapers in the late seventeenth and early eighteenth centuries can be found in Jeremy Black, *The English Press in the Eighteenth Century* (London: Croom Helm, 1987); Michael Harris, *London Newspapers in the Age of Walpole: A Study of the Modern English Press* (Rutherford: Associated University Press, 1987) and James Sutherland, *The Restoration Newspaper and Its Development* (Cambridge: Cambridge University Press, 1986). For a very helpful study of newspaper advertising for this period, see R.B. Walker, "Advertising in London Newspapers, 1650-1750," *Business History* 16 (1973): 112-30.

[13]The entire run of the *Daily Courant* is 11 March 1702 to 28 June 1735, and this run was fully surveyed (the run for 1728 is missing January and February, and the run for 1729 ends with September). In addition to this survey of the *Daily Courant*, the entire runs of the literary magazines *The Tatler* (1709-1711),

in addition to the dates of the courses, the complete text of each notice located in this survey was entered into several computer files for later retrieval and analysis. This has allowed for a fuller and more detailed investigation.

Lecture advertisements are valuable not only for straightforwardly providing the names of the lecturers and the starting dates of their courses, but also for a number of other valuable details, such as pricing schemes, lecture venues, the residential addresses of the lecturers, the names of booksellers through whom course subscriptions could be obtained, and the scientific content of the courses. To this available detail we can supplement further material extricated from information directly and indirectly taken from the texts of the advertisements, including evidence of the social location of the audience (actual and targeted), along with posturing, salesmanship, competitive strategies, and inter-lecturer slander and derogation. The material gleaned from advertisements can also be cross-referenced and supported with other types of sources, such as contemporary testimony, course textbooks, analogous evidence from the work of earlier and later lecturers, modern biographical sources,[14] as well as what can be reconstructed of the social, economic and physical environment of early eighteenth-century London.[15] Finally, a comprehensive survey

---

The Spectator (1711-1712) and *The Englishman* (1713-1714) were fully surveyed, as well as the *Daily Post* from 1719 to 1728. These newspapers were viewed on the Early English Newspaper microfilm collection filmed mainly from the Burney Collection of Newspapers stored at the British Library, and the surveys were carried out on microfilm at the University of Toronto, the British Library, the University of British Columbia and in the later stages of this project, reels borrowed from the University of British Columbia were viewed at the University of Victoria. As much newspaper surveying is a weariness of the eyes—as well as the flesh—it is entirely possible that I have missed the occasional reference. Also, many newspaper runs represented in the microfilm collection are missing the occasional issue. However, as most lectures and lecture courses were advertised with more than one newspaper advertisement, the possibility of missing lecture course dates (which are more important than catching every last advertisement) is greatly reduced. To further minimize the risk of missing lecture dates, I surveyed some of the more important and transitional years a second time.

[14]In addition to *The Dictionary of National Biography* (*DNB*), *The Dictionary of Scientific Biography* (*DSB*) and Taylor's two works on mathematical practitioners (*MPTS* and *MPH*), a very helpful source is R.V. and P.J. Wallis' *Biobibliography of British Mathematics and Its Applications. Part II 1701-1760* (Letchworth: Epsilon, 1988). A number of other helpful biographical and bibliographical sources are suggested by Steven Shapin and Arnold Thackray in their essay "Prosopography as a Research Tool in History of Science: The British Scientific Community 1700-1900," *History of Science* 12 (1974): 1-28.

[15]Much material on the London of the eighteenth century can be found in *The London Encyclopaedia*, ed. Ben Weinreb and Christopher Hibbert (London: Macmillan, 1983). A more specific and very useful study of the social, cultural and economic background of London in the eighteenth century can be found in George Rudé's *Hanoverian London: 1714-1808* (London: Secker & Warburg, 1971). Also very helpful are two more

and analysis of the entire corpus of advertisements for the period can provide us with data over the long term on advertising strategies, price fluctuations, seasonal lecturing patterns, and lecturing frequency (from which, combined with other data, approximate lecturing revenues can be extrapolated). From this survey and analysis, profiles of lecturing patterns, lecture course subjects and price trends were produced and are included in tabular form as Appendices I-X. These profiles are a more practical alternative to unnecessary detail, referencing and repetition, and will be referred to constantly in this thesis. While this study is certainly not exhaustive and far from infallible, it is hoped that the combination of microanalysis, contextualization and broad quantitative survey will give us a somewhat better understanding of the world of the early eighteenth-century experimental lecturers and their audience.

1.4 Parameters and Outline of This Study

This thesis is intended to outline the rise of public experimental lecturing in London by concentrating on the lecturing careers of the first generation of lecturers. A number of considerations have led to a limitation of the period formally covered to the twenty-four year period from 1705 to 1728. First, this period allows coverage of the full public experimental lecturing careers of Francis Hauksbee, Sr. (1705-1713), James Hodgson (1705-1709),

---

recent works by Peter Earle: *The Making of the English Middle Class: Business, Society and Family Life in London, 1660-1730* (London: Methuen, 1989), and idem, *A City Full of People: Men and Women of London 1650-1750* (London: Methuen, 1994). For careers and professions in early eighteenth century England, an excellent survey is Geoffrey Holmes, *Augustan England: Professions, State and Society, 1680-1730* (London: George Allen & Unwin, 1982). Very helpful for the commercial and economic context of eighteenth century England is Brewer and Porter, eds., *Consumption and the World of Goods* (cited in full above); Neil McKendrick, John Brewer and J.H. Plumb, *The Birth of a Consumer Society: The Commercialisation of Eighteenth-Century England* (Bloomington: Indiana University Press, 1982) and Plumb, *The Commercialisation of Leisure in Eighteenth-century England* (Reading: University of Reading, 1973). Crucial to a study of experimental and mathematical lecturers (who often used coffee houses as venues) is Bryant Lillywhite's encyclopedic *London Coffee Houses* (London: George Allen & Unwin, 1963), as well as the earlier work by Aytoun Ellis, *The Penny Universities: A History of the Coffee-Houses* (London: Secker & Warburg, 1956). Essential to locating the residences and venues of the experimental lecturers is John Rocque's detailed 1746 map of London, complete with street names and coordinates. The map has been reproduced in its original size for map libraries, and is also reprinted in full in Andrew Davies' *The Map of London: From 1746 to the Present Day* (London: B.T. Batsford, 1987) and *The A to Z of Georgian London*, intro. by Ralph Hyde (Lympne Castle, Kent: London Topographical Society, 1982). (The map coordinates used in this thesis are those given in the original 1746 Rocque map).

Francis Hauksbee, Jr. (1712-1728), William Whiston (1712-1728), Thomas Watts (1718-1724), Benjamin Worster (1718-1724), as well as the first half of the career of J.T. Desaguliers (1713-1744). The special focus placed on the lecturing career of Whiston in this study also helped determine the 1728 terminal date. Furthermore, there is a practical consideration because the main newspaper used to reconstruct the careers of these lecturers, the *Daily Courant*, becomes increasingly less reliable beginning in the mid-1720s.[16] From this point on the lecturers turn more and more to the growing number of other daily newspapers available for advertising.[17] Thus, extending the formal survey much beyond this period involves an increasing number of newspapers with increasing advertisement densities. Since one of the intentions of this project is to provide as comprehensive a survey of the subject as possible, the period considered has been limited accordingly.

A brief outline will help delineate the main goals of this thesis. First, chapter two begins the main part of this study by tracing the growth of experimental philosophy in England as well as the rise of scientific lecturing in London from the late seventeenth century. Chapter three then shifts to concentrate specifically on the rise of the phenomenon of experimental lecturing from 1705 to 1712, focusing primarily on the career of Francis Hauksbee, Sr. The next three chapters are devoted to reconstructing the lecturing careers of William Whiston, Francis Hauksbee, Jr., J.T. Desaguliers, and the various lecturers of the Little Tower Street Academy. The chief sources here are lecture advertisements for the courses, along with the profiles of the lecturing dates, given as Appendices I-VIII. This process of reconstruction provides a framework from which we can move on to discuss in chapters seven, eight and nine the thematic issues of the entrepreneurial, economic and social aspects of lecturing in this period. It is also hoped that the reconstructions offered in chapters three to six—along with the tabular profiles—will prove to be helpful to other scholars who

---

[16]This trend can be seen by viewing Appendix IX.

[17]It is largely because of this factor that a full survey was also made of the *Daily Post*, from its first issue in October 1719 to the end of 1728. This newspaper was the first daily to appear since the *Daily Courant* appeared on 11 March 1702. As the lecture course profiles in Appendices II-VII reveal, Whiston, the younger Hauksbee, Desaguliers and especially the Little Tower Street lecturers, all relied on the *Daily Post* as well. In order to limit the size of the apparatus, however, only references to the *Daily Courant* will be given except where there is need to refer to a lecture course that is only advertised in the *Daily Post*.

work on this and related subjects. Chapter seven focuses on the lecturers' printed "literary technologies," and chapter eight on some of the competitive and entrepreneurial strategies used by the various lecturers. This chapter also takes into account the steady rise in the number of experimental courses to the mid-1720s, and assesses the effect competition may have had on the lecturers. Chapter nine concentrates on the social locations of experimental lecturing, and includes a discussion of the social face of the audience. Chapter nine also includes a consideration of the potential income available through lecturing, along with the role and value of patronage. Finally, chapter ten introduces several broader and comparative themes, draws together some of the more important findings of this study, places early eighteenth-century experimental lecturing in its context, and offers some observations about the significance of experimental and scientific lecturing for the history of science. This thesis concludes with a number of appendices. In addition to the appendices already mentioned, Appendices XI-XII provide information on Whiston's sources of patronage and Appendix XIII reprints the subscription list to the first volume of Desaguliers' *Course of Experimental Philosophy* (1734). Appendices XIV-XXI include reprints of several experimental and astronomical lecture course syllabi. As it has not been possible to treat every aspect of this material in detail within the main text, I hope that this collection of constructed profiles and reprinted course catalogues will provide helpful data and information for other scholars who study experimental lecturing and related areas. There is still much work to be done on eighteenth century scientific lecturing and science popularization, but I hope that this study represents a step forward.

2. THE RISE OF PUBLIC SCIENTIFIC LECTURING IN ENGLAND

2.1 The Forerunners of Public Scientific Lecturing in England

Before turning to public experimental lecturing proper, it will be helpful to look at some earlier analogous developments in public scientific lecturing. The origins of public scientific and experimental lecturing can be traced at least as far back as the 1660s. Our first example takes us back to Oxford in the last years of the Protectorate. In 1658 the Prussian chemist Peter Stahl (or Staehl) visited Samuel Hartlib in England, after which time the millenarian education reformer recommended Stahl to Robert Boyle.[1] According to Anthony Wood, Robert Boyle brought Stahl to Oxford in late 1659.[2] From 1660-1663 Stahl delivered a number of chemistry courses at Oxford in private homes, counting among his scholars John Wallis and Christopher Wren.[3] Anthony Wood records his own attendance at one of Stahl's courses beginning on 23 April 1663. At this "club," which was comprised of at least ten auditors, Wood says that they "wrote and took notes from the mouth of their master, who sate at the upper end of a table."[4] Wood paid a thirty shilling fee at the commencement of the course, and an additional thirty shillings at the conclusion on 30 May 1663.[5] This amounts to a fee of £3 for a five week course—almost identical in cost and duration to many of the science courses of the early eighteenth century.

Robert Hooke (1635-1702), in his long-time position as Curator of Experiments at the Royal Society, was involved in a lengthy career of experimental demonstrations. Additionally, a lectureship in mechanics, with annual remuneration set at £50, was

---

[1]G.H. Turnbull, "Peter Stahl, the First Public Teacher of Chemistry at Oxford," *Annals of Science* 9(3) (1953): 268; Charles Webster, *The Great Instauration: Science, Medicine and Reform 1626-1660* (London: Duckworth, 1975), p. 165

[2]Turnbull, "Peter Stahl," pp. 265, 269.

[3]Turnbull, "Peter Stahl," pp. 269-70.

[4]Wood, *Life and Times*, ed. A. Clark (Oxford, 1891), 1: 474-5., cited in Turnbull, "Peter Stahl," p. 270.

[5]Turnbull, "Peter Stahl," p. 270.Webster also mentions that Wallis testifies that Stahl was invited to Oxford "to conduct for classes of six or eight 'of better rank amongst us . . . a whole course of chymistry'" (Webster, *Great Instauration*, p. 165).

established for Hooke in 1664 by Sir John Cutler.[6] Hooke, who none-the-less experienced difficulty in collecting his salary from Cutler, published the lectures in 1679 as the *Lectiones Cutlerianæ*.[7] To this published work we can add several other publications on experimental philosophy, including such works as those published by Robert Boyle, Henry Power and Richard Waller.[8] Also, the foundation of the Boyle Lectures in 1692, established with a legacy left in Robert Boyle's will, led to the creation of a series of annual lectures on subjects that often mixed science and religion for apologetic purposes.[9] Two public science lecturers, John Harris and William Whiston, delivered Boyle Lectures. These and other analogous developments helped set the stage for the arrival of the polite form of entertainment and education seen in the experimental lectures of the early eighteenth century.[10]

2.2 Newtonian Science and Experimental Philosophy in the Universities

Although the importance of experimental philosophy in the universities during the late

---

[6]An extensive treatment of Hooke's Cutlerian Lectures is found in Michael Hunter, *Establishing the New Science: The Experience of the Early Royal Society* (Woodbridge: Boydell, 1989), pp. 279-338.

[7]Hooke, *Lectiones Cutlerianæ, Or a Collection of Lectures: Physical, Mechanical, Geographical, & Astronomical. Made before the Royal Society on several Occasions at Gresham Colledge* (London: Printed for John Martyn Printer to the Royal Society, at the Bell in S. Pauls Church-yard, 1679).

[8]Boyle, *New Experiments Physico-mechanicall, touching the spring of the air, (made, for the most part, in a new pneumatical engine): written by way of letter to the Right Honourable Charles, Lord Vicount of Dungarvan, eldest son to the Earle of Corke* (Oxford: Printed by H: Hall, Printer to the University, for Tho: Robinson, 1660); Power, *Experimental Philosophy in Three Books: Containing New Experiments Microscopical, Mercurial, Magnetical. With some Deductions, and Probable Hypotheses, raised from them, in Avouchment and Illustration of the now famous Atomical Hypothesis* (London: Printed by T. Roycroft, for John Martin, and James Allestry, at the Bell in S. Pauls Church-yard, 1664); Waller, trans., *Essayes of Natural Experiments Made in the Academie del Cimento, Under the Protection of the Most Serene Prince Leopold of Tuscany. Written in Italian by the Secretary of that Academy. Englished by Richard Waller, Fellow of the Royal Society* (London: Printed for Benjamin Alsop at the Angel and Bible in the Poultrey, over-against the Church, 1684).

[9]On the Boyle Lectures and their apologetic nature, see Margaret C. Jacob, *The Newtonians and the English Revolution 1689-1720* (Ithaca: Cornell University Press, 1976), passim; eadem, "The Church and the Formulation of the Newtonian World-view," *Journal of European Studies* 1 (1971): 128-48; John J. Dahm, "Science and Apologetics in the Early Boyle Lectures," *Church History* 39(2) (1970): 172-86; Henry Guerlac and Margaret Jacob, "Bentley, Newton and Providence (the Boyle Lectures Once More)," *Journal of the History of Ideas* 30(3) (1969): 307-18.

[10]See also the summary of the rise of this sort of scientific education in Morton and Wess, *Public & Private Science*, pp. 44-6.

seventeenth and early eighteenth centuries should not be exaggerated, several future public experimental lecturers were students at Oxford and Cambridge in this period—at a time when several proponents of experimental philosophy taught at these institutions. According to Gerard L'E. Turner, the Scottish Newtonian David Gregory was the first to promote experimental philosophy at Oxford.[11] Gregory (1661-1708), who had held the Chair of Mathematics at the University of Edinburgh since 1683, had been appointed to the Savilian Chair of Astronomy at Oxford in 1691 with the recommendation and support of Isaac Newton.[12] Three years after Gregory's arrival in Oxford John Keill (1671-1721),[13] Gregory's student from Edinburgh and another aspiring Newtonian, came to Oxford and began to lecture on experimental philosophy.[14] From perhaps as early as 1694 Keill lectured on Newtonian physics, using experiment as a pedagogical aid. Keill appears to have been the first to teach the new Newtonian natural philosophy with the use of experimental demonstrations.[15] The material from his Oxford courses was published in 1701 in his influential *Introductio ad veram physicam* (*An Introduction to the True Physics*).[16] Keill's student John Theophilus Desaguliers later wrote that

Dr. John Keill, was the first who publickly taught Natural Philosophy by

---

[11]Gerard L'E. Turner,"The Physical Sciences," in *The History of the University of Oxford. Volume V. The Eighteenth Century*, ed. L.S. Sutherland and L.G. Mitchell (Oxford: Clarendon Press, 1986), p. 670. A good summary of the teaching of experimental philosophy at Oxford in the early eighteenth century can be found in R.T. Gunther, *Early Science in Oxford* (Oxford, 1923), 1: 195-202. For biographical information on Gregory, see D.T. Whiteside, "David Gregory," *DSB*, 5: 520-2; Taylor, *MPTS*, p. 278; *Biographia Britannica* (London, 1757), 4: 2365-72, and *DNB*, 8: 536-7. On the rapid acceptance of Newtonianism in Scotland, see Paul B. Wood, "The Scientific Revolution in Scotland," in *The Scientific Revolution in National Context*, ed. Roy Porter and Mikuláš Teich (Cambridge: Cambridge University Press, 1992), pp. 269-74.

[12]Turner, "Physical Sciences," p. 670; Richard Westfall, *Never at Rest: A Biography of Isaac Newton* (Cambridge: Cambridge University Press, 1980), p. 500.

[13]For biographical details on Keill, see David Kubrin, "John Keill," *DSB*, 7: 275-7; Taylor, *MPTS*, p. 288; *DNB*, 10: 1198-9.

[14]Turner, p. 671; David Kubrin, "John Keill," *DSB*, 7: 275.

[15]Kubrin, "John Keill," *DSB*, 7: 276.

[16]Keill, *Introductio ad veram physicam* (Oxford, 1701). This work was eventually translated into English with the title *An Introduction to Natural Philosophy, or Philosophical Lectures Read in the University of Oxford* (London, 1720). Kubrin, "John Keill," *DSB*, 7: 276.

> Experiments in a mathematical Manner: for he laid down very simple Propositions, which he prov'd by Experiments, and from those he deduc'd others more compound, which he still confirm'd by Experiments; till he had instructed his Auditors in the Laws of Motion, the Principles of Hydrostaticks and Opticks, and some of the chief Propositions of Sir Isaac Newton concerning Light and Colours. He began these Courses in Oxford, about the Year 1704 or 1705, and that Way introduc'd the Love of the Newtonian Philosophy.[17]

When Keill travelled to New England in 1709, his student Desaguliers lectured on experimental philosophy in his place.[18]

A semi-formal tradition of teaching experimental philosophy continued at Oxford for the next several decades. John Whiteside (1679-1729),[19] Keeper of the Ashmolean Museum from 1714 until 1728, lectured on "all parts of Natural Philosophie Experiments and Mathematics, for which he is very well accomplished, with excellent Instruments well made, at expense of neare 300*l.*"[20] This was a large capital expenditure, and no doubt the one and a half guinea fee that Whiteside charged the gentlemen and students of the University, was meant to recoup this initial cost.[21] Whiteside had apparently divided the entrance hall of the Ashmolean into two sections, and after lecturing on one side he moved with his students to

---

[17]Desaguliers, Preface, *A Course of Experimental Philosophy*, vol. 1 (London: Printed for John Senex, *et al*, 1734), sig. C1[r]. The beginnings of what would become the standard quadripartite syllabus of mechanics, hydrostatics, pneumatics and optics are seen in this description of the subject matter of Keill's lectures. Desaguliers' later dates for the introduction of Keill's course may reflect the fact that the former was not at Oxford until 1705.

[18]Turner, "Physical Sciences," p. 671.

[19]Whiteside entered Balliol College at Oxford on 16 May 1696, is known to have received an MA at Oxford in 1704, was elected FRS on 3 July 1718, and at some point, was ordained. On Whiteside, see Wallis and Wallis, *Biobibliography*, pp. 108-9 and Taylor, *MPH*, p. 148.

[20]Arthur Charlett to Dr. John Richardson, Ladyday [25 March] 1716 (cited in Gunther, *Early Science in Oxford*, 1: 199-200). Wallis and Wallis list three editions of a three page anonymous publication entitled *A course of mathematical lectures and experiments (Mechanicks. Hydrostaticks. Pneumaticks. Opticks. Architecture. Magneticks. Astronomy)*, which they date at 1720, 1721 and 1722 and attribute to Whiteside. These editions, all of which are held at Oxford, are almost certainly different versions of Whiteside's course catalogue, or syllabus. The edition dated 1720 gives evidence of a twenty-two day course with a one and a half guinea entrance fee, subscriptions for which were taken in at the Ashmolean Museum. The edition dated 1721 extends the course to twenty-four days (Wallis and Wallis, *Biobibliography*, p. 109).

[21]The fee is given in Charlett to Richardson, Ladyday [25 March] 1716, cited in Gunther, *Early Science in Oxford*, 1: 200.

the other side, where his servant demonstrated the experiments upon which Whiteside had lectured.[22] After Whiteside's death in 1729, his instruments were bought in January 1730 (N.S.) by James Bradley, Savilian Professor of Astronomy since 1721.[23] Bradley, who had already begun lecturing on experimental philosophy at the Ashmolean in 1729, continued in this course until 1760.[24] In all, Bradley delivered seventy-nine courses during these years, and from 1746 to 1760 the average number of auditors was thirty-seven, which with a fee of three guineas per student,[25] brought in from about £233 to £350 annually for the two to three courses he held each year.[26] Interestingly, both Whiteside and Bradley structured their syllabi around Whiston and Hauksbee's 1714 experimental lecture course manual, which included both engravings of the experimental apparatus as well as brief explanations of the figures.[27] This replication of the Whiston-Hauksbee experimental course during these years at Oxford must be taken into account in any consideration of the influence of the lecture course of the former Cambridge professor and his instrument-maker partner.

A similar Newtonian experimental revolution began to take place in Cambridge in the first decade of the eighteenth century.[28] William Whiston, also a Newtonian (although

---

[22]Gunther, *Early Science in Oxford*, 1: 200. It is instructive that it was an unnamed and otherwise invisible servant who manually performed the experiments.

[23]Turner, "Physical Sciences," p. 672; Gunther, *Early Science in Oxford*, 1: 201. Bradley was ordained in 1719 and appointed Astronomer Royal at Greenwich in 1742 upon the death of Edmond Halley. He is best known for his discovery of the aberration of starlight, which provided the first direct, empirical evidence for the earth's revolution around the sun. Bradley also provided a very accurate measurement of the speed of light. For biographical details on Bradley, see A.F. O'D. Alexander, "James Bradley," *DSB*, 2: 387-9; Wallis and Wallis, *Biobibliography*, pp. 126-7; Taylor, *MPH*, p. 112 and *DNB*, 2: 1074-9.

[24]Turner, "Physical Sciences," p. 672.

[25]Taylor says the fee was two guineas. This may refer to an earlier price Bradley charged, which, if true, would reflect a steady rise from Whiteside's entrance fee of one and a half guineas, and then first a fee of two guineas, then three for Bradley. See Taylor, *MPH*, p. 148.

[26]Turner, "Physical Sciences," p. 673; Gunther, *Early Science in Oxford*, 1: 201. See both Turner and Gunther for more detail on Bradley's course.

[27]Turner, "Physical Sciences," p. 673.

[28]An excellent account of the establishment of Newtonian natural philosophy in Cambridge is found in John Gascoigne, *Cambridge in the Age of the Enlightenment: Science, Religion and Politics From the Restoration to the French Revolution* (Cambridge: Cambridge University Press, 1989), pp. 142-84.

not without his differences with Keill, theological and otherwise), took over Newton's position as Lucasian Professor of Mathematics by the latter's agency in 1701.[29] In the early 1690s Whiston had set out to master the contents of Newton's *Principia*,[30] and thereafter became one of the most enthusiastic supporters and teachers of Newtonian natural philosophy both through lectures and publications first at Cambridge and then in London. By 1707, Whiston, together with Plumian Professor appointee Roger Cotes (also a disciple of Newton), began at Cambridge a course of experimental philosophy, which included experimental material from Torricelli, Pascal, Boyle and Hooke.[31] Robert Smith, Cotes' cousin and successor, testified in his preface to the published version of Cotes' lectures that the lectures were "performed before large assemblies at the Observatory in Trinity College Cambridge; first by the Author in conjunction with Mr. *Whiston*, at that time Professor of the Mathematicks, then by the Author alone, and after his decease by my self."[32] These lectures appear to have had a double influence. First, Whiston would later acknowledge that he made use of material presented in these lectures in his public experimental courses in London.[33] Second, among the "large assemblies" of students who attended these lectures

---

[29]Evidence published in Whiston's *Astronomical Lectures, Read in the Public Schools at Cambridge* (London, 1715), shows that Whiston was lecturing on astronomy at Cambridge as early as February 1701; he first lectured as Newton's deputy. This same book records that Whiston was chosen Professor on 8 January 1702 and officially admitted Professor on 21 May 1702 (Whiston, *Astronomical Lectures*, p. 192).

[30]Whiston, *Memoirs of the Life and Writings of Mr. William Whiston*, 2nd ed. (London: Printed for J. Whiston and B. White, 1753), 1: 34. As is now well known, primarily through the efforts of James E. Force, Whiston also became attracted to Newton's unorthodox theology. Whiston, in fact, linked Newton's discoveries in science with what he saw as similar discoveries about the true nature of primitive Christianity. Whiston also added a millenarian emphasis when writing about "the wonderful Newtonian philosophy," which he said he looked upon "in a higher light than others, and as an eminent prelude and preparation to those happy *times of the restitution of all things, which God has spoken of by the mouth of all his holy prophets, since the world began*, Acts iii. 21" (Whiston, *Memoirs*, 1: 34).

[31]Gascoigne, *Cambridge in the Enlightenment*, pp. 151-2. Roger Cotes (1682-1716) was elected first Plumian Professor of Astronomy and Experimental Philosophy in 1707 at the age of twenty-five. He held this position until his death from fever at the age of thirty-three. On Cotes see Ronald Gowing, *Roger Cotes—Natural Philosopher* (Cambridge: Cambridge University Press, 1983); J.M. Dubbey, "Roger Cotes," *DSB*, 3:430-3; Gascoigne, *Cambridge in the Enlightenment*, pp. 150-6.

[32]Smith, in Preface to Cotes' *Hydrostatical and Pneumatical Lectures* (London: Printed for the Editor, 1738), sig. A3^{r}.

[33]More detail on this is provided below in chapter 4.

were the Newtonians of the next generation.

Several future public scientific and experimental lecturers were to move through Cambridge and Oxford during the first two decades of the eighteenth century, as students, lecturers or both. At Oxford during these years were J.T. Desaguliers (1705-1712) and James Stirling (1711-1715); at Cambridge were William Whiston (1701-1710), James Jurin (1702-1709), Benjamin Worster (1701-1708) and Peter Brown (1704-1708). It seems likely that, in the case of the students, their appearance at these Universities exposed them to the new experimental philosophy then being taught. We will have occasion to deal with most of these men later in this thesis. However, as Jurin lectured not in London but in the provincial town of Newcastle-on-Tyne, we will provide an account of his experiences here. James Jurin (1684-1750), an early example of this new breed of scientific practitioners, entered Trinity College, Cambridge in 1702, graduated BA in 1705, was elected Fellow of Trinity in 1706, and obtained an MA in 1709.[34] After this he was master of the grammar school at Newcastle-on-Tyne from 1710-1715, and during this time, perhaps as early as 1711, he began presenting scientific lectures in that town for fee.[35] Jurin apparently generated and saved from his public lecturing and schoolmastering a full £1000, and was able to use this money to help him realize his goal of becoming a physician. Accordingly, after moving to London in 1715, he received an M.D. from Cambridge in 1716, and went on to be elected FRS in 1717, and appointed Fellow of the College of Physicians in 1719.[36] After this, Jurin, whom Richard Westfall describes as a Newtonian, was appointed as one of the two secretaries of the Royal Society (1721-1727) and edited volumes 31-34 of the *Philosophical Transactions*

---

[34]On Jurin, see Wallis and Wallis, *Biobibliography*, pp. 53-5 and *DNB*, 10: 1117-8. Jurin's presence at Cambridge during these years makes it possible for him to have heard Whiston lecture on mathematics, astronomy and physics, or he could have attended the Whiston-Cotes experimental philosophy lectures in 1707. Jurin would later have William Innys print a one hundred and thirty-six page booklet of "physico-mathematical dissertations" (Jurin, *Dissertationes Physico-Mathematicæ, Partim antea editæ in Actis Philosophicis Londinensieus, Jam auctiores et emendatiores, Partim nunc primum impressæ. Auctore Jacobo Jurin, M.D. Colleg. Medic. Londin. & Reg. Societ. Socio, in Nosocomio Thomæ Guy, Armrl, Medico, olim Colleg. Trinit. apud Cantabrigienses Sodale* [Londini: Impensis Gulielmi Innys, in Areâ Occidentali D. Pauli, 1732]).

[35]Wallis and Wallis, *Biobibliography*, p. 53; *DNB*, 10: 1117. Larry Stewart cites an advertisement Jurin placed in the *Newcastle Courant* (24-6 January 1712) for a course on natural philosophy particularly intended for "Gentlemen concerned in Collieries and Lead-Mines" (Stewart, *Public Science*, p. 147).

[36]Wallis and Wallis, *Biobibliography*, p. 53; *DNB*, 10: 1117.

(1720-1727).[37] Thus, in Jurin's case, scientific lecturing could provide a significant financial stepping stone to something greater.

2.3 Early London Chemical and Mathematical Lecture Courses

It will be helpful now to turn particularly to the rise of public scientific lecturing in London. The chemist George Wilson (*c.*1631-1711) was giving courses on chemistry in London at least as early as the beginning of the 1690s.[38] While there is no indication of the precise date that Wilson began offering courses to the public, the fact that Wilson's *Complete Course of Chemistry* came out in 1691 probably indicates that he was running the course either privately or publicly by that date. There is, however, conclusive evidence that Wilson was running the course for fee by the summer of 1694. In what may be one of the earliest advertisements for a public scientific lecture course, Wilson advertised his "Course of Chymisty" during April, May and June in *Collection for the Improvement of Husbandry and Trade*, the weekly paper of John Houghton:

> A course of Chymistry will be carried on by *George Wilson*, at the *Herme's* Head in *Well-Yard*, behind St. *Bartholomew's* Hospital in Smithfield, in which will be performed above *One Hundred* several Operations. They who desire to know such a Process, with all its necessary *Attendants*, may, for *Three Guineas* each, be accomodated, if they will before the Second of *July* next pay Mr. *Marmaduke Brown*, Stationer, at the Sign of the Cross-Keys on *Ludgate-Hill*, near *Fleet-Bridge*, *Two Guineas*, and Subscribe for the payment of the *third Guinea* when the Course shall be half run through, that he may provide Necessaries for the carrying it on.[39]

This advertisement contains many of the standard elements of the later ads for the period 1712-1728. The subject of the course, the name of the "performer" and the location of the venue, are all prominently displayed. Also provided is a short quantitative statement of the

---

[37]Westfall, *Never at Rest*, pp. 680, 686; M.B. Hall, *Promoting Experimental Learning*, p. 117; Wallis and Wallis, *Biobibliography*, p. 53; *DNB*, 10: 1117.

[38]The best source for Wilson is a short biography prepared over forty years ago by F.W. Gibbs (Gibbs, "George Wilson (1631-1711)," *Endeavour* 12 (1953): 182-5). Taylor asserts that the earliest public lecture course to be advertised was a course on chemistry in 1696, but she does not say whether this was Wilson. (Taylor, *MPTS*, p. 138).

[39]Cited in Gibbs, "George Wilson," p. 184.

content of the course: "above *One Hundred* several Operations." Two words in the advertisement suggest to us (and the audience to whom he was appealing) that the course would not simply involve lecturing. We are told that "Operations" were to be "performed," and, again, not just one or two, but "above *One Hundred.*" The price is given as three guineas, and the payment scheme is outlined as two guineas down with the balance at the mid-point of the course. This indicates that there was a paying market for scientific lectures by the middle of the 1690s.[40] Finally, a date, or at least a deadline, is given, and a stationer is also involved in the subscription scheme.

Apparently Wilson was successful in his public lecturing venture, and he seems to have spawned more than one competitor. One of these, William Johnston, formerly employed by Robert Boyle himself, placed advertisements in 1696 in the *Collection for the Improvement of Husbandry and Trade*. His advertisement contains a crucial element that will interest us, as can be seen by the following excerpt: "Courses of *Chimistry*, with Experiments on the *Air-Pump*, Mr. *Boyle*'s Experiment of *Colours*, or any of his Experiments of what sort soever, may be seen at any time at the sign of *Van Helmont's Head* in *Fetter-Lane*."[41] This may in fact be the first example of an advertisement for a public lecture course that included pneumatic, and possibly mechanical, experiments.

Wilson's first advertisement in the *Daily Courant* for his already well-established course appeared on 15 September 1702:

> *A Course of Chymistry, beginning the 12th of* October *next; consisting of above* 100 *Operations, will be Perform'd by Mr.* Geo. Wilson, *Chymyst, at his Elaboratory in* Well-yard *near St.* Bartholomew's Hospital *by* Smithfield; *The terms are 2 Guineas and a half. Such Gentlemen as will go in the Course, are desir'd to Pay one Guinea Entrance presently, and the other Guinea and a half, at the beginning of the Course.*[42]

---

[40]This expands on the account given by Morton and Wess, who do not deal with these early lectures by Wilson, and note that the paying market was established "by the early years of the eighteenth century." Morton and Wess, *Public & Private Science*, p. 46.

[41]Cited in Gibbs, "George Wilson," p. 184.

[42]*Daily Courant* (cited hereinafter as *DC*. All yearly dates from this newspaper are New Style, and all monthly dates Old Style) Tuesday 15 September 1702, No. 128.The advertisement also appeared in the same newspaper Saturday 26 September 1702, No. 138; Tuesday 29 September 1702, No. 141; Tuesday 6 October

This brief advertisement shows that Wilson was still performing his "above 100 Operations" in Well Yard.[43] There is now less ambiguity about the starting date, which in this case is clearly identified as 12 October 1702. The operations are to be "Perform'd" by Wilson, whose role is further identified as "Chymyst." Next the venue is identified in a two-part statement that includes the immediate space where the operations are to be demonstrated (the "Elaboratory"),[44] and the address in London. In this advertisement the subscription rate is given at two and a half guineas, a reduction from the entrance fee advertised in 1694—perhaps the result of market forces and competition. The payment schedule has also been altered: one guinea down and the balance at the commencement, rather than mid-point, of the course. Finally, the target group is identified as "Gentlemen." Missing from this ad is a separate statement about where subscriptions may be paid, and it can be assumed that this could be done at Wilson's"Elaboratory." From this point on, the course remained relatively stable and unaltered.[45] Wilson's lecturing career lasted until his death at eighty in early 1711.

1702, No. 147; Thursday 8 October 1702, No. 149 and Saturday 10 October 1702, No. 151.

[43]Well Yard was adjacent to St. Bartholomew's Hospital in West Smithfield, just north of Christ's Hospital (Rocque D1 7/11).

[44]The words "elaboratory" and "laboratory" have interesting etymologies and histories that suggest they were originally conceived of as places of work and activity (the Latin etyma *ēlabōrātōrium* and *labōrātōrium* mean respectively "a place where things are worked out" and "a place where work is done"). An interesting discussion of idea and use of early modern laboratories is found in Owen Hannaway, "Laboratory Design and the Aim of Science: Andreas Libavius versus Tycho Brahe," *Isis* 77 (1986): 585-610.

[45]Further advertisements for Wilson's "Course in Chymistry" are found in the *Daily Courant* (with the reference to the first notice in advertisement series only) for courses to begin on: 27 April 1703 (Thursday 18 March 1703, No. 286); 20 September 1703 (Thursday 26 August 1703, No. 424); 20 January 1704 (Saturday 15 January 1704, No. 546); 1 February 1705 (Thursday 11 January 1705, No. 8550; 4 February 1706 (Saturday, January 19, 1706, No. 1175); 15 April 1706 (Thursday 14 March 1706, No. 1220);18 November 1706 (Monday 4 November 1706, No. 1422); 9 February 1707 (Tuesday 7 January 1707, No. 1476), deferred to 10 February 1707 (Saturday 25 January 1707, No. 1492); 26 May 1707 (Tuesday 29 April 1707, No. 1624); 13 October 1707 (Thursday 11 September 1707, No. 1739); 8 December 1707, No. 1803 (Tuesday 25 November 1707, No. 1803), deferred first to 15 December 1707 (Thursday 4 December 1707, No. 1811) and then to 17 December 1707 (Wednesday 17 December 1707, No. 1822); 7 March 1708, "sooner if there comes a Company" (Saturday 31 January 1708, No. 1860); 17 May 1708 (Tuesday 13 April 1708, No. 1920), deferred to 7 June 1708 (Saturday 22 May 1708, No. 1954); 6 September 1708 (Saturday 7 August 1708, No. 2019), deferred to 15 September 1708 (Thursday 2 September 1708, No. 2041); 10 January 1709, or "sooner if there comes a Company" (Tuesday 7 December 1708, No. 2221); 29 August 1709 (Friday 22 July 1709, No. 2416); sometime in February 1710, with the date to be determined after the receipt of ten subscriptions (Saturday 21 January 1710, No. 2573); 5 June 1710 (Wednesday 3 May 1710, No. 2660); 16 April 1711 (Saturday 17 March 1711, No. 2935). Many of these ads promised refunds for auditors "If their Business so fall out that they cannot attend

The next lecturer from this period we will consider is John Harris (*c.*1666-1719), who began to lecture on mathematics at public venues in London in 1698.[46] Harris was elected FRS in 1696, delivered the Boyle Lectures for 1698, and was also known for his popular encyclopedic *Lexicon Technicum* (1704).[47] Harris was the first to lecture for a course on mathematics set up by Charles Cox "for the public good."[48] This course, which was initially delivered free,[49] was presented first for a short time in St. Olave's vestry room, and shortly thereafter in the Session House, at St. Margaret's Hill in Southwark, before being transferred to the Marine Coffee House, in Birchin Lane, in the City of London.[50] Advertisements for Harris's course can be found in the first year of the publication of the *Daily Courant* for a course planned to begin on 2 October 1702 at the Marine Coffee House.[51] After this, many

---

the Course," hinting at the occupations of some of the auditors). A very similar chemistry course is offered from late 1711 to 1716 by Edward Bright; an analysis of Bright's advertisements indicates that this course may have been heavily dependent on Wilson's text.

[46]Harris had an illustrious academic, religious and scientific career. Having entered Trinity College, Oxford in 1683, he graduated B.A. in 1686, followed by an M.A. while at Hart Hall in 1689. After this he took holy orders and served in a number of clerical positions. He is thought to have received a B.D. in 1699 from Cambridge, and he is known to have obtained a D.D. in 1706 from Lambeth. On Harris, see Robert H. Kargon, "John Harris," *DSB*, 6; 129-30; Wallis and Wallis, *Biobibliography*, pp. 2-4; Grant Carr-Harris, "The Ancestry of John Harris (1667-1719)—Father of the Encyclopaedia," *Notes and Queries* (February 1978): 19-23; Taylor, *MPTS*, pp. 138-41, 284; *DNB*, 9: 13-14. See also Stewart's treatment of Harris in *Public Science*, pp. 108-14.

[47]Wallis and Wallis, *Biobibliography*, p. 2. Harris' Boyle Lectures were entitled *Immorality and Pride, the Great Causes of Atheism* (see Margaret Jacob, *Newtonians and the English Revolution*, p. 273).

[48]Charles Cox (later Sir Charles Cox) was an M.P. (from 1701) and brewer from Southwark. See Hans, p. 153; Musson and Robinson, p. 37; Stewart, *Public Science*, p. 111.

[49]Hans, p. 153. Hans here asserts that Harris' course was "elementary and resembled popular talks rather than a systematic course."

[50]Taylor, *MPTS*, pp. 138-9, 284. The location of the Marine Coffee House (Rocque E2 2/6), a short stroll from the Royal Exchange (Rocque E2 2/5), is significant. Two maps produced after the fire of 1748 that swept through the shops of Exchange Alley and Birchin Lane, show the area in 1748 to have been heavily commercial, with several bankers' and insurance offices, along with many other coffee houses, being near neighbours to the Marine Coffee House. These maps are reproduced in Ellis, facing page 94 and Lillywhite (plates 2 and 3). Lillywhite also notes some of the commercial connections of this coffee house (Lillywhite, pp. 359-61). Stewart argues that Harris, while lecturing at the Marine Coffee House, "catered primarily to the shipping interests and investors of Birchin Lane" (Stewart, *Public Science*, p. 113).

[51]*DC* Monday 28 September 1702, No. 140; Tuesday 29 September 1702, No. 141; Wednesday 30 September 1702, No. 142. This advertisement also reveals that Harris was acting as a private tutor at his home in Amen Corner. Amen Corner was just northwest of St. Paul's at the end of Pater Noster Row (Rocque D2 7/1).

more advertisements for mathematical lectures presented by Harris at the Marine Coffee House appear until late 1706 or early 1707.[52] These advertisements provide a number of interesting details. For example, the notice for the 12 March 1703 course announces that "All Persons may come *Gratis*."[53] It is not known whether this policy continued after this date, as no entrance fee is mentioned in any of the remaining notices for Harris' course. Another important detail is revealed in an advertisement for a course to be presented by Harris on 2 October 1705:

> To Day being Tuesday the 2nd Day of October, at the Marine Coffee-house in Birchin-lane, Mr. Harris will go on with the Public Mathematic Lecture: beginning then with Geometry anew; and he will explain largely the Uses of all the Propositions, as he goes along: and with a particular regard to the principles of true Mechanick Philosophy, the Laws of Nature, and of Motion. The Lecture begins every Tuesday and Fryday Night at 7 a Clock. The book is Printed for D. Midwinter at the Rose and Crown in St. Paul's Church-yard.[54]

This advertisement shows that Harris too was beginning to introduce mechanical philosophy into his course. As this course ran later in the same year that Francis Hauksbee, Sr. and James Hodgson held their first experimental lecture, Harris may have been attempting to compete with the former. It also demonstrates that the qualifier "Mathematic" did not mean that the course would hold strictly to pure mathematics.[55] A January 1706 advertisement

---

[52]These include advertisements in the *Daily Courant* (with only the references for the first in each series given here) for lectures to begin on 24 November 1702 (Tuesday 24 November 1702, No. 189); 12 March 1703 (Friday 12 March 1703, No. 281); 11 January 1704 (Monday 10 January 1704, No. 541); 2 May 1704 (Thursday 27 April 1704, No. 634); 16 January 1705 (Thursday 18 January 1705, No. 861, with this notice appearing after the course had begun); 2 October 1705 (Tuesday 2 October 1705, No. 1082); 29 January 1706 (Friday 25 January 1706, No. 1180), 15 October 1706 (Monday 14 October 1706, No. 1404). Harris' name is not give in the advertisement for the 29 January 1706 course, although it does appear in the notice for the 15 October 1706 course. There is also an advertisement for a mathematical lecture at the Marine Coffee House to begin on 18 (or 25) February 1707 (*DC* Monday 17 February 1707, No. 1510). As the lecturer's name is not given, however, it is not certain whether this series was presented by Harris, his successor James Hodgson, or someone else.

[53]*DC* Friday 12 March 1703, No. 281. The Book printed by Midwinter probably refers to one of a number of mathematical works made available at these lectures.

[54]*DC* Tuesday 2 October 1705, No. 1082.

[55]On the inclusiveness of the term "mathematics" in the early modern period, see Shapin, *Social History of Truth*, pp. 315-17.

gives notice of a mathematical lecture series at the Marine to "begin again on Tuesday the 29th of this Instant January, at 7 a Clock in the Evening, if the Subscriptions be fully completed before that Time," indicating that there was a predetermined minimum threshold of subscriptions to make the course viable.[56] The notices indicate that the course was held for one hour starting at 6 or 7 pm, and held on Tuesdays and Fridays, or Tuesdays, Thursdays and Fridays. This mathematical course at the Marine Coffee House continued into the 1710s, with Harris lecturing there until 1706 or early 1707, followed by James Hodgson (1707-1708 or 1709),[57] Humphrey Ditton (1710),[58] and William Whiston (1713-1714).[59]

---

[56]*DC* Saturday 26 January 1706, No. 1181

[57]In her entry on Hodgson, Taylor states that Hodgson lectured at the Marine Coffee House "during 1708-9" (Taylor, *MPTS*, p. 288), while in her entry on Harris she asserts that Hodgson took over in 1707 (Taylor, *MPTS*, p. 284). This ambiguity is cleared up by a series of advertisements for "The Publick Mathematical Lecture at the Marine Coffee-house" placed in the *Daily Courant* for a course due to begin on 24 October 1707, which gives "James Hodgson, F.R.S." as the lecturer (*DC* Monday 20 October 1707, No. 1772; Wednesday 22 October 1707, No. 1774; Thursday 23 October 1707, No. 1775). As mentioned above, it is also possible that Hodgson began lecturing on mathematics at the Marine in February 1707. Further Hodgson mathematical courses at the Marine are advertised in the *Daily Courant* for May 1708 (*DC* Saturday 8 May 1708, No. 1942; Thursday 13 May 1708, No. 1946) and 20 September 1708 (*DC* Saturday 18 September 1708, No. 2054; Monday 20 September 1708, No. 2055). The advertisements for the May 1708 series give notice that the lectures were until that time read on Tuesdays and Fridays, but that from that time they would be read on Mondays and Thursdays between 7 and 8 pm. These advertisements also give notice that "Geometry will be explain'd on Mondays and Mechanicks on Thursdays, with its Application." Hodgson took up the position of Master of the Mathematical School at Christ's Hospital early in 1709 (Taylor, *MPTS*, p. 288), and I was not able to find any advertisements in the *Daily Courant* during 1709 for the mathematical course at the Marine Coffee House.

[58]Taylor, *MPTS*, p. 293. The first mathematical series at the Marine delivered by Humphrey Ditton was advertised to begin on 7 October (deferred from 3 October) 1710 (*DC* Monday 11 September 1710, No. 2772; Friday 29 September 1710, No. 2788; Friday 6 October 1710, No. 1794). There are no advertisements in the *Daily Courant* for the mathematical course at the Marine during 1711 and 1712.

[59]Evidence that Whiston took over the position of lecturer at the Marine Coffee House will be presented below.

3. THE LECTURING CAREERS OF FRANCIS HAUKSBEE, SR. AND JAMES HODGSON, 1705-1713

3.1 Biographical Information on Francis Hauksbee, Sr. and James Hodgson

The first formal series of experimental and mechanical lectures appears to have taken place in 1705 through a partnership between the instrument-maker Francis Hauksbee, Sr. (*c.*1666-1713),[1] and James Hodgson (1672-1755), former assistant to John Flamsteed, the Astronomer Royal.[2] Hauksbee, who had no formal academic training, appeared at the 15 December 1703 meeting of the Royal Society to perform an experiment with his air-pump. This date was also the first at which Newton presided as president, and it seems likely that Hauksbee's performance was part of Newton's agenda to reinvigorate the Society with experimental practice and observation.[3] Hauksbee had been advertising scientific instruments

---

[1]The most extensive accounts of Francis Hauksbee, Sr. and his scientific work are by Henry Guerlac. See Guerlac, "Francis Hauksbee: Expérimentateur au profit de Newton," *Archives internationales d'histoire des sciences* 16 (1963): 113-128 (reprinted in Guerlac, *Essays and Papers in the History of Modern Science* [Baltimore: The Johns Hopkins University Press, 1977], pp. 107-19); idem, "Sir Isaac and the Ingenious Mr. Hauksbee," in *Mélanges Alexandre Koyré*, ed. I. Bernard Cohen and René Taton (Paris, 1964), 1; 228-53 and idem, "Francis Hauksbee," *DSB*, 6: 169-75. A list of Hauksbee's many articles that appeared in the *Philosophical Transactions* can be found in Wallis and Wallis, *Biobibliography*, pp. 12-14. See also the many references to Hauksbee in Heilborn, *Electricity* and the accounts of Hauksbee in Westfall, *Never at Rest*, pp. 632-4, 684-6, 708, 745-6, 793. Also helpful is Duane H.D. Roller's introduction to the 1970 reprint of Hauksbee's *Physico-Mechanical Experiments on Various Subjects*, 2nd ed. (New York: Johnson Reprint [orig. publ. 1719]), pp. ix-xix; David W. Corson, "Pierre Polinière, Francis Hauksbee, and Electroluminescence: A Case of Simultaneous Discovery," *Isis* 59 (1968): 402-13 and Gad Freudenthal, "Early Electricity Between Chemistry and Physics: The Simultaneous Itineraries of Francis Hauksbee, Samuel Wall, and Pierre Polinière," *Historical Studies in the Physical Sciences* 11(2) (1981): 203-12.

[2]For Hodgson, see Wallis and Wallis, *Biobibliography*, pp. 14-15; Taylor, *MPTS*, pp. 288-9; eadem, *MPH*, pp. 129-30; *DNB*, 9: 961; Morton and Wess, *Public & Private Science*, pp. 41-4 and Stewart, *Public Science*, pp. 114-17. The entry in Wallis and Wallis provides a list of Hodgson's publications, which include articles printed in the *Philosophical Transactions*. Also many of his activities as assistant to Flamsteed and afterwards can be traced in Francis Baily, ed., *An Account of the Revd. John Flamsteed, the First Astronomer-Royal* (London, 1835; reprint: London: Dawsons, 1966). James Hodgson (also called John) married Flamsteed's niece Anna, and through his marriage became one of the principle beneficiaries of Flamsteed's will. Hodgson's family ties to Flamsteed were probably a main contributing factor in his continuing association with his former employer.

[3]Newton introduced a written "Scheme for establishing the Royal Society" when he began his presidency, which announced that "Natural Philosophy consists in discovering the frame and operations of Nature, and reducing them, as far as may be, to general Rules or Laws, —establishing these rules by observations and experiments, and thence deducing the causes and effects of things . . ." (BL Add. MS. 4005.2, cited in Westfall, *Never at Rest*, pp. 631-2). Newton's support of experiment, and his patronage of such men as Hauksbee, clearly played a role in the rise of the phenomenon of experimental lecturing. Hauksbee himself appears to have been a favourite of Newton. Although he clearly did not view the experimenter as an

in the newspapers at least as early as May 1699,[4] and thus did not emerge, as Guerlac puts it, "from total obscurity;"[5] yet the beginning of a relationship with the Royal Society and the powerful figure of Newton was a major turning point in his career. After this initial presentation, Hauksbee appeared several times at Royal Society meetings to carry out experiments with an air-pump, and was paid for his services.[6] Sometime after 1704 he began to perform the office of curator of experiments for the Royal Society, and did so until his death in 1713. He was also elected FRS on 30 November 1705.[7] Hauksbee is known for his early work in electricity, and was apparently the first to design an instrument for producing charges of static electricity (soon to be a staple in public science lectures). While working in the service of the Royal Society, Hauksbee contributed many papers to the *Philosophical Transactions* on electricity and experiments with the air-pump.[8] As for Hodgson, who was

---

intellectual peer, Newton was impressed by Hauksbee's abilities as a demonstrator of experiments, and on at least one occasion in 1705 requested a private demonstration from Hauksbee and his air-pump at his residence for a number of "philosophical persons." Hauksbee was to receive two guineas for his performance, although the performance does not seem to have taken place (see Newton to Sloane, 14 September 1705 and Newton to Sloane, 17 September 1705, *The Correspondence of Isaac Newton* [Cambridge: Cambridge University Press, 1959-77], 4: 446-7, 448).

[4]From May 1699 to September 1701, Hauksbee advertised a new type of scarificator (for blood-letting) in the *Post Man* and *Flying Post* (*Post Man* 31 January-2 February 1699, No. 570; *Post Man* 13-15 November 1701, No. 900; *Flying Post* 9-11 May 1699, No. 624; *Flying Post* 13-16 September 1701). Cited in D.J. Bryden, "Evidence From Advertising for Mathematical Instrument Making in London, 1556-1714," *Annals of Science* 49 (1992): 345.

[5]Guerlac, "Francis Hauksbee," *DSB*, 6: 169.

[6]For example, Hauksbee was ordered to be paid two guineas at the 16 February 1704 meeting of the Society, and five guineas at the 12 July 1704 meeting. Although Hauksbee's position was never made official, he continued to receive gratuities for his services. For example, he received £15 for 1705, £20 for 1706, £40 for 1707, and between £30 and £40 annually from 1708 to 1712. After his death earlier in 1713, Hauksbee's widow was ordered to be paid £20 on 24 August 1713 for his partial year of services. This information is based on Guerlac's study of *The Journal Book of the Council of the Royal Society*, Vol. 2, 1682-1727 (Guerlac, "Sir Isaac and Mr. Hauksbee," pp. 233-4; see also Westfall, *Never at Rest*, pp. 632-3).

[7]Guerlac characterizes Hauksbee's role before the Society as that of a "paid performer." He also points out that Hauksbee was never officially given the title "Curator of Experiments," as had his predecessors Robert Hooke and Denis Papin (Guerlac, "Francis Hauksbee,"*DSB*, 6: 169). Richard Westfall believes that although the German traveller Zacharias Conrad von Uffenbach made a point of seeking out "the natural-philosopher Hauksbee" while in London in 1710, Newton himself seems to have regarded Hauksbee as more of a servant than a scientific peer (Westfall, *Never at Rest*, p. 634).

[8]Guerlac, "Francis Hauksbee," *DSB*, 6: 169.

elected FRS on 3 December 1703, we know that he left his position as assistant to John Flamsteed, the Astronomer Royal, in October 1704 shortly before he began lecturing with Hauksbee.[9] Flamsteed himself gave testimony to Hodgson's abilities in a 24 June 1701 letter to John Wallis, referring to him as "a sober young man . . . a very good geometrician and algebraist [who] understands the series and fluxions."[10] So confident was Flamsteed of Hodgson's abilities, that he declared that his assistant would be able to complete and publish his own work on astronomy "if God should call me hence before I shall have perfected them myself."[11]

3.2 The First Public Experimental Lectures in London

On 5 December 1704, Hauksbee and Hodgson placed their first advertisement for an experimental lecture course in the *Daily Courant*.[12] They then made some corrections and added several elaborations to the text of the notice, and on 9 December 1704 placed the following advertisement, which ran for eight additional insertions:

> For the Advancement of Natural Philosophy and Astronomy, as well as for the Benefit of all such Curious and Inquisitive Gentlemen as are willing to

---

[9]Taylor, *MPTS*, p. 288. However, it is evident from Flamsteed's published correspondence that Hodgson continued to serve the Astronomer Royal informally as the latter's agent in London.

[10]Flamsteed to Wallis, 24 June 1701, cited in Baily, ed., *Account of Flamsteed*, p. 197.

[11]Flamsteed to Wallis, 24 June 1701, cited in Baily, ed., *Account of Flamsteed*, p. 197.

[12]*DC* Tuesday 5 December 1704, No. 824. It is difficult to determine whether it was Hauksbee or Hodgson who initiated this series. Morton and Wess place the emphasis on Hodgson, apparently because he seems to have been the principal lecturer of the course (Morton and Wess, *Public & Private Science*, pp. 41-4). I have chosen to place the emphasis on Hauksbee since he continued the course both on his own and with others after Hodsgon ended his public experiment lectures. Abraham Sharp, also once an assistant to Flamsteed, in a letter to the latter emphasizes the responsibility and costs to which Hodgson was exposing himself: "It is a great undertaking for one, especially so young a man, to teach all parts of experimental philosophy, and the apparatus or instruments in order thereto which he intimates is now making for him. It will, in my opinion, be too great a charge for a single purse" (Sharp to Flamsteed, 25 October 1704, in W. Cudworth, *Life and Correspondence of Abraham Sharp* [London, 1889], pp. 81-2, cited in Rowbottom, "Experimental Philosophy," p. 48). As Rowbottom points out, collaboration with the instrument-maker Hauksbee would no doubt have greatly alleviated the financial burden (Rowbottom, "Experimental Philosophy," p. 48). Sharp's letter also demonstrates that Hodgson (and perhaps Hauksbee) had been planning the lecture course at least as early as October 1704. It is not known how early Hauksbee became involved. Hauksbee's qualifications as an experimental demonstrator were already established by his service to the Royal Society, and as an instrument-maker he would have in any case made an excellent partner in the venture.

> lay the best and surest Foundation for all useful Knowledge. There is provided Engines for Rarafying and Condensing Air, with all their Appurtenances, (according to Mr. Hauksbee's Improvements) Microscopes of the best Contrivance, Telescopes of a convenient length, with Micrometers adapted to them, Prisms, Barometers, Thermometers, and Utensils proper for Hydrostatical Experiments, with such other Instruments as are necessary for a Course of Experiments, in order to prove the Weight and Elasticity of the Air, its Usefulness in the Propogation of Sounds and Conservation of Life: The Pressure or Gravitation of Fluids upon each other: Also the new Doctrine of Lights and Colours, and several other matters relating to the same Subjects, by James Hodgson Fellow of the Royal Society. All Gentlemen that are willing to encourage so great an Undertaking, or are willing to be benefitted by it, must subscribe two Guineas, one to be paid at the time of Subscription, the other two months after the Course begins, which will be Monday the 8th of January next, at Mr. More's (formerly Coll. Ayers) at the Hand and Pen in St. Paul's Church-yard, where Subscriptions are taken in, likewise at Mr. Hauksbee's in Giltspur-street without Newgate, at Mr. Rowley's under St. Dunstan's Church Fleetstreet, and at Mr. Senex's Bookseller next the Fleece Tavern in Cornhill, where proposals at large may be seen.[13]

By the standards of most later experimental lecturers of the first generation, this was a long and elaborate notice. The advertisement contains a number of elements, however, that would become standard in many of the notices used by the other members of the first generation of lecturers. First, like the advertisements of the chemist George Wilson, this notice contains the unambiguous claim that the knowledge gained from this course would be useful and practical. The content of the course, a mixture of mechanical experiments with the air-pump and material on astronomy, reflects the separate skills of the two men, with Hauksbee obviously capitalizing on his experience demonstrating experiments at the Royal Society, and Hodgson utilizing his expertise in astronomy, gained through his assistantship to Flamsteed at Greenwich. Interestingly, although Hauksbee appears at the end of the notice as a person from whom subscriptions could be obtained, it is only Hodgson's name that is

---

[13]*DC* Saturday 9 December 1704, No. 828. The other eight insertions are: *DC* Tuesday 12 December 1704, No. 830; Wednesday 13 December 1704, No. 831; Thursday 14 December 1704, No. 832; Wednesday 10 January 1705, No. 854; Thursday 11 January 1705, No. 855; Friday 12 January 1705, No. 856; Saturday 13 January 1705, No. 857; Monday 15 January 1705, No. 858. The last five advertisements indicate that the originally planned starting date of Monday 8 January 1705 date was deferred until the following Monday 15 January 1705.

headlined as actually delivering the course, even though in later advertisements both names appear side by side. It is possible that this may have something to do with the fact that at this point, only Hodgson was a Fellow of the Royal Society, and Hauksbee may have felt that he had neither the prestige nor the credentials to appear as one knowledgeable in matters of science. This may be confirmed in the next course they advertised together, in January 1706, by which time Hauksbee had been elected FRS. In the advertisements for this lecture course, both Hauksbee's and Hodgson's names appear together (Hodgson's name being listed first), followed by the shared qualification: "Fellows of the Royal Society."[14] It also seems likely that Hodgson delivered the lectures and supplied most of the theoretical information, and that Hauksbee acted mainly as the demonstrator (a pattern we will see develop in the courses of Whiston and the younger Hauksbee). This advertisement also demonstrates that Hauksbee and Hodgson were working closely with two London instrument-makers, John Rowley and John Senex, who sold subscriptions for the course at their shops.[15] The appearance of the name of John Senex, bookseller, engraver and instrument-maker, is particularly significant. As we will see, the association of Senex with the experimental lecturers would last for many years.[16] Finally, in this early lecture course we also see the experiments move from the private world of the Royal Society to a venue open to the paying, monied public. Phenomena previously exposed only to the men of a cloistered club, were now being more widely disseminated as they moved down the social scale to become a part of the world of the improvement-conscious gentry and middle-class, along with the tradesmen of an increasingly commercial London.

---

[14]*DC* Friday 4 January 1706, No. 1162.

[15]John Rowley, mathematical and astronomical instrument maker, had established his shop on Fleet Street in 1698. He was responsible for improvements in the design of the orrery, and was appointed Master of Mechanics to the King at the Hanoverian succession. His apprentice and successor was Thomas Wright, the famous orrery maker. See the entries on Rowley in Porter, *et al*, *Science and Profit*, p. 25; Taylor, *MPTS*, pp. 294-5, and eadem, *MPH*, pp. 140-1.

[16]Senex was appointed Geographer to the Queen in 1707, and elected FRS in 1710. See the entries on Senex in Taylor, *MPTS*, p. 301 and eadem, *MPH*, p. 143.

3.3 Lecturing Patterns of the Hauksbee-Hodgson London Lecture Courses

The subscription rate for the first Hauksbee-Hodgson course in 1705 is given as two guineas, slightly cheaper than Wilson's contemporary course on chemistry. From the payment scheme of one guinea down and one "two months after the course begins" we may deduce that the intended length of this course was long compared to later courses by both Hauksbee the elder, and other experimental lecturers of the first generation.[17] We do not know, however, if their course was run on six consecutive week nights, or whether it was offered only once a week. From the first advertisement for the January 1705 series we know that each lecture was intended to start by 6 pm and conclude by 8 pm.[18] This information was dropped from the subsequent notices for this series, but a 5 pm or 6 pm starting time is adhered to in all the later series in which Hauksbee was involved. Presumably this would allow the attendance of those who had business concerns during the day.

The first Hauksbee-Hodgson lecture course must have been successful, for the two advertised at least seven further courses together, including courses scheduled to begin on 21 January 1706 (deferred to 28 January),[19] 7 February 1707,[20] 21 October 1707 (deferred to 10 November),[21] 11 March 1708,[22] 16 October 1708 (deferred to 26 October),[23] 25 January

---

[17]Hauksbee and Hodgson may have found the course too long after only this first trial, for in their next advertised series the second guinea was to be paid on the third night after the commencement of the course. *DC* Friday 4 January 1706, No. 1162.

[18]*DC* Tuesday 5 December 1704, No. 824.

[19]*DC* Friday 4 January 1706, No. 1162; Tuesday 15 January 1706, No. 1171; Saturday 19 January 1706, 1175; Monday 21 January 1706, No. 1176; Monday 28 January 1706, No. 1182. This series was run at 5 pm on Mondays and Thursdays at "the room standing over the Entrance to the Queen's Head Tavern in Fleet-street, near Temple-Bar." While these advertisements give the names of both Hauksbee and Hodgson, the next two advertised courses only mention Hauksbee. However, as Hauksbee himself in the ads for these two series is referred to only in the identification of the venue, and not as a performer, it is probable that Hodgson was involved as well.

[20]*DC* Friday 31 January 1707, No. 1497; Saturday 1 February 1707, No. 1498; Monday 3 February 1707, No. 1499; Wednesday 5 February 1707, No. 1501; Friday 7 February 1707, No. 1502. In this series, in which only Hauksbee's name is mentioned, the lectures were to begin at 6 pm at "Mr. Hauksbee's in Wine Office Court Fleetstreet."

[21]*DC* Monday 20 October 1707, No. 1772; Tuesday 21 October 1707, No. 1773; Tuesday 4 November 1707, No. 1785; Wednesday 5 November 1707, No. 1786; Thursday 6 November 1707, No. 1787; Saturday 8 November 1707, No. 1789. This series, once again beginning at Wine Office Court at 6 pm, and held on Mondays and Thursdays, also carries only Hauksbee's name and does not specifically advertise a lecturer or

1709 (deferred to 27 January)[24] and 25 November 1709.[25] Hauksbee's lecturing partnership with Hodgson then ended as the latter took up the position of Master of the Mathematical School at Christ's Hospital shortly after the January 1709 series,[26] and Hauksbee's name appears alone in the advertisements from this point. Hauksbee then advertised for experimental lecture courses to begin 25 November 1709,[27] 9 February 1710[28] and 13

---

demonstrator. The 20 October 1707 *DC* also includes the following advertisement, giving notice of Hodgson's involvement in the mathematical lectures at the Marine: "The Publick Mathematical Lecture at the Marine Coffee-house in Birchin-Lane, will begin again on Friday the 24th of October, at 7 in the Evening, and be continu'd as usually, by James Hodgson, F.R.S." (*DC* Monday 20 October 1707, No. 1772; Wednesday 22 October 1707, No. 1774; Thursday 23 October 1707, No. 1775). Morton and Wess deem it unlikely that Hodgson was involved in the experimental course with Hauksbee at this time (Morton and Wess, *Public & Private Science*, p. 49 n.40), although it is logistically possible that Hodgson was involved in the course at Hauksbee's shop as well.

[22]*DC* Thursday 4 March 1708, No. 1886; Friday 5 March 1708, No. 1887; Saturday 6 March 1708, No. 1888; Tuesday 9 March 1708, No. 1890; Wednesday 10 March 1708, No. 1891; Thursday 11 March 1708, No. 1892. These advertisements give both the names of Hauksbee and Hodgson, and give notice that the course was to run on Mondays and Thursdays.

[23]*DC* Monday 4 October 1708, No. 2067; Tuesday 5 October 1708, No. 2068; Thursday 7 October 1708, No. 2070; Friday 8 October 1708, No. 2071; Saturday 9 October 1708, No. 2072; Wednesday 20 October 1708, No. 2081; Monday 25 October 1708, No. 2085; Tuesday 26 October 1708, No. 2086. This course, the advertisements of which list both Hauksbee and Hodgson, was to run Tuesdays and Fridays "till finish'd."

[24]*DC* Wednesday 12 January 1709, No. 2251; Thursday 13 January 1709, No. 2252; Friday 14 January 1709, No. 2253; Tuesday 18 January 1709, No. 2256; Thursday 20 January 1709, 2258; Friday 21 January 1709, No. 2259; Saturday 22 January 1709, No. 2260; Monday 24 January 1709, No. 2261; Tuesday 25 January 1709, No. 2262; Wednesday 26 January 1709, No. 2263; Thursday 27 January 1709, No. 2264.

[25]*DC* Monday 14 November 1709, No. 2514; Wednesday 16 November 1709, No. 2516; Thursday 17 November 1709, No. 2517; Friday 18 November 1709, No. 2518; Monday 21 November 1709, No. 2520; Tuesday 22 November 1709, No. 2521; Wednesday 23 November 1709, No. 2522; Thursday 24 November 1709, No. 2523; Friday 25 November 1709, No. 2524.

[26]Taylor, *MPTS*, p. 288. Flamsteed refers to Hodgson's new position at Christ's Hospital in a letter to Abraham Sharp dated 24 March 1709 (cited in Baily, ed., *Account of Flamsteed*, p. 270).

[27]*DC* Monday 14 November 1709, No. 2514; Wednesday 16 November 1709, No. 2516; Thursday 17 November 1709, No. 2517; Friday 18 November 1709, No. 2518; Monday 21 November 1709, No. 2510; Tuesday 22 November 1709, No. 2521; Wednesday 23 November 1709, No. 2522; Thursday 24 November 1709, No. 2523; Friday 25 November 1709, No. 2524.

[28]*DC* Friday 3 February 1710, No. 2584; Saturday 4 February 1710; Monday 6 February 1710; Tuesday 7 February 1710; Thursday 9 February 1710, No. 2589.

November 1710.[29] Next, in October 1711, Hauksbee advertised for a lecture to start "so soon as a Convenient Number of Gentlemen have Subscribed."[30] We also see in Hauksbee's lecture series a clear pattern of lecturing in the winter months (with the exception of a later August 1712 course).[31] In the next section, we will see that the later first generation lecturers held to this seasonal pattern virtually without exception. Hauksbee also may have been hired to deliver private demonstrations on other occasions. We do know that in June1710 the German traveller Zacharias Conrad von Uffenbach unsuccessfully sought out the elder Hauksbee and bought a copy of his 1709 *Physico-Mechanical Experiments* for six shillings, and that Uffenbach was later entertained in October 1710 by "one after another" of Hauksbee's experiments.[32]

Through the ads we can also see Hauksbee moving his premises closer to the main instrument-making area of London on Fleet Street. In his first advertisements, he is located on Gilt-spur Street, just south of West Smithfield.[33] By 1707, Hauksbee was living at Wine Office Court, an alley off the north side of Fleet Street just east of St. Dunstan's Church (where the course was also held).[34] Finally, sometime between late June and early November 1710, Hauksbee moved his premises over one alley west to Hind Court (also the new site of

---

[29]*The Tatler* Saturday 4 November to Tuesday 7 November 1710, No. 247; *DC* Monday 6 November 1710, No. 2820; *Tatler* Tuesday 7 November to Thursday 9 November 1710, No. 248; *DC* Tuesday 7 November 1710, No. 2821; *DC* Wednesday 8 November 1710, No. 2822; *Tatler* Thursday 9 November to Saturday 11 November 1710, No. 249; *DC* Thursday 9 November 1710, No. 2823; Friday 10 November 1710, No. 2824; Monday 13 November 1710, No. 2826.

[30]*DC* Wednesday 23 October 1711, No. 3129; 24 October 1711, No. 3130; Thursday 25 October 1711, No. 3131; Friday 26 October 1711, No. 3132; Saturday 27 October 1711, No. 3133; Monday 29 October 1711, No. 3134.

[31]See Appendix I for a full profile of the elder Hauksbee's lecturing career.

[32]Uffenbach, *London in 1710: From the Travels of Zacharias Conrad von Uffenbach*, trans. and ed. W.H. Quarrell and Margaret Mare (London: Faber & Faber, 1934), pp. 77-8, 168-170. Uffenbach provides a brief, but helpful, account of some of Hauksbee's experiments, and his account demonstrates that many of the experiments were performed for their dramatic and visual effect.

[33]Rocque D1 12/6

[34]Rocque D2 1/3. For the new address, see *DC* Friday 31 January 1707, No. 1497.

the courses).[35] The latter two locations positioned him in the midst of the scientific and mathematical instrument-making trade.[36]

The next time the elder Hauksbee advertised a course was in January 1712, and for the first time he was receiving direct competition from none other than his young nephew of the same name,[37] who had teamed up with Humphrey Ditton for his own experimental lecture course.[38] This evident competition is all the more striking because Francis Hauksbee, Jr. appears to have begun as an instrument-making apprentice to his uncle, from whom he also appears to have acquired his demonstration skills.[39] The younger Hauksbee and Ditton had placed advertisements beginning on 7 January in *The Spectator* and the *Daily Courant* for a course of "Hydrostatical, Pneumatical, Magnetical, and Optical Experiments" to

---

[35]Rocque D2 1/3. For the new location, see *DC* Monday 6 November 1710, No. 2820. Hauksbee's premises were still located at Wine Office on 29 June 1710 when Uffenbach attempted to visit him (Uffenbach, *London in 1710*, pp. 77). As for Uffenbach's 28 October 1710 visit with Hauksbee, the former only notes that the location was nearby the premises of John Rowley, who was established on Fleet Street by St. Dunstan's Church (see Uffenbach, *London in 1710*, pp. 168-9 and next footnote). The evidence from the 6 November 1710 advertisement, however, makes it probable that Hauksbee would have been at Hind Court by this time.

[36]Olivia Brown, "The Instrument-Making Trade," in Porter, *et al*, *Science and Profit*, p. 23. In Uffenbach's his second and successful attempt to visit the elder Hauksbee, Uffenbach relates how he first visited the shop of "the mechanician, Rohly," and then went straight to see Hauksbee, whom Uffenbach describes as living near "Rohly" (Uffenbach, *London in 1710*, pp. 77, 168-9). "Rohly" is almost certainly John Rowley the instrument-maker mentioned above.

[37]Morton and Wess characterize this competition as a sort of family feud (Morton and Wess, *Public & Private Science*, pp. 49-50), which is entirely possible since it is clear that the younger Hauksbee did not inherit either his uncle's instrument-making business or his lecture course. Still, the two Hauksbees were to work together on a course in August 1712 (more on this below).

[38]Humphrey Ditton (1675-1715), from a family of nonconformists and himself once a dissenting preacher, had been appointed master of the mathematical school at Christ's Hospital through the agency of Isaac Newton. Ditton was still teaching at this school at the time of the January 1712 lecture course. Later he would team up with Whiston to develop an unsuccessful scheme to determine longitude at sea. See Wallis and Wallis, *Biobibliography*, p. 9; *DNB*, 5: 1026; Taylor, *MPTS*, p. 293, and eadem, *MPH*, p. 116.

[39]Beside circumstantial evidence, the fact that the younger Hauksbee was first employed by his uncle appears to be confirmed by the record of a visit Uffenbach made to the Hauksbee establishment at Wine Office Court on 28 June 1710. This was Uffenbach's first attempt to meet the elder Hauksbee, but when he arrived Uffenbach said that "we did not find him in, but his cousin, a young man, took us up and showed us some common experiments with the Antlia" (Uffenbach, *London in 1710*, p. 77). Although Uffenbach refers to the young man as the elder Hauksbee's "cousin" (a simple mistake: he may only have been told that they were related), the reference to the man being "young" as well as the fact that he had obviously been entrusted to mind the shop, almost certainly points to Francis Hauksbee, Jr. who would have been twenty-three at this time.

commence on Monday, 14 January 1712, and to be presented at the younger Hauksbee's residence at Crane Court, just off Fleet-street (and next door to the new premises of the Royal Society).[40] As for Francis Hauksbee, Sr., he immediately followed suit and placed advertisements in the same two publications beginning on 14 January for a course of experiments intended to begin the following Monday, 21 January 1712.[41] Obviously aware of his new competition, the elder Hauksbee, who now distinguished himself as "Sen." for the first time,[42] appended a brief statement appealing to the public that he was "the only Person to whom the late Improvements are owing."[43] Perhaps due to his loss of monopoly, the elder Hauksbee was not able to fill his course by his originally intended date of 21 January. In fact, Francis Hauksbee, Sr. does not appear to have commenced this series of lectures until 11 February 1712.[44] The elder Hauksbee would participate in at least two more experimental lecture courses before his death in the spring of 1713, one in August 1712 with Whiston, Ditton and his nephew (after a reconciliation?), and another with Whiston in January 1713. These courses are dealt with in the next chapter.

---

[40]*The Spectator* Monday 7 January 1712, No. CCLXVIII; Wednesday 9 January 1712, No. CCLXX; Thursday 10 January 1712, No. CCLXXI; Friday 11 January 1712, No. CCLXXII; *DC* Thursday 10 January 1712, No. 3196; Saturday 12 January 1712, No. 3198. In these notices, the younger Hauksbee also advertised his scientific instruments (including air pumps).

[41]*DC* Monday 14 January 1712, No. 3199; Wednesday 16 January 1712, No. 3201; Friday 18 January 1712, No. 3203; *The Spectator* Tuesday 15 January 1712, No. CCLXXV; Thursday 17 January 1712, No. CCLXXVII; Saturday 19 January 1712, No. CCLXXIX. It may be, as Morton and Wess suggest (Morton and Wess, *Public & Private Science*, p. 49), that the elder Hauksbee's planned 21 January 1712 course was a confirmation of the course he had advertised in October 1711 (spurred on by his nephew's competition), to begin as soon as "a Convenient number of Gentlemen have subscribed" (*DC* Wednesday 23 October 1711, No. 3129). Given the elder Hauksbee's already established practice of running a course in October or November as well as January, February or March, however, it is possible that the course heavily advertised in October was also held around that time (see Appendix I).

[42]In his advertisements, the elder Hauksbee used the full title "Mr. Fra. Hauksbee, Sen. F.R.S." to his nephew's mere "Francis Hauksbee, Jun."

[43]*DC* Monday 14 January 1712, No. 3199.

[44]*DC* Monday 11 February 1712, No. 3222.

4. THE LECTURING CAREERS OF WILLIAM WHISTON AND FRANCIS HAUKSBEE, JR., 1712-1728

4.1 The Scientific Lecturing Careers of William Whiston and Francis Hauksbee, Jr.

The next lecturing careers that we will reconstruct are those of William Whiston[1] and the younger Francis Hauksbee.[2] The account here will be presented mainly from the perspective

---

[1]As a source for his life, Whiston's autobiography is a most helpful, if somewhat rambling, account (Whiston, *Memoirs of the Life and Writings of Mr. William Whiston*, 2nd. ed. (London: Printed for J. Whiston and B. White, 1753; orig. publ. 1749-50). Unfortunately, although the *Memoirs* include accounts of many of Whiston's activities, as well as the publication of some of his correspondence, they do not contain a detailed account of his lecturing career. Whiston's *Memoirs* can be supplemented with correspondence and other manuscripts held at the British Library, the Leicestershire Record Office, and libraries at Oxford, Cambridge and other institutions. Also of help are the published letters of many of Whiston's contemporaries, as well as other contemporary testimony. As outlined above, we will also rely heavily on the evidence provided by newspaper advertisements. The best secondary sources for Whiston's life and works are Maureen Farrell, *William Whiston* (New York: Arno Press, 1981) and James E. Force, *William Whiston: Honest Newtonian* (Cambridge: Cambridge University Press, 1985). Farrell's *William Whiston* is a unaltered reprint of her 1973 University of Manchester Ph.D. dissertation ("The Life and Work of William Whiston"). Force's biography, on the other hand, is a considerably revised version of his 1977 Washington University Ph.D. dissertation "Whiston Controversies: The Development of 'Newtonianism' in the Thought of William Whiston." Farrell's work focuses much more on Whiston's scientific work than does Force's biography, although neither book provides a comprehensive account of Whiston's lecturing career. While Farrell does include a section on Whiston's public lectures, her neglect of the evidence provided by advertisements renders her account defective and incomplete (Farrell, *William Whiston*, pp. 205-14). The best recent treatment of Whiston's scientific activities, including his lecturing career and his work on longitude, is that found in Stewart, *Public Science*, passim. Also valuable are the references to Whiston's lecturing and scientific work in Morton and Wess, *Public & Private Science*, passim. For Whiston's early lecturing career, especially as it interacted with Pope and other Wits, see Marjorie Nicholson and G.S. Rousseau, *"This Long Disease My Life:" Alexander Pope and the Sciences* (Princeton: Princeton University Press, 1968), pp. 137-56. There are also entries for Whiston in Taylor, *MPTS*, p. 285 and eadem, *MPH*, pp.146-8. Even with these helpful sources, there is no focused, comprehensive full-length account of Whiston's lecturing career. This present study is intended to be a step in that direction.

[2]Biographical sources on the younger Francis Hauksbee are limited. But see Guerlac, "Francis Hauksbee," *DSB*, 6: 175-6 (Guerlac incorrectly gives the beginning of the Whiston-Hauksbee lecturing collaboration as 1715); Wallis and Wallis, *Biobibliography*, pp. 64-5, and *DNB*, 9: 171 (this latter entry wrongly speculates that Francis Hauksbee, Jr., was the son of the elder Hauksbee). It is possible to provide a rough outline of the younger Hauksbee's career. Born in April 1688 in London to a draper named John Hauksbee (the elder Francis' brother), Hauksbee appears to have begun as an apprentice to his uncle. As already outlined, on 28 June 1710 the German traveller Uffenbach speaks of seeing experiments performed at the elder Hauksbee's premises in Wine Office Court by a young man (Uffenbach, *London in 1710*, p. 77). It is possible, given his prowess at experimentation in 1710, that the younger Hauksbee had also been assisting in his uncle's lecture demonstrations. By January 1712 the younger Hauksbee had set up his own premises at Crane Court (*The Spectator* Monday 7 January 1712, No. CCLXVIII). Hauksbee delivered an experimental course with Ditton in January 1712 and with Ditton, Whiston and his uncle in August of the same year, before beginning a fifteen year scientific lecturing career with Whiston in 1713 (this is covered fully below). During this time, Hauksbee continued to operate his own instrument shop, also the venue of his courses with Whiston. Hauksbee's instrument-making activities included designing and constructing air-pumps and telescopes (see Hauksbee and Whiston, Advertisement, *An Experimental Course of Astronomy; Proposed by Mr. Whiston and Mr. Hauksbee*

of Whiston, by far the more active of the two in this period. Whiston's public lecturing career, dating as it does from 1712-1750 (although his lecturing in the latter part of this period was much reduced), is not only the longest, but also the most complicated and diversified of the lecturers treated in this thesis.[3] Whiston lectured on mathematics, longitude, astronomical phenomena, geometry and religious topics (many of these were single night lectures), in addition to his experimental and astronomical lecture courses with the younger Hauksbee. This section will take Whiston's wider lecturing career into account by briefly touching on Whiston's independent lectures as well. In keeping with the purpose of this thesis, however, the chief focus will be the lecture courses Whiston developed with Hauksbee.

4.2 Biographical Background to William Whiston

Whiston entered Clare Hall, Cambridge as a sizar in 1686, qualified as B.A. in 1690, was elected to the Exeter Fellowship in 1691 and was then made Probationary Senior Fellow of Clare in 1693—the same year he obtained his M.A.[4] He then set himself up as a tutor at Clare and began to take in students. Whiston also took holy orders in 1693, and then went on to act as chaplain to John Moore, Bishop of Norwich. In 1696 Whiston published his first,

---

[(London), *c.* 1725], p. [4]; Hauksbee, *Proposals for Making a Large Reflecting Telescope* [(London), 1715?]). Hauksbee also teamed up with the chemist Peter Shaw for a course of chemistry in the early 1730s. Although the younger Hauksbee was never voted FRS as his uncle had been, his relationship with the Royal Society should be noted as well. First, after his uncle's death, Hauksbee was ordered to be paid five guineas at the 24 August 1713 meeting of the Royal Society. This was to be a brief period of service, however, as Desaguliers was to take over the semi-official post of curator of experiments in 1714 (Guerlac, "Francis Hauksbee," *DSB*, 6: 176). Still, Hauksbee certainly benefitted from his appointment on 9 May 1723 as clerk and housekeeper of the Royal Society (Guerlac, "Francis Hauksbee," *DSB*, 6: 176; *DNB*, 9: 171). Hauksbee's association with his uncle, his own experience in experiment, and his next-door location to the premises of the Royal Society in Crane Court, possibly were factors leading to this appointment. Hauksbee held this post, which paid £50 per annum, until his death on 11 January 1763 (Millburn, *Wheelwright of the Heavens*, p. 143).

[3]Desaguliers' lecturing career is arguably the most extensive based on sheer volume of lectures given. In the years 1713-1744 Desaguliers may have given close to two hundred complete experimental lecture courses. Aside from a less-popular lecture course on astronomy, however, Desaguliers appears to have rarely strayed from his tried and proven experimental course.

[4]I provide only a brief outline of Whiston's early scientific career here. I am presently engaged in a larger study of Whiston's scientific and religious careers, a preliminary investigation of which is presented in my paper, "'Sometime Professor of the Mathematicks:' The Alternative Career Strategies of William Whiston," unpublished typescript, 1994.

and perhaps most important, work, *A New Theory of the Earth*.[5] It was apparently this work that attracted the attention of Isaac Newton, and after serving as parish priest at Lowestoft cum Kessingland since 1698, Whiston was called by Newton to come to Cambridge to lecture in his place in 1701. The following year, Whiston officially took over Newton's post as the third Lucasian Professor of Mathematics. This was not to last, however, for it was not long before Whiston began to disseminate antitrinitarian views, with the result being his formal expulsion from Cambridge on 30 October 1710.[6] Shortly after this, Whiston moved to London, and took up residence with his family at Union Court, by Ely House.[7] Aside from some property worth roughly £30 per annum,[8] and what he could earn from publishing, Whiston was in desperate need of income. After earning about £120 annually while at Lowestoft,[9] and £100 per year as Lucasian Professor,[10] Whiston's expulsion from Cambridge was a serious financial set-back. Whiston had, however, a number of other things going for him.

It will now be helpful to assess what qualifications and experience Whiston had to offer as a potential mathematical and experimental lecturer in 1712 (the date he began lecturing publicly). Whiston was in fact particularly well-suited to taking on this role, and was one of only a handful of men in this period who had the necessary experience to present

---

[5]Whiston, *A New Theory of the Earth, From its Original, to the Consummation of all Things* (London: Printed by R. Roberts for Benj. Tooke, 1696).

[6]Whiston, *Memoirs*, 1: 150.

[7]This evidence is from the address given at head of letter dated 18 December 1710 and printed in Whiston, *Memoirs*, 1: 151. The original copy of this letter is held at the Leicestershire Record Office (L.R.O. Conant MSS. DG11/DE.730/2, item 99). This is the only reference to this address I have come across. Union Court (Rocque D1 10/4) was not much more than a narrow back alley, and may have been associated with nearby Ely House.

[8]A small farm near Newmarket came into Whiston's hands sometime around 1701.Whiston in his will of 30 August 1734 mentions that the "Lands belonging to my Farm at Dullingham Lay in the County of Cambridge . . . are of yearly Value of thirty pounds or thereabouts." L.R.O. Conant MSS. DG11/1018.

[9]Whiston, *Memoirs*, 1: 108, 290.

[10]This is the income given for the position when it was held by Newton (Westfall, *Never at Rest*, p. 206). To this income may be added whatever Whiston earned from his publications, his property revenue, as well as the £50 he earned in 1707 as the Boyle Lecturer for that year.

and demonstrate experimental science. First, Whiston had worked as a tutor at Cambridge. Second, and most importantly, as Lucasian Professor he had delivered academic lectures at Cambridge on mathematics, astronomy, Newtonian physics and experimental philosophy. Whiston first delivered a series of lectures on astronomy from February 1701 to December 1703, and these were published first in Latin in 1707,[11] and then in English in 1715.[12] Whiston also taught mathematics and his abilities in this discipline are demonstrated in his publication of three mathematical textbooks during his tenure as Lucasian Professor. First, in 1703, Whiston published an edited version of Euclid's *Elements of Geometry*.[13] He then published an edition of Newton's mathematical lectures in 1707,[14] and another textbook of his own in 1710.[15] Most significantly, in 1707 Whiston also began to deliver experimental lectures at Cambridge with Roger Cotes.[16] These lectures were to be an important source when Whiston began lecturing in the next decade.

> Mr. *Cotes* and I began our first course of philosophical experiments at *Cambridge, May 5*, 1707. In the performance of which, certain hydrostatick and pneumatick lectures were composed; they were in number twenty-four; the one half by Mr. *Cotes*, and the other half by myself: which lectures were also afterward made use of in the like [enlarged] courses, which Mr.

---

[11]Whiston, *Prælectiones astronomicæ Cantabrigiæ in scholis publicis habitæ . . . Quibus accendunt Tabulæ plurimæ Flamstedianæ correctæ, Hallenianæ, Cassinianæ, et Streetianæ. In Usum Juventutis Academicæ* (Cantabrigiæ, 1707).

[12]Whiston, *Astronomical lectures, read in the Public Schools at Cambridge; by William Whiston, . . . whereunto is added a collection of astronomical tables, being those of Mr. Flamsteed corrected, Dr. Halley, Monsieur Cassini and Mr. Street* (London, 1715).

[13]Whiston, ed., *Andrea Tacquet Elementa Euclidea Geometriæ Planæ ac Solidæ et Selecta ex Archimede Theoremata* (Cantabrigæ: Typis Academicis. Impensis Corn. Crownfield, 1703). This publication went through numerous editions until 1805.

[14]Whiston, ed., *Arithmetica Universalis; sive De Compositione et Resolutione Arithmetica Liber* (Cantabrigiæ: Typis Academicis, 1707).

[15]*Prælectiones Physico-Mathematicæ* (Cantabrigiæ: Typis Academicis, 1710).

[16]After his move to London in 1710, Whiston maintained contact with Cotes. See the correspondence between them (1714-1715) on Whiston's longitude research and other scientific matters, including the 1715 solar eclipse (Trinity College MS. R.4.42, fos 162-6).

Hauksbee and I performed many years in London.[17]

Thus Whiston had not only a strong theoretical backing, but also practical experimental experience when he appeared without a job in London. He also had the prestige of being the former holder of the post once held by the great Isaac Newton,[18] and although his heresy prevented him from ever obtaining an official, salaried post again, it was not a hindrance to him as he entered the commercial and practical world of London in the 1710s.

4.3 Whiston's Early Scientific Career in London

Little of any detail is known of Whiston's activities in London from December 1710 to the summer of 1712. Larry Stewart suggests that Whiston may have early on established contact with John Senex and worked with him designing instruments.[19] We do know that Whiston engaged himself in at least two potentially money-making activities. First, he spent much of this time engaged in the publication of several lengthy religious works, many of them related to his heretical views, for which he was still under prosecution.[20] Second, sometime before 15 August 1711, Whiston moved to a more practical residence and set himself up as a private

---

[17]Whiston, *Memoirs*, 1: 118. As Whiston notes, Cotes' lectures were later published separately by Robert Smith (his assistant and successor at the post) as *Hydrostatical and Pneumatical Lectures*, ed. R. Smith (London: Printed for the Editor, 1738). This volume presents a four-week course of sixteen lectures intended for undergraduates. The reduction from twenty-four to sixteen lectures may indicate that Cotes streamlined the course after he took it over on his own. According to Gowing, in the original Cotes-Whiston course, which was "mostly written by Cotes," the students were required to carry out the experiments themselves. The text of Cotes' syllabus is reproduced as Appendix XV. The close similarity between Cotes's syllabus and the sections on hydrostatics and pneumatics in the Hauksbee-Whiston experimental course syllabi can be seen by comparing Appendix XV with Appendices XVI and XVII.

[18]Whiston was fond of capitalizing on his former post by adding "Sometime Professor of the Mathematicks" under his name on the title page of many of his publications.

[19]Stewart, *Public Science*, p. 95.

[20]In all, Whiston published twenty-three works in the years 1711-1712, ranging from single sheets to a multi-volume work, most of them on religious subjects. The most important of Whiston's works to emerge at this time was his *Primitive Christianity Reviv'd*, 5 vols. (London: Printed for the Author, 1711-1712), which is a large manifesto of Whiston's Christian primitivism and attempt to arrive at the original doctrines of the Christian faith. Whiston placed a number of advertisements for some of these publications in the *Daily Courant* in 1711 and 1712. The book advertisements usually included prices and the names of the booksellers where the publications could be purchased. Also, many of the books also contained price lists. We can conclude from this advertising campaign and published price lists that Whiston was hoping for some financial return from his publishing efforts.

tutor in mathematics. This information was published in an advertisement for one of his new books:

> Note, That the Author is Removed to a Convenient House at the lower-end of Cross-street Hatton Garden: Where he has begun to Teach the Mathematicks, and is ready to Instruct all such as are dispos'd to learn those Sciences; without all Regard to Controversies in Religion, or Differences in Politicks, neither of which are to be discours'd of during the time of such Lectures.[21]

Cross Street was a move up from Union Court, and appears to represent a degree of stabilization in Whiston's economic situation. We may infer from what Whiston says in the advertisement that the new residence, whether it was leased or purchased, had sufficient room for him to carry out his tutoring.[22] It is also instructive that a well publicised heretic such as Whiston should offer his assurances of remaining aloof from religious topics—especially during a Tory ascendency in Parliament. Thus, sometime before 15 August 1711 Whiston had begun to make a name for himself as a private teacher of mathematics. There is no evidence, though, from advertisements or any other source, that Whiston engaged in formal *public* lecturing until we first see him active in the already mentioned August 1712 course jointly run by the Hauksbees, Humphrey Ditton, and himself.

This August 1712 series will now demand our attention. As outlined above, Francis Hauksbee, Jr. and Humphrey Ditton had teamed up in January 1712 to conduct a course of experiments. Later the same month, the elder Francis Hauksbee was advertising his own course as well. By July of the same year, these three, with the addition of Whiston, had agreed to run a course together. A single notice appeared for this course on 25 July 1712:

> Courses of Hydrostatical and Pneumatical Experiments, in 18 Lectures, are

---

[21]*DC* Wednesday 15 August 1711, No. 3070.

[22]Whiston's private tutoring appears to have continued for several years at least. A letter dated 31 October 1716 from John Jackson to Whiston is addressed: "For The Reverend Mr Whiston Teacher of the Mathematicks at his House In London . . . in Cross street Haton garden" (Jackson to Whiston, 31 October 1716. L.R.O. Conant MSS. DG11/DE.730/2, item 105). The name of one of Whiston's mathematic students, the young German Baron Gemmingen, is given in Whiston's *Memoirs*. Contextual evidence in Whiston's autobiography shows that Gemmingen, whose sister Lady Gemmingen was a court companion of Princess Caroline, was first studying under Whiston no later than 1719 and was still his student as late as 1724 (Whiston, *Memoirs*, 1: 134-5, 269-70). There is no evidence to suggest how much remuneration Whiston received for his private instruction of Gemmingen.

> agreed to be performed hereafter alternatively by Mr. Hauksbee, Sen. and Jun. and the Explanatory Lectures to be read alternatively by Mr. Whiston and Mr. Ditton. The first Course is intended to be begun on Monday Aug. 4 at 6 in the Evening, at Mr. Hauksbee's, Jun. in Crane-Court, near Fetter-Lane, Fleet-street: Where the Accounts of the Experiments is to be had gratis, and where Subscriptions are taken in: As also at Mr. Hauksbee's, Sen; in Hind-Court, Fleet-street, at Mr. Whiston's at the Lower End of Cross-street, Hatton-Garden, and at Mr. Ditton's in Christ's Hospital.[23]

The course of "Hydrostatical and Pneumatical Experiments" would be delivered in eighteen separate lectures; the description of the course implies that demonstrations with air-pumps would be a main feature. Whiston and Ditton were to read, with the two Hauksbees demonstrating. This social division of labour reflects the academic backgrounds of Whiston and Ditton, and the practical experience of the instrument-making Hauksbees.[24] The venue of the course was the younger Hauksbee's residence and shop in Crane Court, next to the newly relocated premises of the Royal Society. The course price is not given, although it is likely to have been set at the going rate of two guineas per auditor. No instrument-makers or booksellers appear to have been involved in this venture, as the subscriptions were to be taken in at the individual residences of the Hauksbees and Whiston, as well as Ditton's premises in Christ's Hospital, where he was still teaching. Ephemeral course catalogues had been printed beforehand and were available at these same locations. The course was to begin on a Monday, and if the eighteen lectures were given six nights a week, the course would have been completed on a Saturday at the end of the third week.

While there is no evidence that the foursome ever lectured together again (indeed, the elder Hauksbee was dead by April 1713; Ditton by 1715), we do know that Whiston and Francis Hauksbee, Sr. teamed up for a course at Hind Court to begin on 26 January 1713—the last course the elder Hauksbee would give. This information is provided at the end of an advertisement for Whiston's *Reflexions on an Anonymous Pamphlet*:

> Note, That the Author continues to teach the Mathematicks at his own House in Cross-street, Hatton-Garden; and that he and Mr. Hauksbee, Sen. begin a

---

[23]*DC* Friday 25 July 1712, No. 3365.

[24]Steven Shapin provides an excellent discussion of analogous social divisions of experimental labour in the seventeenth century in his *Social History of Truth*, pp. 355-407.

> Course of Hydrostatical and Pneumatical Experiments at Mr. Hauksbee's House in Hind-Court, Fleetstreet, next Monday, at 6 in the Evening; every one to pay Two Guineas.[25]

Once again the course was to start on a Monday at 6 pm, with the entrance fee set at two guineas. We know that the course did begin, for a follow-up advertisement placed on 28 January affirms this, as well as noting that the starting time had been changed to "5 every Evening."[26] Both this and the previous notice also advertise that Whiston was still carrying out private tutoring at his own residence.

The next advertisement, placed on 17 March, signals two new directions in Whiston's career:

> To Morrow at 11 a Clock, is intended to be begun a Course of Hydrostatical and Pneumatical Experiments, at Mr. Hauksbee's, Jun. in Crane-Court, near Fetter-lane, Fleetstreet. Price 2 Guineas. The Explanatory Lecture is Read by Mr. Whiston. Who also intends to begin Mathematick Lectures at the Marin Coffee-house in Birchin-lane next Monday, at 6; and at Douglas's Coffee-house in St. Martin's-lane, at 8 the same Evening; and upon suitable Encouragement to continue the same every Monday Evening at the same Hours and Places; beginning with the Explication of his New Scheme of Astronomy.[27]

First, we see Whiston beginning a series with the younger Hauksbee at the latter's residence, a pattern that would last until early 1728. Second, we see that Whiston had set himself up not only as lecturer at the already established mathematical course at the Marine Coffee House, but that he was also to carry out a repeat performance later the same evening at Douglas's Coffee House. The experimental lecture course, which, in a rare admission in print, was deferred to 23 March,[28] would not interfere with this evening work, as it was set to begin at 11 am. Having two lectures at two separate venues in the same night may seem an overextension of Whiston's abilities. However, a quick look at John Rocque's map of

---

[25]*DC* Wednesday 21 January 1713, No. 3518.

[26]*DC* Wednesday 28 January 1713, No. 3524.

[27]*DC* Tuesday 17 March 1713, No. 3564. This ad was also placed the following day: *DC* Wednesday 18 March 1713, No. 3565.

[28]*DC* Monday 23 March 1713, No. 3569.

1746 shows that the Marine and Douglas's were only a short walk apart.[29] Still, although Whiston would later run two lectures in the same evening on other occasions, three lectures a day seems to have been too much. On 1 April Whiston advertised that his mathematic lectures were now running Mondays at the Marine, and Tuesdays at Douglas's, both starting at 6 pm.[30]

In August of the same year, Whiston was once again advertising mathematical lectures:

> Mr. Whiston intends this Day to revive his Mathematick Lecture at the Marine Coffee-house in Birchin Lane; and to Morrow to remove his other Lecture from Douglas's in St. Martin's Lane to Button's near Covent-Garden; and to begin at 6 a Clock in the Evening, as usual.[31]

This notice not only demonstrates Whiston's continued presence at the Marine Coffee House on Monday evenings, but it clarifies when Whiston began his long relationship with the Whig proprietors of Button's. Furthermore, because it also tells us that Whiston was at Douglas's Coffee House before 24 August 1713, this advertisement corroborates the evidence provided in Alexander Pope's often cited 14 August 1713 letter to John Caryll, in which the Tory poet tells his correspondent in rapturous tones that he has been "in dialogues with Whiston and the astronomers."[32] Clearly, if Whiston had been able to inspire a poet with his material, he had learned how to captivate an audience. Pope's references in his letter to astronomy, the stars and "a thousand systems round about me," suggest that Whiston's "mathematical" lectures also contained material on astronomical subjects, something that Whiston confirms in his *Memoirs*.[33]

---

[29]From the Marine Coffee House (Rocque E2 2/6, in a coffee house district in Cornhill close to the Royal Exchange), one would walk south down Birchin Lane, cross over Lombard Street, then down either St. Nicholas Lane or St. Clements Lane, and then across Great Eastcheap to Douglas's on St. Martin's Lane (Rocque E2 5/5).

[30]*DC* Wednesday 1 April 1713, No. 3577.

[31]*DC* Monday 24 August 1713, No. 3701.

[32]Pope to Caryll, 14 August 1713, *The Correspondence of Alexander Pope*, ed. George Sherburn (Oxford: Clarendon Press, 1956), 1: 185.

[33]Whiston, *Memoirs*, 1: 257-8.

4.4 The Whiston-Hauksbee Course of Experiments, 1713-1728

By early December 1713, Whiston and Hauksbee were advertising another experimental lecture course in both the *Englishman* and the *Daily Courant*. The first ad for the new lecture, set to begin on 11 January 1714, was placed in the *Englishman*:

> On Monday the 11th of January 1713-14, at Six in the Evening, will begin a Course of Philosophical Experiments, under the following Heads, viz. Mechanicks; in which all the Phaenomena of the Mechanical Powers and Motions are shewn and explain'd. Hydrostaticks; wherein the Gravitation and pressure of Fluids and Solids are demonstrated. Pneumatics; wherein the various Elects and Properties of the Air are explained and demonstrated. Opticks; wherein the Nature of Vision in general, and the various Effects and Properties of Convex and Concave Glasses, both single and combin'd in Telescopes and Microscopes, and other Optical Machines, are explain'd, &c. These Experiments will be performed by Mr. Francis Hauksbee (the Nephew of the late Mr. Hauksbee, deceased) and his Assistant, at the House of the said Francis Hauksbee in Crane-Court, near St. Dunstan's Church in Fleetstreet, London.[34]

The details of the lecture course given in this advertisement would remain relatively unaltered for the next fifteen years. The course was to follow what became for this period a standard quadripartite subject division of mechanics, hydrostatics, pneumatics and optics. This advertisement ran for five additional insertions in the *Englishman* and the *Daily Courant*.[35] It is interesting that in the first four notices in this advertising series only Hauksbee's name is listed as demonstrator of the experiments, with an unnamed "Assistant." By 6 January 1714, however, the unnamed assistant is identified as Whiston, with both names appearing as demonstrators (Whiston's name is printed first). Why this should be is a puzzle; after all, Whiston's name had appeared in print in previous ads with both the elder and younger Hauksbees. The advertisement also shows that the younger Hauksbee was quick to capitalize on the better-known name of his uncle, the former demonstrator of the Royal Society and pioneer in experimental lecturing in London.

While there is no indication of how long the January 1714 course continued, or if the

---

[34]*The Englishman* Saturday 5 December to Tuesday 8 December 8 1713, No. XXVIII.

[35]*DC* Monday 7 December 1713, No. 3791; *Englishman* Tuesday 8 December to Thursday 10 December 1713, No. XXIX; *DC* Wednesday 9 December 1713, No. 3793; *DC* Wednesday 6 January 1714, No. 3807; *Englishman* Thursday 7 January to Saturday 9 January 1714, No. XLII.

course was run six nights a week, Whiston was again lecturing on mathematics at Button's by mid-January (and perhaps earlier). Moreover, by late in the same month, Whiston's mathematical course was so popular that a move to a larger premises was necessary. We learn this from a postscript added to a notice for one of Whiston's publications:

> Note, That the Author this day intends to remove his Mathematick Lecture from Mr. Button's Coffee-house to a larger Room close by it, at Mr. Dale's an Upholsterer over the Corner of the nearest Piazza in Cov. Garden.[36]

This move is confirmed in two later advertisements, with the time identified as 6:15 pm every Tuesday evening.[37] This implies that the experimental course was not run every week night during the simultaneous running of the mathematical series. Whiston and Hauksbee were apparently successful in their venture and they next advertise lecture courses starting 10 February 1714 and 14 April 1714.[38]

A new development is announced in the advertisements for the 14 April series: "The Figures of all the Instruments used in this Course of Experiments, are now curiously Engraved on Copper, and will shortly be printed, with an Explication, for the Use of those Gentlemen who have already attended, or may hereafter attend at these Courses."[39] The production of a course book, which sold for five shillings, offered both extra revenue and additional advertising exposure.[40] It may also have been the result of demand from their auditors. By the time Whiston and Hauksbee were advertising their next course of experiments, set to begin 31 August 1714, the course text had been published.[41] This text offers invaluable information on the content and length of the lecture course, and greatly

---

[36]*Englishman* Saturday 23 January to Tuesday 26 January 1714, No. XLIX.

[37]*Englishman* Saturday 6 February to Tuesday 9 February 1714, No. LV; *DC* Monday 8 February 1714, No. 3835.

[38]*Englishman* Saturday 6 February to Tuesday 9 February 1714, No. LV; *DC* Wednesday 31 March 1714, No. 3879; Friday 2 April 1714, No. 3881.

[39]*DC* Wednesday 31 March 1714, No. 3879.

[40]Neither the advertisements or the text itself include the price. However, the price is consistently advertised as five shillings in the price lists of Whiston's other books of the same period, and Whiston gives this price in his *Memoirs* as well. Whiston, *Memoirs*, 1: 201.

[41]*DC* Saturday 28 August 1714, No. 4008.

enhances what we know of the course from the advertisements. For example, Whiston and Hauksbee's *A Course of Mechanical, Optical, Hydrostatical, and Pneumatical Experiments* opens with an outline of the material to be covered the course, which consists of twenty-six lectures.[42] (We will have reason to return to this course manual below for a fuller discussion of its content). Whiston and Hauksbee, perhaps riding a wave of initial popularity, gave five experimental lecture courses in 1714, including a final course commencing 25 October of that year. This is the greatest number of experimental courses they would give in a single year. After 1714, the two men settled into a fairly regular pattern of advertising two experimental courses every winter season until early 1728.[43] Further evidence as to the frequency and length of the courses will be assessed below, after we have examined another course offered by Whiston and Hauksbee.

4.5 The Whiston-Hauksbee Course of Astronomy, 1718-1726

By 1718 Whiston and Hauksbee had also developed an astronomical lecture course, and fifteen starting dates were advertised from February 1718 to March 1726.[44] Of these fifteen dates, none is advertised as beginning earlier than 26 January, and none later than 24 March; most were offered in February.[45] The first course of astronomy, apparently triggered by a forthcoming partial solar eclipse, appeared in the *Daily Courant* on 12 February 1718:

> An Experimental Course of Astronomy, by Mr. Whiston and Mr. Hauksbee, to begin on Monday Feb. 17. 1717-8. at Six in the Evening (two Days before the Eclipse of the Sun,) at Mr. Hauksbee's in Crane-Court, Fleetstreet, at which Place, and also at Mr. Whiston's in Cross-Street, Hatton-Garden,

---

[42]As the summaries of each lecture given in the syllabus are labelled as "1st DAY," "2d," "3d" and so on, it is clear that the experimental course was originally intended to continue for twenty-six separate evenings. The syllabus is published in Hauksbee and Whiston's manual, *A Course of Mechanical, Optical, Hydrostatical, and Pneumatical Experiments: To be perform'd by Francis Hauksbee; and the Explanatory Lectures read by William Whiston, M.A.* [London], 1714), pp. 1-3. There has been some ambiguity over the initial publication date of this manual. I establish the 1714 date below in chapter seven. The syllabus printed on pages 1-3 of this manual, along with a post-1722 version, are reprinted as Appendices XVI and XVII.

[43]See Appendix V.

[44]See Appendix V.

[45]This does not include an astronomical course that was run during the October 1723 transit of Mercury, which appears to have been a special course tailored to the event.

Catalogues of the Course are deliver'd out, and Subscriptions are taken in.[46]

This abbreviated notice was replaced the following January with a more elaborate advertisement that became standard for the remaining insertions:

> An Experimental Course of Astronomy, in which the Principles of that most noble Science will be fully explain'd, in a very easy and familiar manner. To which End are contrived Models of the Ptolemaick, Tachonic, and Copernican systems of the World, with several others for particular Explanations. There are also provided Telescopes for observing the Fixed Stars and Planets, Quadrants for taking their Altitudes, and Micrometers for measuring the Diameters of the Planets, and other Instruments necessary for Celestial Observations. By Wm. Whiston, M.A. and Fra. Hawksbee. To begin on Monday the 26th Instant, at 6 in the Evening, at Mr. Hauksbee's House in Crane Court, near Fetter-lane, Fleetstreet, where Catalogues of this Course are given Gratis, as likewise at Mr. Whiston's in Cross-street, Hatton Garden, Mr. Marshal's at the Archimedes in Ludgate-street, and at Mr. Culpeper's at the Royal Exchange.[47]

The origin of the material in this series can be traced to Whiston almost exclusively. For although Hauksbee designed and sold telescopes, Whiston had not only delivered lectures on astronomy at Cambridge (as well as publishing them in Latin and English), and lectured in connection to astronomical events in 1715 and 1716, but he had also only recently published his *Astronomical Principles of Religion*, which was aimed at a popular audience.[48] Although this text contains much apologetic material on the design argument, it includes an impressive amount of material on the science of astronomy, complete with the calculated dimensions of the solar system and engravings of various astronomical features by John Senex. This text, which came out in two editions, was one of the more popular Newtonian science texts of the period that was aimed at a broader audience.[49]

Establishing the length of this course is not without some difficulties. Two versions

---

[46]*DC* Wednesday 12 February 1718, No. 5090.

[47]*DC* Thursday 22 January 1719, No. 5383.

[48]Whiston, *Astronomical Principles of Religion, Natural and Reveal'd* (London: Printed for J. Senex and W. Taylor, 1717). This book was advertised as published on 14 April 1717 (*DC* Thursday 14 April 1717, No. 4822).

[49]Rousseau, "Science Books," pp. 217-18.

of the course catalogue for this lecture series have survived, and consist of a twenty-six and twenty-five item syllabi printed on three numbered pages.[50] We must not automatically assume, as Farrell and Hans have, that the twenty-five items (or twenty-six) represent twenty-five nights of lectures.[51] While the earlier syllabus indicates that each of the headings represents a single lecture,[52] there are at least three considerations that may indicate the twenty-six and twenty-five items in the catalogues were not meant to represent twenty-five to twenty-six separate nights, for a one month course. First, unlike the experimental course text, the subjects listed for consideration are simply numbered, and are not listed as "first night," "second night," and so on. Second, the content to be dealt with in each section is usually relatively basic and need not have taken up an entire night. For example, item II in the later syllabus is "*Ptolemy*'s System explain'd, and demonstrated to be false," and item IX is simply "The *Altitude* of the *Pole*, or *Latitude* of *Places*, actually shew'd in the Heavens."[53] Third, from 1721 to 1725, two courses of astronomy were advertised each February (with one on 1 March), no more than sixteen and no less than seven days apart.[54] It is possible that some of these dates may represent deferred lectures, but the consistency of the pattern may argue against this.[55] It is thus possible that this course was either run in six days, or was

---

[50]Whiston and Hauksbee, *An Experimental Course of Astronomy; Proposed by Mr. Whiston and Mr. Hauksbee* ([London], c. 1718-1722) and *An Experimental Course of Astronomy; Proposed by Mr. Whiston, and Mr. Hauksbee* ([London], c. 1722-1725). The earlier version lists twenty-six headings, while the second edition lists twenty-five. I provide reasons below in chapter seven for assigning these publication dates. The two syllabi are reprinted in this thesis as Appendices XX and XXI. A comparison of the two catalogues reveals that several alterations were made when the second edition was printed.

[51]Farrell, *William Whiston*, p. 211; Hans, *New Trends in Education*, p. 143. There is another reason why the headings are not listed as lectures on consecutive evenings: since many of the demonstrations involved astronomical phenomena, it was probably necessary to allow for flexibility in the scheduling.

[52]Whiston and Hauksbee, *Course of Astronomy*, 1st ed., p. 1. It is possible that three to five lectures were presented in one evening; this would allow for the completion of the course in six days.

[53]Whiston and Hauksbee, *Course of Astronomy*, 2nd ed., pp. 1-2.

[54]Since the 17 February 1718 and 26 January 1719 courses of astronomy are both followed by at least a month without other lectures, it may be that when the course was first conceived and run, it was in fact intended to be run on twenty-five separate evenings.

[55]One clear deferral is seen in the example of the 24 March 1726 lecture, which had been deferred from 22 March 1726 (see Appendix V).

meant to be flexible in length.[56] On the other hand, most of the second February or March dates are followed my a month or more before another lecture by Whiston or Hauksbee. Also, given the competitive pressures Whiston and Hauksbee were facing, it may not have been possible for them to present an astronomical course for a minimum of three guineas if they did not give their auditors a full-length course. Furthermore, since the astronomical course focused heavily on observation, the relatively simple lecture subjects may nevertheless have taken up an entire evening if every one of ten to twenty auditors was given an opportunity to participate personally in the astronomical observations. Additional information may clarify this matter. In either case, since the earlier edition of the syllabus shows that the course originally cost each auditor a full five guineas, and we know that the course was later advertised in the newspapers and in the catalogue as requiring a three guinea entrance fee, we must assume that this was an expensive course.[57] More will be said about the schedules of the two Whiston-Hauksbee courses below.

4.6 Lecturing Patterns of the Whiston-Hauksbee London Lecture Courses

It will now be helpful to fit the description of a twenty-six to twenty-eight evening experimental lecture course and the course of astronomy, into Whiston and Hauksbee's lecturing patterns from 1713 to 1728.[58] First, five experimental course starting dates were

---

[56]Indeed, unpredictable weather would have required the two men to be flexible. This is evident from a note printed in the first edition of the syllabus, which says "[t]hat both when the *Air* proves cloudy, so as to hinder any of these *Observations*, and whilst the *Instruments* are preparing for the same; Parts of the *usual Course* of *Mechanic*, *Optic*, *Hydrostatic* and *Pneumatic* Experiments, as desir'd by any of the *Company*, shall be interpos'd" (Whiston and Hauksbee, *Course of Astronomy*, 1st ed., p. 3). Filling in the time with demonstrations from the experimental course would not have been difficult, as the both courses were held at the same venue.

[57]The post-1722 catalogue includes the five guinea fee also, but on the copy held by the British Library this price has been reduced to three guineas by a manuscript note. A manuscript date on this same copy reveals that the corrections were made in 1725, and this, combined with contemporary evidence from newspaper advertising, shows that Whiston and Hauksbee were charging three guineas by 1725. The earlier higher entrance fee may indicate that the course was originally conceived as a more specialized course for a smaller group, as evidence from the pricing schemes of other lecturers shows that smaller groups were charged higher prices per auditor.

[58]To avoid an unnecessarily cumbersome apparatus, references are not given for all these dates. Instead, the following discussion should be supplemented with references to Appendices II-V.

advertised in 1714, and usually two, and sometimes three, starting dates every year from 1715 until early 1728, after which the Whiston-Hauksbee collaboration ended. It is also clear that some of the advertised starting dates for the course of experiments represent deferred dates (resulting from failures to enrol the predetermined minimum number of auditors for a given course). The best indication of a deferred lecture is an impossibly close interval between starting dates, the most apparent being the twice-deferred course advertised to begin on 16, 21 and 25 November 1720. Another sign may be a year with more than two advertised dates, which would thus break from what may be a pattern of two *intended* experimental courses each winter season. All these experimental courses are in addition to Whiston and Hauksbee's course of astronomy and Whiston's separately run courses on mathematics, astronomy and the longitude. Hauksbee also carried out several courses on gunnery on his own, and teamed up with an anatomist to perform courses in anatomy in the 1720s. We will now determine how well a pattern of a twenty-six to twenty-eight night experimental course corroborates with the assembled evidence.

If the experimental course was originally run as a twenty-six night series, as the earlier version of the course manual suggests, each course would take about a month to complete at six nights a week.[59] By reconstructing calendars one can determine, for example, that the starting date Monday 11 January 1714 allowed for exactly twenty-six lecturing days before the next scheduled experimental course was set to begin on Wednesday 10 February 1714. However, while there are at least thirty days between starting dates for Whiston and Hauksbee's experimental courses until 1718, after this the unproblematic pattern begins to break down. A starting date of 27 January in 1718 is followed only twenty-one days later by a course of astronomy. An experimental course slated to begin on 20 October of the same year is followed fourteen days later by an experimental course advertised to begin on 3 November 1718. Other Whiston-Hauksbee experimental course dates appearing closer

---

[59]It is doubtful that scientific lectures ever took place on Sunday. First, although lectures are advertised to start on every day of the week from Monday to Saturday, I have not come across a single lecture by any lecturer billed to commence on a Sunday. Also, as Roy Porter observes, in the eighteenth century, "Sunday was a day apart. A vestige of the Puritan day of enforced godliness, it was still a time of enforced inactivity" (Porter, *English Society in the Eighteenth Century* [Harmondsworth: Penguin, 1982], p. 169). Sunday was a day of religious worship and Whiston for one was strongly opposed to "Sabbath-breaking," which he called a "notorious Crime" (Whiston, *Memoirs*, 2: 244-5).

together than a month are 18 and 30 October 1722, 18, 21 and 28 January 1723, 6 and 13 November 1723, 11 and 23 November 1724, 3 and 10 February 1725, 8 and 18 November 1725, 26 January and 2 February 1726, 9 and 21 November 1726 and 5,19 and 26 February 1728. To further complicate this, several experimental lecture course dates are followed closely by starting dates for other courses, such as the course of astronomy.[60] When we see dates for an experimental course by the same lecturers advertised closer than one month apart, we have to assume one of three possibilities: 1) the lecture was deferred in order to attract further auditors to complete the required minimum number, 2) neither the first, second or third advertised starting dates materialized in a course, and thus the course was never run, or 3) the lecture course had been streamlined and reduced in length (such as by delivering multiple lectures on the same night). Taking the first two possibilities together, I will present two different models that may account for Whiston and Hauksbee's less than straightforward lecturing patterns. I will begin by considering the possibility that the abundance of close intervals represent a move to streamlined and shorter lecture courses.

Sometimes lecturers would acknowledge that a course was being deferred. In most cases, however, a second date was advertised without any notice that the lecturers were moving the date back in order to fill out the subscriptions (Whiston and Hauksbee only acknowledge in print one deferral in an advertisement from 1713 to 1728). Yet, towards the end of the period especially, the pattern of close intervals is quite consistent, and this may suggest that Whiston and Hauksbee were running abbreviated versions of their courses. It could also be argued that Whiston and Hauksbee would not continue to spend money on advertising both their experimental and astronomical lecture courses year after year if most of their advertised series regularly failed to attract the required number of auditors. But

---

[60]These examples are: 19 January 1719 (experimental) and 27 January 1719 (astronomical); 16,21, 25 November 1720 (experimental) and 13 December 1720 (Hauksbee and William Cheselden, anatomy); 9 March 1721 (experimental) and 28 March 1721 (Hauksbee-Cheselden, anatomy); 15 January 1722 (experimental) and 31 January 1722 (Hauksbee-Cheselden, anatomy); 28 January 1723 (experimental) and 12 February 1723 (astronomical); 27 January 1724 (experimental) and 10 February 1724 (astronomical); 10 February 1725 (experimental) and 22 February 1725 (astronomical); 21 November (experimental) and 5 December 1726 (Whiston on geometry); 25 January 1727 (experimental) and 8 February 1727 (Whiston on geometry). In the last two cases, however, Whiston's geometry lectures were held in the day, and thus would not have directly conflicted with any evening courses.

perhaps the strongest case for a shortened experimental course are two advertisements that include two dates with intervals of less than a month together in the same insertion. The first clear example is found in an advertisement that gives notice both of an experimental course to begin on Monday 19 January 1719 and an astronomical course to begin on Monday 26 January 1719—exactly one week, or six lecturing days, later.[61] The other example is an advertisement that gives notice of a course of experiments set to begin Monday 28 January 1723.[62] After advertising for an experimental course to begin 18 January 1723,[63] Whiston and Hauksbee include in the same advertisements for the 28 January 1723 course notices for an astronomical course to begin Tuesday 12 February. Thus, in both these examples, the course starting dates appear to have been *planned* this close together. It is conceivable that in the second example Whiston and Hauksbee were holding their experimental course on Mondays, Wednesdays and Fridays, which would have allowed them to run their course of astronomy on Tuesdays and Thursdays. This is not possible with the first example though, as both experimental and astronomical courses were scheduled to begin on a Monday. In fact, when all of Whiston and Hauksbee's experimental and astronomical lecture courses are compared, there is no completely consistent pattern (as we will see there is with Little Tower Street) of holding these courses on particular days of the week only (as in a M-W-F pattern for experimental courses and a T-T pattern for courses of astronomy). Although the experimental courses tend to start on Mondays or Wednesdays, they are advertised to begin on Tuesdays, Thursdays and Fridays as well. Similarly, courses of astronomy are advertised to begin on Mondays, Tuesdays, Wednesdays and Thursdays.

Although there are only two examples of dates close together in the same advertisements, several of the other dates may have been planned about this close together as well. Furthermore, of these possibilities, there are eight examples of experimental course

---

[61]*DC* Friday 9 January 1719, No. 5372; Tuesday 13 January 1719, No. 5375; Friday 16 January 1719, No. 5378. The 26 January 1719 course of astronomy date is also advertised separately later: *DC* Thursday 22 January 1719, No. 5383.

[62]*DC* Thursday 24 January 1723, No. 6633; Saturday 26 January 1723, No. 6635.

[63]*DC* Thursday 10 January 1723, No. 6621; Saturday 12 January 1723, No. 6623.

starting dates followed by other lectures that are less than one month apart, yet allow for a minimum of twelve lecturing days between starting dates.[64] It is thus possible that some of the experimental courses were being abbreviated or shortened, with one, two and three lectures being collapsed together and delivered in a single evening. If this is true, most of the courses that are followed by other courses with intervals of less than a month could have been run in twelve lecturing days (i.e. about half the original number of days), often starting on a Monday and finishing the second Saturday. This is, after all, only six lecturing days less than the August 1712 Hauksbee-Hauksbee-Ditton-Whiston course, and the lectures may have continued later into the evening. Some of these courses could have been run in six lecturing days, for an even more abbreviated format. It is possible that a good market and steady demand for scientific courses may have allowed lecturers to streamline their courses while charging the same fee. If this is so, Whiston and Hauksbee may have adapted their courses to include the material from two to three lectures in a single night (resulting in lengthier or more condensed lecturing evenings), in an attempt to run a greater number of lectures in the winter lecturing season.

Ironically, shorter lectures may also reveal a more difficult market with increased competition. We know, for example, that in 1726 and 1727 Whiston advertised abbreviated "small Courses" for a reduced rate,[65] perhaps due to increasing market pressure and competition. Thus it is possible that this was happening with the Whiston-Hauksbee

---

[64]These examples are: Monday 27 January 1718 followed by Monday 17 February 1718 (eighteen lecturing days); Monday 20 October 1718 followed by Monday 3 November (twelve lecturing days); Friday 25 November 1720 followed by Wednesday 13 December (sixteen lecturing days); Thursday 9 March 1721 followed by Tuesday 28 March 1721 (seventeen lecturing days); Monday 15 January 1722 followed by Wednesday 31 January 1722 (fourteen lecturing days); Monday 27 January 1724 followed by Monday 10 February 1724 (twelve lecturing days); Monday 21 November 1726 followed by Monday 5 December 1726 (twelve lecturing days) and Wednesday 25 January 1727 and Wednesday 8 February 1727 (twelve lecturing days). Another four examples allow for ten lecturing days; these are: Thursday 18 October 1722 followed by Tuesday 30 October 1722; Wednesday 11 November 1724 followed by Monday 23 November 1724; Wednesday 10 February 1725 followed by Monday 22 February 1725 and Wednesday 9 November 1726 followed by Wednesday 21 November 1726.

[65]These courses are dealt with below.

experimental and astronomical series as well.[66] On the other hand, it is possible that many of the close dates represent second attempts to fill a course (this would imply, of course, that Whiston and Hauksbee fairly consistently failed to fill their courses in the first attempt). In this case, it may be possible to assume that the closer the second date to the first, the closer they had been to filling out their full subscription minimum. If many of the dates are due to deferrals of this nature, it would probably have been the result of the increasing competitive pressure from both Desaguliers (since 1713) and the Little Tower Street lecturers (since 1718)—pressure that appears to have contributed to the breakdown and collapse of the Whiston-Hauksbee collaboration in 1727 and 1728.[67] If competition was a crucial factor in any possible adaptation of the schedule of the Whiston-Hauksbee course, it may be significant that the abbreviated intervals began shortly after Little Tower Street entered the market. Unfortunately, we are only dealing with one form of evidence—lecture advertisements—and the details provided by these notices are rarely corroborated with other types of evidence.[68]

Thus, we are left with two possibilities: that by the 1720s the Whiston-Hauksbee lecture courses were regularly failing to attract the minimum number of auditors by the initially advertised date, or the possibility (given the two advertised close dates) that at least some of their courses in the 1720s were streamlined to less than half the original number of days. Several lines of evidence appear to give the first of these two models the most weight. First, the post-1722 experimental lecture course syllabus not only continues to present the lectures as presented on consecutive days (using ordinal numbers), but demonstrates that the

---

[66]A hint that this was occurring with the course of astronomy is seen in the manuscript note on the British Library copy of the astronomical course syllabus that reduces the originally printed entrance fee of a full five guineas to three (this copy is dated below as having been passed out to a subscriber for the 22 February 1725 astronomical course).

[67]Interestingly, while a comparison with the reconstructed lecturing patterns of Desaguliers and the Little Tower Street Academy reveals a small number of close dates (see Appendices VI-VII), these examples do not amount to anywhere near the frequency and consistency of those seen in Appendix V.

[68]One course for which we have external evidence that it was held, is the 8 February 1720 course of astronomy. A letter written by Whiston's son (and cited below) confirms that this course was running by 11 February 1720 (N.S.). This can not be used to prove that the course was short, though, since the following course was held a full four weeks later (see Appendix V).

course had by that time been *expanded* to twenty-eight evenings. Second, no similar pattern of abbreviated courses is seen in the careers of either Desaguliers or the lecturers of the Little Tower Street Academy. Finally, the evidence presented below that points to the collapse of the Whiston-Hauksbee experimental course in early 1728, seems to confirm that the two lecturers finally succumbed to the increasing market pressures.[69] Still, the evidence is not completely conclusive. These remaining ambiguities reinforce the fact that this is a first attempt at this sort of reconstruction of lecturing patterns for this period; further research and additional evidence will hopefully clarify some of these issues in the future.

4.7 Whiston's Independent Lectures

Whiston often lectured on his own, not only on mathematics, but on astronomy and other subjects as well. Early on, Whiston also learned to cash in on astronomical phenomena such as solar and lunar eclipses, transits of Mercury and Venus, and the sudden appearance of *aurora borealis* (incorrectly identified by many as a meteor). The first example of this occurred in the weeks leading up to the total eclipse of the sun on 22 April 1715:

> Mr. Whiston intends this Day, at Seven in the Evening, to continue his Mathematick Lecture, at Mr. Button's Coffee-house, near Covent-Garden; and to go on with that part of Astronomy which is necessary to the understanding of Eclipses, and his Copernicus, just published; with Dr. Halley's and his own Schemes of the next total Eclipse of the Sun. Which Lecture he designs to continue every Wednesday and Friday till that Eclipse, and every Wednesday afterward. The Price as formerly.[70]

---

[69]If this model is accepted, the two seemingly anomalous examples of lecture dates advertised close together could be seen as exceptions to a general pattern of longer courses; evidence that the two lecturers were advertising particular dates, and then reconfiguring the schedules, or as evidence that Whiston and Hauksbee were advertising two separate courses at the same time, with the hope that they would fill at least one of them.

[70]*DC* Friday 18 March 1715, No. 4180. Whiston's "Copernicus" refers to an accompanying handbook he sold with a scientific instrument he designed of the same name (Whiston, *The Copernicus Explain'd: Or a Brief Account of the Nature and Use of an Universal Astronomical Instrument, for the Calculation and Exhibition of New and Full Moons, and of Eclipses, both Solar and Lunar; with the Places Heliocentrical and Geocentrical of all the Planets, Primary and Secondary* [London: Printed for the Author, 1715]). This sixty-page duodecimo handbook, dedicated to General James Stanhope, sold for one shilling. The "Copernicus" itself, apparently designed by Whiston and fabricated by John Senex, sold for six guineas. Both the instrument and the manual were intentionally produced before the eclipse in order to take advantage of public interest in the coming event (Whiston, *Memoirs*, 1: 206). Earlier, Whiston had also placed a separate advertisement for his Copernicus, at which time he advised potential buyers to purchase the instrument before the coming 22 April 1715 eclipse (*DC* Wednesday 23 February 1715, No. 4160). See also Farrell, who notes that Whiston presented

Not only did Whiston manage to capitalize on the high public interest in the coming solar eclipse,[71] first by incorporating the subject of astronomy and eclipses into his mathematical course, but he also arranged for a public, commentated viewing of the eclipse. This latter event was also advertised on the day of the eclipse, along with an engraved chart of the eclipse, a printed explanation, and Mr. Senex's necessary smoked glasses:

> Mr. Whiston hereby gives Notice, That he intends to observe the great Eclipse next Friday over the North-West Piazza in Covent Garden. Tickets are delivered out at his own House in Cross-street, Hatton Garden, and at Mr. Button's Coffee-House near Covent Garden. And Note, That his Second or Easy Scheme, Price 1 s. His Method or, Observations, Price 2 d. and Mr. Senex's Smoak'd Glasses, Price 6 d. are very proper to be had by such as would with any Care observe the same either there or elsewhere.[72]

Fortunately, we do not need to speculate how successful this endeavour was for Whiston. By his own account, the enterprising Whiston was able to make about £120 not only directly through lectures and the sales of books and charts before and after the April 1715 solar eclipse, but also indirectly from patronage gifts.[73] Whiston had certainly learned that

---

his Copernicus at the 10 February 1715 meeting of the Royal Society (Farrell, *William Whiston*, pp. 214-18).

[71]It is likely that the high public interest was itself in large part the result of the successful marketing of entrepreneurs like Whiston, and booksellers who were advertising charts of the eclipse by Whiston, Halley and Flamsteed.

[72]*DC* Tuesday 19 April 1715, No. 4207.

[73]Whiston, *Memoirs*, 1: 204-5. Whiston also advertised a follow-up series on the eclipse in November of the same year (*DC* Tuesday 8 November 1715, No. 4381). In what may be an independent corroboration of this public viewing, Roger Cotes in a letter to Newton about the eclipse, told the latter that "A Freind [*sic*] assur'd me He could very easily & distinctly read the smallest letters engrav'd about Mr Whistons Scheme of the Heavens, which he had in his hands at that time"(Cotes to Newton, 13 May 1715, *Correspondence of Newton*, 6: 223-4). Even if Cotes' friend was not actually at Whiston's public viewing, that fact that he had a copy of one of Whiston's "schemes" in his hands during the eclipse is perhaps a testimony to the popularity of Whiston's astronomical charts. "Mr Whistons Scheme of the Heavens" is likely the same "Scheme" mentioned in the advertisement for the eclipse. As to the specific identity of the "Scheme," it was likely either a second edition of Whiston's *A Scheme of the Solar System, with the orbits of the planets and comets belonging thereto, described from Dr. Halley's accurate table of comets, Philsoph. Transact. No. 297 founded on Sir Isaac Newton's wonderful discoveries by William Whiston, M.A.* (first published 1712), or his *A Compleat Account of the great Eclipse of the Sun which will happen Apr. 22d. in the Morning* (dated 2 April 1715). Both charts, single sheets, sold for one shilling each. Illustrations and descriptions of both an early nineteen century edition of Whiston's *Scheme*, and the 2 April 1715 edition of Whiston's *Compleat Account*, can be found in Maureen Farrell, "Rare Items Relating to William Whiston (1667-1752) in the Houghton Library," *Harvard Library Bulletin* 24(3) (July 1976): 349-59.

astronomical phenomena were beneficial not only for polite education and entertainment, but also for profit. Several other examples of Whiston's efforts in this regard will help fill out our understanding of his industry.

Before the lunar eclipse of 29 August 1718, Whiston advertised two preliminary lectures at the Marine and Button's, as well as a public "showing" of the event itself:

> Mr. Whiston hereby gives Notice, That he intends, if the Air be not too cloudy to show the next total and almost central Eclipse of the Moon, next Friday, Aug. 29th, to all curious Persons who shall desire to see it; at the lowest House on the Left Hand of Surrey-Street, in the Strand; beginning at six a Clock; all that come to pay 5s. a piece. And in order to the Spectators and others better understanding the Nature and Uses of such Eclipses, he intends to read two lectures beforehand, at the Marine Coffee-house in Birchin-lane on Monday and Wednesday; and at Button's Coffee-house by Covent-Garden, on Tuesday and Thursday, at Eight a Clock in the Evening; at the usual rate of 1 s. a piece. And Note, that he intends to make his own Copernicus, and the exact Description of his Eclipse lately published by Mr. Senex and Mr. Taylor, the Foundations of what he explains on this Matter.[74]

Whiston charged one shilling an auditor at the coffee houses, and a full five shillings for each spectator at the event itself. From this it can be assumed that it was deemed worth paying the price of five coffee house lectures for the benefit of hearing an astronomer comment on an event that could be viewed on its own for free! This ad also provides us with another piece of valuable information: one shilling was the "usual rate" of single night coffee house lectures.[75]

In October 1723 Whiston and Hauksbee timed the beginning of a course of astronomy to coincide with the 29 October 1723 transit of Mercury across the sun:

> Mr. Whiston gives Notice, that Mr. Senex yesterday published his Scheme of the transits of Mercury over the Sun, with the Path of the present Comet. Price 1 s. That he and Mr. Hauksbee intend to begin their Astronomical Course, on Tuesday next, the Transit of Mercury, precisely at half an Hour after Two in the Afternoon; with a Lecture on such Transits and on Comets, At the farthest House but two of Southampton-Row, Bloomsbury, and that

---

[74]*DC* Saturday 23 August 1718, No. 5254. This same ad was also placed the following Monday (*DC* Monday 25 August 1718, No. 5255).

[75]Many of Whiston's ads for single night lectures mention the price as the "usual rate" or "as formerly," but do not actually give the amount.

> he still attends every clear Night, to shew all that go his small Course, the Comet, before it disappear.[76]

Once again, Whiston had a scheme of the event prepared beforehand by John Senex to sell for the standard price of one shilling.[77] The lecture also appears to have involved observations of a comet that was then visible in the night-time sky. After the transit, on 1 November, Whiston also advertised "two distinct Lectures to explain those curious and uncommon Phænomena, this Day and To-morrow, in the Evenings, at the Marine Coffee house in Birchin-lane, at 6 a Clock; and at Button's near Covent-Garden at 8; every one paying as formerly."[78]

The next great astronomical event was the full solar eclipse of 11 May 1724. True to his usual pattern, Whiston was prepared with a ninety-four page book and a scheme,[79] and also delivered lectures before the event.[80] For the day of the event itself, Whiston planned two preliminary lectures, followed by the viewing of the event at approximately 5:40 pm, with Whiston fervently hoping, no doubt, for clear weather. That Whiston also hoped for a large monied crowd, is evident from both the venue he had secured for the event, and the prices he intended to charge:

> Mr. Whiston gives Notice, that he has obtain'd the Use of the large Room at the Horse-Guards to shew the great Eclipse in on Monday. Where he intends by Way of Preparation, to explain his ORRERY from Eleven till One; his COPERNICUS and COPERNICUS IMPROV'D from half an Hour after

---

[76]*DC* Friday 25 October 1723, No. 6868. The owner of this house on Southampton Row was a near neighbour to Whiston, who was living to the southwest on the other side of Bedford House. Rocque's 1746 map of London shows that this house, situated as it was across from an open field (Rocque C1 8/4), offered an unobstructed view of the western sky.

[77]Whiston, *A Scheme of the Transits of Mercury and Venus over the sun for two and a half centuries* ([London], 1723). This scheme was reprinted in 1736.

[78]*DC* Friday 1 November 1723, No. 6674.

[79]Whiston, *The calculation of solar eclipses without parallaxes. With a specimen of the same in the total eclipse of the sun, May 11, 1724* (London: J. Senex and W. Taylor, 1724). Whiston also sold a scheme of the 1724 eclipse separately as *A Scheme of the Solar Eclipse, May 11th 1724*. The book sold for 1s. 6d. and the scheme alone for 1s (see Whiston, *Memoirs*, 1: 269).

[80]Whiston placed an advertisement on 20 April 1724 to give notice of a series of lectures on "the Nature of Comets, Transits of the inferior Planets, and Eclipses, both Solar and Lunar" to run "every Tuesday and Friday Evening till the great Eclipse be over." *DC* Monday 20 April 1724, No. 7019.

> Three till Five; and then, if the Air be clear, to shew the Eclipse it self, which may begin by 40 after Five, and for which proper Preparations are making. All the Nobility, Ladies and Gentlemen that intend to be present, may have Tickets at the Author's in Great Russell-street, over-against Montague-House, and at the Room above-mention'd, at One Guinea a-piece. None that come after the Lectures are over and barely to see the Eclipse, are to pay less than half a Guinea.[81]

Whiston's particular appeal to the "Nobility, Ladies and Gentlemen" is undisguised, and his price of one guinea for three and a half hours of lecturing, along with a few minutes of commentary on the eclipse while it was transpiring, certainly appears to be a sharp rise in price, value for value, over his past performances. Even the simple viewing of solar eclipses had appreciated in value from one shilling in 1715 to over ten times that amount. The high prices may have had something to do with the rates he was paying at the House Guards, but they may also reflect Whiston's confidence in past lecturing successes.

While astronomically informed men like Whiston could plan for a major event like a solar or lunar eclipse, a degree of flexibility also allowed for swift capitalization on unanticipated events in the heavens. After an unexpected incidence of *aurora borealis* on 6 March 1716, Whiston advertised two separate lectures:

> Mr. Whiston intends to explain the surprizing Appearances of Tuesday Night, the Sixth Instant, this night, at 8 a-Clock, at the Marine Coffee-House in Birchin-Lane; and to Morrow Night at the same Hour, at the large room in Villars-street, York Buildings: For which last Lecture Tickets are delivered at Mr. Whiston's in Cross-street Hatton Garden; at Tom's Coffee-house by the Temple; at Button's Coffee-house by Covent Garden; and at St. James's Coffee-house by St. James's Palace: That last Place is conveniently fitted for Ladies as well as Gentlemen. All good Accounts of this Appearance will be acceptable either before or after that Day.[82]

The second venue was Richard Steele's Censorium, the 200 seats of which were set up to accommodate both male and female auditors.[83] Even if the room was only partly filled,

---

[81] *DC* Friday 8 May 1724, No. 7035. The Horse Guards building was located in Whitehall, just south of the Admiralty Office, in Westminster. The west side of the building faced a large parade grounds (Rocque C2 10/2).

[82] *DC* Thursday 15 March 1716, No. 4493.

[83] A physical and functional description of this room is given in John Loftis, "Richard Steele's Censorium," *Huntington Library Quarterly* 14(1) (1950-1): 43-66.

Whiston probably took home enough net proceeds to make the venture well worth his while. These lectures were followed by a published account of the "Surprizing Meteor."[84] Whiston also advertised for coffee house lectures at the Marine and Button's after a similar appearance of *aurora borealis* in March 1719.[85] In these lectures we have seen just some of the more important examples of Whiston's entrepreneurial independent lecturing career—a career that was as enterprising as it was flexible.

4.8 Hauksbee's Independent Lecture Courses

Francis Hauksbee did not carry out anywhere near as many lectures on his own in this period as did Whiston. However, it will be helpful to comment on two lecturing projects in which the younger Hauksbee involved himself. Having already considered Hauksbee's brief pre-Whiston lecturing career, the next time he appears in a lecture advertisement without Whiston is in December 1720. At this time, Hauksbee had teamed up for a course of anatomy with the prominent surgeon William Cheselden.[86] The first advertisement appeared on 6 December 1720 in the *Daily Courant*:

> A Course of Anatomy designed for the Entertainment of Gentlemen, in which will be shewn all the known Mechanisms of the Human Body, together with the Comparative Anatomy of Birds, Beasts, and Fish, with the various Contrivances of their different Ways of Life; the whole to be illustrated by a Variety of Mechanical Experiments, there being a new Set of Instruments made for this Purpose. This Course to be performed by Wm. Cheselden, Surgeon, F.R.S. and Fra. Hauksbee, at his House in Crane Court, Fleet-street, where Subscriptions are taken in. To begin on Tuesday the 13th Instant, at 6 in the Evening.[87]

---

[84]Whiston, *An Account of a Surprizing Meteor, Seen in the Air, March 6th, 1715/16, at Night* (London: Printed for J. Senex and W. Taylor, 1716).

[85]*DC* Friday 27 March 1719, No. 5438. As with the 1716 appearance, the 1719 event was described as a meteor. Also, Whiston once again published an account of the appearance shortly thereafter, presumably to capitalize on any lingering interest in the event. Whiston, *An Account of a Surprizing Meteor, seen in the Air March 19 1718/9. at Night* (London: Printed for J. Senex and W. Taylor, 1719).

[86]For an account of Cheselden, see Zachary Cope, *William Cheselden 1688-1752* (Edinburgh: E. & S. Livingstone, 1953).

[87]*DC* Tuesday 6 December 1720. This advertisement reappeared twice in the *Daily Courant*: *DC* Friday 9 December 1720, No. 5970; *DC* Monday 12 December 1720, No. 5972.

It is interesting that although this was to be an anatomical lecture course, mechanical experiments were to be involved. It is also noteworthy that the venue is Hauksbee's residence and instrument shop, the already established location of the Whiston-Hauksbee experimental lecture courses. The target audience is identified up front as "Gentlemen" with the purpose to be primarily their entertainment. William Cheselden can be identified as one of the best-known London surgeons in this period. He was appointed, through the agency of Isaac Newton, as anatomical demonstrator for the Royal Society in 1714 (roughly the same time that Newton had chosen Desaguliers to replace the recently deceased Francis Hauksbee, Sr. as curator of experiments). Cheselden, however, does not appear to have been a regular performer at the Royal Society—perhaps, as Westfall surmises, because of the success of his surgical practice.[88] Cheselden, along with Richard Mead, an equally prominent London physician, was also Isaac Newton's physician during the latter's final illness.[89] It may be that the apparent success of his surgical career also prevented Cheselden from becoming a regular member of the elite group of lecturers in this period, as there is only evidence for three further anatomical courses with Hauksbee, namely, courses advertised to start on 28 March 1721,[90] 16 November 1721,[91] and 31 January 1722.[92]

The second project in which Hauksbee involved himself, this time on his own, was

---

[88]Westfall, *Never at Rest*, p. 685.

[89]Westfall, *Never at Rest*, pp. 866-7, 869.

[90]*DC* Thursday 23 March 1721, No. 6059. This advertisement appends the following statement: "N.B. This Course being chiefly intended for Gentlemen, such Things only will be omitted as are neither Instructive nor Entertaining; and Care will be taken to have nothing Offensive," which not only reveals, apparently, that the first series contained elements that some found offensive, but also that the course was intended for "Gentlemen" and that it was meant to be both "Instructive" and "Entertaining." Many other lecture ads also promise these two last qualities. The above cited appendix is also found in the rest of the Cheselden-Hauksbee anatomy lecture advertisements.

[91]*DC* Tuesday 7 November 1721, No. 6255; Thursday 9 November 1721, No. 6357; Monday 13 November 1721, No. 6260; Wednesday 15 November 1721, No. 6262.

[92]*DC* Saturday 20 January 1722, No. 6318; Tuesday 23 January 1722, 6320; Thursday 25 January 1722, No. 6322; Saturday 27 January 1722, No. 6324; Tuesday 30 January 1722, No. 6326. Zachary Cope refers to the March 1721, November 1721 and January 1722 lecture courses, but not the earlier December 1720 course. He does, however, affirm that there is no evidence of further lecture courses advertised beyond the January 1722 course (Cope, *William Cheselden*, p. 5). The evidence presented in Appendix IX may reveal a peak of advertisements (and perhaps of public interest) for anatomical lectures in this period.

a course of "gunnery." This course was first advertised in May 1721:

> A Course of Gunnery, in which the Theory of shooting with the Mortar Piece, so as to strike any Object Upon, Above, or Below the Plane of the Horizon, will be demonstrated, and the Practice illustrated by Variety of Experiments to be made with a very exact Brass Mortar-Piece, fitted for this Purpose. To be perform'd by Fra. Hauksbee. The Charge of going this Course is one Guinea, to be paid at the Time of Subscription; the Course to begin on Wednesday the 3d of May, at 6 in the Evening, at Mr. Hauksbee's, in Crane-Court, near St. Dunstan's Church in Fleet-street. Where subscriptions are taken in.[93]

Once again the venue for the lectures is identified as Hauksbee's residence in Crane Court, the same place the subscription of one guinea an attender is to be taken in. The demonstrations are classified as "Experiments," with Hauksbee as the only named performer. There is no indication as to the length of the course, but Hauksbee likely ascertained that the entrance rate of one guinea was competitive. This first course must have resulted in a measure of success, for Hauksbee advertised another course of gunnery for 3 May 1722, this time with the entrance fee increased to one guinea and a half.[94] The series of advertisements for Hauksbee's second course of gunnery also provides an added detail about the structure of the course. The lectures "preparatory" to the course were to be delivered at Crane Court, while the "Experiments" were to be carried out "in the Fields."[95] Holding the course in May would allow Hauksbee and his auditors to take advantage of the warmer weather and the increased daylight hours of the spring. However, whether it was due to the increased fee or lack of interest on the part of the auditors or even Hauksbee himself, the second running of this course was also the last to be advertised in the *Daily Courant*. After this period, Hauksbee involved himself in several other projects, including what appears to have been an experimental course with Benjamin Robins around 1730,[96] and a course of chemistry

---

[93]*DC* Saturday 29 April 1721, No. 6091; Tuesday 2 May 1721, No. 6093.

[94]*DC* Tuesday April 24 1722, No. 6398; Thursday 26 April 1722, No. 6400; Tuesday May 1 1722, No. 6404.

[95]The "fields" are likely a reference to the Artillery Ground in Moorgate (Rocque E1 7/4).

beginning in 1731 with the Chemist Peter Shaw.[97] Hauksbee also had the security of his position as caretaker of the premises of the nearby Royal Society on Crane Court, to which he had been appointed in 1723 and for which services he received the annual remuneration of £50 until his death in 1763.

4.9 The End of the Whiston-Hauksbee Collaboration

In the mid-1720s there were several new developments in Whiston's lecturing career. First, in September 1724, Whiston was invited to travel to Bristol to present a course of experiments there.[98] Not only does this demonstrate that Whiston did not always initiate his own lectures, but it tells us that Whiston's fame as a lecturer had extended to provincial towns by 1724. Since many London newspapers were sent out to the provinces, it is possible that Whiston became known in Bristol through the distribution of papers containing advertisements of his courses. Two years later in 1726 we see Whiston not only moving out to the resort towns of Bath and Tunbridge Wells as well as Bristol, but we also see Whiston, for the first time, begin to advertise lectures with specifically religious topics:

---

[96]Wallis and Wallis refer to an altered reprint of Hauksbee and Whiston's *Course of Mechanical, Optical, Hydrostatical and Pneumatical Experiments*, dated *c.* 1730. This reprint appears to identify Robins as Hauksbee's lecturing partner in this venture (Wallis and Wallis, *Biobibliography*, p. 65). Robins (1707-1751), who was elected FRS in 1727, is best known for his work in ballistics. For Robins' work in ballistics see Brett D. Steele, "Muskets and Pendulums: Benjamin Robins, Leonhard Euler, and the Ballistics Revolution," *Technology and Culture* 35(2) (1994): 348-82; William Johnson, "Benjamin Robins (Eighteenth Century Founder of Scientific Ballistics): Some European Dimensions and Past and Future Perceptions," *International Journal of Impact Engineering* 12(2) (1992): 293-323; H.M. Barkla, "Benjamin Robins and the Resistance of Air," *Annals of Science* 30(1) (1973): 107-22. Brett Steele notes that one engineer has referred to Robins as "one of the fathers of aerodynamics," while a second engineer has used the term "a founder of modern gunnery" (Steele, p. 348). For biographical information on Robins of a more general character, see William Johnson, "Benjamin Robins: New Details of His Life," *Notes and Records of the Royal Society of London* 46(2) (1992): 235-52; Wallis and Wallis, *Biobibliography*, pp. 161-2; J. Morton Briggs, Jr., "Benjamin Robins," *DSB*, 11: 493-4 and *DNB*, 16: 1320-2.

[97]Shaw and Hauksbee's "COURSE of PHILOSOPHICAL CHEMISTRY Design'd for the Improvement of Practical Philosophy, as applied in Various Arts, Trades, Manufactures and Business" was first advertised for a starting date of Monday 6 December 1731 at 6 pm. *DC* Saturday 13 November 1731, No. 9365; Tuesday 16 November 1731, No. 9367; Thursday 18 November 1731, No. 9369; Saturday 20 November 1731, No. 9371; Tuesday 23 November 1731, No. 9373; Thursday 25 November 1731, No. 9375; Saturday 27 November 1731, No. 9377; Tuesday 30 November 1731, No. 9379; Thursday 2 December 1731, No. 9381; Saturday 4 December 1731, No. 9383.

[98]Whiston, *Memoirs*, 1: 272.

> In the year 1726, I procured to be made me, by Mr. *Crosedale*, a very skilful workman, but according to my own directions, and at the expense of about forty guineas, a model of the tabernacle of *Moses*, and of the temple at *Jerusalem*, serving to explain *Solomon's*, *Zorobabel's*, *Herod's*, and *Ezekiel's* temples; and had lectures upon them at *London*, *Bristol*, *Bath* and *Tunbridge-wells*.[99]

Whiston's lecturing at provincial sites is an early example of what would soon become a standard pattern among lecturers such as Desaguliers and those of the second generation in mid-century. It is interesting that Whiston's move to religious topics in both his London and provincial lectures occurred at the same time his lecture series with the younger Hauksbee was beginning to break down. The coincidence of these two trends seems to make a link between them an unavoidable conclusion. It is less clear whether Whiston's move to incorporate religious topics was the result of early signs that the experimental course was beginning to fail, or whether it was itself one of the causes of the breakdown. It must be remembered that when Whiston began to advertise his services as a private tutor in mathematics, he had made it perfectly clear at that time that religious issues were not to be a part of his syllabus. These factors notwithstanding, it cannot be said that Whiston (or other lecturers for that matter) left religion completely out of his scientific material, for his *Astronomical Principles of Religion* (1717) was nothing if not a blend of scientific facts and religious polemics about design and providence in nature.

By June 1726, Whiston was advertising a small course to be run in his own house, apparently made up of highlights of material presented in previous lectures:

> Mr. Whiston proposes a small, but curious Course of Lectures, under the Heads following: First Monday, Magnetism. Wednesday, Astronomical Principles. Friday, Astronomical Numbers. Second Monday, Eclipses. Wednesday, Sacred Architecture past; or, Solomon's, Zorobabel's, and Herod's Temples. Friday, Sacred Architecture Future; or, Ezekiel's Temple. To begin, at his own House over-against Montague-House, this Evening, at Six a-Clock. Where Proposals are given gratis; as also by the Booksellers of London and Westminster.[100]

---

[99]Whiston, *Memoirs*, 1: 283.

[100]*DC* Monday 20 June 1726, No. 7699.

Similar reduced-rate, abbreviated courses were offered beginning on 4 July 1726,[101] 5 December 1726,[102] and 8 February 1727.[103] The July course also offered a viewing of Whiston's model of Ezekiel's Temple at 5 pm (one hour before the lectures began) for a fee of 2*s.* 6*d.* a viewer. The pricing scheme for the lectures themselves was variable: the basic fee was one guinea, but anyone who had attended Whiston's course of astronomy in the past had only to pay a half guinea, and those who were only interested in just the last two lectures of the course (on the tabernacle and the various temples at Jerusalem) were also only required to pay half a guinea. The advertisements placed in December 1726 and February 1727, virtually identical, also offered a broad range of lecturing and tutoring services:

> Thursday, Dec. 1.
>
> Mr. Whiston gives Notice, That he intends upon Monday the 5th Instant to begin to teach the Elements of Geometry to two different Setts of Scholars, at Two Guineas a Quarter each: The one Sett at Ten in the Morning, at his own House, over-against Montague-House; the other at Four in the Afternoon, at the Marine Coffee-house in Birchin-lane: each Sett to proceed every Monday, Wednesday, and Friday, as soon as Six have paid their Entrance Guineas. He also gives Notice, that he intends to have six Lectures upon Magnetism, Astronomy, and sacred Architecture, at each of those Places, the Week following after 20 Guineas are subscrib'd, at Six in the Evening: Where Proposals are given gratis, and Tickets deliver'd, for a Guinea a-piece; or half a Guinea for the three Lectures on sacred Architecture alone. He further desires, that those who have a Mind to subscribe for his Collection of Authentick Records, belonging to the Old and New Testament, will do it to himself, and that very soon; it being almost ready for the Press: And to take Notice, that into it will be inserted a genuine Epistle of the Corinthians to St. Paul, and St. Paul's Answer, just now recovered intire from the Armenians, and never published intire in Europe before.[104]

This appears to be the first time Whiston advertised for a course of geometry, and it is

---

[101]*DC* Monday 4 July 1726, No. 7711.

[102]*DC* Thursday 1 December 1726, No. 7840.

[103]*DC* Thursday 2 February 1727, No. 7894.

[104]*DC* Thursday 1 December 1726, No. 7840. An advertisement in the *Daily Post* gives notice of a Monday 17 April 1727 commencement date for the second proposed course, which appears to show that he was eventually successful in filling this course (*Daily Post* Saturday 15 April 1727, No. 2359).

important to note that Whiston was still maintaining his connection with the Marine Coffee House at this late date. Also of interest is Whiston's plan to begin his six evening course on magnetism, astronomy and sacred architecture only after twenty guineas had been subscribed. This not only tells us the number of auditors Whiston desired for this particular course (and perhaps the amount of room he had in his residence), but it also shows that his rates were a guinea for six nights and half a guinea for three nights. These fees are markedly higher that the usual rate of one shilling per night at most of Whiston's coffee house lectures in the past.

The last Whiston-Hauksbee course of experiments was advertised for a starting date of 26 February 1728 (after being deferred from 5 and then 19 February).[105] The last course of astronomy had been advertised for 24 March 1726 (after being deferred from 22 March).[106] To corroborate with the evidence from the survey of advertisements, we have unambiguous testimony from Whiston that his lecture courses with Hauksbee were completely over by early 1728.[107] In a letter of Whiston to a Mr. Archer in April 1728, Whiston complained to his correspondent that "since our Courses of Experiments seem to be at an end, which was one of y^{e} main supports of my self & family, we cannot but greatly want some assistance."[108] From this comment it becomes clear how important the income from lecturing income had become for Whiston. Although his letter also shows that lecturing income was not his only means of support, it is obvious that Whiston had come to depend on it. Furthermore, given that Whiston had been receiving a significant amount of his income from lecturing we must assume that he (and Hauksbee) had been relatively successful until

---

[105]*Daily Post* Monday 29 January 1728, No. 2606; Wednesday 31 January 1728, No. 2608; Friday 2 February 1728, No. 2610; Tuesday 13 February 1728, No. 2619; Thursday 15 February 1728, No. 2621; Monday 26 February 1728, No., 2630. As the last advertisement was placed on the last advertised starting date of the course, and because it refers to the course beginning on that day, it is likely that the course finally did run after two deferrals.

[106]*Daily Post* Wednesday 23 March 1726, No. 2026; Thursday 24 March 1726, No. 2027.

[107]Whiston's comment does not apply to single night lectures and coffee house efforts, although these too were presented much less frequently from the late 1720s.

[108]Whiston to Mr. Archer. 5 April 1728. British Library Add. MS. 28,104, fo. 26r. Archer is only identified on the address as "Mr. Archer in Soho Square" (Add. MS. 28,104, fo. 27r). A Mr. Archer named in the 1721 subscription for Whiston's longitude research may be the same person (see Appendix XI).

1727 or 1728 in filling courses. It may be possible to infer from this that many of the advertised lecture dates in the 1720s materialised in full courses. This and a later letter to the same contact also reveal that one of Whiston's new endeavours was placing bound volume sets of his works in various London libraries at rates of eight to nine guineas a set.[109] Hereafter Whiston turned increasingly to scientific and religious publishing, work on longitude and cartography, all the while still collecting patronage from his several loyal patrons.[110]

We can now consider the factors that may have led to the discontinuation of the Whiston-Hauksbee courses in experiment and astronomy. First, we know that the two lecturers had been facing competition beginning in 1713 from Desaguliers and, since 1718, from the Little Tower Street Academy. What was probably a limited market, may have become saturated when Little Tower Street began running their course; there may have been only enough demand in London in the 1720s to support adequately two independently run courses. And we know that the experimental courses of both Desaguliers and the Little Tower Street Academy outlasted Whiston and Hauksbee's jointly-run courses by many years, which may indicate that their lecture courses were more popular in the long run than Whiston and Hauksbee's. Another related problem may have been inferiority or paucity of equipment, for as information in the advertisements shows, the quality of the instruments was an important competitive factor. As well, it is possible that Hauksbee wished to move on to other projects. After all, he already had his instrument-making trade, since 1723 he had been clerk and housekeeper of the Royal Society, and we know that he collaborated in the 1730s with the chemist Peter Shaw on a lecture course of chemistry, and possibly a little earlier than this with Benjamin Robins in an experimental lecture course. Also, Whiston,

---

[109]In his first letter to Archer, Whiston commented that "this Proposal, if it succeed, will very seasonably afford us . . ." (Add. MS. 28,104, fo. 26r). However, a second letter to Archer shows that he had trouble collecting these funds not only from Archer, but at least one other person as well (Whiston to Archer, 7 April 1729. Add. MS. 28,104, fo. 28r). In May 1728 Whiston was also advertising sets of his "Opus Palmarium" to the public for one guinea (*DC* Wednesday 29 May 1728, No. 8310).

[110]It is possible that the £40-50 annuity Whiston began receiving in 1727 from Queen Caroline may have reduced the financial pressure for him to lecture. I deal with Whiston's various sources of patronage below, and in my paper, "'Sometime Professor of the Mathematicks.'"

already a known heretic and an object of some ridicule for his millenarian views, began to introduce religious topics into his independent lectures by the summer of 1726. This may have further marginalized him in the eyes of many. Another factor to consider is Whiston's age: he turned sixty in December 1727. Still, we know that the chemist George Wilson regularly lectured until he was eighty, and Whiston himself was nothing if not an energetic man. Whiston's age did stop him from carrying out further public lectures, an extensive publishing industry that included a mammoth translation of the works of the Jewish historian Josephus (which is still being reprinted today),[111] work on longitude and other scientific work such as designing telescopes,[112] as well as directing a survey of the English Channel and coastline.[113] Thus lack of energy and industry were probably not the main reasons behind the termination of the lecture course. The tone of Whiston's remarks in his 1728 letter to Archer indicates that the cessation of the lecture courses was not only involuntary, but that it put him and his family in a difficult financial position. Clearly, Whiston had come to depend on the revenues he obtained from his lectures with Hauksbee. On the other hand, Whiston's loss of lecturing income beginning in 1728 was partially compensated by the beginning of a £40-50 annuity from Queen Caroline the year before (the accession year of King George II and Queen Caroline).[114] This, along with other patronage, may have made lecturing less financially necessary.[115] Whatever was the cause of the demise of the

---

[111]Whiston published over fifty books, revised editions, charts and maps from 1728 until his death in 1752.

[112]Whiston appeared at the 22 October 1734 meeting of the Royal Society with a reflecting telescope that he had apparently invented or improved, and a copy of his presentation notes in his own hand survives as "A Description of Mr. Whiston's Reflecting Telescope for y^e^ discovery of y^e^ Longitude at Sea" (British Library Add. MS. 4433, fos. 45r-46v; see also Whiston's *To the . . . Commissioners of the Admiralty, the memorial of W.W. concerning a reflecting telescope discovered by him* [London, 1737]).

[113]In the early 1740s Whiston directed a survey of the English Channel and southern coastline. The result was a large map entitled *An Exact Trigonometrical Survey of the British Channel from the North Foreland to the Scilly Islands and Cape Clear on the southwest part of Ireland* (London: Sold by W. & I. Mount T. & T. Page on the Tower Hill, [1743] (see also Farrell, *William Whiston*, pp. 171-2).

[114]See Appendix XI.

[115]It should also be pointed out that Whiston's annual expenses probably decreased sharply when he and his wife ceased to keep their own house, and instead lived at their daughter and son-in-law's house in Lyndon, and at their son John Whiston's on Fleet Street. Evidence is presented below to suggest that William

lectures—and strong competition seems to be the most likely candidate—the end came reluctantly.

4.10 Whiston's Post-1728 Public Lecturing Career

This is not to say that Whiston never lectured again, for further advertisements and other evidence show that he lectured on several more occasions from 1729 all the way to 1750 (by which time he was eighty-two). In July 1729 Whiston was advertising similar subjects as he did in 1726 and 1727:

> MR. WHISTON, at Six a-Clock every *Wednesday* at *Grigsby*'s Coffee-house behind the *Royal Exchange*, has a short Lecture upon his Models of the Tabernacle of *Moses*, and the Temples at *Jerusalem*, each Auditor paying 1s. And if any Ladies or Gentlemen, not more than 10 in Number, desire a distinct Lecture, they shall, upon Notice, be attended at the same Place and Hour on other Days of the Week, paying one Guinea. Subscriptions are also there taken for the three large Lectures on that Tabernacle and those Temples, each Subscriber paying half a Guinea; to begin as soon as 20 have subscribed. And Note, that at the same Place the Mathematicks will be taught to any competent Number that desire to learn; each paying a Guinea Entrance, and two Guineas a Quarter for three Lectures a Week.[116]

In this advertisement Whiston, appealing to "Ladies or Gentlemen," offered a number of differently configured lectures. Among other information that can be derived from this notice, it is instructive to see Whiston once again placing minimum (as well as one maximum limit) on the number of auditors for some of his lectures (once again the minimum number is twenty), as well as the fact that privately arranged lectures were more expensive than scheduled talks. In February 1731 Whiston advertised for "a Course of XIV Lectures on Astronomy and Sacred Architecture" at the Amsterdam Coffee House and at Button's.[117] This course, which cost either one guinea for the whole course or one shilling per lecture, included a mixture of religion, astronomy, history and accounts of the Solomonic,

---

and Ruth Whiston were no longer maintaining their own residence by the early 1730s.

[116]*DC* Wednesday 23 July 23 1729, No. 8668. Whiston also speaks in his *Memoirs* about improvements he made "about the year 1728, or 1729" to his lectures on the temples (Whiston, *Memoirs*, 1: 283).

[117]*DC* Tuesday 2 February 1731, No. 9149.

Zerubabelian, Herodian and millennial (Ezekiel) temples at Jerusalem. Here again we see Whiston continue his program of blending science and religion in his lecture courses. This, however, is the last example of a Whiston lecture advertisement in the *Daily Courant* for the period 1712-1735.

Various other sources allow us to supplement this account with a summary of Whiston's lecturing activity in the period from 1730 to 1750. A reference in Whiston's *Astronomical Year* to "astronomical lectures" delivered in the winter of 1736 can be corroborated with an advertisement that appeared in late October in the *Daily Post*:

> MR. WHISTON intends to explain one of the most curious Points of Astronomy, which is that of the Transits of Venus and Mercury over the Sun, To-morrow Night, being the 28th of October, at the Amsterdam Coffee-House behind the Royal Exchange; on Friday Evening, being Oct. 29, at Sutton's Coffee-House in Aldergate-street; and one Saturday Evening, being Oct. 30, at the Temple-Exchange Coffee-House, Fleetstreet; all at Seven o'Clock. The Occasion of the Lecture is this, that Mercury will pass over the Sun for about 23 qrs. Hours the next Day, Oct. 31.[118]

This notice demonstrates that Whiston was still attempting to turn a profit from the movements of the heavens. Larry Stewart has identified two further Whiston lecture series advertised in January 1742, with one on longitude and latitude at the Temple Exchange Coffee House and another course run at the same time on religion:

> Mr. Whiston gives notice, that he intends two small Courses of Lectures for the Months of January: The one, nine lectures concerning Navigation, and the Discovery of the Latitude and Longitude at Sea, including the Survey of the Coasts, and his Method of giving Signals to Ships at Sea by Balls of Fire, to be thrown up, during those Lecture Nights, at Eight o'Clock when the Air is clear, out of a Demiculverin, from Shooter's-Hill; With the Way of observing them, and finding the Ship's Distance from them. The Lectures to be each Wednesday and Thursday Evenings, at Seven o'Clock, at the Temple-Exchange Coffee-house; to begin on Wednesday next. Every one paying a Guinea for the Whole, as a Benefactor, or 1s. each Time, as a bare Auditor. The other six Lectures upon his Models and Schemes of the Tabernacle of Moses, and of Solomon's, Zerobabel's, Herod's, and Ezekiel's

---

[118] *Daily Post* Wednesday 27 October 1736, No. 5343. Whiston's reference is in *The Astronomical Year; or, an account of the many remarkable celestial phænomena of the great year 1736; particularly of the great Comet which was foretold by Sir I. Newton, and appeared at its conclusion* (London, 1737), p. 11, cited in Farrell, *William Whiston*, p. 213.

> Temples at Jerusalem. To be on each Friday and Saturday Evenings, at Seven o'Clock, at the Horn Tavern; to begin on Friday next. Every one paying Half a Guinea for the Whole, as a Benefactor, or 1s. each Time, as a bare Auditor. Some Account of the later Meteor will be added to both Lectures.[119]

Here we see Whiston, by this time in his mid-seventies, lecturing on longitude and religion: two subjects that had brought him some ridicule in the past.

Whiston also apparently advertised for eight lectures on the subjects of astronomy and navigation in 1744.[120] Later the same decade, Whiston had moved more completely to religious lectures (although still incorporating science and astronomy into these talks). In August and September of 1746, Whiston once again delivered his 1726 series on the Tabernacle and Temple at Tunbridge Wells.[121] Whiston also delivered lectures on millenarian themes at Tunbridge Wells from 14-28 July 1748.[122] Furthermore, Whiston also

---

[119]*The London Daily Post, and General Advertiser* Saturday 2 January 1741-2, No. 2246. I owe this reference to Professor Larry Stewart, who kindly sent me a transcript of the advertisement after I failed to uncover it in any microfilm collections of newspapers. Professor Stewart discovered a clipping of this advertisement in British Library Add. MS. 47,012B, fo. 92. These two series are also referred to in Stewart, *Public Science*, p. 192. Nicholas Hans writes that Whiston "delivered two courses of lectures on Navigation in January 1742." This is probably a less detailed reference to the same courses Stewart has identified (Hans, *New Trends in Education*, p. 143).

[120]Hans, *New Trends in Education*, p. 143.

[121]Whiston refers to having a "pretty numerous audience" for this series. Whiston, *Memoirs*, 1: 324, 325, 332 (citation from page 332).

[122]The first date of these lectures, 14 July 1748, coincided with a rare annular solar eclipse. Whiston's lectures at this time were intended to be "preparatory to the Restoration of the Jews to the Rebuilding their Temple, and the commencement of the Millennium." Whiston also pointed to forthcoming astronomical events, such as the 1761 transit of Venus and various eclipses due in the 1760s, as signs of the restoration of the Jews and the approach of the millennium in 1766. Whiston includes an epitome of the six lectures in the first edition of his *Memoirs* (Whiston, *Memoirs*, 1st ed. [1749], 1: 602-10; see also Whiston, *Memoirs*, 2nd ed. [1753], 2: 243-4). Independent corroboration of this series, with its blend of scientific and religious topics, comes from the correspondence of Samuel Richardson, who refers to "the noted Mr. Whiston, showing eclipses, and explaining other phænomena of the stars, and preaching the millennium, and anabaptism" (Richardson to Miss Westcomb, n.d. *The Correspondence of Samuel Richardson* [London: Printed for Richard Phillips, 1804], 3: 318-19). This same volume includes a hand-painted fold-out engraving of a scene in Tunbridge Wells in 1748. Among the notables in this picture is an elderly Whiston, depicted walking away from the crowd with the use of a cane. Furthermore, a letter from the poet Edward Young (1683-1765) to the Duchess of Portland on 4 June 1748 appears to allude to this up-coming series, which may have been presented in London as well: "I give yr Grace Joy of a glorious piece of News, which probably You may live to see accomplished, I shall not. Mr Whiston was with me this Morning, & has assured me that eighteen years hence the Jews will be converted, & that twenty years hence the Millennium will begin; & next Week He begins a Course of Lectures in Town to satisfie ye World in that Particular. Lady Wallingford will probably have a Curiosity to see ye New buildings at Jerusalem for that City is to be rebuilt." Young to the Duchess of Portland, 4 June 1748, *The Correspondence*

took advantage of yet another natural phenomenon, the London earthquakes of February and March 1750,[123] to deliver three lectures on the earthquakes in London on 6, 8 and 10 March.[124] Finally, in what appears to have been his lecturing swan song,[125] Whiston attempted to deliver these same three lectures at Tunbridge Wells, starting on 19 July 1750. Sadly for Whiston, the outcome was a disappointment:

> . . . after my first Lecture, when I had 18 Auditors, and they perceived I intended to discourage the Gaming, and other Fooleries of that Place; and to call them to attend to the Warnings of Providence, by the late Meteors and Earthquakes, and to a Reformation of their Manners, not a single Person came to my second Lecture. So I came away, and was forced to leave the unthinking, and pleasurable Part to their own Folly; and I fear, in no long Time, to their own Destruction also.[126]

Thus was the end of an illustrious public lecturing career that had begun thirty-eight years earlier.

---

of Edward Young 1683-1765 (Oxford: Clarendon, 1971), p. 302. I owe this reference to Professor Gordon Fulton.

[123]The first mild earthquake hit London at just after twelve noon 8 February 1750 and the second at 5:30 am, 8 March 1750. Whiston gives us the attendance for the three lectures he held on these earthquakes as twenty-seven on 6 March, sixty-five on 8 March (attendance was presumably higher on this day because the second tremor had hit that very morning!) and forty-three on 10 March (Whiston, *Memoirs*, 2: 244). The complete texts of the lectures appear as volume two of Whiston's *Memoirs*. An account of these earthquakes, which were taken quite seriously at the time, is found in G.S. Rousseau, "The London Earthquakes of 1750," *Journal of World History* 11(3) (1968): 436-51.

[124]The texts of these lectures are published as volume two of Whiston's *Memoirs*. Hans also refers to Whiston advertising lectures "as late as 1749-50," but does not provide further details. Hans accessed this information, along with the previous examples of Whiston's lectures cited above, from a collection of newspaper cuttings in D. Lyons, *Collectanea*, 2 vols. and 5 vols., which he used at the British Library (Hans, *New Trends in Education*, p. 143).

[125] Farrell cites a letter from an O.J. De La Fontaine to Whiston dated 22 February 1750, in which Fontaine thanks the latter for permitting him to attend Whiston's religious lectures free. Fontaine also promises Whiston that he will bring two or three paying auditors on the lecture due to run the following Tuesday, which would be 27 February 1750 (De La Fontaine to Whiston, Field MS. No. 151B, 22 February 1750, cited in Farrell, *William Whiston*, p. 39). It is not easy to determine, however, if the reference to 1750 is Old Style or New Style. It seems more likely, however, to assume that Whiston was also delivering lectures before the above mentioned talks, than to conclude that he was still giving lectures in February 1751, N.S. In any case, Whiston left behind no reference to this February series in his *Memoirs*.

[126]Whiston, *Memoirs*, 2: 244.

5. THE LECTURING CAREER OF JOHN THEOPHILUS DESAGULIERS, 1713-1726

5.1 The Scientific Lecturing Career of John Theophilus Desaguliers

John Theophilus Desaguliers, arguably the most successful of the early experimental lecturers over the long term, will occupy our attention next. Unlike Whiston and the younger Hauksbee, Desaguliers' experimental lecturing career extends well beyond the period 1712-1728. This reconstruction of his lecturing career, however, will be limited mainly to a survey of the *Daily Courant* up to 1735, with supplementary information supplied from other newspapers such as the *Daily Post*. In these years, there are advertisements in the *Daily Courant* and *Daily Post* for Desaguliers' experimental lectures for every year from 1713 to 1726. From the early 1720s, Desaguliers began to rely increasingly on papers other than the *Daily Courant* and *Daily Post*. For these reasons, along with others already stated, and because Desaguliers' lecturing career is much less diverse than Whiston's and since many of the essential features of experimental lecturing have already been introduced in chapters 3 and 4, the following reconstruction of Desaguliers' early experimental lecturing career will be less extensive.

5.2 Biographical Background to Desaguliers

Jean Theophile Desaguliers, the son of Huguenot parents, was born in La Rochelle, France in 1683, before moving from this country with his family after the revocation of the Edict of Nantes in 1685.[1] His family moved first to Guernsey and then to London, where Desaguliers' father became minister of a French congregation and taught at a school in Islington. Desaguliers entered Christ Church, Oxford in 1705 and took his B.A. in 1709.

---

[1]There are a number of sources for Desaguliers' life and career. The best and most recent treatment of Desaguliers is that found in Stewart, *Public Science*, passim. Other studies include Johan A. Van Reijn, "John Theophilus Desaguliers, 1683-1983," *Thoth* 5 (1983): 165-204; Margaret E. Rowbottom, "John Theophilus Desaguliers (1683-1744)," *Proceedings of the Huguenot Society of London* 21 (1968): 196-218; Paul Richard Major, "The Physical Researches of J.T. Desaguliers" (M.Sc. Thesis, University of London, 1962), and Nicholas Hans, "The Rosicrucians of the Seventeenth Century and John Theophilus Desaguliers, the Pioneer of Adult Education," *Adult Education* 7 (1935): 229-40. A list of Desaguliers' publications, including many that appeared in the *Philosophical Transactions*, can be found in Wallis and Wallis, *Biobibliography*, pp. 45-9. See also the shorter accounts, A. Rupert Hall, "John Theophilus Desaguliers," *DSB*, 4: 43-6; Taylor, *MPTS*, p. 300; eadem, *MPH*, p. 116 and *DNB*, 5: 850-1.

After this he studied for a short time at Hart Hall under John Keill, who had established a course of experiments at that college.[2] Then, significantly, at some point in 1710 Desaguliers succeeded Keill at Hart Hall as lecturer of experimental philosophy, a position Desaguliers held until 1712, the same year he received his M.A. from Hart Hall. In 1712 Desaguliers moved back to London, and early in 1713 advertised his first course of experiments. Within a year of arriving back in London Desaguliers had come into Newton's favour, and began to act unofficially as curator of experiments for the Royal Society—a role he fulfilled until his death in 1744.[3] On 29 July 1714 Desaguliers was elected FRS.[4] Desaguliers also took holy orders and in 1714 was appointed chaplain to James Brydges, the Duke of Chandos, who became his patron and gave him the living of Whitchurch, Middlesex.[5] Furthermore, on 19 March 1719 Desaguliers, after completing the requirements, received both his Bachelor and Doctor of Common Law from Oxford.[6] Finally, having previously been initiated as a Freemason, in 1719 Desaguliers became Grand Master of the Grand Lodge.[7]

5.3 Desaguliers' Lecture Courses, 1713-1726

John Theophilus Desaguliers did not long delay in establishing himself as an experimental lecturer after his move back to the metropolis in 1712. From an advertisement Desaguliers placed in *The Post Boy*, we know that the former Oxford lecturer's first course was up and running by 7 January 1713:

> *There is now begun*
> A COURSE of MECHANICAL and EXPERIMENTAL PHILOSOPHY, consisting of Four parts, *viz. Mechanicks*, *Hydrostaticks*, *Pnuematicks*, and *Opticks*, to be perform'd by John Theophilus Desaguliers, of Hart-Hall in

---

[2]Taylor notes that Keill's course syllabus, which was published in the 1707 *Oxford Intelligencer*, was very similar in content to the Cambridge Whiston-Cotes course of the same year. Taylor, *MPTS*, p. 288.

[3]This semi-official position had been vacant since the death of elder Hauksbee earlier in the year.

[4]Hall, "Desaguliers," *DSB*, 4: 43-44.

[5]*DNB*, 5: 850. Rowbottom gives the date as 1716 (Rowbottom, "Desaguliers," p. 205).

[6]Rowbottom, "Desaguliers," p. 206.

[7]Rowbottom, "Desaguliers," p. 207.

> Oxford, A.M. at Mr. Brown's, Bookseller, at the Black Swan and Bible without Temple-Bar. Enquire of Mr. Robert Lloyd, in Bedford-street near Hand Ally, Grays-Inn; Mr. Geo. Payne, at the Leather Office in the Old Jury; or at Mr. Brown's aforesaid, where Catalogues of the Experiments may be had. Those who are willing to be present, are to pay One Guinea at the Time of Subscription, and One Guinea more the Third Night after the Course is begun. *N.B.* The Course began on the 7th of January 1712-13. at Six in the Evening.[8]

The course advertised here displays a number of features that are by now familiar: the quadripartite syllabus of mechanics, hydrostatics, pneumatics and optics; a course catalogue available to prospective auditors; a two guinea entrance fee (with one guinea down and one after the course had begun), and a six o'clock starting time. Desaguliers made sure that his academic qualifications were displayed, and had also managed to arrange for three shops where course catalogues might be picked up, including Mr. Brown, a bookseller, at whose premises this course was being held.

These arrangements seem to have been temporary, for his next advertised lecture (with a starting date of 14 May 1713), shows that he had agreed to run a course at the residence of the widow of the elder Francis Hauksbee:[9]

> At Mrs. Hawksbee's, at the upper-end of Hind-Court in Fleetstreet, will be perform'd a Course of Mechanical and Experimental Philosophy, consisting of 4 Parts, (v.z.) Mechanics, Hydrostatics, Pneumatics, and Optics, by John Theophilus Desaguliers of Hart-Hall in Oxford, A.M. This Course begins on Thursday the 14th of May 1713, at 6 in the Evening; and those who desire to be present are to pay one Guinea at the time of Subscription, and one Guinea more the 3d Night after the Course is begun. Subscriptions are taken in by Mr. George Payne at the Leather Office in St. Martin's lane, Mr Jonah Bowyer, Bookseller, at the Rose in Ludgate-street, Mr. Jonas Brown, Bookseller, at the Black-Swan and Bible without Temple-Bar, Mr. Desaguliers at the French School in Islington, or Mrs. Hawksbee's, where the Course is given. N.B. Catalogues of the Experiments may be had at the above

---

[8]*The Post Boy* Tuesday 6 January to Thursday 8 January 1712-13, No. 2726.

[9]It should be stressed that as Francis Hauksbee, Sr., was in his mid-forties when he died, his untimely death would have been both emotionally and financially devastating to his widow Mary, who, given marriage patterns at that time, was likely even younger than him. Incredibly, Wallis and Wallis record Hauksbee's burial date as 29 April 1713, which means that Desaguliers placed his first advertisement (4 May 1713) less than a week after the interment (Wallis and Wallis, *Biobibliography*, p. 12).

mention'd Places.[10]

Desaguliers' arrival at the former venue of the elder Hauksbee is significant. Here we see the former Oxford lecturer performing at the same location Hauksbee and his associates had held their lectures. It had only been August of the previous year that an eighteen lecture course by the two Hauksbees, Ditton and Whiston had been run at the same venue, and it had been as recent as 26 January 1713 that, with Whiston assisting, the elder Hauksbee had run his last course there. That Whiston, the younger Hauksbee and Desaguliers should all have had an association with the elder Hauksbee, says much about the influence and prestige of this pioneer of London experimental lecturing. As for Desaguliers, he appears to have been taking over the elder Hauksbee's course, along with the location, apparatus and any regular clientele the latter may have established.

After this course, Desaguliers advertised another course at Mrs. Hauksbee's for 14 December 1713, this time with the quadripartite syllabus qualified by the phrase "rationally demonstrated and proved by more than 300 Experiments."[11] Soon after this, Desaguliers began advertising in *The Englishman* on 14 January 1714 for an experimental lecture course to start on 8 February 1714.[12] This course was also to be held at Mrs. Hauksbee's residence. Two further ads were placed for an 8 February starting date,[13] but three days after this date, on 11 February, Desaguliers was still advertising, this time for a 12 February starting date.[14] This evidence almost without a doubt suggests a deferral (assuming that the course was run on the second date). Here the value of a complete survey of the advertisements of all lectures is once again demonstrated. For although Desaguliers had been advertising from 14 January

---

[10]*DC* Monday 4 May 1713, No. 3605.

[11]*DC* Friday 27 November 1713, No. 3783; *DC* Tuesday 8 December 1713, No. 3792. G.S. Rousseau refers to a catalogue of Desaguliers entitled *A Catalogue of the Experiments in Mr Desaguliers Course*, which is marked in an eighteenth-century hand with the date 14 December 1713. Rousseau claims that this lecture course took place at the Bedford Coffee House, but this must be a mistake. The catalogue is held by the British Library (shelf mark 551.d.19.81) (Rousseau, "Science Books," p. 255 n. 181).

[12]*The Englishman* Thursday 14 January to Saturday 16 January 1714, No. XLV.

[13]*DC* Monday 18 January 1714, No. 3817; *DC* Thursday 4 February 1714, No. 3832.

[14]*DC* Thursday 11 February 1714, No. 3838.

for an 8 February starting date, Whiston and the younger Hauksbee began advertising on 6 February for their own experimental lecture course to begin 10 February 1714. On top of this, in the same newspaper we read that Whiston's mathematical course had just been moved from Button's to a larger room at a nearby upholsterer, obviously due to its popularity.[15] There is no evidence that the Whiston-Hauksbee course was deferred.[16] Thus it may have proved difficult for Desaguliers to fill up his subscriptions by his initially scheduled date.

This pattern repeats itself the next time Desaguliers advertised a course. On 23 March 1714 he began advertising for a course set to begin on Monday 5 April.[17] However, on Monday 5 April Desaguliers had placed another advertisement with a new starting date two days later:

> On Wednesday the 7th of April 1714, at 6 in the Evening, will begin a Course of Mechanical and Experimental Philosophy, wherein the Principles of Mechanicks, Hydrostaticks, Pneumaticks and Opticks, are rationally demonstrated, and prov'd by more than 300 Experiments; by J.T. Desaguliers of Hart-Hall in Oxford, M.A. Those who desire to be present, are to pay one Guinea at the time of Subscription, and one Guinea more at the beginning of the Course. Catalogues of the Experiments may be had at the Widow Hawksbee's in Hind-Court, Fleet-street; where the Course is perform'd. N.B. The Lectures will be given in Latin, French, or English, as the Auditors shall require.[18]

There is no reference in the notice to the lecture being deferred, as it clearly must have been—such an admission may not have made good marketing sense. It seems likely that, as with his last course, competition may have been part of Desaguliers' difficulty, for Whiston and Hauksbee had been advertising their own experimental course, to begin on 14 April, since 31 March 1714.[19] Once again, there is no evidence that the Whiston-Hauksbee course

---

[15]Both notices appear in *The Englishman* Saturday 6 February to Tuesday 9 February 1714, No. LV.

[16]On the other hand, there is no *conclusive* evidence that the Whiston-Hauksbee experimental lecture course ran on the date advertised either. Even still, their advertising probably cut into Desaguliers' potential customers.

[17]*DC* Tuesday 23 March 1714, No. 3872.

[18]*DC* Monday 5 April 1714, No. 3883.

[19]*DC* Wednesday 31 March 1714, No. 3879; Friday 2 April 1714, No. 3881.

was deferred. After these two courses in early 1714, however, Desaguliers seems to have secured his place in the market, and he attracted enough interest to fill up virtually all his courses by the first advertised dates.[20] Before we leave this last advertisement, we should highlight Desaguliers' introduction, for the first time, of a notice that he was willing to give his talks in Latin and French, as well as English. This demonstrates that Desaguliers, whose first language was French, was appealing to monied French travellers and *émigrés*, and that he was also attempting to attract both British and other university-trained foreigners.

Desaguliers' next advertised lecture, for a starting date of 11 October 1714, shows three new developments:

> On Monday the 11th of October 1714, at 6 in the Evening, will begin a Course of Experimental Philosophy, wherein the Principles of Mechanicks, Hydrostaticks, Pneumaticks and Opticks, are rationally demonstrated and prov'd by more than 300 Experiments, by J.T. Desaguliers, M.A. and F.R.S. at his House at the farther-end of Plough-Court in Fetter-lane, where Subscriptions are taken in and Catalogues of the Experiments may be had. The Terms are two Guineas, one to be paid at the time of Subscription, and the other when the Course begins. N.B. Ten Tables of Figures relating to the Course, and Engraven in Copper Plates, are given to every Subscriber.[21]

First we see that Desaguliers, having been elected FRS in April of that year, was now including that designation after his name, as James Hodgson and the elder Hauksbee had done before him. Second, we learn that he had moved the venue of his course and the location for taking out subscriptions from the well-established site at Mrs. Hauksbee's in Hind Court, to his own residence on Plough Court, off Fetter Lane.[22] This placed Desaguliers just north of the instrument-making district around St. Dunstan's Church on Fleetstreet, as well as Crane Court, where the Royal Society was meeting (next door to where Whiston and

---

[20]There is a possible deferral of a Desaguliers course in November 1719, and two fairly certain ones in April 1722 and March 1723 (see Appendix VI).

[21]*DC* Friday 8 October 1714, No. 4043.

[22]This also shows that A. Rupert Hall is incorrect when he says that Desaguliers moved straight to Channel Row, Westminster, when he came back to London from Oxford. See Hall, "Desaguliers," *DSB*, 4: 43.

Hauksbee were running their course).[23] This notice also shows that Desaguliers was offering either a folio sheet, or a small pamphlet of engravings of experiments—just seven months after Whiston and Hauksbee first began to advertise their course book. As there is no evidence that Desaguliers printed the equivalent of a course book until 1717, and since the printed engravings were given free to subscribers (as opposed to the five shillings charged for the Hauksbee-Whiston course book), it can be assumed that this publication was ephemeral. Nevertheless, it may have been the beginnings of a more substantial course manual.

There are no further Desaguliers advertisements in the *Daily Courant* until one year later, when a notice appeared for a course to begin on 10 October 1715. Two new developments are revealed in this advertisement:

> On Monday the 10th Instant, at 6 in the Evening, will begin a Course of Experimental Philosophy; by J.T. Desaguliers, M.A. F.R.S. at his House in Channel-Row, Westminster. In this Course are rationally demonstrated the Principles of Mechanicks, Hydrostaticks, Pneumaticks, and Opticks; and proved by more than 300 Experiments. The Terms are Two Guineas and a Half, One Guinea paid at the time of Subscription, and the rest when the Course begins. N.B. Ten Tables of Figures engraven on Copper Plates, are given Gratis to every Subscriber.[24]

First, another change of venue is announced, this time to Channel Row in Westminster, which was also Desaguliers' new home. Moving to Westminster was a move up in the world, both materially and socially, and Desaguliers would remain at this location until 1739.[25] It is interesting that this change in venue also coincides with a rise in the course entrance fee from two to two and a half guineas. These two developments may represent a degree of stabilization in Desaguliers' career and financial status. Desaguliers may also have found that

---

[23]"Plough Court" can probably be identified with the "Plough Yard" of Rocque's 1746 map. This was a court leading off the east side of Fetter Lane (Rocque D1 12/2). There is also a "Plow Court" off Gray's Inn Lane to the northwest (Rocque D1 9/1) and a "Plough Yard" off Holbourn Hill to the northeast (Rocque D1 11/4). The first example, however, is the only lane that runs off Fetter Lane.

[24]*DC* Tuesday 4 October 1715, No. 4351; Thursday 6 October 1715, No. 4353; Saturday 8 October 1715, No. 4355.

[25]The section of Channel Row that on which Desaguliers lived was destroyed in 1739 to make way for the western approach of the Westminster Bridge, which opened in 1750 (Hall, "Desaguliers," *DSB*, 4: 45). This area can be seen on Rocque's map of 1746 (C2 13/3).

his courses had become popular enough to justify raising his price. It is interesting that Whiston and Hauksbee had already advertised their entrance fee at two and a half guineas in February of the same year.[26] Because there are no advertisements in the *Daily Courant* for Desaguliers' lecture courses for the first half of 1715, it is not possible to determine if Desaguliers was attempting to bring his price in line with Whiston and Hauksbee, or *vice versa*. At this point, Desaguliers' experimental lecture course appears to have stabilized into a regular pattern of two to four courses each year in London, as Appendix VI illustrates.

The next development of significance occurred in April 1717, when Desaguliers advertised for the first time a course of astronomy, along with his regular experimental course:

> On Tuesday the last Day of April 1717, at 6 in the Evening, will begin a Course of Experimental Philosophy, wherein the Principles of Mechanicks, Hydrostaticks, Pneumaticks and Opticks, are explain'd and demonstrated by more than 300 Experiments. By J.T. Desaguliers, M.A. F.R.S. at his House in Channel Row, Westminster; where may be had Catalogues of the Experiments, and Books for the Use of the Auditors, containing all the Lectures, and written in the most plain and intelligible Manner. And at the same Hour on Wednesday the 1st of May 1717, will begin a Course of Astronomy, wherein the Phœnomena of the Heavenly Bodies, the Causes of the Motions, and the System of the World, will be explain'd and illustrated by several Experiments; and the Manner of using Telescopes in observing the Stars and Planets by Day or Night, the Spots in the Sun, Eclipses, and taking the Diameters of Planets, and apparent Distances of the Fix'd Stars from each other. By the said J.T. Desaguliers. N.B. The Lectures will be in French, Latin, or English, as the Gentlemen present shall desire.[27]

Along with advertising new texts he had produced to go with his course of experiments,[28]

---

[26]*DC* Tuesday 8 February 1715, No. 4157; Friday 11 February 1715, No. 4150. These are the only two advertisements that I have come across that give a price for the Whiston-Hauksbee experimental course. The copy of the course book held by the British Library also gives the price as two and a half guineas. However, although we now know that this manual was initially published in 1714, we also know that there were several printed of this undated text. As already demonstrated, the copy held by the British Library, could have been printed at any time from 1714 to early 1722.

[27]*DC* Tuesday 16 April 1717, No. 4832; *DC* Tuesday 23 April 1717, No. 4838.

[28]One of the texts was probably Desagulier's eighty page synopsis of his lecture course, produced for auditors who preferred not to take their own notes. Desaguliers, *Physico-Mechanical Lectures, or an account of what is explained and demonstrated in the course of mechanical and experimental philosophy* (London, 1717).

Desaguliers here outlines a course of astronomy that appears to be similar to that first advertised by Whiston and Hauksbee in February 1718.[29] Perhaps Desaguliers was attempting to tap into the public interest in astronomy. If so, Desaguliers' course of astronomy seems to have proved less popular than that of Whiston and Hauksbee, as the May 1717 date is one of only four such courses advertised in the *Daily Courant* and *Daily Post* for the period up to 1728.[30]

Desaguliers was not adverse, it seems, to trying his hand at the "observational" public astronomical lectures that Whiston had made his own specialty years earlier. The first and only example of such an event was advertised before the 29 October 1723 transit of Mercury:

> On Monday the 21st Instant, at Six in the Evening, will begin a Course of Experimental Philosophy, wherein the Principles of Mechanics, Hydrostatics, Pneumatics and Optics, are proved and demonstrated by more than 300 Experiments. By J.T. Desaguliers L.L.D. F.R.S. at his House in Channel-Row, Westminster, where Subscriptions are taken in, and Catalogues may be had; as also at Mr. John Senex's, Bookseller, at the Sign of the Globe over-against St. Dunstan's Church in Fleetstreet, and Mr. Edward Scarlet, Spectacle-maker, at the Archimedes and Globe at the Corner of King's Street, near St. Ann's Church, Soho. N.B. Those that are Subscribers to this Course will have an Opportunity to see Mercury pass over the Disk of the Sun like a Spot, on the 29th Instant, if the Weather be fair: There being a Convenient Room and Apparatus prepared for that Purpose.[31]

Whiston and Hauksbee also advertised a viewing of this transit and, unlike Desaguliers, actually refer to the house were the transit was to be viewed.[32] However, while Whiston and Hauksbee planned to start their course (in this case it was astronomy) on the day of the

---

[29]Whiston, however, had been advertising lectures on astronomy independent of Hauksbee since November 1715, and appears to have been including astronomy in his mathematical coffee shop lectures since 1712 or 1713. Whiston had also, of course, delivered lectures on astronomy while Lucasian Professor at Cambridge.

[30]One astronomical course held in Bath around the time of the 11 May 1724 solar eclipse is dealt with below. The other two, both deferred at least once each, were held in April 1722 and February 1725. See Appendix VI.

[31]*DC* Monday 14 October 1723, No. 6858; *DC* Wednesday 16 October 1723, No. 6860; *DC* Friday 18 October 1723, No. 6862.

[32]*DC* Friday 25 October 1723, No. 6868.

transit, Desaguliers' experimental course was to commence several days before the event (which was to begin at 2:30 in the afternoon), and thus Desaguliers could give details after the course had begun. It is possible that a room had been prepared in his own house, with a telescope ready to be set up at an elevated window. However, depending on the location of the sun in the sky at that time of the day (the transit had been calculated to begin at 2:30 in the afternoon),[33] and the positions of the windows of his house (a window with a southern or southwestern exposure would have been best), Desaguliers may have had to arrange for a room at another home or building. Like Whiston, Desaguliers also hoped to benefit from the 11 May 1724 solar eclipse. An ad that appeared in the Daily Post shows that he planned to run a course of astronomy around the time of the event in the town of Bath:

> On the 7th Day of May, will begin an Experimental Course of Astronomy, at Bath, wherein the System of the World and the CœLestial Phœnomena will be explain'd, and the Physical Causes of the Motions of the Heavenly Bodies demonstrated by a great many Experiments contriv'd for that purpose. Herein Eclipses will be more particularly consider'd, and the great Eclipse of the Sun on the 11th Day of the said Month, which will be total at Bath) will be explain'd and shewn in the most Advantageous manner. By J.T. Desaguliers, L.L.D. F.R.S. N.B. Proposals may be had of, and Subscriptions are taken in by Mr. Ja. Leake, Bookseller, at Bath and Mr. John Senex, Bookseller, over against St. Dunstan's Church, Fleet-street; and all this Month of April of the Proposer, at his House in Channel-row, Westminster.[34]

This is an early example of Desaguliers moving out to provincial locations to perform lecture courses, and it is interesting to see that, as with the Whiston-Hauksbee course of astronomy, this astronomical lecture course is characterized as an "Experimental Course." This last course, along with the one held in October 1723, are the only two of "observational" lectures advertised by Desaguliers in the *Daily Courant* and *Daily Post* for the years up to and including 1726.

---

[33]See Whiston and Hauksbee's advertisement for the same event in *DC* Friday 25 October 1723, No. 6868.

[34]*Daily Post* Tuesday 28 April 1724, No. 1431. Larry Stewart points to Desaguliers' involvement in an observational project with the Royal Society at Bath during the eclipse (Stewart, *Public Science*, p. 146). It is not known whether this astronomical course was related to that project.

5.4 Lecturing Patterns of Desaguliers' London Lecture Courses

The fact that Desaguliers' above quoted April 1717 experimental course was set to begin on a Tuesday at 6 pm, and the course of astronomy on a Wednesday at the same time, shows that in this case his experimental course could not have been run on six consecutive nights of the week. A further detail is given in the advertisements for Desaguliers' next running of the astronomy lectures, April 1722:

> On Wednesday the 18th Instant, at Six in the Evening, will begin a Course of Experimental Philosophy, wherein the Principles of Mechanics, Hydrostatics, Pneumatics, and Optics, are proved and demonstrated by more than 300 Experiments, by J.T. Desaguliers, L.L.D. F.R.S. at his House in Channel-Row, Westminster, where Catalogues of the Experiments may be had; as also of Mr. Senex against St. Dunstan's Church in Fleet-street, and Mr. Scarlett's, Spectacle-maker, near St. Ann's Church in King-street, Soho. N.B. A Course of Astronomy will be likewise performed at the same place, on different Days.[35]

Taking the two advertisements together, it appears that at this time Desaguliers performed the different courses on alternating days. Desaguliers' experimental lecture course notes, published in 1717, reveal that his experimental course at that time consisted of twenty-two lectures.[36] Syllabi for the experimental course printed in 1724 and 1725 show that the course was still made up of twenty-two lectures and cost two and a half guineas a piece.[37] These syllabi also tell us that the experimental lectures were run at 6 pm, with the astronomical

---

[35]*DC* Friday 13 April 1722, No. 6389; *DC* Tuesday 17 April 1722, No. 6392; *DC* Saturday 21 April 1722, No. 6396. The last advertisement reveals that this lecture was deferred until 23 April. Notice also that Desaguliers was advertising himself as "LL.D" by this date.

[36]This is demonstrated in his *Physico-Mechanical Lectures* (London, 1717). See Hans, *New Trends in Education*, pp. 138-9 and Hall, "Desaguliers," *DSB*, 4: 45. I have not seen the English edition of the 1717 manual, but I have seen the French translation, and this also reveals a twenty-two lecture course (Desaguliers, *Leçons Physico-Mechaniques* [London: For the Author, 1717]).

[37]Desaguliers, *A Course of Mechanical and Experimental Philosophy* (1724, 1725). A clause is also included in this advertisement that notes that "any set of gentlemen that desire a private course are to pay three guineas each or if the lectures be French, the price likewise three guineas" (cited in Hans, *New Trends in Education*, p. 139). The same information (except the reference to twenty-two lectures) is provided in the edition of Desaguliers' syllabus of the same title reprinted as Appendix XVIII, although a manuscript alteration increases the price for general auditors to three guineas.

course delivered at 11 am.[38] With this alternate schedule, both courses could be run concurrently, although in the case of the course of astronomy, it would not allow for night-time observation. It seems likely that both schedules were used. The same syllabi also identify the astronomical course as consisting of sixteen lectures,[39] which confirms that it was a shorter course, as may have been the case with Whiston and Hauksbee's course of astronomy.

At the conclusion of Desaguliers' 1734 *A Course of Experimental Philosophy*, included along with an advertisement for his experimental course, is a notice for "A short but full Course of Astronomy."[40] In 1734 the charge was one guinea for each auditor, with a set minimum of ten auditors, or ten guineas for a smaller number. Desaguliers provides an indirect hint of the overall length of both his courses, when he promises in this experimental course syllabi of c.1725 that a person attending his courses would find the principles demonstrated "*better understood in a Month or six Weeks, than in a Year's close application to Books only.*"[41] Discounting Sundays, a twenty-two lecture course would take just under four weeks to complete if run on consecutive evenings; a sixteen lecture course would be finished in under three weeks. Alternatively, an experimental course run three nights a week (M-W-F) would take just over a month and a half to go through, while an astronomical course of sixteen lectures run at one lecture each Tuesday and Thursday, would also take about a month and a half to complete, depending on the configuration of the

---

[38]Nicholas Hans, who cites this information, actually says that the experimental courses were "delivered on Mondays at six p.m." and the course of astronomy "on Tuesdays at eleven in the morning" (Hans, *New Trends in Education*, p. 139). As this would draw out the course of experiments to almost half a year, I interpret this to mean that the lecture courses generally *commenced* on these days of the week. An 11 am starting time for the astronomical course seems to indicate that Desaguliers did not place the same emphasis on night time observation as did Whiston and Hauksbee in their astronomical course.

[39]Desaguliers, *Course of Mechanical and Experimental Philosophy* (1724,1725), cited in Hans, *New Trends in Education*, p. 139. A syllabus was also printed in 1725 for the course of astronomy: Desaguliers, *An Experimental Course of Astronomy* (see Hall, "Desaguliers," *DSB*, 4: 45).

[40]Placed after index in Desaguliers, *A Course of Experimental Philosophy* (London: Printed for John Senex, *et al*, 1734).

[41]Desaguliers, *Course of Mechanical and Experimental Philosophy* (c.1725), p. 1 (see Appendix XVIII). This claim is also cited in Hans, *New Trends in Education*, p. 139.

calendar for the particular month. Still, while some aspects of Desaguliers' courses, such as the number and content of lectures, can be illustrated on the available evidence, the exact configuration of the scheduling of these lectures remains to be demonstrated.

5.5 Desaguliers' Post-1726 Lecturing Career

The newspaper survey undertaken for this present study does not allow for a comprehensive analysis of Desaguliers' post-1726 lecturing career. However, several other sources provide some details of the period between 1726 and his death in 1744. We can begin by assessing Desaguliers' success in lecturing after his ads disappear from the *Daily Courant*. Desaguliers claimed to have run one hundred and twenty-one courses by early 1734,[42] which would mean an average of about five courses per year from 1713 to 1734.[43] The accumulated data presented in Appendix VI reveal a total of forty starting dates for Desaguliers' course of experiments (excluding dates doubled up by deferrals; this may represent closer to thirty-five actual courses). While we have no information on the amount of lectures performed from 1726 to 1734, Desaguliers' testimony demonstrates that even in the period from 1713 to 1726, for which we do have information from advertisements, the *Daily Courant* alone does not provide us with a full account of the frequency of Desaguliers' lecturing (as it nearly does with the lectures of Whiston and Hauksbee). There are anywhere from one to four Desaguliers experimental courses advertised each year in the *Daily Courant* from 1713 to 1726. Desaguliers' figure, as well as the average rate per year it implies, can be explained by several factors. First, Desaguliers starts his accounting of his experimental courses from his lectures at Hart Hall, Oxford in 1710-1712.[44] Second, it is evident that Desaguliers did

---

[42]Desaguliers, Preface, *Course of Experimental Philosophy*, p. [xvi]. While the context implies with a fair degree of certainty that Desaguliers is referring specifically to *experimental* lecture courses, it must be allowed as a possibility that he was including his astronomical lecture courses in order to pad his figure. This figure also reveals Desaguliers' success by demonstrating that he must have consistently filled his advertised and unadvertised courses.

[43]Heilbron estimates that this figure represents "some six cycles of his lectures every year." His comments, however, reveal that he is only including the public lectures from 1713 and not Desaguliers' lectures at Oxford from 1710 to 1712. Heilbron, *Electricity*, p. 161.

[44]Desaguliers, *Course of Experimental Philosophy*, Preface.

not advertise his lectures exclusively in the *Daily Courant*. We know that he used the *Post Boy* in 1713 and *The Englishman* in 1714, and after the introduction of the *Daily Post* in 1719 he began to rely increasingly on this newspaper. Third, Desaguliers was almost certainly including his provincial lectures in his figure, along with the lectures he carried out in the Netherlands in 1730.[45] Desaguliers also carried out private, unadvertised lectures. This is implied by his advertisement in his *Course of Experiments*, which shows that by 1734 at least, he was running unadvertised lectures to groups of various sizes, including private tutorials.[46] Desaguliers is probably including these unadvertised courses in his total figure as well. Still, 121 courses (perhaps most of them having twenty-two lectures) from 1710 to 1734 represents a fairly active career, and this on top of his experimental duties at the Royal Society and his other scientific work.[47] Desaguliers continued his lecturing at Channel Row until 1739, when his house was torn down to make way for the new Westminster Bridge. After this he took up residence in rooms at the Bedford Coffee House (by then a popular Whig meeting place),[48] where he performed his courses until his death on 10 March 1744, two days short of his sixtieth birthday.[49]

---

[45]*DNB*, 5: 850.

[46]The notice reads: N.B. The Course of Experimental Philosophy, of which this First Volume contains Half, is perform'd by the Author at his House in *Channel-Row*, *Westminster* (where Catalogues of the Experiments may be had) on such Days, and at such Hours, as shall be agreed upon by the Majority of the Auditors. *N.B. Every Auditor is to pay Three Guineas, when the Number is not less than twelve Persons; but any Three or Four, nay any one Person, may have a Course to themselves paying the Price of Twelve.*" Desaguliers, *Course of Experimental Philosophy*, after index.

[47]The degree of Desaguliers' scientific activity fits in well with Larry Stewart's characterization of Desaguliers' lacklustre efforts to fulfil his clerical duties. See Stewart, *Public Science*, p. 218.

[48]Stewart, *Public Science*, pp. 135, 146.

[49]Hall,"Desaguliers," *DSB*, 4: 45.

6. THE LITTLE TOWER STREET ACADEMY LECTURES, 1718-1728

6.1 Experimental Lectures at the Little Tower Street Academy

The Academy at Little Tower Street represents another type of venue for experimental courses, in addition to the instrument shops, book shops, coffee houses and residential venues used by the Hauksbees, Whiston and Desaguliers.[1] The first director of the school, Thomas Watts, appears to have founded a school at Abchurch Lane in 1715, which was originally called the Accomptant's Office.[2] The testimony of the advertisements shows that Watts had relocated the academy to Little Tower Street by early 1718.[3] The original name was still in use at this time, and true to this name its purpose was the education of young accountants and clerks.[4] In this section we will trace the teaching of experimental philosophy at the Little Tower Street Academy from the years 1718 to 1728.

6.2 Biographical Information on the Little Tower Street Lecturers

Little is known of the background of Thomas Watts (1695-1742), the apparent founder of the Academy.[5] He appears in advertisements in the *Daily Courant* as a lecturer at the Academy from 1718 to 1724. After this his name continues to appear in general advertisements for the Academy, and he becomes involved in a diverse number of commercial projects, including the Sun Fire Office from 1720, as well as acting as Whig

---

[1]There is little scholarly information on the Little Tower Street Academy, but see Hans, *New Trends in Education*, pp. 82-7 and Stewart, *Public Science*, pp. 134-5.

[2]Hans, *New Trends in Education*, p. 82.

[3]Evidence for this will be presented below. This moves forward the 1720 date given by Hans for the move to Little Tower Street (Hans, *New Trends in Education*, p. 82). Little Tower Street consisted of a short, sharp bend connecting Little Eastcheap and Tower Street, east of the Tower of London (Rocque E2 5/8).

[4]The early advertisements for the academy continue to mention this original and continuing purpose of the school.

[5]But see P.J. Wallis, "Thomas Watts: Academy Master, Freemason, Insurance Pioneer, MP," *History of Education Society Bulletin* 32 (1983): 51-3; Stewart, *Public Science*, pp. 134-9; Wallis and Wallis, *Biobibliography*, p. 78; Taylor, *MPH*, p. 146 and Hans, *New Trends in Education*, pp. 82-4.

M.P. for Mitchell (1734-1741) and Tregony (1741-1742).[6] Furthermore, it is known that Watts was an associate and business advisor of James Brydges, the Duke of Chandos.[7] Thomas Watts' lecturing partner for 1718-1724 was Benjamin Worster (1685- *c.*1725).[8] Worster, who was from Middlesex, had been educated at Cambridge, having been admitted as a pensioner to Emmanuel College on 6 March 1701, where he received his B.A. in 1704-1705 and his M.A. in 1708, the same year he was ordained in London as a deacon.[9] In 1722 Worster published an experimental course textbook, and the contents, which reveal the standard quadripartite subject matter, derive from the experimental lecture course he ran with Thomas Watts.[10] In 1725 William Watts and Peter Brown began to lecture in the place of Thomas Watts and Worster. Little is known of William Watts (*fl.* 1725-1754), who seems to have been Thomas's brother.[11] William Watts remained at the Academy until sometime in the 1740s, when he moved to another academy situated on Poland Street, where he was active until at least the mid-1750s.[12] Peter Brown (b. *c.* 1688) seems to have been with the Academy from 1717-1727 as a mathematics teacher, and taught experimental philosophy (according to the advertisements) with William Watts from early 1725 to early 1727.[13]

---

[6]Stewart, *Public Science*, p. 137; Wallis and Wallis, *Biobibliography*, p. 78.

[7]Wallis and Wallis, *Biobibliography*, p. 78. This connected Watts with Desaguliers' patron.

[8]On Worster, see Stewart, *Public Science*, pp. 134-5; Wallis and Wallis, *Biobibliography*, p. 120; Taylor, *MPH*, p. 151 and Hans, *New Trends in Education*, p. 82-3, 141-2.

[9]J. Venn and J.A. Venn, *Alumni Cantabrigienses* (Cambridge: Cambridge University Press, 1922-54), vol. IV, part 1, p. 465. Worster's presence at Cambridge at this time makes it possible for him to have attended Whiston's mathematical and astronomical lectures, and even the experimental course started by Whiston and Cotes in 1707.

[10]Worster, *A Compendious and Methodical Account of the Principles of Natural Philosophy: As they are Explain'd and Illustrated in the Course of Experiments, perform'd at the Academy in Little Tower Street* (London: Printed for the Author, and sold by W. and J. Innys, 1722).

[11]See the brief accounts of William Watts in Stewart, *Public Science*, p. 135, 138, 373, 376, 379; Wallis and Wallis, *Biobibliography*, p. 163; Taylor, *MPH*, pp. 166-7 and Hans, *New Trends in Education*, p. 56, 83, 86-7.

[12]Hans, *New Trends in Education*, pp. 86-7.

[13]On Brown, see Stewart, *Public Science*, p. 135; Wallis and Wallis, *Biobibliography*, p. 159; Taylor, *MPH*, p. 113 and Hans, *New Trends in Education*, p. 83.

Brown appears in the advertisements as "formerly of Trinity College in Cambridge."[14] The records of Trinity College confirm that Brown was admitted to Trinity College as a sizar at age sixteen on 5 April 1704, and that he graduated BA in 1707-1708. He was the son of Thomas Brown of Barnard Castle, Durham.[15] Finally, the last lecturer to appear at the Little Tower Street Academy is James Stirling (1692-1770), of whom much more is known.[16] Born in Scotland and from a family with Jacobite sympathies, Stirling first attended Glasgow University, before entering Balliol College in Oxford in 1711. By 1715 John Keill had brought Stirling's achievements to the attention of Isaac Newton. Stirling left Oxford sometime in 1716 without graduating after refusing to take the oaths necessary for him to continue in his scholarship. An accomplished mathematician, Stirling published his first work on that subject in 1717.[17] After this Stirling travelled to Venice, where he had secured a position, and remained there until 1724, at which time he returned to Scotland, and shortly thereafter established himself in London.[18] Through Newton's agency Stirling was elected FRS in 1726, and the following year he appeared at the Little Tower Street Academy.[19] While lecturing at the Academy, Stirling assisted in the publication of a course syllabus for the Academy,[20] and in 1730 he published *Methodus differentialis*, his *magnum opus* on

---

[14]See, for example, the first advertisement in which Brown appears, for a course to start 8 February 1725: *DC* Wednesday 3 February 1725, No. 7270.

[15]Venn and Venn, *Alumni Cantabrigienses*, vol. 1, part 1, p. 236. As with Worster, Brown's presence at Cambridge during the years of Whiston's Lucasian Professorship allows for the possibility that Brown attended some of Whiston's mathematical and scientific lectures.

[16]See Ian Tweddle, *James Stirling: "This About Series and Such Things"* (Edinburgh: Scottish Academic Press, 1988); C. Tweedie, *James Stirling: A Sketch of His Life and Works Along With His Scientific Correspondence* (Oxford, 1922); P.J. Wallis, "James Stirling," *DSB*, 13: 67-70; Stewart, *Public Science*, pp. 128, 135, 154, 156, 227 n41, 251, 254, 374-5; Wallis and Wallis, *Biobibliography*, p. 87; Musson and Robinson, *Science and Technology*, pp. 41-2; Taylor, *MPH*, 144-5 and Hans, *New Trends in Education*, pp. 68, 82-5, 140, 142.

[17]Stirling, *Lineæ tertii ordinis Neutonianæ, sive illustratio tractus D. Neutoni de enumeratione linearum tertii ordinis* (Oxford, 1717).

[18]Wallis, "Stirling," *DSB*, 13: 67.

[19]Wallis, "Stirling," *DSB*, 13: 67. According to Hans (*New Trends in Education*, p. 84), Stirling obtained his position at the Academy through the influence of both Desaguliers and Newton.

[20]Stirling, *et al*, *A Course of Mechanical and Experimental Philosophy* ([London], 1727).

mathematics.[21] He was to remain lecturing at the Academy and the Bedford Coffee House until 1735, when he returned to Scotland to head the reorganization of the Scottish Mining Company mines at Leadhills, Lanarkshire.[22]

6.3 The Little Tower Street London Lecture Courses, 1718-1728

The establishment of the Little Tower Street lecture course brought the number of consistently run public experimental courses to three in 1718. The first Little Tower Street experimental lecture course advertised in the *Daily Courant* appeared on 22 March 1718 for a course to begin on 2 April:

> A Course of Mechanical, Hydrostatical, Pneumatical and Optical Experiments, perform'd by Benj. Worster, M.A. and Tho. Watts. To begin Wednesday the 2d of April, at six in the Evening, at the Accomptant's Office for qualifying young Gentlemen for Business, in Little Tower-street. Where Catalogues may be had, and Subscriptions are taken in, as also at Mr. Innys's in St. Paul's Church-yard, and Mr. Clarke's, in Birchin lane.[23]

The course was well organised from the start, with a bookseller (Innys) and a stationer (Clarke) involved in the enterprise, a prepared catalogue with the by now standard quadripartite syllabus, along with the familiar evening starting time of 6 pm. The "performers" are identified as Benjamin Worster and Thomas Watts, with the former's academic credentials presented after his name (Worster's name is invariably placed first in the notices). The business and commercial aspects of the Academy, which still carried the name "Accomptant's Office," are evident in the advertisement.

Worster and Watts next appear in 1718 in advertisements for a course to begin on 29 September:

> A Course of Mechanical, Hydrostatical, Pneumatical, and Optical Experiments, by Ben. Worster, M.A. and Tho. Watts, at the Accomptant's Office for qualifying young Gentlemen for Business, in Little Tower-street;

---

[21]Stirling, *Methodus differentialis: sive tractatus de summatione et interpolatione serierum infinitarum* (London, 1730).

[22]Wallis, "Stirling," *DSB*, 13: 68.

[23]*DC* Saturday 22 March 1718, No. 5122; Tuesday 25 March 1718, No. 5124; Thursday 27 March 1718, No. 5126.

> will begin on Monday the 29th Instant, at 6 in the Evening. N.B. That the Course will contain not only all that is usual, but likewise some considerable Experiments which are entirely New; and that the Apparatus it self is new and compleat, and every thing contriv'd according to the latest Improvements. Catalogues may be had, and Subscriptions taken in at the Place of Performing, at Mr. Innys's, Bookseller, near St. Paul's Church, and at Mr. Clarke's, Stationer, in Birchin lane, near the Royal Exchange.[24]

This second advertised lecture shows that Worster and Watts were successful with their first course and had managed to break into the market. This time they also promise, in addition to what is "usual," new experiments and apparatus. It is possible that the success of their first series encouraged them to invest in more and better instruments. Whatever the case, they made the most of this advertising hook, for it appears in every one of the remaining Worster-Watts advertisements up to and including their last course together on 21 October 1724. The two next advertise for a starting date of 10 November 1718.[25] After this time Worster and Thomas Watts ran four lectures every year from 1719 to 1723, and two in 1724—the last year they lectured at the Academy.[26] Although their lecturing pattern becomes quite regular, it will be helpful to stress two additional features of the advertisements for this period.

First, in the advertisements for the 23 November 1719 lecture course, Worster and Watts append a further explanation of the benefits of their course: "the whole being very diverting and useful, not only for those who have learned Mathematicks, but for such as are not at all acquainted with that Study."[27] Here again we see a common conception of an essentially dual purpose of these experimental lectures: entertainment and utility. We also

---

[24]*DC* Tuesday 2 September 1718, No. 5262; Thursday 25 September 1718, No. 5282; Saturday 27 September 1718, No. 5284.

[25]*DC* Friday 17 October 1718, No. 5301; Wednesday 22 October 1718, No. 5305; Friday 31 October 1718, No. 5313; Saturday 8 November 1718, No. 5320.

[26]I am taking 11 January 1721 and 15 November 1723 as the starting dates of deferred lectures. There are two reasons for this. First, these dates are both followed by starting dates abnormally close given the established pattern (11 January 1721 is followed only twenty-one days later by a 1 February 1721 date and 15 November 1723 is followed only seven days later by a 22 November 1723 date). Second, if 11 January 1721 and 15 November 1723 are taken as non-deferred course dates, it breaks the otherwise regular planned pattern of four lectures per annum.

[27]*DC* Wednesday 11 November 1719, No. 5634; Monday 16 November 1719, No. 5638; Wednesday 18 November 1719, No. 5640; Monday 23 November 1719, No. 5644.

see an attempt to reassure potential auditors that the course was also good for both those who were familiar with the discipline of mathematics and those who were not (which would, after all, have included virtually everyone!). The next development of significance is the pre-publication announcement, appended to the advertisements for the 4 October 1721 course, of a new experimental philosophy textbook, written by one of the joint principals of the Academy, Benjamin Worster:

> N.B. There is in the Press, and will speedily be published, A Compendious and Methodical Account of the Principles of Nature Philosophy, as they are explained and illustrated in the Course of Experiments performed at the Academy in Little-Tower-street, by Benj. Worster, A.M.[28]

The next series of advertisements, announcing a course to begin on 10 January 1722, also give notice that the text would be published on the same day that the course was to begin.[29] In all, Worster and Thomas Watts appear to have delivered at least twenty-seven experimental lecture courses between April 1718 and October 1724.[30]

When the next Little Tower Street experimental course is advertised, for a course to start 8 February 1725, the two lecturers are listed as Peter Brown and William Watts:

> A Course of Mechanical, Hydrostatical, Pneumatical, and Optical Experiments, by Mr. Brown, formerly of Trinity College in Cambridge, and Mr. Watts, of the Academy in Little Tower-street; to begin on Monday the 8th Instant, at Six in the Evening. Catalogues may be had, and Subscriptions are taken in at the Place of performing; at Mr. Clark's in Birchin-lane, at Mr. Symon's near the Royal Exchange; and at Mr. Innys's, at the West-End of St. Paul's Church.[31]

---

[28]*DC* Monday 25 September 1721, No. 6218; Friday 29 September 1721, No. 6222; Wednesday 4 October 1721, No. 6226.

[29]*DC* Saturday 6 January 1722, No. 6306; Tuesday 9 January 1722, No. 6308. Worster's Preface is dated "Dec. 30. 1721" (Worster, *Principles of Natural Philosophy*, p. viii).

[30]See Appendix VII.

[31]*DC* Wednesday 3 February 1725, No. 7270; Friday 5 February 1725, No. 7272. Although William Watts' first name is not given in this advertisement, it can be assumed that the designation "Mr. Watts" refers to him. First, there seems to be no convincing reason for Thomas Watts to suddenly drop his first name after advertising it for seven years. Second, William Watts' first name does appear with Brown's in the advertisements for the course to begin on 16 November 1726 (see the first advertisement in this series: *DC* Wednesday 2 November 1726, No. 7815). Perhaps the proprietors of the Academy felt that it would appear too unstable for two names to drop from the advertising and be replaced by two completely different lectures, and

While Watts, who almost certainly did not have a university education, is given no credentials, Peter Brown is identified as having studied at Cambridge. The lack of reference to a degree, if we did not know otherwise, would appear to imply that Brown did not take a degree (assuming that, as with Desaguliers, the greatest possible qualifications were always given in the ads). Perhaps his BA was not considered as prestigious as an MA or a LL.D. Although Peter Brown is still listed as performing lectures for the Academy in a syllabus published some time in 1727,[32] the last time he appears in a Little Tower Street advertisement is for a course set to begin on 18 January of the same year,[33] after having given two courses each year with William Watts in 1725 and 1726.

By the early 1720s advertisements listing a wide range of educational services offered at the Little Tower Street Academy began appearing in both the *Daily Courant* and the *Daily Post*. Here is an elaborate example from March 1726:

> At the Academy in Little Tower-street, is to be learn'd every Qualification necessary for Business or Accomplishment, after a peculiar and approved Method, there being retained several Professors capable to answer for their respective Trusts, to teach Writing, Arithmetick, and Merchants Accounts, all Parts of Mathematicks, and to give Courses of Experimental Philosophy, also the Classicks and modern Languages, and to Foreigners and others not well informed therein, the English Language, Drawing, Dancing, &c. There are also proper Accommodations for Boarding, and those that do not board may be taught either in publick or private, the Pupils being under proper Regulations, and the whole Education so calculated as to answer the Ends of those whose Fortunes are not abounding, as well as of the rich, the Charge increasing only with the Number of Qualifications to be attain'd, as may be seen at large in the Account of the Conditions and Terms to be had at the said Academy. Letters are directed to Mess. Tho. and W. Watts: And from this Academy Noblemen, Gentlemen, and Merchants, may be always likely to be supplied with Stewards, Clerks, or Book-Keepers, duly qualified, and capable to give Security for their Fidelity.[34]

---

thus decided to make it appear as if Thomas Watts was still lecturing.

[32]Brown's name, along with that of Stirling who replaces him in the advertised lectures, appears in the advertisement placed in the 1727 Little Tower Street syllabus *A Course of Mechanical and Experimental Philosophy*. Cited in Hans, *New Trends in Education*, p. 83.

[33]*DC* Friday 13 January 1727, No. 7877; Wednesday 18 January 1727, No. 7881.

[34]*DC* Friday 25 March 1726, No. 7625.

The information in this advertisement is a very diversified, and provides confirmation of the continuing mercantile connections of the Little Tower Street Academy, as well as the fact that the Academy also acted as an employment agency. It is also interesting to see a deliberate appeal to "those whose Fortunes are not abounding," in addition to "the rich," along with evidence of some sort of a sliding fee scale. This notice also demonstrates that the Little Tower Street lecturers, like Desaguliers, appealed to foreigners as well. The general notice of the availability of "Courses of Experimental Philosophy," may be either a reinforcing notice for the Academy's regularly scheduled experimental courses, or it could represent an attempt to attract interest in additional courses. Finally, this advertisement also reveals Thomas Watts' continuing association with the Academy.

The next experimental lecturer to appear in advertisements for the Little Tower Street Academy is James Stirling, who we first see in a notice for a course set to begin on 1 November 1727:

> A Course of Mechanical and Experimental Philosophy, to begin on Wednesday the 1st of November, at Six in the Evening, at the Academy in Tower-street, by Mr. James Stirling, F.R.S. and Mr. William Watts: The Design in this Course is to demonstrate those Things by Experiments that have been found out by Geometrical Reasoning; which may be useful to such as are acquainted with Mathematicks, but will be more particularly so to those who are not acquainted therewith; it being very possible this Way to come to the Knowledge of many Things, which cannot be attain'd any other without much Study and Application. Subscriptions are taken in, and Catalogues to be had at the Place of Performing, at Mr. Strahan's and Mr. Symon's near the Royal Exchange, Mess. Inny's near St. Paul's Church, and at Mess. Woodman and Lyon's in Covent Garden.[35]

It is interesting to see in this advertisement that Stirling is announced as a Fellow of the Royal Society, while his academic background at Glasgow and Oxford is left out. The notice is worded differently than the immediately previous Little Tower Street advertisements, and places emphasis on experiment as a non-geometrical method of learning natural philosophy and mechanics, as well as stressing the claim that learning through experiment involves a reduced investment of time and effort. Stirling and William Watts then advertise four

---

[35]*DC* Tuesday 24 October 1727, No. 8124; Tuesday 31 October 1727, No. 8130; Wednesday 1 November 1727, No. 8131.

experimental courses in 1728, which takes us to the end of the period under consideration.[36]

The next development is seen in a Little Tower Street advertisement that gives notice of a course of geography and astronomy to be presented by Stirling and Watts on 26 March 1728:

> A Course of Geography and Astronomy, by Mr. JAMES STIRLING, F.R.S. and Mr. WILLIAM WATTS, to begin on Tuesday the 26th of March, at the Academy in Little-Tower-street, at Six in the Evening. In this Course will be explained the System of the Universe in general, and the Terraqueous Globe in particular, from whence will be given a distinct Idea of these Sciences, and their Application to the useful Parts in Life, and the whole will be so illustrated with proper Instruments, (as Globes, Spheres, Orrery, and several other Contrivances) that those who have not been used to Studies of this Nature may hereby easily attain to a great Degree in this most useful part of Knowledge. The Charge is Two Guineas; but any Number, not exceeding Six, and paying for Six, may go through the same in private at their own Hours, and those who are desirous may go over the Course again for One Guinea, and afterwards as often as they please gratis. Catalogues may be had at the Place of performing, at Mr. Strahan's and Mr. Symon's near the Royal Exchange; Mess. Innys in St. Paul's Church-yard; and Mess. Woodman and Lyon in Covent-Garden.[37]

This advertisement reveals a completely new course with a reconfigured schedule and payment scheme. First, the subject matter, geography and astronomy, had not been advertised before by the Academy. Second, although globes, spheres and orreries were to be used as pedagogical aids, this was not an experimental course. Nevertheless, the utility of the knowledge demonstrated in the course is emphasised. The move to astronomy at this point is interesting; perhaps with the demise of Whiston and Hauksbee's astronomical lectures, a niche for this subject had opened up, as Desaguliers appears to have been the only other lecturer offering a course of astronomy at this time. Using Tuesday as a starting day is a clear break from the Little Tower Street tradition of starting on either Monday,

---

[36]The starting dates of these courses are given in Appendix VII. No Little Tower Street advertisements appear in the *Daily Courant* from March 1728 until the newspaper's demise in 1735. However, there are indications that Stirling and William Watts continued to advertise their courses in the *Daily Post*. For example, an advertisement for an experimental lecture course presented by these two men to start on 15 January 1729 appears in the *Daily Post* late in 1728 (Thursday 19 December 1728, No. 2885).

[37]*DC* Saturday 23 March 1728, No. 8253.

Wednesday or Friday, and gives evidence of a new lecturing schedule for this course. Furthermore, the course fee is given at only two guineas, which may indicate that it was of shorter duration than the experimental course. Also, as with Desaguliers, the advertisement offers a payment scheme whereby a private course might be set up, as well as the guarantee that a person could attend the course a second time for half-price, and after that for unlimited sessions—a sort of lifetime membership.

The last Little Tower Street advertisement to appear in the *Daily Courant* for the period up to and including 1735, is a general ad for a wide range of educational services offered by the school. This notice ran for three consecutive insertions in late October 1728:

> The Academy in Little Tower-Street, is carryed on by Mr. William Watts, Mr. James Stirling, F.R.S. and Mr. John Bland, late of the Custom-House; where, after a peculiar and approved Method, any Qualifications necessary for Business or Accomplishment are to be learned, as Writing, Arithmetick, Merchants Accounts, all Parts of the Mathematick, Classicks, French, &c. and also a curious and compleat Apparatus for giving Courses of Geography, Astronomy, and Experimental Philosophy. The Pupils may be boarded in the Academy, or daily attend the Hours for Instruction. The Accommodations are proper and convenient, and the whole Oeconomy so suited, as to tend to a diligent Application to Business, and a regular Way of Life, and which will Answer the Ends of those whose Fortunes are not abounding, as well as of the Rich, the Charge encreasing only with the Number of Qualifications to be attained, as may be seen at large in the Terms and Conditions to be had at the said Academy.[38]

This advertisement once again reveals the continuing commercial interests of the Academy, as does the appearance of the name of John Bland, formerly a clerk at Custom House.[39] The promise is also made that the courses offered would be of benefit to "those whose Fortunes are not abounding, as well as of the Rich." Even with this stress on curricula that would assist a young man preparing himself for business, the courses of geography, astronomy and experimental philosophy, along with their apparatus, were still being advertised—albeit

---

[38]*DC* Thursday 24 October 1728, No. 8437; Friday 25 October 1728, No. 8438; Saturday 26 October 1728, No. 8439.

[39]John Bland (1702-1750) is perhaps best known for his *Essay on Writing* (1730), which he produced while at the Little Tower Street Academy. Bland took a clerkship at Custom House in 1717, and became Writing Master in 1726 at the Little Tower Street Academy, where he stayed until 1739. *DNB*, 2: 660.

without set starting dates. Unfortunately, no notices for coffee house experimental courses by Academy lecturers appear in the *Daily Courant* or the *Daily Post* in this period.[40]

6.4 Lecturing Patterns of the Little Tower Street Academy Lecture Courses

At this point it will be helpful to bring together the available information in order to reconstruct the Little Tower Street lecturing patterns and course schedule.[41] Compared with the complicated and seemingly contradictory patterns of Whiston and Hauksbee's courses, Little Tower Street is relatively straightforward and poses few problems. The material presented above demonstrates that after running three courses in 1718, Benjamin Worster and Thomas Watts delivered four advertised lectures each year from 1719 to 1723, with courses generally beginning in January, March, October and November. On two occasions, once due to a possible deferral from a January date, lectures were advertised as beginning in February. In 1724, Worster and Thomas Watts advertised only two courses, one for a starting date in February and the other to begin in October. When William Watts took over with Peter Brown, this semi-annual pattern is continued into 1727 (including a November 1727 course with Stirling). On the whole, the courses seem to have been quite stable, with evidence of only two, or at the most, three deferrals.[42] Under Worster and Thomas Watts, from 1719 to 1723, the starting dates are advertised at fairly regular intervals in the lecturing season, especially those of October and November, which are always between thirty-seven and forty-four days apart.[43]

Although I have not come across any direct evidence to suggest how many lectures the Little Tower Street experimental course contained, the accumulated evidence of regular

---

[40]However, Wallis and Wallis refer to lectures delivered by Thomas Watts and Benjamin Worster "at Innys's, booksellers, and Clarke's, stationers" (Wallis and Wallis, *Biobibliography*, p. 78), and Taylor notes that Brown and Stirling also presented their experimental course at "a room over the Bedford coffee-house, Covent Garden" (Taylor, *MPH*, p. 113). Taylor's information appears to derive from the 1727 Little Tower Street course catalogue.

[41]Refer to Appendix VII for a comprehensive listing of course dates.

[42]That is, almost certainly 15 November 1723 to 22 November 1723 and 26 January 1726 to 2 February, and possibly 11 January 1721 to 1 February 1721.

[43]See Appendix VII.

intervals between the starting dates of courses in the lecturing season can be combined with other available evidence to allow for some extrapolations. First, in his citations from the 1727 Little Tower Street syllabus, Nicholas Hans not only notes that the entrance fee for the course in experimental philosophy was three guineas at this time, but also that this course ran three times a week.[44] Second, in the entire period from 1718 to the end of 1728, experimental lecture courses are advertised without exception as starting on either Monday, Wednesday or Friday evenings, but never on Tuesdays or Thursdays. This strongly suggests a weekly M-W-F pattern for the lecture course. This conclusion is verified by the advertisements for the experimental course originally advertised to begin on 15 November 1723, which include the following note:

> N.B. Courses are continually performing at the Academy above, every Monday, Wednesday, and Friday, in the Evening, during the Winter Season, and at other proper Times (that do not interfere with the Hours of Education) any select Company may go through the Course in private, either at Home or Abroad.[45]

Not only does this advertisement refer to a winter lecturing season and the possibility of private courses, but it provides direct evidence that the course of experiments was *regularly* run on Mondays, Wednesdays and Fridays. Therefore, since we know the interval periods between starting dates in the lecturing season, and the days of the week on which the course was performed, we can provide an extrapolation of the number of lectures in each course.

There are no fewer than thirty-seven days and no more than forty-four between lecture starting dates in October and November from 1718 to 1723. A similar pattern of intervals is evident between starting dates in January, February and March. There are also no less than forty-two days between November and January starting dates. By reconstructing the calendars for these periods and counting the number of Mondays, Wednesdays and Fridays between the starting dates, a pattern emerges. The interval from 29 September to 10

---

[44]Stirling, *et al*, advertisement, *Course of Experimental Philosophy*, cited in Hans, *New Trends in Education*, p. 83.

[45]*DC* Wednesday 6 November 1723, No. 6878; Monday 11 November 1723, No. 6882. This course was deferred to 22 November 1723, exactly one week later, and the advertisements for the new date contain the same appendix. *DC* Friday 15 November 1723, No. 6886; Wednesday 20 November 1723, No. 6890.

November 1718 allows for a maximum of eighteen lecture course days; 12 January to 4 March 1719, allows for twenty-two; 14 October to 23 November 1719, seventeen; 26 January to 9 March 1720, eighteen; 19 October to 25 November 1720, sixteen; 1 February to 10 March 1721, sixteen;[46] 4 October to 10 November 1721, sixteen; 10 January to 19 February 1722, seventeen; 3 October to 14 November 1722, eighteen; 16 January to 6 March 1723, twenty; 9 October to 22 November 1723, eighteen.[47] From this pattern it seems safe to conclude that the Little Tower Street experimental courses originally ran for no more than sixteen lectures, and thus were scheduled differently than the Whiston-Hauksbee and Desaguliers courses.[48] As the syllabi for the different experimental lecture courses show that the Little Tower Street lecturers covered a similar amount of material to the other experimental lecture series, this shorter course may indicate that each evening lecture was longer on average than the lectures of other courses. The consistency of the Little Tower Street schedule and the low deferral rate, also indicate that the Little Tower Street experimental course offered a stable source of income for its proprietors.[49]

[46]11 January to 1 February 1721 allows for only nine course days, and thus is probably a deferral since it breaks sharply from the established pattern. The originally initially intended starting date of 11 January 1721 allowed for twenty course days for the previous course, which was advertised to begin 25 November 1720.

[47]The originally intended date of 15 November 1723 allowed for sixteen days between the starting dates.

[48]This applies to the period in which Benjamin Worster and Thomas Watts were running the course (1718-1724). It is likely that the later lecturers made alterations in the previous patterns.

[49]It is also noteworthy that from January 1720, the Little Tower Street lecturers almost always advertised their courses in both the *Daily Courant* and the *Daily Post*, unlike the other experimental lecturers. This demonstrates that the Little Tower Street advertising bill would have been higher, and also may imply that they were consistently attracting a larger number of auditors than Whiston, Hauksbee and Desaguliers (this in addition to the fact that the premises at the Academy probably allowed for a greater number of auditors than residential venues).

7. EXPERIMENTAL COURSE LITERARY TECHNOLOGIES

7.1 Advertising Experimental Science

Without advertisement, the phenomenon of experimental lecturing would not have been possible. Experimental lecturers promoted their courses in several ways. First, they did so primarily through newspaper advertisements. The success of this method of promotion is revealed by the consistent and continuing use of the medium. The particular style of promotion, which exposed science and science lecturers to a consuming public, and the popular form of experimental philosophy, were in large part defined by the arrival of the newspaper press—a medium that was just beginning to have a significant impact on cultural life in the metropolis.[1] A second means of exposure was through the course "catalogue." These small and inexpensively produced ephemera could be picked up at booksellers' shops and the lecture venues themselves. They would no doubt also find themselves in broader circulation at the coffee houses and other places of meeting, as prospective auditors passed them around and compared their contents. A third medium of promotion was through notices placed in course textbooks and other more permanent publications.[2] Finally, the ever-present word of mouth advertising would ensure that even many who did not read the printed

---

[1]One of the most immediate consequences of the lapse of the Licensing Act in 1695, was a pronounced expansion in the circulation of newspapers in England. In the ensuing years, a plethora of new titles appeared in London, and even in the provinces. It has been estimated that by 1704, on the eve of the first public experimental lecture course in London, the twice-weekly *London Gazette* was printing 6000 copies each Monday and Thursday, the tri-weekly *Post Man* and *Post Boy* were publishing each week 11,600 and 9000 copies respectively, and the *Daily Courant* (the only London daily until 1719) was circulating 800 copies each day. In all, something like 44,000 newspapers were being produced each week in the metropolis in 1704. With some fluctuations, this number continued to grow rapidly. As James R. Sutherland points out, the success of a daily such as the *Daily Courant*, demonstrates the emergence of a public that was willing to purchase and read a daily on top of the great number of newspapers published twice and thrice weekly. Sutherland, "The Circulation of Newspapers and Literary Periodicals, 1700-30," *Library* 4th ser. 15 (1934-35): 110-11. See also Jeremy Black, *English Press*, pp. 1-24.

[2]Even the associates of lecturers might include such advertisements in their own publications. For example, Humphrey Ditton placed in his *The New Law of Fluids* both an advertisement for the younger Hauksbee's air-pumps and other scientific instruments, as well as the following notice: "N.B. That at the same Place, and by the same Person, are shewn Courses of Philosophical Experiments under the following Heads, viz. Mechanicks, Hydrostaticks, Pneumaticks and Opticks: Also Lectures read on each Head" (Ditton, *The New Law of Fluids: Or, a Discourse Concerning the Ascent of Liquors, in Exact Geometrical Figures, Between Two nearly Contiguous Surfaces* [London: Printed by J. Roberts, for Benj. Cowse, at the Rose and Crown in St. Paul's Church-Yard, 1714], p. [viii]). Ditton also included a defense of his proposal with Whiston for discovering the longitude (Ditton, *New Law of Fluids*, pp. [75-80]).

advertisements were aware of the courses. These four means of advertising probably resulted in privately arranged courses from time to time as well. The lecturers' use of newspaper advertisements will be touched upon in sections below on competition and the social location of the advertisements. Immediately below, however, we will turn to a more detailed consideration of the function of course texts, catalogues and other ephemera.

7.2 Literary Technologies: Lecture Course Texts, Catalogues and Ephemera

As we have already seen, experimental lecturers produced various types of printed material to go along with their courses. These forms of "literary technology" ranged from cheaply produced course syllabi and single sheet ephemera to full volumes of the texts of lectures, complete with engravings.[3] The ephemera (such as catalogues) were either distributed at no charge as part of the lecturers' promotional strategies, or were given free to those who attended the courses (such as sheets of printed copper plates). This last strategy formed a part of the lecturers' promotion in the newspaper advertisements. The more substantial bound manuals and texts, on the other hand, which included engravings and figures, were offered for sale and thus contributed to the lecturers' income. Removed from the immediate physical context of the lecture demonstrations, the course texts, with their commentaries on experiments and three dimensional copper engravings (some showing experimental activity taking place), not only allowed for a multiplication of auditors, but also created a "virtual audience."[4] This section will also demonstrate that these printed by-products of lecturing are valuable for their descriptions of course content by providing both syllabi and other types of material, such as information about course fees and venues. Occasionally, biographical details about the lecturers can also be gleaned from such material.

---

[3] I am taking the term "literary technology" from Shapin and Schaffer's *Leviathan and the Air-Pump*, where they apply it to Boyle's printed texts, which included both text and engravings (see Shapin and Schaffer, *Leviathan and the Air-Pump*, p. 25).

[4] I am borrowing and adapting these constructs from Shapin and Schaffer, who speak of "the technology of virtual witnessing," which not only multiplies the number of possible witnesses, but also "involves the production in a *reader's* mind of such an image of an experimental scene as obviates the necessity for either direct witness or replication" (Shapin and Schaffer, *Leviathan and the Air-Pump*, p. 60). As my concern here is more directly related to the influence of the lecturers and the identity of the audience rather than the sociology of knowledge production, I am employing the term "virtual audience."

7.3 Francis Hauksbee, Sr. and James Hodgson

The use of printed "catalogues" or "proposals" began with the first experimental lecture course offered by the elder Hauksbee and James Hodgson. The initial advertisement for their 8 January 1705 course gives notice that course proposals were available for viewing at the venue at Mr. More's (possibly a bookkeeper), the shops of the instrument-makers Rowley and Senex, and at Hauksbee's own premises on Gilt-spur Street.[5] It is not clear whether the proposals for this course were given away to prospective auditors, or merely available for viewing, as the advertisement implies. In any case, by the time they were advertising their 7 February 1707 lecture course, Hauksbee (and possibly Hodgson) were giving notice that the "Proposals at large may be had, and the Utensils . . . seen" at Hauksbee's premises in Wine Office Court.[6] A course syllabus, dating from the period Hauksbee and Hodgson were lecturing at Wine Office Court, has survived and is held by the Bodleian Library.[7] The publication in 1709 of Hauksbee's *Physico-Mechanical Experiments* was an obvious spin-off from both his public experimental courses and his experimental duties at the Royal Society.[8] The text was advertised as recently published in August 1709:

> Just Publish'd,
> A Book Entitled, Physico: Mechanical Experiments on various Subjects. Containing an Account of several Surprizing Phenomena Touching Light and Electricity Producible on the Attrition of Bodies. With many other Remarkable Occurrances on different Heads, not heretofore observ'd.

---

[5]*DC* Tuesday 5 December 1704, No. 824.

[6]*DC* Friday 31 January 1707, No. 1497. Hodgson's name does not appear in this advertisement. However, since it is an abbreviated notice, and because Hauksbee's name only appears in reference to the venue, it need not be implied that Hodgson was not involved in this series.

[7]Hauksbee and Hodgson, *An Account of Hydrostatical & Pneumatical Experiments. To be Perform'd in the COURSE, at the House of Mr. Hauksbee, in Wine-Office-Court, in Fleet-street. By James Hodgson and Francis Hauksbee, F.R.S.* ([London], *c.* 1706-9). (The Bodleian reference is John Johnson Collection, Entertainments Folder 7). The approximate printing date of this catalogue can be determined from Hauksbee's address at Wine Office Court (where he lived from late 1706 to the middle of 1710), and by the appearance of Hodgson's name on the syllabus (Hodgson lectured with Hauksbee only until early 1709). The first page of this syllabus is reproduced in Morton, *Science in the 18th Century*, p. 20 and the entire syllabus is transcribed as Appendix XIV in this thesis.

[8]Francis Hauksbee, Sr., *Physico-Mechanical Experiments on Various Subjects* (London: By R. Brugis, for the Author, 1709). Westfall notes that this text was comprised largely of material Hauksbee had already published in the *Philosophical Transactions* (Westfall, *Never at Rest*, p. 634).

> Together with an Explanation of all the Machines, (the Figures of which are curiously engrav'd on Copper) and other Apparatus us'd in making the Experiments. Sold only in Wine-Office Court in Fleetstreet, by F. Hauksbee, F.R.S. Price bound 6 s.[9]

As we have already seen in the case of the German traveller Uffenbach, this text sold for six shillings. Also, the statement about "Surprizing Phenomena Touching Light and Electricity" clearly reveals an emphasis on the spectacular. Later experimental texts would follow in this same tradition. When the younger Hauksbee and Humphrey Ditton advertised their 14 January 1712 course, they too offered complementary "Proposals for a Course of Hydrostatical, Pneumatical, Magnetical, and Optical Experiments."[10] Similarly, when the two Hauksbees, Ditton and Whiston advertised their 4 August 1712 course, "Accounts of the Experiments" were also offered for free.[11] It is possible that the same catalogue developed by the elder Hauksbee and James Hodgson, was also adapted for these latter two courses.[12]

7.4 William Whiston and Francis Hauksbee, Jr.

Whiston and Francis Hauksbee, Jr. first publicly advertise complementary proposals in the notices for their 10 February 1714 course,[13] although they probably had course catalogues on hand before this date. Although I am not aware of any surviving separate copies of these catalogues, it is clear that the course catalogue is reproduced at the beginning of their course manual.[14] Shortly thereafter, in March 1714, the two men announced in the *Daily Courant*

---

[9]*DC* Thursday 11 August 1709, No. 2433.

[10]*DC* Saturday 12 January 1712, No. 3198.

[11]*DC* Friday 25 July 1712, No. 3365.

[12]The use of the term "Accounts of the Experiments," so similar to the heading on Hauksbee and Hodgson's catalogue cited above, may suggest this.

[13]*Englishman* Saturday 6 February to Tuesday 9 February 1714, No. LV.

[14]Hauksbee and Whiston, *A Course of Mechanical, Optical, Hydrostatical, and Pneumatical Experiments*, pp. 1-3. The course catalogue, which also gives its name to the bound course manual, is separately paginated from the rest of the book and is clearly a unit in itself. It includes the cost of the course as well as the venue and subscription locations. Probably the only alteration is the appendage: "The Figures and Descriptions of the principal Instruments used in this Course of Experiments, are as follows" (Hauksbee and Whiston, *Course of Experiments*, p. 3). A later version of the course catalogue is bound with a post-1722 edition of the

that engravings for a course manual had been completed, and that a full manual would "shortly be printed, with an Explication, for the Use of those Gentlemen who have already attended, or may hereafter attend at these Courses."[15] The text, which sold for five shillings, was first advertised in late August 1714.[16] This early edition of *A Course of Mechanical, Optical, Hydrostatical, and Pneumatical Experiments* opens with a reproduced catalogue of the syllabus outlining the material covered in a twenty-six lecture course.[17] The subtitle clearly identifies Hauksbee as the demonstrator and Whiston as the lecturer. The course entrance rate is given as two and a half guineas, and the payment scheme as "One Guinea at the Time of Subscription, and the Remainder, the Third day after the Course is began."[18] Subscriptions were to be taken in at either Whiston's residence on Cross Street, or

---

course manual (see footnote 17 below). The earlier and later versions of the syllabus have been reprinted as Appendices XVI and XVII.

[15]*DC* Wednesday 31 March 1714, No. 3879.

[16]*DC* Saturday 28 August 1714, No. 4008.

[17]Hauksbee and Whiston, *Course of Experiments*, pp. 1-3. There are copies of this course text at the British Library (537.l.23[6]); the Bodleian Library (Rigaud d. 185, 186); the Fellow's Library at Clare College, Cambridge (P.5.22); Trinity College, Cambridge (NQ.16.76[6]. This appears to have been Isaac Newton's copy; see Harrison, ed., *Library of Newton*, p. 157); the Whipple Science Museum, Cambridge (Curator's Room Shelf 8), and Dr. Williams's Library in London (shelf mark 1013.M.7.). Other copies are listed in Wallis and Wallis, *Biobibliography*, pp. 64-5. The copy held by the British Library has been microfilmed and can be viewed as part of the Eighteenth Century Microfilm Collection (listed under Hauksbee's name). As this particular copy is accessible through microfilm, I have based my comments in this chapter on it. There has been some uncertainty in the past about the publication date of this course book. For example, the Bodleian gives the date as "1730;" the Clare College catalogue as "*c.*1714;" the British Library and the Eighteenth Century Microfilm Collection as "1714?;" while Dr. Williams's Library lists the item simply as "1714." The above cited advertisements for the text, along with Whiston's own testimony of a 1714 publication date (Whiston, *Memoirs*, 1: 201), remove any uncertainty about the *initial* publication date of the text. But it should be noted that in the same place in his *Memoirs* Whiston also says the text was reprinted several times (presumably unaltered). Furthermore, it appears to have always been printed without a publication date. Thus in the case of the microfilmed British Library copy, the actual printing date of the text can only be dated at some point from 1714 (the initial publication date) to early 1722 (since it gives Whiston's address as Cross Street, where he lived only until the summer of 1722). The copy held by the Bodleian not only gives Whiston's address as Great Russell Street (where he lived from the latter half of 1722), but it also includes a printed price of three guineas for the course. Since experimental course entrance fees appear to have risen from two and a half guineas to three around 1725, the Bodleian syllabus probably dates from 1725 or a little later. At least one extant copy of this manual appears to be an even later edition produced by Hauksbee for a similar course he seems to have run with Benjamin Robins (see the entry for this *c.*1730 edition in Wallis and Wallis, *Biobibliography*, p. 65). Most copies, however, were probably produced in the mid-1710s. Farrell has also examined a copy of the course book and includes a description of it in Farrell, *William Whiston*, pp. 207-9.

[18]Hauksbee and Whiston, *Course of Experiments*, p. 3.

Hauksbee's at Crane Court, which is also given as the course venue.[19] The syllabus is followed by an advertisement for air-pumps and other instruments, which are described as "made and Sold by *Francis Hauksbee*, (the Nephew of the late Mr. *Hauksbee*, deceas'd) in *Crane-Court*, near *Fetter-Lane* in *Fleetstreet*, London,"[20] indicating not only that the lecture course venue was also an instrument-making shop, but that the younger Hauksbee had taken on this profession as well. Following this is a series of twenty copper-engraved plates showing the instruments and experiments involved in the course.[21] Each plate (printed verso) is accompanied by a facing page of written explanations (printed recto).[22] The opposite sides of these sheets are left blank, almost certainly with the purpose of note-taking in mind.[23] The first seven nights are devoted to mechanics, including replications of Galileo's experiments with falling bodies, along with the use of pulley systems and the operation of pendulums.[24] The next five nights deal with optics, including experiments of reflection and refraction, an illustrated explanation of the workings of the eye, as well as descriptions of the use of telescopes and microscopes and an exposition of Newton's theory of colours.[25] Hydrostatic demonstrations occupy the following three evenings, including the famous Torricellian experiment, as well as demonstrations of water pumps and the weights of various bodies

---

[19]Hauksbee and Whiston, *Course of Experiments*, p. 3. Since Farrell in her description gives the amount as three guineas, and Whiston's address as Great Russell Street, it is apparent that Farrell was examining a post-1722 edition of the text (Farrell, *William Whiston*, p. 209).

[20]Hauksbee and Whiston, *Course of Experiments*, p. [4].

[21]Fourteen of the plates are marked "Sutton Nichols sculp.", with the other six inscribed "I. Senex sculpt." See also Farrell, *William Whiston*, p. 209.

[22]These written explanations are essentially descriptions of the facing plates, yet information about the actual experiments and demonstrations can be gleaned from many of them.

[23]This description applies to the most accessible copy, that held by the British Library and included on the Eighteenth Century Microfilm Collection. Some copies were bound with extra blank sheets interleaved as well. This is the case with the copy I examined at Dr. Williams's Library and also matches the description given by Farrell, *William Whiston*, p. 209.

[24]Hauksbee and Whiston, *Course of Experiments*, plates 1-6.

[25]Hauksbee and Whiston, *Course of Experiments*, plates 7-11.

suspended in fluids.[26] This is followed by a full eleven nights of pneumatic experiments, consisting of a variety of demonstrations with air-pumps and replications of the elder Hauksbee's experiments with electricity.[27] A comparison of the plates in the section on pneumatics reveals that many of the pneumatical experiments had their origin in the elder Hauksbee's course.[28] The air-pumps illustrated in each course book are identical to the elder Hauksbee's design, which appears to have been taken over by the nephew. A later version of the course manual, printed no earlier than late 1722 and probably around 1725, reveals an elaboration from a quadripartite syllabus of mechanics, optics, hydrostatics and pneumatics to a quinquepartite syllabus that also included magnetics.[29]

Although no separate course manual was ever produced for the Whiston-Hauksbee lecture series on astronomy, two course catalogues for the series have survived. One surviving copy, which is slightly mutilated, is held by the British Library and can be dated to sometime between 1722 and 1726.[30] This catalogue consists of a twenty-five item syllabus

---

[26]Hauksbee and Whiston, *Course of Experiments*, plates 12-14.

[27]Hauksbee and Whiston, *Course of Experiments*, plates 15-20. The twentieth evening was to begin with "A Parcel of Air weighed in the Balance"—an experiment Jonathan Swift was fond of satirizing!

[28]Compare plates 16, 17, 18 and 20 in Hauksbee and Whiston, *Course of Experiments*, with tables I, VI, V and VII in Francis Hauksbee, Sr., *Physico-Mechanical Experiments*.

[29]Hauksbee and Whiston, *A Course of Mechanical, Magnetical, Optical, Hydrostatical, and Pneumatical Experiments* ([London], c. 1725). This is the copy held by the Bodleian Library. The first three pages are reprinted as Appendix XVII.

[30]Whiston and Hauksbee, *An Experimental Course of Astronomy; Proposed by Mr. Whiston and Mr. Hauksbee* ([London], c. 1722-1726). The British Library shelf mark is 537.l.23.(4.), and this copy has been microfilmed and is now part of the Eighteenth Century Microfilm Collection. Since this makes this the most accessible copy, I will base most of my comments on it. The printed British Library catalogue dates this catalogue as "1730?" Morton and Wess list the catalogue as "London 1730" (Morton and Wess, *Public & Private Science*, p. 53 n.60). Another copy held by the Bodleian is dated "c.1714" (shelf mark Antiq. c. E. 9 [108]). Maureen Farrell re-dated the British Library copy of the pamphlet to 1714 or 1715, based mainly on manuscript alterations on page 3 of the catalogue, which cancel out the printed price of five guineas and reduce it to three, as well as adding the notice: "[to] begin on Monday Feb^{r}. 22^{d}. at Six in y^{e} Evening." Farrell points out that 22 February fell on a Monday in 1714 and 1720, and opts for a 1714 date (Farrell, *William Whiston*, pp. 210-11). The Eighteenth Century Microfilm Collection microfilmed copy of the catalogue, perhaps reflecting Farrell, provisionally dates the item as "1714?" None of these suggested dates can be correct. First of all, as the survey of lecture advertisements has shown, the Whiston-Hauksbee course of astronomy was not run until February 1718. Second, the British Library copy of the pamphlet includes Whiston's address on page 3 as "Great Russel-Street," where Whiston and his family did not live until the summer of 1722. We also know that the course of astronomy was last run in March 1726. Finally, the course was advertised to begin on

printed on three numbered pages, with an unnumbered advertisement for Hauksbee's telescopes and other instruments appended at the end (virtually the same as the advertisement in the 1714 experimental course manual). The course catalogue reveals a broad range of astronomical topics and demonstrations. First, there are explanations to show the superiority of the Copernican system—especially as improved by Newton—over the Ptolemaic and Tychonic systems. After this ground work is in place, the course moves on to displays and practical demonstrations of various astronomical instruments, including telescopes, quadrants and micrometers. This demonstration is then followed by active observation (where conditions allowed) of various astronomical features, including identifications of the principal stars, the eclipses of Jupiter's satellites, sunspots and the phases of the moon. Also included in the course are explications of several theoretical concerns, such as accounts of the nature of eclipses, cometary theory and the tides. It seems that the unpredictability of both the weather and the particular astronomical phenomena that were to be observed, necessitated a flexible schedule in the order of the items given in the syllabus.

7.5 John Theophilus Desaguliers

Desaguliers was more active than Whiston and Hauksbee in producing material to go along with his courses (although it must be said that Whiston was very active in producing more general works on science). Desaguliers, too, had "Catalogues of the Experiments" on hand when he ran his first course on 7 January 1713.[31] The British Library holds a copy of an early

---

Monday 22 February 1725 at 6 pm with a three guinea entrance fee in *DC* Monday 15 February 1725, No. 7280. Thus the annotation must have been made at some point between 10 February 1725 (the previous course of astronomy) and 22 February 1725, either by Hauksbee, Culpeper, Smith or one of their assistants (the annotation is not in Whiston's hand). The British Library's copy of the catalogue then must date from no later than this and no earlier than the summer of 1722. It is impossible to date the catalogue any more precisely than this, since the catalogues were obviously continuously printed according to demand to be on hand when a course was being advertised. It is likely for this same reason the catalogues were not printed with a date. The British Library copy of this syllabus is reprinted as Appendix XXI in this thesis. The earlier copy of the catalogue held by the Bodleian, includes Whiston's address as Cross Street, Hatton Garden, which means that this copy must date from February 1718, when the astronomical course first ran, and early 1722, after which time Whiston and his family moved to Great Russell Street. The Bodleian Library's copy of the catalogue is reprinted as Appendix XX.

[31] *The Post Boy* Tuesday 6 January to 8 January 1712-13, No. 2726.

edition of Desaguliers' course catalogue, entitled *A Catalogue of the Experiments on Mr. Desaguliers's Course*.[32] The Bodleian Library also holds what appears to be a later edition of Desaguliers' course catalogue.[33] The introductory paragraph of this catalogue provides some interesting details about the intent of the course:

> A COURSE of Mechanical *and* Experimental PHILOSOPHY. *Whereby any one, altho' unskill'd in Mathematical Sciences, may be able to understand all those* Phænomena *of Nature, which have been discovered by* Geometrical Principles, *or accounted for by* Experiments; *and Mathematicians may be diverted in seeing those Machines us'd, and Physical Operations perform'd, concerning which they have read.*[34]

Here we once again see the claims that the course would be of benefit to both novices and experts in mathematics and that the experiments would be "diverting," as well as the standard Newtonian assertion that natural phenomena have been brought to light by experiments and "geometrical principles." The catalogue itself reveals the standard quadripartite subject division of mechanics, hydrostatics, pneumatics and optics. Finally,

---

[32]Larry Stewart has identified this catalogue, which is dated 14 December 1713 (the date of Desaguliers' third London course), in *A Collection of Advertisements* (British Library shelf mark C112.f.7; cited in Stewart, *Public Science*, p. 406). G.S. Rousseau refers to a copy of the same name with 14 December 1713 written on in an eighteenth-century hand (British Library shelf mark 551.d.19.81) (Rousseau, "Science Books," p. 255 n. 181).

[33]This edition is a bilingual English and French publication (Desaguliers, *A Course of Mechanical and Experimental Philosophy / Cours de Philosophie. Mecanique & Experimentale* [n.p.p., n.d.]; Bodleian Library, MS. Rawl. D. 871, fos 141r-147r). In Morton and Wess, *Public & Private Science* (p. 53), where pages 1 and 3 of the catalogue are reproduced, the document is dated "c. 1713," but this cannot be correct for the following reasons: 1) Desaguliers is referred to as chaplain to the Duke of Chandos, a position he did not obtain until 1714, 2) Desaguliers is identified as FRS, but he did not become so until 29 July 1714, 3) Desaguliers' address is given as Channel Row, Westminster, where he did not live until early or mid-1715 and finally, 4) Desaguliers is referred to as "LL.D.," an honour to which he did not attain until 19 March 1719 (the references for these biographical details are given above). Thus this particular printing must have been produced at some point after March 1719. Perhaps for similar reasons, Stewart simply lists the document as "n.d., post-1719" (Stewart, *Public Science*, p. 123). The annotations at the end of the Bodleian copy, which increase the course price from two and a half to three guineas, were probably written around 1725, when this increase in entrance fees occurred (see Appendix X). Stewart has also identified another copy of this catalogue, with slightly different orthography in the long title, at the Spalding Gentleman's Society (Maurice Johnson MSS., Drawer 1). Stewart provides the publication details as "London, 1725" (Stewart, *Public Science*, p. 405). A. Rupert Hall also refers to a 1724 edition (Hall,"Desaguliers," *DSB*, 4: 45), and Nicholas Hans mentions editions published in both 1724 and 1725 (Hans, *New Trends in Education*, p. 139). The copy held by the Bodleian Library may thus be a copy of either the 1724 or 1725 editions (without the publication details), or an earlier (post-March 1719) undated copy. The Bodleian copy of the syllabus is reproduced in full as Appendix XVII.

[34]Desaguliers, *Course of Mechanical and Experimental Philosophy*, p. 3.

while Desaguliers does not advertise catalogues for his less frequently run course of astronomy in this period, a catalogue for this course printed in 1725 has also survived.[35]

By the time he was advertising his 11 October 1714 course, Desaguliers was also announcing that "Ten Tables of Figures relating to the Course, and Engraven in Copper Plates, are given to every Subscriber."[36] This ephemeral publication came as part of the subscription fee, and was in addition to the course catalogues already offered. Since Desaguliers began offering these tables only after Whiston and Hauksbee had published their course manual (which also included copper engravings), it is possible that Desaguliers was responding in kind to their competition. These tables are also offered in the next two courses Desaguliers advertised in the *Daily Courant*.[37] When Desaguliers advertised his 30 April 1717 experimental lecture course, he gave notice that in addition to "Catalogues of the Experiments," he was now also offering "Books for the use of the Auditors, containing all the Lectures, and written in the most plain and intelligible manner."[38] This is a reference to his 1717 publication, *Physico-Mechanical Lectures*, which was also published simultaneously in French.[39] This publication, which bore a similar short title to the elder Hauksbee's 1709 text, was apparently produced to meet the demand of auditors who did not want to take their own notes.[40] The physical appearance and quality of this eighty-page

---

[35]Desaguliers, *Experimental Course of Astronomy* (1725), cited in Hall, "Desaguliers," *DSB*, 4: 45.

[36]*DC* Friday 8 October 1714, No. 4043.

[37]*DC* Tuesday 4 October 1715, No. 4351; Wednesday 4 January 1716, No. 4351.

[38]*DC* Tuesday 16 April 1717, No. 4832.

[39]Desaguliers, *Physico-Mechanical Lectures, Or, An Account of What is Explain'd and Demonstrated in the Course of Mechanical and Experimental Philosophy, Given by J.T. Desaguliers, M.A. F.R.S.: Wherein the Principles of Mechanics, Hydrostatics and Opticks, are demonstrated and explain'd by a great Number of Experiments. Design'd for the Use of all such as have seen, or may see Courses of Experimental Philosophy* (London: Printed for the author, 1717); idem, *Leçons Physico-Mechaniques, ou Abregé du Cours de Philosophie, Mechanique & Experimentale de Jean Theophile Desaguliers, Maître ès Arts, & Membre de la Societé Royale. Ou il dêmontre les Principes de la Mechanique, de l'Hydrostatique, & de l'Optique, par un grand nombre d'Experiences: Pour servir a ceux qui ont vû, ou qui ont deffein de voir des Cours de Philosophie Experimentale* (A Londres: Pour l'Autheur, & se vend aussi chez Richard Bridger au haut de Hind-Court en Fleet-street; & chez Guillaume Vreem à deux Portes du Chêne Royal en Earle-street, proche de la Pyramide, 1717).

[40]This is apparent from the preface to the reader.

manual reveals that it was produced at the lowest possible cost, and although it contains much more written material than the 1714 Whiston-Hauksbee manual, it includes only simple engravings, which do not compare in size, detail or quality to those in Whiston and Hauksbee's publication. It does, however, demonstrate that at this time Desaguliers' experimental course included twenty-two lectures on mechanics, hydrostatics and optics. The manual also provides a moderate account of each of these lectures. Lectures 1-8 are on mechanics, lectures 9-15 focus on hydrostatics, and lectures 16-22 concentrate on optical demonstrations. In this syllabus, pneumatics are subsumed under the general heading "mechanics." I have not been able to determine if this manual was sold independently of the course, in addition to being offered free to attending auditors. Although Desaguliers continued to advertise his course catalogues, he does not give notice of his 1717 course manual again in the *Daily Courant*. It is probably a testimony to the popularity of Desaguliers' lecture course, that in 1719 he had to contend with an unauthorized pirate edition of his lecture notes, produced by one of his auditors, Paul Dawson.[41] Dawson had apparently received financial support to attend Desaguliers' lectures from none other than Richard Steele (to whom Dawson dedicated the 200 page book). Desaguliers found himself forced to produce an authorized version of this text the same year; interestingly, he used the same publishers who had supported Dawson's version.[42] The version by Dawson and the two 1719 editions authorized by Desaguliers each sold for five shillings.[43]

By 1723 Desaguliers was also beginning to prepare a full-scale text of his

---

[41]Dawson, *A system of experimental philosophy, prov'd by mechanicks. Wherein the principles and laws of physicks, mechanicks, hydrostaticks, and opticks, are demonstrated and explained* (London: For B. Creake and J. Sackfield, sold by W. Mears, 1719), cited in Wallis and Wallis, *Biobibliography*, p. 46.

[42]A second edition of this authorised version appeared the same year as well: Desaguliers, *Lectures of Experimental Philosophy. Wherein the Principles of Mechanicks, Hydrostaticks, and Opticks, are Demonstrated and Explained at large, by a great Number of curious Experiments: With a Description of the Air Pump, and the several Experiments thereon: of the Condensing-Engine; as also of the different Species of Barometers, Thermometers, and Hygrometers; with several Experiments to prove and explain Sir Isaac Newton's Theory of Light and Colours, as performed in a Course of Mechanical and Experimental Philosophy. To which is added, A Description of Mr. Rowley's Machine, called the Orrery, which represents the Motion of the Moon about the Earth, Venus, and Mercury about the Sun, according to the Copernican System: All carefully Examined and Corrected by Mr. Desaguliers*, 2nd ed. (London: For W. Mears, B. Creake and J. Sackfield, 1719), cited in Stewart, *Public Science*, p. 406 and Wallis and Wallis, *Biobibliography*, p. 46.

[43]Wallis and Wallis, *Biobibliography*, p. 46.

experimental course. In March 1724 he advertised for subscribers to help support this undertaking:

> Lately Published, Proposals for Printing by Subscription a Course of Experimental Philosophy, in 2 Vols. in Quarto, with a great many Copper Plates curiously Engraven by the best Hands. Subscriptions are taken in by the Author John Theoph. Desagulier, L.L.D. F.R.S. at his House in Channel-Row, Westminster; J. Senex against St. Dunstan's Church in Fleetstreet; and W. Taylor in Pater-Noster-Row. "On Thursday December 5, 1723. The Author having brought several Sheets of this Work, and several of the Plates to the Royal Society, a Committee was appointed to examine them, who the Thursday following having made their Report in Favour of what they examined, the President was pleased to give his Imprimatur in these Words--- ----------December 12, 1723. Imprimatur Liber cui Titulus, A Course of Experimental Philosophy. Is. Newton, F.R.S.[44]

This project was to involve the instrument-maker and publisher John Senex, and Desaguliers was quick to point out in print that the great Isaac Newton had given the proposed work his imprimatur. The text was a long time in coming, however; the first volume was not published until 1734, by which time some of the original subscribers, including Newton, had died. Notice of its publication appeared in the *Daily Courant* on 22 March 1734:

> Next Week will be published, A Course of Experimental Philosophy By J.T. Desaguliers, LL.D. F.R.S. Chaplain to his Grace the Duke of CHANDOS. Vol. I. Adorned with 32 Copper Plates. Printed for the Author; and sold by John Senex, in Fleetstreet; W. Innys and R. Manby, in St. Paul's Church-yard; and Thomas Longman, in Paternoster-Row. NB. The Subscribers may have their Books delivered at the Author's House, in Channel-Row, Westminster.[45]

A further two advertisements, placed a week and a half later, reveal that the text was actually published on 2 April 1734.[46] The second volume appeared in 1744, followed by a corrected second edition of Volume 1 in 1745 and a corrected third edition of both volumes in 1763.[47]

---

[44]*DC* Tuesday 31 March 1724, No. 7002.

[45]*DC* Friday 22 March 1734, No. 5606.

[46]*DC* Tuesday 2 April 1734, No. 5614; Wednesday 3 April 1734, No. 5615.

[47]For bibliographic references to these and other publications relating to Desaguliers' lecture courses, see Wallis and Wallis, *Biobibliography*, pp. 45-9.

7.6 The Little Tower Street Academy

Finally, we see similar patterns when we turn to the Little Tower Street Academy. The first Little Tower Street course advertisement in the *Daily Courant* offers catalogues at the Academy, as well as at the shops of the bookseller Innys and the stationer Clarke.[48] By September 1721, Little Tower Street was advertising the forthcoming publication of a course text:

> There is in the Press, and will speedily be published, A Compendious and Methodical Account of the Principles of Nature Philosophy, as they are explained and illustrated in the Course of Experiments performed at the Academy in Little-Tower-street, by Benj. Worster, A.M.[49]

The 252 page text, written by the university-trained Worster, was published on 10 January 1722.[50] The course text was printed by W. and J. Innys, who also printed for the Royal Society. Included with the text (in this case at the end) is a copy of the Little Tower Street course catalogue, a promotional strategy we have already seen utilized by Whiston and Hauksbee in their 1714 manual.[51] The syllabus itself is quite detailed, outlining as it does a full one hundred and thirty-one sub-headings under the general subject divisions of mechanics (sixty-seven headings), hydrostatics (seventeen), pneumatics (twenty-one) and optics (twenty-six).[52] The course book is advertised with the lecture courses until October 1724, the last time Benjamin Worster and Thomas Watts advertise a course together.[53] No

---

[48]*DC* Saturday 22 March 1718, No. 5122. Two course catalogues, entitled *A course of experimental philosophy*, survive from the period Thomas Watts and Benjamin Worster collaborated. The two catalogues, tentatively dated as 1721 and 1722, are listed in Wallis and Wallis, *Biobibliography*, p. 120.

[49]*DC* Monday 25 September 1721, No. 6222.

[50]Benjamin Worster, *A Compendious and Methodical Account of the Principles of Natural Philosophy: As they are Explain'd and Illustrated in the Course of Experiments, perform'd at the Academy in Little Tower-Street* (London: Printed for the Author, and sold by W. and J. Innys, at the Prince's Arms in S. Paul's Church-yard, 1722). For the publishing date, see *DC* Saturday 6 January 1722, No. 6306.

[51]Worster, *Account of Natural Philosophy*, pp. 230-9. Wallis and Wallis confirm that this appended syllabus is identical to the individual surviving copies of the course catalogue. Wallis and Wallis, *Biobibliography*, p. 120.

[52]Worster, *Account of Natural Philosophy*, pp. 230-9. Reprinted as Appendix XIX in this thesis.

[53]*DC* Wednesday 7 October 1724, No. 7169; Wednesday 14 October 1724, No. 7175.

price is given for the volume. The engravings in Worster's text are crude and simple, nothing more than schematized, geometrical line drawings, and are clearly not up to the standards set by the engravings printed in the elder Hauksbee's *Physico-Mechanical Experiments*, or the Nichols and Senex engravings of the course manual of the younger Hauksbee and Whiston. None-the-less, a second revised and corrected edition printed in London for Stephen Austen appeared in 1730.[54] As new personnel were taken on by Little Tower Street, no doubt bringing with them different and additional skills, new syllabi had to be produced. Thus a fifteen page Little Tower Street syllabus was produced in 1727, containing the names of James Stirling, Peter Brown, William Watts and the instrument-maker William Vream.[55] This syllabus is another example of how such catalogues can expand our knowledge of the different experimental lecture courses.[56]

7.7 Standardization and the "Virtual" Audience

It will now be helpful to summarize several things about the use of course catalogues, manuals and texts. First, all the experimental lecturers used catalogues and had them available from the date of their first lecture courses. In other words, experimental lecture courses were not publicly advertised without catalogues having first been printed. Second, the catalogues were available at the venues themselves, and often at the shops of booksellers

---

[54]Wallis and Wallis, *Biobibliography*, p. 120.

[55]Stirling, *et al*, *A course of mechanical and experimental philosophy* ([London], 1727), cited in Wallis and Wallis, *Biobibliography*, p. 87.

[56]For example, the 1727 Little Tower Street syllabus indicates that it was Stirling and Brown who carried out the lecturing component of the experimental course, which is consistent with the social and technical division of labour that we have already seen with Whiston and Hauksbee, in which the theoretical aspect of the course was left in the hands of the university-trained member of the lecturing team. We are also introduced to William Vream, who was an instrument-maker who made air-pumps and demonstrated for the Little Tower Street experimental courses, as well as assisting Desaguliers (see the entry for Vream in Wallis and Wallis, *Biobibliography*, pp. 87-8). Vream published a description of the air-pump, which both Richard Bridger and himself sold at their separate premises. This pamphlet, which was bound with Desaguliers' 1717 lecture notes, was printed in both an English edition as well as a bilingual Latin and French edition. The publication details confirm that Bridger had taken over the elder Hauksbee's instrument-making shop in Hind Court (see Vream, *A description of the air-pump, according to the late Mr. Hauksbee's best and last improvements* [London, 1717] and idem, *Antliæ Pneumaticæ descriptio ad Methodum Hauksbeianam, Optime & nuperrime emendatam* [London, 1717]).

and instrument makers (the latter phenomenon illustrates the commercial cooperation between the lecturers and other supportive enterprises). Third, the catalogues were obviously an important method of advertising the lecturers, and were always given out free. Fourth, there appears to have been a demand for more substantial accounts of the material covered in the courses, and accordingly, all the experimental lecture courses dealt with in this study produced manuals or full texts at some point. Fifth, not only do we see a degree of similarity between lecturers with respect to the first four points, but a study of the different course syllabi reveals that there was also a great degree of standardization in course content. Not only do the Whiston-Hauksbee (early version), Desaguliers and Little Tower Street experimental course catalogues reveal the same quadripartite structure, but many of the individual headings and descriptions are the same or similar—right down to the wording.

Finally, this produced material is also important because it could be exposed to people who never physically attended the original lectures. This extension of the audience included non-English speakers as well. Francis Hauksbee, Sr.'s 1709 course text *Physico-mechanical experiments* appeared in an Italian translation in 1716,[57] in the Dutch language in 1735,[58] and in French in 1754.[59] Also, Desaguliers not only printed bilingual course catalogues, but he produced more substantial lecture notes in both French and English as well. This clearly reflects a market beyond that of native Londoners, and hints at the spread of the material from these London lectures not only to French *émigrés* and travellers, but possibly also to the continent itself. As the manuals and texts represent relocatable "hard copies" of the lecture course material, their role in disseminating scientific knowledge at the popular level must not be overlooked. Readers of this material formed a sort of "virtual audience" that was not under the same geographical constraints as the members of the

---

[57]Hauksbee, *Esperienze fisico-meccaniche sopra varj soggetti contenenti un racconto di diversi stupendi fenomeni intorno la luce e l'elettricità producible dallo strofinamento de' corpi. Con molte altre notabili apparenze non mai prima osservate. Colle spiegazioni di tutte le macchine. Opera di F. Hauksbee della Società Regia tradotta dall' Idioma Inglese* (Firenze, 1716).

[58]Hauksbee, *Natuurkundige en tuigwerkelyke ondervindingen over verscheide inderwerpen . . . Uit het Engelich vertaalt door P. Le Clercq* (Amsterdam, 1735; reprinted 754).

[59]Hauksbee, *Expériences physico-mechaniques sur différens sujets, et principalement sur la lumiere et l'electricité, produites par le frottement des corps*, 2 vols. (Paris, 1754).

physical audience. In one case, we have already seen how the course manual of Whiston and Hauksbee made its way to Oxford, where it was used in similar experimental courses delivered by John Whiteside and James Bradley.[60] These final examples illustrate the influence through literary technologies beyond that of the original lectures delivered to London auditors.

[60]This does not mean that Whiteside and Bradley (or anyone else) were able to reconstruct an experimental course using only the Whiston-Hauksbee course manual. To do so with such a cursory text implies that the two men had independent knowledge of experiment, and that they had probably seen it demonstrated at Oxford, as well as London. In other words, in the sense of Steven Shapin and Simon Schaffer, they shared an "experimental culture" with other active experimental lecturers and demonstrators. It is perhaps significant then, that Arthur Charlett, in his 1716 letter to John Richardson, speaks of Whiteside "going to London to visit the Virtuosos." Charlett to Richardson, Ladyday [25 Mar.] 1716, cited in Gunther, *Early Science at Oxford*, 1: 199.

8. ENTREPRENEURIAL AND COMPETITIVE LECTURING STRATEGIES

8.1 Competitive Forces

Each separately run experimental course did not exist in a vacuum. From 1713 there were two separately run courses being offered to the public; by 1718, with the arrival of Little Tower Street on the market, there were three. Even in 1712, competition already existed between the elder Hauksbee and his nephew.[1] It will be helpful to begin by considering the placement and wording of the advertisements with respect to competition and promotion. After Little Tower Street entered the market in 1718, there were many occasions when advertisements for competing lectures appeared in the same newspaper, and at times even side-by-side. Competition among the experimental lecturers was especially high during the years 1719 to 1722.[2] The busiest year, 1721, shows two experimental courses advertised as starting in January (Little Tower Street and Desaguliers);[3] one experimental course (Little Tower Street) and with two Whiston-Hauksbee courses of astronomy in February; three experimental courses in March (Whiston-Hauksbee, Desaguliers and Little Tower Street; starting on 9, 10 and 10 March respectively); one experimental course in May (Desaguliers); two experimental courses in October (Little Tower Street and Desaguliers), and these are closely followed by a 10 November date for Little Tower Street and a 2 December starting date for Whiston and Hauksbee. Thus, at more than one point in 1721, most notably early March, there were two or three courses from which to choose. The combined lecture course profile presented in Appendix VIII reveals another interesting phenomenon. At several points on the profile were there are two or more courses being advertised simultaneously, the increased competitive pressure often resulted in one or more deferrals.[4] The fact that these pressure points most often adversely affected Whiston and Hauksbee and least often

---

[1]Morton and Wess provide a brief account of this public competition in Morton and Wess, *Public & Private Science*, p. 49-50.

[2]See Appendices V, VI, VII, and especially the combined profile given as Appendix VIII.

[3]This only if the 11 January 1721 Little Tower Street course was not deferred (see Appendix VII).

[4]Examples of such deferrals are found during February 1714, April 1714, November 1719, November 1720, January 1723, November 1723, October and November 1724, February 1725, October and November 1725, January and February 1726 and November 1726.

resulted in a failed Little Tower Street date, may also be significant. In addition to inter-lecturer competition in the winter lecturing season, there were often several other types of science lecture courses being advertised at the same time as experimental courses. Furthermore, advertising lecturers also had to compete with other evening public events that attracted the paying public, such as musical performances and the theatre.

There was, therefore, clearly a need to make one's own course seem as attractive as possible. Here self-promotion is always evident, for besides the emphasis on the qualitative ("new and improved") and quantitative ("more than 300 Experiments"), there is also a focus on the relative prestige of the lecturers. From the earliest experimental lecturers of the first generation, the elder Hauksbee and James Hodgson, we witness the prominent display of the title "FRS." We also see the younger Hauksbee and Desaguliers in turn both advertising their connections with the experimental course pioneer Francis Hauksbee, Sr. As for Whiston, he is often advertised as "M.A." or "A.M.." Desaguliers also maximizes his prestige in his earliest advertisements by first displaying his Oxford M.A., along with his association with Hart Hall, and is then quick to add the titles "FRS" and "LL.D." as he acquires them. Finally, we see the university-trained lecturers of Little Tower Street announcing their academic qualifications, as well as Stirling's position as FRS. These credentials probably would not have been advertised if they did not find at least some resonance with the monied public.

With all this competition there were bound to be winners and losers. Whiston and Hauksbee started their careers riding a wave of popularity that crests as early as 1714, when they apparently deliver no fewer than five experimental lecture courses. By this time (and certainly by 1715) the entrance fee for the courses had been increased from two guineas per auditor to two and a half. Yet after this, while Whiston and Hauksbee appear to remain fairly stable in their lecturing patterns, they do not seem to manage more than two per year.[5] They do, however, run (or attempt) two courses of astronomy each year for several years at the seemingly high prices of three to five guineas per auditor. Whiston also ran many independent lectures of his own, in addition to the experimental and astronomical courses with Hauksbee. Desaguliers, after some minor difficulties in filling two courses in 1714,

---

[5]See Appendix V.

appears to have gone on to perform three, four and even five courses each year.[6] Worster and Thomas Watts, after breaking into the market in 1718, are solid with at least four courses each season from 1719 to 1723. By 1725, Desaguliers, along with Whiston and Hauksbee, were charging three guineas per auditor for their experimental lecture courses. By no later than 1727, and probably earlier, the same price was being charged by Little Tower Street—surely a measure of the success of experimental lecturing.[7] Still, by the mid-1720s, Desaguliers and especially the lecturers at Little Tower Street, appear to have been consistently attracting more auditors than Whiston and Hauksbee. Thus, the competitive forces appear to have driven the Whiston-Hauksbee experimental course out of the market, and contributed to its demise in 1728.[8]

8.2 Self-Promotion and Inter-Lecturer Derogation

These same competitive forces were sometimes manifested in defensive statements made in the advertisements themselves. We witnessed this first in January 1712, when the two Hauksbees were competing against each other. Such statements are also seen early on in Whiston and Hauksbee's notices. In an advertisement for an experimental course set to begin 14 February 1715, Whiston and Hauksbee show that they are aware of competing apparatus in the market when they describe their course manual in the following way:

> N.B. We have taken care to have the principle of the Instruments used in this Course of Experiments (which 'tis hoped are not inferior either in Number or Exactness to the best Collections that have heitherto [*sic*] been used upon the like Occasion) exactly deliniated and curiously Engraved on 20 Copper Plates, with some explanatory Notes, for the Use of those Gentlemen who attend at these Courses.[9]

---

[6]See Appendix VI.

[7]There is conclusive evidence that Desaguliers was still charging three guineas an auditor by 1734, as this is the price advertised in his 1734 *Course of Experimental Philosophy*. For a profile of the gradual rise in science course entrance fees, see Appendix X.

[8]Still, the resiliency of the Whiston-Hauksbee courses for so many years (sixteen in the case of the experimental course) was a success in itself.

[9]*DC* Tuesday 8 February 1715, No. 4157; Friday 11 February 1715, No. 4150.

Although they employed the skilled engravers Sutton Nichols and John Senex to produce their copper engravings, Whiston and Hauksbee are clearly aware that there were other works on the market at this time, such as the elder Hauksbee's *Physico-Mechanical Experiments*, which auditors and others would inevitably compare with their own humbler publication. The fact that their cursory manual sold for five shillings compared to the six shilling price of the elder Hauksbee's much fuller text, may also have caused concern about value comparisons.

Although not directly referring to any insinuations that may have been circulating (as seen in the above quotation), Whiston and Hauksbee once again found it necessary to defend the quality of their instruments in November 1719, with the statement: "All the Instruments which are very numerous used in this Course, are not inferior to any that ever yet have, or perhaps ever will be used in the like Courses."[10] Two years later, in November 1721, Whiston and Hauksbee again reassure potential clients that "The Apparatus of Instruments used in this Course [is] inferior (either in Number or Exactness) to none that yet have, or perhaps ever will be used in the like Courses."[11] Aside from these impossibly exaggerated claims, and the fact that this language may have also been an indirect way of announcing the relative quality of own their instruments, it is possible that Whiston and Hauksbee are once again publicly revealing a real or perceived sense of insecurity about their experimental apparatus. Obviously, with prices and lecture lengths comparable, other factors such as the quality or number of performing instruments are going to be taken into consideration by potential auditors having to decide between three courses. The phrase "the like Courses" may refer not only to the other two public experimental courses, and possibly other science lecture series as well, such as university courses in experimental philosophy. It thus may be significant that Whiston and Hauksbee express these concerns after the Little Tower Street lecturers enter the market and secure their niche; Whiston and Hauksbee may have seen the handwriting on the wall and the early signs of their eventual demise. Similar statements are

---

[10]*DC* Monday 9 November 1719, No. 5632; Wednesday 11 November 1719, No. 5634; Friday 13 November 1719, No. 5636.

[11]*DC* Tuesday 24 October 1721, No. 6243; Saturday 28 October 1721, No. 6247; Monday 30 October 1721, No. 6248; Wednesday 1 November 1721, No. 6250.

also found in the rest of the advertisements for the Whiston-Hauksbee experimental lectures; that is, lectures advertised to begin on 18 October 1722,[12] 18 January 1723,[13] 28 January 1723,[14] 6 November 1723,[15] 13 November 1723,[16] 27 January 1724,[17] 11 November 1724,[18] 10 February 1725,[19] 8 November 1725,[20] 18 November 1725,[21] 26 January 1726,[22]and 8 March 1727.[23] This long continued reassurance to potential auditors may reflect sustained competitive pressure from Desaguliers and the Little Tower Street Academy.

Desaguliers, on the other hand, did not deem it necessary to defend his experiments and apparatus until 1724. In an advertisement for an experimental course to begin on 10 January of that year, Desaguliers desired to give notice "that his Apparatus is not worse than other Peoples, or his Machines and Experiments fewer. He is obliged to take Notice of these Things, because the contrary has been industriously reported."[24] Here we see more than

---

[12]*DC* Friday 12 October 1722, No. 6545; Monday 15 October 1722, No. 6547; Wednesday 17 October 1722, No. 6549.

[13]*DC* Thursday 10 January 1723, No. 6621; Saturday 12 January 1723, No. 6623; Thursday 15 January 1723, No. 6625.

[14]*DC* Thursday 24 January 1723, No. 6623; Saturday 26 January 1723, No. 6635.

[15]*DC* Wednesday 30 October 1723, No. 6872; Saturday 2 November 1723, No. 6875.

[16]*DC* Monday 11 November 1723, No. 6882.

[17]*DC* Thursday 16 January 1724, No. 6638; Tuesday 21 January 1724, No. 6942; Friday 24 January 1724, No. 6945; Monday 27 January 1724, No. 6947.

[18]*DC* Wednesday 4 November 1724, No. 7193; Friday 6 November 1724, No. 7195; Tuesday 10 November 1724, No. 7108.

[19]*DC* Saturday 6 February 1725, No. 7273; Tuesday 9 February 1725, No. 7275.

[20]*DC* Tuesday 2 November 1725, No. 7503; Thursday 4 November 1725, No. 7505; Saturday 6 November 1725, No. 7507.

[21]*DC* Monday 15 November 1725, No. 7514; Wednesday 17 November 1725, No. 7516.

[22]*DC* Tuesday 18 January 1726, No. 7568; Thursday 20 January 1726, No. 7570; Saturday 22 January 1726, No. 7572; Wednesday 26 January 1726, No. 7575.

[23]*DC* Monday 27 February 1727, No. 7915; Wednesday 1 March 1727, No. 7917.

[24]*DC* Monday 6 January 1724, No. 6929; Thursday 9 January 1724, No. 6932.

advertising rhetoric and self-promotion: this notice gives direct evidence that Desaguliers' course and apparatus had been maligned. This evidence demonstrates that someone, either an auditor or another lecturer, had implied or boldly stated that Desaguliers' equipment was of inferior quality. The fact that the first advertisement for this course, placed on 1 January 1724, did not contain this notice, may suggest that the insinuation had been of recent origin.[25] In any case, Desaguliers felt that the slander was potentially damaging enough to continue this notice in advertisements for lectures set to start on 16 and 23 March 1724.[26] By January 1726 the disclaimer had been dropped.[27] In the cases of Whiston and Hauksbee, as well as Desaguliers, the chief concerns are both qualitative and quantitative. With Whiston and Hauksbee, the concern was over the quality and number of the apparatus; with Desaguliers, there is this same focus, with the additional concern over the number of experiments. When we turn to the advertisements of the Little Tower Street Academy, we do not see any such disclaimers, although, as we have already demonstrated, every Worster and Thomas Watts advertisement except the first contains a notice about the experiments and apparatus being both "new and improved." It is possible that the lack of directly defensive statements in Little Tower Street advertisements shows that they, or their equipment, were never maligned. It is also possible that the Little Tower Street lecturers were, or were among, those who were casting aspersions on others.

8.3 Inter-Lecturer Cooperation

This implied evidence of competition should not be taken as proof that the lecturers never cooperated. An interesting example of inter-lecturer cooperation is found in a project Richard Steele sponsored at his 200 seat Censorium in late 1719. An advertisement that appeared in the 17 November 1719 *Daily Post* reveals a proposal that included J.T. Desaguliers, Thomas Watts and Benjamin Worster:

---

[25]*DC* Wednesday 1 January 1724, No. 6925.

[26]*DC* Friday 6 March 1724, No. 6981; Monday 9 March 1724, No. 6983; Wednesday 11 March 1724, No. 6985; Thursday 19 March 1724, No. 6992; Saturday 21 March 1724, No. 6994.

[27]*Daily Post* Wednesday 26 January 1726, No. 1978.

> At *Richard Steele*'s great Room in Villars-street, York-Buildings, on Tuesday, the 1st of December will begin two Courses of Experimental Philosophy, (the same Lecture of each Course being perform'd the same Day) the one at 12 at Noon in French by Dr. Desaguliers and Mr. Watts, the other a 6 in the Evening by Mr. Worster and Mr. Watts, and at both Courses the Experiments will be made with the curious Apparatus belonging to Mr. Worster and Mr. Watts from Little-Tower-street, with several new Machines contriv'd by Dr. Desaguliers. Catalogues may be had gratis, and Subscriptions are taken in at Mr. Innis's near St. Paul's Church.[28]

This ambitious project thus involved a mid-day course delivered by Desaguliers and Thomas Watts in French (both of whom were fluent in that language),[29] and a second evening course with Thomas Watts performing a second shift with Benjamin Worster, his lecturing partner from Little Tower Street. It seems likely that Desaguliers and Worster, both university educated, were the principal lecturers in the courses, with Watts carrying out many of the experiments.[30]

Aside from the obvious agreement to run such a joint project, there are two other areas of cooperation evident.[31] First, it is evident that this course was well planned as to timing not to conflict with the regular lecturing schedules of either Desaguliers or those of the Little Tower Street Academy. The fact that both courses are set to begin on a Tuesday probably implies that the course was run on Tuesdays and Thursdays, especially when one considers the simultaneous independent schedules of the lecturers' regular courses. Desaguliers had already advertised in the *Daily Courant* for starting dates of 2 and 23 November 1719 for his own experimental course.[32] However, even if we assume that this

---

[28]*Daily Post* Tuesday 17 November 1719, No. 39.

[29]Desaguliers, as we already know, was a native French speaker. Watts' proficiency in that language is demonstrated by his translation from the French of Rohault's *Treatise of Mechanics*. See Wallis and Wallis, *Biobibliography*, p. 78.

[30]This is not to imply that Thomas Watts, one of the proprietors of the Little Tower Street Academy, was considered to be of inferior social status. It is possible that unnamed servants or instrument-makers were employed for the purpose of physically demonstrating the experiments.

[31]Wallis and Wallis note that Desaguliers was on friendly terms with the staff of the Little Tower Street Academy. Also, Desaguliers and the Little Tower Street lectures shared an association with the instrument-makers William Vream and Richard Bridger. Wallis and Wallis, *Biobibliography*, pp. 45, 87-8.

[32]See Appendix VI.

course was still running by 1 December, since Desaguliers' independent lectures were delivered in the evening, there would not have been a scheduling conflict. Similarly, Watts and Worster were already involved in an experimental course at Little Tower Street that had been advertised to begin on 23 November 1719.[33] Once again, however, this would not have caused a conflict, for as we have already seen, Watts and Worster ran their Little Tower Street course on Mondays, Wednesdays and Fridays. Second, we see that apparatus owned by both Little Tower Street and Desaguliers was to be used in this combined effort, and that if Desaguliers departed to deliver his own course in the evenings at Channell Row, he left some of his equipment behind for the 6 pm Censorium performance. This not only implies that Desaguliers had duplicates of some of his instruments, but that he felt secure in leaving some of his equipment in the hands of Watts and Worster. This interlacement of schedules involved foresight, planning and cooperation. Thus, although these two courses were likely initiated by Steele, this example shows that it would be wrong to conclude that competition absolutely precluded cooperation, for cooperate the lecturers certainly did upon occasion—especially when it was to their mutual benefit.

[33]See Appendix VII.

9. THE SOCIAL LOCATIONS OF EXPERIMENTAL LECTURING

9.1 The Social Location of the Lecture Advertisements

Since the most important method of promotion was newspaper advertisements, it will be profitable to consider their social location.[1] What did a paper such as the *Daily Courant* offer to a reader? The front side of the *Daily Courant* (this paper almost always consisted only of one sheet) contained mostly foreign news, culled mainly from Dutch and other news publications from the continent. Also presented on either the front or the back of the paper, was port news, shipping information and reports on stocks. Much of the reverse side of an average *Daily Courant* was taken up with a dizzying array of advertisements that reveal the growing commercial and consumer interests of early eighteenth-century London. The value of these advertisements for the student of social history should be immediately obvious.[2] Public sales and auctions, often held at coffee house venues, featured quite prominently. Also commonly found are advertisements for pharmaceutical products and medicines, including all sorts of cure-alls and snake oil treatments such as the "Attila of the Gout," the "Delightful Chymical Liquor, for the Breath, Teeth and Gums," and the multi-purpose "Vivifying Drops for Barrenness in Women and Imbecility in Men."[3] Entertainment all the

---

[1]Extensive reading of newspaper advertisements for the purpose of locating notices for scientific lectures and books has provided a familiarity with the content of the advertising columns of the *Daily Courant*. I will not attempt to provide references for all the examples enumerated here, many of which are common enough and duplicated many times over.

[2]A similar claim was also made over sixty years ago by Mrs. Herbert Richardson, who surmises that it would be possible "to write a complete and detailed social history of the seventeenth and eighteenth centuries, using no other data than the advertisement columns of the Newspaper." Richardson, *The Old English Newspaper* (London: The English Association, December 1933), The English Association, Pamphlet No. 86, p. 20.

[3]The last two products, which were ubiquitous in the advertising columns at this time, find themselves placed in advertisements below a notice for Whiston and Francis Hauksbee, Sr.'s January 1713 experimental course. Prospective purchasers of the "Vivifying Drops" are promised that for five shillings they would receive a "Bottle with Directions" of a concoction that was sure to "renovate the vital Ferment of the Blood , rectify the languid state of all the Fluids, rouse, fortify, and increase the Spirits, invigorate the Nerves, restore juvenile Warmth, and cause a sparkling Gladness and ardent Courage to flow into the Heart, and expand it self through the whole human System . . ." The promoters of the "Delightful Chymical Liquor" in turn, assured buyers that without a doubt "in a Moment [it] makes the most Nauseous Breath Smell delicately Fine and Charming, and in a very little time infallibly Cures, so that an offensive Breath will not return; It certainly makes the blackest and most foul Teeth perfectly White, Clean and beautiful to a Miracle; cures the Scurvy in the Gums, tho' never

way from theatre and musical performances to public boxing matches were also advertised. The publication and sale of books and pamphlets were advertised in great numbers in the *Daily Courant*, from detailed notices of first publications to lists and prices of books available at bookshops. Notices of lost valuables, robberies and escaped slaves and domestic servants also frequently appear in the advertising columns. Occasionally, one even finds examples of "personal" advertisements, placed by displaced young gentlemen who were seeking marriage partners and who found themselves in the metropolis without social connections. It is significant that virtually everything advertised in the *Daily Courant* reflected the interests of the monied classes, that is, the aristocracy, the gentry and the well-off middle class—those who had sufficient wealth or disposable income available for the purchase of consumer goods and services. These were the people to whom the advertisers and notices appealed.

Advertisements for theatre, shows, and performances also allow us to discover the varieties, time and costs of evening entertainment with which the experimental lecturers were competing. Such comparisons may also tell us the *function* some patrons may have expected the experimental lectures to fulfil. Two examples from the 21 January 1713 number of the *Daily Courant*, which also carried a notice of the 26 January 1713 experimental course of Whiston and the elder Hauksbee, will offer excellent illustrations. The first example is an advertisement for Punch's Theatre in Covent Garden:

> At Punch's Theatre in the Little-Piazza, Covent-Garden, this present Wednesday, being the 21st of January, will be presented an Opera call'd, The State of Innocence; or The Fall of Man. With variety of surprising Scenes and Machines, particularly the Scene of Paradise in its primitive Station, with Birds, Beasts, and all its ancient Inhabitants; the Subtilty of the Serpent in betraying Eve; with variety of diverting Interludes: Concluding with a Piece of Machinary, representing an Infernal Lake and a Cœlestial Paradise: With all the other Decorations belonging to the said Opera. Beginning exactly at Six a Clock. Boxes 2 s. Pit 1 s. Note, No Money to be return'd after the Entertainment is begun.[4]

---

so inveterate, making the Flesh to grow again, when almost Eaten away, and infallibly, fastens loose Teeth . . ." These ads did not come with the warning *caveat emptor*. *DC* Wednesday 28 January 1713, No. 3524.

[4]*DC* Wednesday 21 January 1713, No. 3518.

This notice offers us several points of comparison between the forms of public theatre and public science lectures. First, the advertisement reveals something of the same emphasis on spectacle and contrivances that we have already seen displayed in the experimental course advertisements. This opera was to be an entertaining performance of sight and sound, with the all important "*diverting* Interludes," just as the auditors of the science courses were promised diverting material in the experiments. The opera was also set to begin at 6 pm, the same time as most of the experimental lectures, indicating this time conformed to the social schedules of both theatre attenders and science course auditors. Furthermore, the one shilling fee for a place in the pit is exactly equivalent to the price of many one evening science lectures, such as those run by Whiston in the coffee houses. This indicates that one shilling was a standard price for an evening's entertainment. Finally, we also see a similar policing of entrance fees as evidenced in Whiston's public viewings of astronomical events.

The second example moves us down the social scale, but still offers points for comparison:

> An Entertainment by Mr. Clinch of Barnet, who imitates the Flute, Double Curtel, the Organ with 3 Voices, the Horn, Huntsman and Pack of Hounds, the Sham-Doctor, the Old Woman, the Drunken Man, the Bells: All Instruments are performed by his natural Voice. To which is added an Essex Song by Mr. Clinch himself. To be seen this present Evening at 7 a Clock, at the Crown Tavern without Cripplegate. Price 1 s.[5]

Although Whiston and other scientific lecturers doubtless considered their scientific lectures of a higher quality (not to mention of a more redeeming and worthwhile character) than that offered by this performer, the price is still the going rate of one shilling for a one evening performance. It is not known whether Whiston and the others were competing for the same class of auditors as Mr. Clinch, but they were certainly competing for the same time slot and shilling.

9.2 The Audience for Experiment

A prosopographical analysis of the audience for experiment will help determine further the

---

[5]*DC* Wednesday 21 January 1713, No. 3518.

social face of those men and women interested in popular experimental philosophy. Such an analysis will also provide, in part, information on the greater and lesser patrons of the experimental lecturers. An accurate identification of the experimental course audience is difficult, however, given the lack of direct information about lecture course auditors. Still, information gleaned from various sources allows us to generalize that the audience for experiment consisted mainly of gentlemen, nobles and the monied commercial classes (i.e. the well-off tradesmen and the middle class).[6] Aside from the most obvious social indicator of the audience—the price—there are several other indications of just who came to see and hear experiments.[7] These indications include allusions to the target audience in advertisements; retrospective confirmations of the identity of the audience by the lecturers; specific examples of the names of auditors, and the daily and seasonal lecturing patterns.

The chemist George Wilson, in his first advertisement in the *Daily Courant*, appeals to "such Gentlemen as will go in [his] Course."[8] The elder Hauksbee and James Hodgson,

---

[6]Nicholas Hans notes that many well known people came to Desaguliers' lecture courses (Hans, *New Trends in Education*, p. 141 n.1). G.S. Rousseau likewise comments that auditors included "famous poets and writers, financiers, politicians, physicians, courtiers, foreigners, and other dignitaries" (Rousseau, "Science Books," p. 246 n.64). Michael Hunter points out that this group would have included the "pseudo-gentry," that is, "people of private means, usually in an urban environment, who lived the life of leisure traditionally asociated with the landed classes although not landed themselves" (Hunter, *Science and Society in Restoration England* [Aldershot: Gregg Revivals, 1992], p. 73).

[7]While acknowledging the difficultly in attempting to convert late seventeenth- and early eighteenth-century British currency into modern equivalents, Peter Earle estimates in his 1994 book *A City Full of People* that a very rough approximation can be arrived at by multiplying by a factor of one hundred (Earle, *A City Full of People*, p. xiii). This would render a three guinea course (one guinea = 21 shillings or £1 1s.) into something over three hundred pounds in 1994 rates. Also, Alan Morton provides a 1990s equivalent for Stephen Demainbray's late 1750s natural philosophy course. Demainbray's thirty-four lecture course cost two and a half guineas (which shows a deflation from prices earlier in the century), and Morton estimates that this is equivalent to around £160 in 1993 (Morton, *Science in the 18th Century*, p. 48). Such estimates, however, probably do not adequately explain the low buying power of a poor early eighteenth-century Londoner. Even with a relative increase in both wages and buying power in this period (Earle, *A City Full of People*, p. 17), the income of many poorer Londoners kept them at the subsistence level. Male labourers in London during this period, generally earned from between 9*s*. to 12*s*. per week (about £23 to £31 per year). The weekly wages of lower-paid journeymen were between 12*s*. and 15*s*. (about £31 to £39 per year). Female labourers made less, with wages ranging from 7*s*. to 8*s*. (roughly £18 to £20 each year), but as low as 3s. per week in some cases (just under £8 per year). The experimental lecture courses were simply out of reach for the lower classes. Besides, most of the lower classes had to work long hours that would have precluded their attendance at lecture courses, if such attendance was not already precluded because of their social standing (incomes taken from Rudé, *Hanoverian London*, p. 88).

[8]*DC* Tuesday 29 September 1702, No. 141.

in the first advertisement for their experimental lecture course, give notice that the course is "for the Benefit of . . . Curious and Inquisitive Gentlemen."[10] Whiston and the younger Hauksbee, when advertising their new course manual, mention that it is "for the Use of those Gentlemen who have already attended, or may hereafter attend at these Courses."[11] Whiston speaks of his "numerous and noble audience" at his lectures during the 22 April 1715 eclipse of the sun.[12] Also, in his advertisement for his lectures at the Horse Guards before and during the eclipse of 11 May 1724, Whiston appeals to "All the Nobility, Ladies and Gentlemen that intend to be present."[13] In an April 1717 advertisement for both his experimental and astronomical courses, Desaguliers states that "The Lectures will be in French, Latin, or English, as the Gentlemen present shall desire."[14] Both the reference to "Gentlemen" and the offer to deliver his lectures in French or Latin suggest an aristocratic and educated target audience.

Gentle women, as well as Gentlemen, also attended. In addition to the reference to "Ladies" in the above mentioned advertisement for the solar eclipse of 11 May 1724, Whiston refers to women in two other advertisements. First, in the advertisement for his lecture on the *aurora borealis* at the Censorium on 16 March 1716, potential auditors are told that the room "is conveniently fitted for Ladies as well as Gentlemen."[15] Second, in his 23 July 1729 lecture advertisement, he announces that "any Ladies or Gentlemen, not more than 10 in number," who wished a private course, could go through one at one guinea each.[16]

---

[10]*DC* Tuesday 5 December 1704, No. 824.

[11]*DC* Wednesday 31 March 1714, No. 3879; Friday 2 April 1714, No. 3881; Saturday 23 October 1714, No. 4056; Tuesday 8 February 1715, No. 4157; Friday 11 February 1715, No. 4150.

[12]Whiston, *Memoirs*, 1: 204.

[13]*DC* Friday 8 May 1724, No. 7035.

[14]*DC* Tuesday 16 April 1717, No. 4832. In addition to English lecture summaries and catalogues, Desaguliers also provided bilingual catalogues printed in English and French, and French and Latin.

[15]*DC* Thursday 15 March 1716, No. 4493. It is interesting that the appeal to female auditors is not repeated when the combined experimental courses at the Censorium with Desaguliers, Thomas Watts and Worster are advertised in 1719.

[16]*DC* Wednesday, 23 July 1729, No. 8668.

Desaguliers, too, mentions the presence of women at his courses in the Preface to his *A Course of Experimental Philosophy*. Here the former Oxford lecturer speaks of his "*great Pleasure*" at having seen "*the* Newtonian Philosophy *so generally received among all Persons of all Ranks and Professions, and even* the Ladies, *by the Help of Experiments.*"[17] However, the special mention in Whiston's 1716 notice that seating was available for women, along with Desaguliers need to make the aside "even the Ladies," both tend to suggest that women were in the minority of the auditors.[18] Furthermore, the many exclusive references to gentlemen in the advertisements and the syllabi seem to imply that at many courses, it was not uncommon for there to be no women present at all.

Another factor that allows us to assess the target audience is temporal. First, we have learned that the most common starting time for the lectures was 6 pm. The coffee houses generally emptied at this same time as their patrons went off to the theatre or for a walk in the park.[19] Also, as we have already seen, the 6 pm starting time for entertainment is confirmed in newspaper advertisements.[20] Second, there is indirect evidence that the evening time slot was also intended to make it easier for those in business to attend the courses.[21] Third, the seasonal patterns revealed in the profiles extrapolated from the lecture advertisements show quite plainly that virtually all of the lecturing was carried out in the

---

[17]Desaguliers, Preface, *Course of Experimental Philosophy*, sig. C1^{v}. Desaguliers' reference to the professions should not be overlooked.

[18]The published list of subscribers to the first volume of Desaguliers' *A Course of Experimental Philosophy* (1734) reveals both that women were among the subscribers, and that they were in the minority. Thirteen women's names appear in the complete subscription list of 307 names (4.2% of the total). See Appendix XIII.

[19]Ashton, *Social Life in the Reign of Queen Anne*, 1: 216.

[20]Peter Earle notes that the steadily increasing number of oil-burning street lamps in London since the 1680s encouraged "a much greater public use of the evenings, as theatres opened and closed later and more people went on to taverns and coffee-houses afterwards" (Earle, *English Middle Class*, p. 78). Again, we see how lecturing fitted into this evening social pattern.

[21]An example of this is a language teacher who taught French, Greek, Latin and English, and who held courses in 1712 at 6:30 pm and "from 6 to 10 [pm], for the Benefit of those that cannot come in the Day-time" (*DC* Thursday 31 January 1712, No. 3214). Also, we have already seen above how the chemist George Wilson promised refunds for auditors, "if their Business so fall out that they cannot attend the Course."

winter season.[22] There is an obvious reason for this. The lecturers were largely targeting the aristocratic and monied classes, and the winter was the social season of the higher classes in London. In the summer months, London emptied itself of many of its aristocratic citizens, as they went to their country estates or to the resort towns, and thus the potential market was much reduced. The lecturers, however, soon learned to compensate for this by engaging in an itinerant industry of following their aristocratic clientele out to the provincial sites and delivering lecture courses there. In all this, we see that it was part of the lecturers' strategy to structure their courses around the daily schedule of the coffee house patrons (and to a certain extent, those in business), as well as the seasonal social patterns of the higher classes.

To the above general testimony about the social standing of the auditors, we can add the names of several men that we know attended some of the lectures of Whiston. Alexander Pope and Richard Steele have already been mentioned;[23] to their names we can probably add Joseph Addison.[24] In addition to these men, Whiston also speaks of General James Stanhope

---

[22]See Appendices I-VIII. The evident seasonal pattern that emerged from the construction of these profiles is one of the most valuable results of this present study. It is also confirmed by testimony from advertisements of both experimental and non-experimental science lecturers. Desaguliers, for example, noted in a January 1724 advertisement that he ran "Courses of Experimental Philosophy all the Winter and Spring" (*DC* Monday 6 January 1724, No. 6929). Likewise Thomas Watts and Benjamin Worster gave notice in many of their advertisements that courses were continually run at their Academy, "every Monday, Wednesday, and Friday, in the Evening, during the Winter Season" (see for example, *DC* Wednesday 6 November 1723, No. 6878).

[23]G.S. Rousseau, without giving a source, attests that Pope not only attended Whiston's lectures at Button's (which would have been the mathematical series), but that the Tory poet also bought the Whiston-Hauksbee course manual for six shillings (Rousseau, "Science Books," p. 246 n.66). If Pope did in fact purchase the course manual (at one shilling above the going rate!), it is possible that he also attended Whiston and Hauksbee's experimental course in Crane Court.

[24]Christopher Wordsworth attests that Addison attended Whiston's "astronomical lectures" in London, but does not provide a source for this assertion (Wordsworth, *Scholae Academicae: Some Account of the Studies at the English Universities in the Eighteenth Century* [Cambridge: Cambridge University Press, 1910], p. 242). Peter Smithers has speculated that Addison's hymn on creation that appeared in the *Spectator* (Saturday 23 August 1712, No. 465) was influenced by Whiston's lectures on astronomy (Smithers, *The Life of Joseph Addison* [Oxford: Clarendon Press, 1954], p. 273). Smithers was not aware of any lecturing dates, but we do know that Whiston had begun an eighteen lecture course with the two Hauksbees and Humphrey Ditton on 4 August 1712 (*DC* Friday 25 July 1712, No. 3365). It is possible that Whiston was presenting astronomical material in this course; it is also feasible that Whiston had influenced Addison at an unadvertised astronomical lecture at a coffee house, or that Whiston influenced Addison at a more personal level. We have already seen that Whiston had been able to inspire Alexander Pope to rapturous comments on astronomy and the design argument. In any case, Addison is known to have acquired a general interest in astronomy (Smithers, *Joseph Addison*, p. 273). Addison's introductory comments to the hymn treat the design argument in an apologetic

as his "principle auditor" at Button's,[25] the Duke of Argyle as attending his experimental course,[26] as well as the Duke of Newcastle and Lord Godolphin attending his 1715 lectures on the solar eclipse.[27] Whiston's testimony of actual names is quite helpful, but it must not be taken as representative. For various reasons, this small sampling of names is biased in favour of Whiston's patrons and those with social prestige and authority. In this respect, the subscription list given in the first volume of Desaguliers' *Course of Experimental Philosophy* is very helpful in providing a idea of the men and women who supported Desaguliers' lectures.[28] While this list does not amount to an actual register of Desaguliers' lecture course auditors,[29] it can be assumed that at least some of the people listed had attended his lectures in the past. Also, the list of names probably provides a good indication of the social and occupational locations of people who actually did attend. And, even though the list is not directly a catalogue of auditors' names, in some ways it allows for a more accurate profile

---

manner that is certainly similar to what we see in Whiston's writings; it is difficult to distinguish between these sentiments and similar beliefs that were held by many religious people in the early eighteenth century. The hymn is clearly a paraphrase of Psalm 19, and the design argument implicit in the words of the hymn is present in the words of the Psalmist. The three verses of Addison's hymn, which has made its way into more than one hymnal, are as follows: "I. The Spacious Firmament on high, / With all the blue Etherial Sky, / And spangled Heav'ns, a Shining Frame, / Their great Original proclaim: / Th'unwearied Sun, from day to day, / Does his Creator's Pow'r display, / And publishes to every Land / The Work of an Almighty Hand. / II. Soon as the Evening Shades prevail, / The Moon takes up the wondrous Tale, / And nightly to the listning Earth / Repeats the Story of her Birth: / Whilst all the Stars that round her burn, / And all the Planets, in their turn, / Confirm the Tidings as they rowl, / And spread the Truth from Pole to Pole. / III. What though, in solemn Silence, all / Move round the dark terrestrial Ball? / What tho' nor real Voice nor Sound / Amid their radiant Orbs be found? / In Reason's Ear they all rejoice, / And utter forth a glorious Voice, / For ever singing, as they shine, / 'The Hand that made us is Divine'" (*The Spectator* Saturday 23 August 1712, No. 465).

[25]Whiston, *Memoirs*, 1: 257-8.

[26]Whiston, *Memoirs*, 1: 119. Whiston is referring to Archibald Campbell (1682-1761), a Scotsman who became Lord Islay in 1705 and the third Duke of Argyle in 1743 (*DNB*, 3: 793). Campbell is known to have had an interest in mathematics and astronomy, practices that he patronized accordingly (Taylor, *MPH*, p. 130).

[27]Whiston, *Memoirs*, 1:205. There is also independent evidence that Pope attended some of Whiston's lectures on the 1715 eclipse. In a letter from John Gay and Pope to Caryll, mention is made of the debt Pope owes to Whiston for his "skill in astronomy and particularly in the revolution of eclipses." Gay and Pope to Caryll, April 1715, *Correspondence of Pope*, 1:288.

[28]The names found in this list are included as Appendix XIII.

[29]For example, Isaac Newton's name is included, but it is doubtful that he ever attended any of Desaguliers' experimental courses. Still, as suggested above, even those who did not physically attend one of Desaguliers' lectures formed a "virtual" audience through an active reading of the text.

of the sorts of people who may have attended. This is because the list is exhaustive, and thus is not biased by the pre-selection of prestigious names. The complete list of 307 subscribers is nevertheless an impressive who's who of London, and included George I, George II, Queen Caroline, several prominent politicians from the Whig Sir Robert Walpole to the Tory leader of the opposition Sir William Wyndham, men of science and FRS such as Isaac Newton, Hans Sloane, Martin Folkes, as well as nobles, clergymen and other notables.[30] However, the list also includes the names of lesser gentry, tradesmen and merchants. It is perhaps not surprising that this subscription list for Desaguliers' text also contains the names of several of Whiston's patrons.[31] This sort of overlap in disbursements of patronage demonstrates that some of the more active patrons were probably supporting public science in a general way, rather than rewarding individual practitioners of science for entirely unrelated and personal reasons.

9.3 Lecturing Income Potential

Assessing the income potential of the experimental lectures is fraught with difficulty because of incomplete evidence. Nevertheless, some extrapolations and suggestions can be made. In this regard, Whiston's testimony that £120 maintained him and his household for a year in 1715 is most helpful, for it gives us an idea of the kind of annual income Whiston and others like him required to live in London at that time. Another comparable example is James Stirling's claim that he was bringing in £200 per year at the Little Tower Street Academy around 1730.[32] Heilbron has estimated Desaguliers' yearly income from lecturing at "perhaps 300 guineas," and he may not be far off.[33] (Desaguliers did not, of course, have to share his earnings with a significant partner). To earn this amount annually Desaguliers would only have needed a minimum of twenty subscribers at three guineas each for five lecture courses

---

[30]Desaguliers, *A Course of Experimental Philosophy*, sigs. A4^{r}-B2^{v}, C3^{v}.

[31]Compare Appendices XII and XIII.

[32]Stewart, *Public Science*, p. 128.

[33]Heilbron also provide figures for lecturers from other periods as well. Heilbron, *Electricity*, pp. 163-4.

a year. Twenty auditors would be a reasonable amount when one considers the space limitations of a residential venue, such as those of Desaguliers and Whiston and Hauksbee. But this number also not only coincides with some references to predetermined subscription minimums, but it also matches the only reference I have come across to the number of auditors at a London course.[34] A 1721 letter of William Whiston, Jr., to his married sister includes the following comment: " . . . My father has begun his course of Astronomy with about 21 subscribers."[35] This one lecture then would have provided Whiston and Hauksbee with sixty-three guineas between them. Staying with 1721, if Whiston and Hauksbee had a minimum of twenty auditors at their four courses that year (assuming that there were two astronomical and two experimental lectures), and if the price of both courses was still two and a half guineas an auditor, this would have provided them each with gross annual earnings of one hundred guineas (£105). They would have made a greater amount if they had more than an average twenty auditors at these lectures, or if they held any unadvertised, private courses. Other years were probably more lucrative, such as 1714 when Whiston and Hauksbee appear to have delivered five experimental lecture courses. Using the minimum of twenty auditors as a guide (as this was the same year Whiston overflowed Button's with auditors, the numbers may have been higher), five lectures of twenty auditors at two and a half guineas each amounts to one hundred and twenty-five guineas for each lecturer (£131 5*s*.). These estimates do not include their additional income from other sources (Hauksbee from his instrument-making; Whiston from his independent lecturing and tutoring, as well as his publishing and various patronage payments).[36] These extrapolations are helpful for

---

[34]It is also significant that Heilbron notes that lecturers usually required a minimum of twenty to thirty paying auditors before they would run a local course. Heilbron, *Electricity*, p. 163.

[35]William Whiston, Jr. to Sarah Barker, 11 February 1720 (Cited in Farrell, *William Whiston*, p. 212). (The younger William Whiston at this time was still living with his father and mother in London). There are strong reasons for taking the date of this letter as Old Style. On 8 February 1720 N.S. Whiston and Hauksbee began a course of experiments. However, on 8 February 1721 N.S. the two men had just started a course of astronomy (See Appendix II). Farrell does not provide a reference for this letter, and I was regrettably not able to find it among the Whiston correspondence held at the Leicestershire Record Office in my all too brief visit to the L.R.O.

[36]This income, with their additional earnings from other sources, compares with that of the better-paid craftsmen. During this period the wages of jewellers, chair-carvers and instrument-makers peaked at £3 to £4 per week, or roughly between £150 to £200 per annum (Rudé, *Hanoverian London*, p. 88). Earnings from

assessing lecturing income potential, and for allowing provisional economical and social comparisons with other occupations. Still, until further information is uncovered, extrapolations of the lecturing income of the first generation of lecturers will remain tentative.

Another indicator of relative success in income is found in the residential locations of the various lecturers. We know, for example, that Whiston found himself with the necessary finances to move from Cross Street to Great Russell Street in the aristocratic neighbourhood of Bloomsbury Square in 1722, where he remained until at least 1730.[37] This may be an indication of his success at lecturing,[38] as leasing a good home could cost between £40 and £60 and more annually—and this without taking into consideration other costs, such as household expenses.[39] As for the younger Hauksbee, he may have been facing rents

---

clerical positions offer further comparisons. Geoffrey Holmes gives £80 per annum as "the basement line of the clerical middle orders" (Holmes, *Augustan England*, p. 95). And most country rectories offered annual earnings of between £80 and £200 (Holmes, *Augustan England*, p. 97). Compared to these rates the lesser clergy of London were rather poorly paid. Many curates serving in the diocese of London were earning from £30 to £45 each year in the 1720s and 1730s (Holmes, *Augustan England*, p. 106). Turning to theatre we find that stage actors at Covent Garden Playhouse earned £1 nightly in the 1730s, which amounted to between £150 and £180 per annum (the same amount Whiston would have earned in a one evening coffee house lecture with twenty auditors paying one shilling each). Stars such as Mrs. Heron earned £250 in the 1735-1736 season, and David Garrick earned £2 each night for one hundred and fifty nights in his first important London performance beginning in 1741 (Rudé, *Hanoverian London*, pp. 65-6).

[37]John Strype in his 1720 survey of London refers to Great Russell Street as "a very handsome and well built street . . . and aristocratic area" (Cited in Weinreb and Hibbert, *London Encyclopaedia*, p. 329). Whiston's descriptions of the location of his residence as "over-against Montague-House," and "by Bloomsbury-Square," indicate that the house was situated on or near the grounds of the present British Museum. Whiston's various residences from the time he moved to London in late 1710 are the subject of some of my on-going research. The last reference I have come across to Whiston living at Cross Street is in a book advertisement placed in *DC* Tuesday 27 February 1722, No. 6350. The next reference to Whiston's address shows that he was living at Great Russell Street by October 1722 (*DC* Friday 12 October 1722, No. 6545). From this point, correspondence and advertisements show that Whiston lived at Great Russell Street until at least the summer of 1730 (*DC* Wednesday 12 August 1730, No. 9000). There are no further references to Whiston living at Great Russell Street, and preliminary research shows that he and his wife alternated between the residence of his married daughter Sarah Barker, who lived in Lyndon, Rutland, and the home of his son John Whiston, a Fleet Street bookseller. This latter evidence may imply a financial decline.

[38]The move of Whiston and his family to Great Russell Street may also have been made possible by the £470 subscription raised for his Longitude research in November 1721, part of which was intended for "the support of [his] family." See Whiston, *Memoirs*, 1: 254-5.

[39]On the cost of renting homes in the various areas of London in this period, see Rudé, *Hanoverian London*, pp. 15-17, 50-2.

around £50 per annum for his shop in Crane Court, Fleet Street.[40] Desaguliers provides us with another example of income stability, for we see him establishing himself in a good neighbourhood in Westminster by 1715, and staying there until 1739. Once again, however, we have to remember that lecturing was not the sole source of income for these men. Rather, it was very much a part-time occupation. Whiston, among other things, published and received patronage; Desaguliers too received patronage, as well as payments for his duties at the Royal Society, income from his Church living and revenue from various financial projects. Nevertheless, the above information shows that lecturing could provide enough of an income supplement to allow these men, with their other occupations, to survive and live fairly comfortably in commercial London.

9.4 Patronage as Secondary Lecturing Income: The Case of William Whiston

While the prominent and consistent placement of well-worded advertisements must have won the lecturers the greatest number of auditors, and while there was certainly money to be made from lecturing, good connections with people of influence were also essential to a scientific lecturers' success.[41] In the case of Whiston, while the advertisements go a long way in providing the chronology and details of his lecturing career, they do not provide a full account of how he managed to get his start as a lecturer. In this regard, the literary figures and prominent Whigs, Joseph Addison and Richard Steele, loom large in establishing Whiston at Button's starting 25 August 1713.[42] In a letter to Steele from Henry Newman, the Secretary of the Society for Promoting Christian Knowledge (of which society Whiston had

---

[40]Olivia Brown, "The Instrument-Making Trade," in Porter, *et al*, *Science and Profit*, p. 21.

[41]This section focuses on the example of Whiston as I am able to draw on my own research into his patronage sources and income. Also, a very valuable and instructive account of J.T. Desaguliers' patronage sources and commercial interests has already been produced and can be found in Stewart, *Public Science*, passim. On the subject of lecturing and patronage, see also Stewart's "Public Lectures and Private Patronage," pp. 47-58. Desaguliers certainly experienced success in receiving patronage. His remunerated position of curator of experiments at the Royal Society (obtained through Newton's agency) and the £70 yearly benefice in Norfolk he received after presenting his lecture course to King George I in 1717, are but two of the more important examples (see Stewart, *Public Science*, p. 130 and Hans, *New Trends in Education*, p. 140.

[42]Whiston's move to Button's on 25 August 1713 from Douglas's Coffee House is advertised in *DC* Monday 24 August 1713, No. 3701.

once been a member), Newman thanks Steele for his charity in providing Whiston with a lecturing venue, but is also careful to caution Steele about Whiston's attraction to heretical ideas:

> I thank you for y^r^ Kindness to M^r^ Whiston as it is a Charitie not only to him but to the Publick in putting him upon an Amusement which may divert him from those Studies that have made him so obnoxious to the reproach of Good Men. I gave him notice immediately of yo^r^ favour, & suppose he will wait upon you for y^r^ Commands. I only beg leave to suggest one thing to you when he does, because it will come with more authority from you than perhaps any man in y^e^ Kingdom beside, and y^t^ is that you will be pleas'd to conjure him Silence upon all Topicks foreign to the Mathematicks in his Conversation or Lectures at y^e^ Coffeehouse. He has an Itch to be venting his Notion about Baptism & the Arrian Doctrine but yo^r^ authority can restrain him at least whilst he is under your Guardianship.[43]

True to Newman's recommendations, Whiston was to find that his presence at one of the more popular coffee houses was not to come about without some policing. Steele appears to have been trying to keep Whiston in check even while he was at Douglas's. In Pope's 14 August 1713 letter to Caryll, Pope speaks of the "brisk sallies and quick turns of wit, which Mr Steele in his liveliest and freest humours darts about [Whiston]."[44] Two years later, after the March 1716 appearance of *aurora borealis*, Steele was sufficiently confident in Whiston's abilities to allow him to use his 200 seat Censorium to discourse on that astronomical event. Whiston for his part was genuinely appreciative of the help he received from Addison and Steele, and, in a section of his *Memoirs* where he mentions Addison, the former Cambridge professor has the following to say:

> Upon occasion of the mention of this person, *Mr. Addison*, who was excellent

---

[43]Newman to Steele, 10 August 1713, White Hall, *The Correspondence of Richard Steele*, ed. Rae Blanchard (Oxford: Clarendon Press, 1968), p. 571.

[44]Pope to Caryll, 14 August 1713, *Correspondence of Pope*, 1: 185. Still, Pope's remarks on Whiston's 1713 coffee house lectures indicate that the latter was using the astronomical subject matter to expound on the religious version of the design argument. This is made especially evident by Pope's allusion both to Creation and Psalm 8:3-4: "When I consider thy heavens, the work of they fingers, the moon and the stars, which thou hast ordained; What is man, that thou art mindful of him?" (See Pope to Caryll, 14 August 1713, *Correspondence of Pope*, 1: 185-6). In fact, allusions to the design argument appear to have been an integral element of the experimental lecturers' subject matter. Both the Dedication to Desaguliers' *Course of Experimental Philosophy*, and the Preface to Worsters' *Principles of Natural Philosophy* imply that the contemplation and demonstration of the works of God were crucial aims of experiment. There is further discussion of this subject below.

> every way, as a traveller, as a prose writer, and as a poet, who was my particular friend; and who, with his friend Sir *Richard Steel*, brought me, upon my banishment from *Cambridge*, to have many astronomical lectures at Mr. *Button*'s coffee-house, near Covent-Garden, to the agreeable entertainment of a good number of curious persons, and the procuring me and my family some comfortable support under my banishment.[45]

Whiston's comments here provide ample testimony not only of the importance of such patronage, but also of the adequacy of the income he derived from lecturing. It is also probable that his lectures at Button's and other coffee houses gave him a platform from which he could advertise his experimental courses.

It is also important to emphasize that Whiston received financial support from patrons for his lecturing and scientific work, in addition to the direct payments he received from auditors. For example, during the solar eclipse of 22 April 1715, Whiston received, in addition to income derived directly from lecturing and the sale of books and schemes, "generous presents from my numerous and noble audience; who at the recommendation of my great friend, the lord *Stanhope*, then secretary of state, gave me a guinea apiece."[46] In addition to these gifts, Whiston also received twenty guineas from the Duke of Newcastle and five guineas from Lord Godolphin, so that his total earnings derived from the eclipse were £120.[47] Thus something substantially more than twenty-five guineas of the £120 total came from patronage. The entire sum, Whiston asserts, maintained him and his family "for a whole year together."[48] Nor, of course, would this have been Whiston's only income for that year.

In the rest of this section we will use what we know about Whiston's lecturing patterns, as well as the available evidence of Whiston's other income sources, to assess both the relative financial success of Whiston's lecturing career, and the economic needs of

---

[45]Whiston, *Memoirs*, 1: 257-8.

[46]Whiston, *Memoirs*, 1: 204.

[47]Whiston, *Memoirs*, 1: 205.

[48]Whiston, *Memoirs*, 1: 205.

Whiston during his main lecturing years.[49] First, the evidence of Whiston's pre-1711 income will provide an idea of the income Whiston was receiving before his expulsion from Cambridge. From 1698 to 1703, Whiston took in about £120 annually from his church living at Lowestoft cum Kessingland.[50] Starting perhaps as early as 1701, Whiston was also taking in revenues of £30-40 per annum from a farm he owned near Newmarket.[51] Then, when Whiston officially took over as Lucasian Professor at Cambridge in 1701 (at which time his living at Lowestoft was annulled), he earned a salary of at least £100 annually until 1710.[52] To this we can add the £50 he earned in 1707 as Boyle Lecturer for that year.[53] Thus from 1698 to 1710, without taking into consideration his publishing revenue, Whiston appears to have been earning at least £120 to £180 each year. Given that a clergyman of moderate means at this time made about £60 per annum, this was clearly a comfortable, although by no means extravagant, living. It is also important as a baseline, for Whiston likely had this previous, more stable income in mind when he later spoke of his financial difficulties. The shift in fortunes from 1710 to 1711 was dramatic. Whiston dropped from a base annual income of at least £130 in 1710 to a fixed income of only £30 the following year (from his property). While Whiston likely had accumulated some capital from his previous earnings, he was still faced with a situation in which he had to establish completely new sources of income, and this at a time when he was being publicly prosecuted for antitrinitarian heresy. In fact, Whiston was not to receive an additional regular, fixed source of income until 1727, when he began to collect a £40-50 annuity from Queen Caroline (which was continued after her death in 1737 by her husband George II).[54] The addition of this annuity in 1727 gave

---

[49]The information discussed here is derived from the accumulated evidence presented in Appendix XI, where much of this material is explained in more detail. To avoid unnecessary duplication, only limited references will be provided here.

[50]Whiston, *Memoirs*, 1: 108, 290.

[51]See Appendix XI, notes 6-8 for the sources that supply this information.

[52]Westfall, *Never at Rest*, p. 206.

[53]This information is given in the will of Robert Boyle, cited in R.E.W. Maddison, *The Life of the Honourable Robert Boyle* (London: Taylor & Francis, 1969), p. 274.

[54]See Appendix XI, notes 18-19 for the sources that supply this information.

Whiston a base income of £70 yearly, and a £20 annuity from Sir Joseph Jekyll's will beginning in 1738 further raised his annual income to £90.[55] Furthermore, as already suggested, from the 1730s Whiston and his wife do not even appear to have been maintaining their own house, with all the costs that go along with this. Thus it was exactly the years in which Whiston was lecturing that he most needed the extra revenue.

Whiston also received many one-time patronage payments, and this more unpredictable income needs to be taken into consideration along with the overall assessment of Whiston's financial success. Unfortunately, several of these one-time payments Whiston received cannot be dated conclusively; there are also other payments for which we have neither dates nor amounts.[56] Thus nothing completely definitive can be extrapolated about Whiston's success in obtaining patronage. But the payments that we can date do provide helpful information. These include fifteen guineas in 1712 from Eugene of Savoy; ten guineas in 1713 from the Duke of Newcastle; something over twenty-five guineas in 1715 during the solar eclipse; fifty guineas in 1719 from Chancellor Parker; £470 3s. 6d. in 1721 from various patrons for work on longitude; £20 in or around 1730 from Sir Joseph Jekyll; £20 in 1730 from "y^{e} Prince" (probably Frederick Louis, the Prince of Wales); £10 in 1736 to act as a charity agent; £175 in 1740-1741 for work on a coastal survey, and finally another £500 in January 1741 for the same coastal survey.[57] These extra payments, many of which were indirect results of his lecturing work, would have contributed much to the maintenance of Whiston's household and lifestyle. The large payments for his work on longitude and the coastal survey stand out as significant as well. It is clear, however, from Whiston's own comments, that a large amount of these funds were redirected to those working under him and for paying expenses directly related to the work. For example, Whiston asserts that the £500 he received in January 1741 did not cover his costs.[58] Still, Whiston also affirms that

---

[55]On the annuity from Jekyll, see Whiston, *Memoirs*, 1: 290 and William Whiston, Jr. to George Whiston, 30 September 1738, L.R.O. Conant MSS. DG11/DE.730/2, item 125.

[56]See Appendix XI for some of these.

[57]Appendix XI provides the sources for these patronage payments.

[58]Whiston, *Memoirs*, 1: 254.

the 1721 subscription of £470 was made not only for his longitude research, but also "for the support of my family."[59] It appears, then, that the income Whiston received from lecturing from 1713 to 1728 greatly assisted him in bringing him back to his original pre-1710 baseline, and perhaps beyond it.

Finally, we will consider Whiston's own qualitative testimony on the material value of his lectures. Reference has been made more than once to Whiston's comment regarding the £120 he received during the 1715 solar eclipse. Whiston noted that this amount of money "was a very seasonable and plentiful supply, and maintained [him] and [his] family for a whole year altogether."[60] We have also considered the testimony of Whiston's April 1728 letter to Mr. Archer, in which Whiston despaired at the loss of his lecture course income, which, he said, "was one of y^{e} main supports of my self & family."[61] To this we can add another comment from Whiston. After outlining his various other income sources, Whiston states in his *Memoirs* that these, "with eclipses, comets, lectures of several sorts in *London* and elsewhere . . . has made me up such a competency as has greatly contented me, and made me to go on all a long comfortably in my studies."[62] This last comment also shows that Whiston's lecturing—which was, after all, only a part-time activity—also provided him with a certain amount of scholarly leisure time. Thus, Whiston's own testimony of the sufficiency of his lecturing income shows that his lecturing provided an income supplement adequate enough to allow him, with his other occupations, to live fairly comfortably with a degree of social prestige in commercial London. We have also seen how important secondary income from patronage was for Whiston. And, although his regular lecturing career seems to have come to an end sooner than he had hoped, the number of years that Whiston sustained his lecturing, to audiences of well-paying nobles, politicians and wits, themselves demonstrate a measure of success.

---

[59]Whiston, *Memoirs*, 1: 254.

[60]Whiston, *Memoirs*, 1: 205.

[61]Whiston to Archer, 5 April 1728. British Library Add. MS. 28,104, fo. 26r.

[62]Whiston, *Memoirs*, 1: 290-1.

10. EIGHTEENTH-CENTURY PUBLIC EXPERIMENTAL LECTURING: RELATIONS, IMAGES, AGENDAS AND CONTEXT

10.1 Isaac Newton, the Royal Society and Public Experimental Lecturing

Newton was important to the rise of experimental lecturing in at least four ways. First, the importance of knowing Newton and receiving the benefits of his intercessions are readily apparent. Newton was responsible for helping launch William Whiston's career in science through arranging for the latter's appointment to the Lucasian Professorship at Cambridge (this even though Newton was later to have a falling out with Whiston). Newton was involved in the appointments of both the elder Hauksbee and J.T. Desaguliers to the *de facto* position of curator of experiments at the Royal Society. Newton was instrumental in helping Humphrey Ditton secure a position as a mathematics teacher at Christ's Hospital, as well as arranging for James Stirling to find a lucrative post at the Little Tower Street Academy. Second, Newton's scientific ideas were crucial to the content of the courses. Although the material used in the experimental courses derived from several sources, Newton's work on mechanics, his theory of colours and his refinements to astronomical theory made their way into the experimental and astronomical course syllabi. Third, Newton's revival of experiment at the Royal Society beginning in 1703,[1] indirectly helped to motivate first Hauksbee and then Desaguliers to better experimental performances, which in turn could be presented publicly for profit. This had a secondary affect as well, encouraging the continued development and growth of an experimental culture in London and other parts of Britain. Finally, Newton was important as a much-invoked icon for the lecturers. The name "Newton" and the adjective "Newtonian" (associated with both the content and the methodology), appeared in the advertisements, in the course syllabi and almost certainly in the delivery of the lectures themselves. The terms "natural philosophy" and "experimental philosophy" were even used interchangeably with the expression "Newtonian philosophy."[2]

---

[1]See M.B. Hall, *Promoting Experimental Learning*, pp. 116-28.

[2]Examples of this can be found in the Preface to Desaguliers' *Course of Experimental Philosophy*, sigs. $B4^{r}$-$C2^{v}$.

Thus Newton had much to give, both directly and indirectly, to the experimental lecturers.[3]

The relationship between the public experimental lecturers and the Royal Society is an interesting one. For although there is no clear evidence of direct sponsorship of the public lectures by the Royal Society, this institution is important to the rise of public experimental lecturing for more than one reason. First, as mentioned above, under the presidency of Isaac Newton, there was a greater emphasis on experiment. And while this must not be exaggerated, the meetings of the Society certainly provided a supportive forum for the elder Hauksbee to begin to refine his demonstration skills and to create an experimental repertoire *before* he began his public demonstrations in 1705. Similarly, when Desaguliers began to act as curator of experiments in 1714, he was able to take to the public experimental demonstrations first perfected and presented for the meetings of the Society. In this way, experimental philosophy developed for the Royal Society was disseminated to a wider public. Unlike the later generations of experimental lecturers, many of the members of the first generation had definable relationships with the Royal Society. John Harris (1696), John Keill (1700), James Hodgson (1703), Francis Hauksbee, Sr. (1705), Roger Cotes (1711), J.T. Desaguliers (1714), James Jurin (1717), John Whiteside (1718), James Bradley (1718), James Stirling (1726) and Benjamin Robins (1727) were all appointed Fellows of the Royal

---

[3]Although there exists no evidence that Newton himself ever attended any of the public experimental lectures, he does seem to have shown some interest in the printed material they produced. His library included a copy of the elder Hauksbee's *Physico-Mechanical Experiments* (1709); a 1716 Italian translation of the same work (Harrison, ed., *Library of Newton*, p. 158); Whiston and Hauksbee's 1714 course manual (Harrison, ed., *Library of Newton*, p. 157), and Desaguliers' eighty-page *Physico-mechanical lectures* (1717). This last item was bound with William Vream's *A description of the air-pump* (London, 1717) (Harrison, ed., *Library of Newton*, p. 259). It is also apparent that Newton received something in return from the experimentalists as well, and he on a few occasions in print hinted at the inspiration he derived from their work. For example, in Query 31 of his *Opticks*, Newton specifically mentions experiments "made by Mr. Hauksbee," from which he draws conclusions (Newton, *Opticks, Or A Treatise of the Reflections, Refractions, Inflections & Colours of Light* [New York: Dover, 1952; based on the 4th ed., London, 1730], p. 393). Newton also alludes to Hauksbee's electrical experiments in Query 8 (Newton, *Opticks*, pp. 340-1). Other references, such as a comment about "Experiments . . . tried before the Royal Society" (Newton, *Opticks*, p. 391), probably refer to experimental work carried out by either the elder Hauksbee or Desaguliers. The possibility that Newton may have received inspiration from experimentalists such as the elder Hauksbee and Desaguliers, though it would not have been as great as the inspiration they derived from him, should nevertheless not be overlooked (for comments of the mutual influence between Newton and Hauksbee, see Guerlac, "Francis Hauksbee," *DSB*, 6: 173).

Society.[4] Whiston may have become a Fellow after being nominated in 1716 or 1720, if his nomination had not been blocked by Newton (again showing how crucial it was to have Newton's support).[5] Although Francis Hauksbee, Jr. was never elected FRS, he was appointed to the remunerated position of clerk and housekeeper of the Society in 1723, a post in which he continued for forty years until his death in 1763. Furthermore, Keill, Hodgson, the elder Hauksbee, Cotes, Ditton, Desaguliers, Jurin, Bradley, Stirling and Robins all contributed papers to the *Philosophical Transactions*, the official journal of the Royal Society.[6] Although not an official or conscious supporter of the public experimental lectures, the Royal Society indirectly helped stimulate the experimental work of the lecturers, provided a forum for the refinement and development of experimental techniques, and offered prestige through association with it.

---

[4]Wallis and Wallis, *Biobibliography*, p. 2; Kubrin, "John Keill," *DSB*, 7: 276; Wallis and Wallis, *Biobibliography*, pp.14, 12, 37, 45, 53, 108, 126, 87 and 161.

[5]Whiston records an event that he dates to around 1720, in which he was at Child's Coffee House with Edmond Halley and Hans Sloane (both FRS). According to Whiston, Halley asked him why he was not a member of the Royal Society. Whiston told them it was because "they durst not choose an *Heretick*." Halley, no High Church Anglican himself, said that if Sloane proposed Whiston, he would second the nomination. However, Newton, himself a crypto-antitrinitarian, balked and threatened to resign as President if Whiston was allowed to join The proposal was subsequently dropped. Although Whiston was never elected, this incident reveals that two men such Halley and Sloane felt that Whiston was a suitable candidate. Nevertheless, Whiston attests that the Society had never refused him entrance to meetings, and that he was permitted to "lay any of my papers or instruments before them, whenever I desired it; without my being an actual member: which, considering my small ability to pay the usual sums for admission, and annual dues, was almost as agreeable to me as being a constant member." (Whiston, *Memoirs*, 1: 249-50). Richard Westfall confirms that Whiston was nominated, but that the Journal Book of the Royal Society records the nominator as Martin Folkes, then Vice-President, and the date as May 1716 (Westfall, *Never at Rest*, p. 653).

[6]For Keill, see Kubrin, "John Keill," *DSB*, 7: 276. For the other lecturers' publications in the *Philosophical Transactions*, see their various entries in Wallis and Wallis, *Biobibliography*. A communication from Whiston to the Royal Society providing his observations of the phenomenon of mock-suns in October 1721, was first read at the Royal Society, and later published, along with other observations of the same phenomenon, in the *Philosophical Transactions Abridged* in 1733 (Farrell, *William Whiston*, pp. 223 and 225).

10.2 The Goals of Experimental Lecturing

Not only were all the experimental lecturers Newtonian in their approach and methodology, but they were also fiercely apologetic in this stance.[7] This is evident in their agenda, which is revealed in publications relating to their lecture courses, as well as scientific and mathematical publications of a more general nature.[8] The public experimentalists believed that true natural knowledge was founded on experiment, not "vain hypotheses." In the preface to his *Physico-Mechanical Experiments*, Francis Hauksbee, Sr. presents without ambiguity the Newtonian agenda of experimental philosophy:

> The Learned World is now almost generally convinc'd, that instead of amusing themselves with *Vain Hypotheses*, which seem to differ little from *Romances*, there's no other way of *Improving* NATURAL PHILOSOPHY, but by *Demonstrations* and *Conclusions*, founded upon Experiments judiciously and accurately made. By this course, after many Ages had pass'd, with little or no Progress in the *True Knowledge* of the *Nature of Things*, greater advances have been made within the compass of a small Number of Years, than was easily to be imagin'd, that the most sagacious Men, with their Greatest Industry, could ever have been capable of attaining to.[9]

Hauksbee then goes on to describe the work of the "Honourable and most Excellent Mr. *BOYLE*," who by experiments shed light on "the Causes and Operations of Nature," especially by "the Invention of that most Useful Instrument the *Air-Pump*."[10] Next, Hauksbee asserts that by the same experimental method, "the most Learned and Incomparable Sir *ISAAC NEWTON* has invented and establish'd the Theory of *Light* and *Colours*."[11] Hauksbee

---

[7]Similar themes related to this "fiercely argumentative program" are explored in Arnold Thackray, "'The Business of Experimental Philosophy:' The Early Newtonian Group at the Royal Society," *Actes du XIIIe Congres International d'Histoire des Sciences* 3B (1971): 155-9.

[8]Many of these more general publications were also crucial in the popularization of Newtonian science. We have already mentioned several publications of this sort produced by Whiston.Desaguliers' English translation from the Latin of the Dutch natural philosopher Willem Jacob Sturm van 'sGravesande's work on Newtonian science (first published as *Mathematical elements of natural philosophy confirmed by experiments* in 1720), was a key text that went through six editions. Desaguliers' Newtonian agenda is also seen in his *The Newtonian system of the world, the best model of government* (Westminster: By A. Campbell, for J. Roberts, 1728).

[9]Hauksbee, *Physico-Mechanical Experiments*, sigs. A2^{r-v}.

[10]Hauksbee, *Physico-Mechanical Experiments*, sig. A2^{v}.

[11]Hauksbee, *Physico-Mechanical Experiments*, sig. A3^{r}.

is unambiguous: true knowledge and new discoveries come by demonstration through experiment, not hypotheses. Similarly, Desaguliers gives notice in his course advertisements that "the Principles of Mechanicks, Hydrostaticks, Pneumaticks and Opticks, are rationally demonstrated and proved by . . . Experiments."[12] Benjamin Worster too in his course text asserts that "the solid Principles of true Philosophy are deduced from the *Phænomena* of Nature, and what Dependence of particular Causes upon general Laws may be rationally concluded from a sufficient Number of certain and undoubted Observations."[13] Worster is also clear that close attention to the works of nature, "tend more to the Advancement of GOD's Glory, and the Displaying his Perfections to Mankind, than the finest Periods and most elaborate Harangues of the greatest Orator can do."[14] Experiment and attention to nature—not words or rhetoric— lead to the true knowledge of nature.

The strong apologetic strain in much of the material in the lecture courses is evident in a negative way as well. For not only is the rhetoric of the lecturers decidedly pro-Newtonian, but the lecturers also include in their pedagogical agenda proofs demonstrating the falsehood of several theories. The catalogue for Whiston and Hauksbee's course of astronomy shows that one of the first items of business is to disprove the Ptolemaic and Tychonic systems of the solar system.[15] The syllabus of the Little Tower Street Academy includes among headings such as "Sir *Isaac Newton*'s first Law of Motion demonstrated," the statement "Monsieur *Des Cartes*'s *Vortices* exploded."[16] Desaguliers includes this heading in his syllabus as well,[17] and in his *Course of Experimental Philosophy* also speaks of the limitations of "Mons. Des Cartes's *philosophical Romance*."[18] Roger Cotes, too,

---

[12]*DC* Friday 27 November 1713, No. 3783.

[13]Worster, *Principles of Natural Philosophy*, pp. iii-iv.

[14]Worster, *Principles of Natural Philosophy*, pp. vii-viii.

[15]Whiston and Hauksbee, *Course of Astronomy*, p. 1.

[16]Worster, *Principles of Natural Philosophy*, p. 233.

[17]Desaguliers, *Course of Mechanical and Experimental Philosophy*, p. 7.

[18]Desaguliers, *Course of Experimental Philosophy*, sig. B3^{r}.

includes an attack on Cartesian vortices in his 1713 Preface to the second edition of Newton's *Principia*.[19] False knowledge, based as it is on "vain hypotheses," must be discarded as useless to the advancement of true natural philosophy.

Another emphasis seen in the work of the lecturers is the stress on the utility of the material presented in the courses. Here the lecturers also could capitalize on an already existing desire for improvement—both moral and practical. Francis Hauksbee, Sr. and James Hodgson, in their first advertisement for their course of experiments, attest that the course is "[f]or the Advancement of Natural Philosophy and Astronomy, as well as for the Benefit of all such Curious and Inquisitive Gentlemen as are willing to lay the best and surest Foundation for all useful Knowledge."[20] In the dedication of the first volume of his *Course of Experimental Philosophy* to the Prince of Wales, Desaguliers attests that "the Business of a Science" is "[t]o contemplate the Works of GOD, to discover Causes from their Effects, and make Art and Nature subservient to the Necessities of Life, by a Skill in joining proper Causes to produce the most useful Effects."[21] In his 1713 Preface to the second edition of Newton's *Principia*, Roger Cotes also takes up this same theme:

> Since the *Newtonian* Philosophy appears true to us, let us have the liberty to embrace and retain it, and to follow causes proved by phenomena, rather than causes only imagined and not yet proved. The business of true philosophy is to derive the natures of things from causes truly existent, and to inquire after those laws on which the Great Creator actually chose to found this most beautiful Frame of the World, not those by which he might have done the same, had he so pleased. It is reasonable enough to suppose that from several causes, somewhat differing from one another, the same effect may arise; but the true cause will be that from which it truly and actually does arise; the others have no place in true philosophy.[22]

The rhetoric of natural religion and the design argument is also evident in the words of

---

[19]Cotes, Preface to the Second Edition, *Sir Isaac Newton's Mathematical Principles of Natural Philosophy and His System of the World*, trans. Andrew Motte, rev. by Florian Cajori (Berkeley: University of California Press, 1947), pp. xxvii-xxxi.

[20]*DC* Tuesday 5 December 1704, No. 824.

[21]Desaguliers, *Course of Experimental Philosophy*, sigs. A2^{r-v}.

[22]Cotes, Preface, *Mathematical Principles of Natural Philosophy*, p. xxvii.

Worster, Desaguliers and Cotes cited above. Whiston also in works such as his *Astronomical Principles of Religion* (1717) and his later public lectures, engaged in a sustained industry of using science not only simply to demonstrate design in creation, but also to present arguments from religion, astronomy and natural philosophy to convince "the *Scepticks* and Unbelievers of our Age."[23] Given the common career paths of intellectuals in the early eighteenth century, it may not be particularly significant that many of the experimental lecturers treated in this thesis had also taken holy orders. What is more significant is just how Newtonian science was being used for religious apologetic purposes.[24]

The *Principia*, written as it was in Latin and the language of mathematics, was not a public book. Nor was it intended to be. As Copernicus had written over a century before in his *De revolutionibus*, "Mathematics is written for mathematicians."[25] For most, the *Principia* remained a veiled, abstract and difficult treatise, replete with mathematical reasoning and filled with incomprehensible geometrical diagrams. Yet some of those who could understand the significance of the science presented in the *Principia*, also understood the practical utility of many of its mechanical principles and that many of these principles could be presented in an intuitive manner. Here is one crucial aspect of the genius and success of the experimental lecturing program: divested of its mathematical garb and theoretical presentation, the new science could be brought to a wider range of people. Thus we read the guarantees of Desaguliers, who said that anyone, "*altho' unskill'd in Mathematical Sciences, may be able to understand all those* Phænomena *of Nature, which have been discovered by* Geometrical *Principles.*"[26] This, even though Desaguliers also

---

[23]Whiston, *Astronomical Principles of Religion*, p. 258-9.

[24]This is all the more significant when one realises that not all religious people agreed with this Newtonian agenda. Some clearly felt that the work of natural and experimental philosophy was in fact dangerous to religion, and Benjamin Worster felt constrained to defend his course text against these accusations. Worster, *Principles of Natural Philosophy*, pp. iii-viii.

[25]Nicolaus Copernicus, Preface, *Copernicus: On the Revolutions of the Heavenly Spheres*, trans. A.M. Duncan (Newton Abbot, Devon: David & Charles, 1976), p. 27.

[26]Desaguliers, *Course of Mechanical and Experimental Philosophy*, p. 3.

confirms that "*The Method of this Course is wholly Mathematical.*"[27] Instead of geometrical definitions, axioms and postulata, though, experiments are employed to "*prove the* Precepts."[28] This methodology, says Desaguliers, avoids the "*merely speculative*," and appeals to the senses to allow for a quick accumulation of knowledge, as well as a way to avoid "*a Year's close application to Books.*"[29]

We have also seen that the lecturers often billed their experimental courses as "diverting" and entertaining, indicating that they felt the skilful demonstration of the powers of nature through experiment offered not only moral education, but also "rational entertainment" for polite ladies and gentlemen who otherwise may have gone off to the theatre. The course syllabi reveal that the intent of the lecturers was often to focus on the spectacular. The experimental demonstrations included the creation of vacuums, the production of frictional electricty, the detonation of gunpowder, experiments to show principles of magnetism, novel displays with the "magic lanthorn," demonstrations with phosphorus and even experiments with live animals. Clearly, auditors did not come to the experimental courses expecting to hear abstract theorizing. Some came for improvement and practical knowledge; for others, as the advertisements reveal, the attraction was active powers and spectacle.

10.3 Early Eighteenth-Century Experimental Lecturing in London

It will be helpful to conclude with some observations on the importance, nature and impact of scientific and experimental lecturing. Along with popular science textbooks, public scientific lecturing was a major factor in disseminating and popularizing science to the non-academic sectors of early eighteenth century English society. One only needs to consider the sheer numbers of auditors who must have gone through these courses to realize the significance of the lecturers' enterprise. Also, even though the evidence of the course syllabi reveal that much of what was being exposed to the public was not specifically *Newtonian*

---

[27]Desaguliers, *Course of Mechanical and Experimental Philosophy*, p. 4.

[28]Desaguliers, *Course of Mechanical and Experimental Philosophy*, p. 4.

[29]Desaguliers, *Course of Mechanical and Experimental Philosophy*, p. 4.

science (even if it was portrayed as such), experimental lecturing played a crucial role in bringing the more recent Newtonian natural philosophy to the consuming public. It is true that the entire population was not exposed to the new science. The evidence presented in this thesis suggests that any observations about the contemporary reputation of science reflect primarily the interests of the gentry, nobility and the improvement-conscious commercial classes. Still, the fact that the market could support several experimental and scientific lecturers says much about the popularity and demand for science in this period. On the other hand, it is also clear that the scientific entrepreneurs themselves had a lot to do with the popularity of natural philosophy, and that they did what they could to cultivate a demand from which they could derive income.

Both the popularity of science, itself partly their own creation, and the growth of a consumer society in London, allowed for the establishment of new scientific entrepreneurial roles for these lecturers. Whiston, after being driven from Cambridge and marginalized on the academic scene, quickly created a way in which he could use his training and theoretical knowledge to continue his role as educator—albeit in a completely different social context. Desaguliers seems to have chosen to leave his academic post at Oxford with the intent to continue his lectures in commercial London. Similar "scientific pilgrimages" saw several other university-trained experimental philosophers migrate to the metropolis to ply their trade. Experimental lecturing offered to these men—if not a completely independent career—certainly lucrative income supplements and the possibility of patronage. Also, in an almost ideal Baconian manner, the experimental lecturing phenomenon brought academics and trade school educators together with craftsmen to provide a combination of theory and practice. Every experimental course offered from 1712 to 1728 included at least one university-trained lecturer to provide the necessary theoretical backing. This context also gave several instrument-makers the opportunity to capitalize on their practical experience. One result of this mixture of associations was the production of forms of knowledge that were often useful and practical (even if much of the material was presented for its utility as spectacle). In the lecture courses, the theoretical discoveries of the previous century were transformed into popular forms that could be visually and physically demonstrated. Furthermore, the lectures provided a filter through which the discoveries and knowledge of

the Royal Society could be exposed to a broader range of people. The lecturers were a sort of front line in the fiercely apologetic agenda of establishing Newtonian natural philosophy. And it would be wrong to assume an uncomplicated model for the mediation of science from Newton to the public. Clearly, the nature and purpose of science changed in the process. Early eighteenth century public science in Britain was simpler, less theoretical and more practical than its academic source. Moreover, it was eclectic (despite the constant invocation of Newton's name), and incorporated material not only from other natural philosophers, but also from craftsmen and instrument-makers. Finally, the science presented by the experimental lecturers was self-consciously public: it was fashioned to be more accessible than its mathematical ancestor, and it concentrated much more on principles amenable to spectacular and entertaining demonstrations than those forms of science created for theoreticians.

The contemporary interest in natural philosophy was not all of the same variety. For some in the gentry and aristocracy, science was a pursuit that could be taken up for the purposes of improvement or even entertainment. For others, especially tradesmen and emerging industrialists, there was much practical benefit to be derived from the knowledge of mechanics presented in the lectures, as well as course texts such as those produced by Desaguliers. Whatever the form and motivation of the interest in natural philosophy, the most significant impact of the experimental lecturers is to be seen in the important role they played in the popularization of science in the early eighteenth century. It is primarily to these practitioners of science that we must look—not Boyle, Newton or the Royal Society—when we examine the increasing presence of science in society. If only for the effect of their work on the imaginations of their non-scientific contemporaries, one should not overlook the crucial function the lecturers fulfilled in the early eighteenth century. With the apologetic edge of the Newtonian agenda, these lecturers brought the utility, ideas, images and spectacles of natural and experimental philosophy to a generation of Londoners and others. They helped take science from the sphere of a small, elite group and introduce it to the trades as well as the world of the coffee houses and polite society. In doing so they helped transform the nature and purpose of science. Here then is the greatest significance of the role played by the members of that new breed, the experimental lecturing entrepreneurs.

BIBLIOGRAPHY

PRIMARY SOURCES

BOYLE, ROBERT. *New Experiments physico-mechanical, touching the spring of the air, and its effects (made, for the most part, in a new pneumatical engine): written by way of letter to the Right Honourable Charles, Lord Vicount of Dungarvan, eldest son to the Earle of Corke.* Oxford: Printed by H. Hall, Printer to the University, for Tho. Robinson, 1660.

COPERNICUS, NICOLAUS. *Copernicus: On the Revolutions of the Heavenly Spheres*, trans. A.M. Duncan. Newton Abbot, Devon: David & Charles, 1976.

COTES, ROGER. *Hydrostatical and Pneumatical Lectures*, ed. Robert Smith. London: Printed for the Editor, 1738.

DESAGULIERS, JOHN THEOPHILUS. *A Course of Experimental Philosophy*, Vol 1. London: Printed for John Senex, in Fleetstreet; W. Innys and Richard Manby, in St. Paul's Church-Yard; and John Osborn and Thomas Longman in Pater-noster Row, 1734.

_____. *A Course of Mechanical and Experimental Philosophy. / Cours de Philosophie. Mecanique & Experimentale.* [London], c. 1725.

_____.*Leçons Physico-Mechaniques, ou Abregé du Cours de Philosophie, Mechanique & Experimentale de Jean Theophile Desaguliers, Maître ès Arts, & Membre de la Societé Royale. Ou il dêmontre les Principes de la Mechanique, de l'Hydrostatique, & de l'Optique, par un grand nombre d'Experiences: Pour servira ceux qui ont vû, ou qui ont deffein de voir des Cours de Philosophie Experimentale* (A Londres: Pour l'Autheur, & se vend aussi chez Richard Bridger au haut de Hind-Court en Fleet-street; & chez Guillaume Vreem à deux Portes du Chêne Royal en Earle-street, proche de la Pyramide, 1717).

DITTON, HUMPHREY. *The New Law of Fluids: Or, a Discourse Concerning the Ascent of Liquors, in Exact Geometrical Figures, Between Two nearly Contiguous Surfaces.* London: Printed by J. Roberts, for Benj. Cowse, at the Rose and Crown in St. Paul's

Church-yard, 1714.

HAUKSBEE, FRANCIS, Sr. *Physico-Mechanical Experiments on Various Subjects*, 2nd ed., intro. by Duane H.D. Roller. New York and London: Johnson Reprint Corporation, 1970 [orig. publ. London, 1719]. The Sources of Science, No. 90.

HAUKSBEE, FRANCIS, Jr. *Proposals for Making a Large Reflecting Telescope*. [London], [1715?]

_____, and WILLIAM WHISTON. *A Course of Mechanical, Optical, Hydrostatical, and Pneumatical Experiments*. [London], 1714.

_____, and WILLIAM WHISTON. *A Course of Mechanical, Magnetical, Optical, Hydrostatical, and Pneumatical Experiments*. [London], c. 1725.

HODGSON, JAMES and FRANCIS HAUKSBEE, Sr. *An Account of Hydrostatical & Pneumatical Experiments*. [London], c. 1706-1709.

HOOKE, ROBERT. *Lectiones Cutlerianæ, Or a Collection of Lectures: Physical, Mechanical, Geographical, & Astronomical. Made before the Royal Society on several Occasions at Gresham Colledge*. London: Printed for John Martyn Printer to the Royal Society, at the Bell in S. Pauls Church-yard, 1679.

JURIN, JAMES. *Dissertationes Physico-Mathematicæ, Partim antea editæ in Actis Philosophicis Londinensieus, Jam auctiores et emendatiores, Partim nunc primum impressæ. Auctore Jacobo Jurin, M.D. Colleg. Medic. Londin. & Reg. Societ. Socio, in Nosocomio Thomæ Guy, Armrl, Medico, olim Colleg. Trinit. apud Cantabrigienses Sodale*. Londini: Impensis Gulielmi Innys, in Areâ Occidentali D. Pauli, 1732.

NEWTON, ISAAC. *The Correspondence of Isaac Newton*, ed. H.W. Turnbull, J.F. Scott, A.R. Hall and Laura Tilling, 7 vols. Cambridge: Cambridge University Press, 1959-1977.

_____. *Opticks, Or A Treatise of the Reflections, Refractions, Inflections & Colours*

of Light. New York: Dover Publications, 1952.

_____. *Sir Isaac Newton's Mathematical Principles of Natural Philosophy and His System of the World* [*Principia Mathematica*], trans. Andrew Motte and rev. by Florian Cajori. Berkeley: University of California, 1947.

NICHOLS, JOHN. *Literary Anecdotes of the Eighteenth Century*, vol. 1. London: Printed for the Author, 1812.

POPE, ALEXANDER. *The Correspondence of Alexander Pope*, ed. George Sherburn, vol. 1. Oxford: Clarendon Press, 1956.

POWER, HENRY. *Experimental Philosophy in Three Books: Containing New Experiments Microscopical, Mercurial, Magnetical. With some Deductions, and Probable Hypotheses, raised from them, in Avouchment and Illustration of the now famous Atomical Hypothesis.* London: Printed by T. Rocroft, for John Martin, and James Allestry, at the Bell in S. Pauls Church-yard, 1664.

RICHARDSON, SAMUEL. *The Correspondence of Samuel Richardson*, ed. Anna Laetitia Barbauld. London: Printed for Richard Phillips, 1804.

SPENCE, JOSEPH. *Observations, Anecdotes, and Characters of Books and Men Collected from Conversation*, ed. James M. Osborn, 2 vols. Oxford: Clarendon Press, 1966.

STEELE, RICHARD. *The Correspondence of Richard Steele*, ed. Rae Blanchard. Oxford: Clarendon Press, 1968.

VREAM, WILLIAM. *Antliæ Pneumaticæ Descriptio ad Methodum Hauksbeianam, Optime & nuperrime emendatam. Usus Ejusdem demonstratur quinquaginta Experimentis notatu dignioibus; Figuræ Vasorum omnium, & totius Apparatûs, as Antliam pertinentium, Tabulis Æneis explicantur. Authore Gulielmo Vreem, Pneumatici Apparatûs Artifice.* Londini: Impensis Authoris, apud quem prostant Venales in Vico vulgo dicto, Earle-street, prope septem Solaria (near the Seven Dials) juxta Regis Caroli Quercus: Et apud Richardum Bridger at superiorem partem Areæ, vulgò dictæ, Hind-Court, Fleet-street, & non alibi, MDCCXVII [1717].

UFFENBACH, ZACHARIAS CONRAD VON. *London in 1710: From the Travels of Zacharias Conrad von Uffenbach*, trans. and ed. W.H. Quarrell and Margaret Mare. London: Faber and Faber, 1934.

WALLER, RICHARD, trans. *Essayes of Natural Experiments Made in the Academie del Cimento, Under the Protection of the Most Serene Prince Leopold of Tuscany. Written in Italian by the Secretary of that Academy. Englished by Richard Waller, Fellow of the Royal Society.* London: Printed for Benjamin Alsop at the Angel and Bible in the Poultrey, over-against the Church, 1684.

WHISTON, WILLIAM. *An Account of a Surprizing Meteor, Seen in the Air, March 6th, 1715/16, at Night.* London: Printed for John Senex and W. Taylor, 1716.

_____. *An Account of a Surprizing Meteor, Seen in the Air, March 19th, 1718/19, at Night.* London: Printed for John Senex and W. Taylor, 1719.

_____. *Astronomical Lectures, Read in the Public Schools at Cambridge.* London, 1715.

_____. *Astronomical Principles of Religion, Natural and Reveal'd.* London: Printed for J. Senex and W. Taylor, 1717.

_____. *The Copernicus Explain'd: Or a Brief Account of the Nature and Use of an Universal Astronomical Instrument, for the Calculation and Exhibition of New and Full Moons, and of Eclipses, both Solar and Lunar; with the Places Heliocentrical and Geocentrical of all the Planets, Primary and Secondary.* London: Printed for the Author, 1715.

_____. *The Longitude Discovered by the Eclipses, Occultations and Conjunctions of Jupiter's Satellites.* London, 1738, 1741.

_____. *Memoirs of the Life and Writings of Mr. William Whiston*, 1st ed. London: Printed for J. Whiston and B. White, 1749-50.

_____. *Memoirs of the Life and Writings of Mr. William Whiston*, 2nd ed. London: Printed for J. Whiston and B. White, 1753.

_____. *Reflexions on an Anonymous Pamphlet, Entituled, a Discourse of Free Thinking*. London: Printed for the Author, 1713.

_____, and FRANCIS HAUKSBEE, Jr. *An Experimental Course of Astronomy; Proposed by Mr. Whiston and Mr. Hauksbee*. [London, *c.* 1718-1722]

_____, and FRANCIS HAUKSBEE, Jr. *An Experimental Course of Astronomy; Proposed by Mr. Whiston and Mr. Hauksbee*. [London, *c.* 1722-1725]

WORSTER, BENJAMIN. *A Compendious and Methodical Account of the Principles of Natural Philosophy: As they as Explain'd and Illustrated in the Course of Experiments, perform'd at the Academy in Little Tower-Street.* London: Printed for the Author, and sold by W. and J. Innys, at the Prince's Arms in S. Paul's Church-yard, 1722.

YOUNG, EDWARD. *The Correspondence of Edward Young 1683-1765*, ed. Henry Petit. Oxford: Clarendon Press, 1971.

NEWSPAPERS

Daily Courant. [London]. 1702-1735.

Daily Post. [London]. 1719-28, 1736.

The Englishman. [London]. 1713-1714.

The Post-Boy. [London]. 1713.

The Spectator. [London]. 1711-12.

The Tatler. [London] 1709-11.

MANUSCRIPTS

British Library Add. MS. 4433, fos 45-46.

British Library Add. MS. 28,104, fos 26-27.

British Library Add. MS. 32,718, fos 76-77.

Leicestershire Record Office. Conant MSS. DG11/1018.

Leicestershire Record Office. Conant MSS. DG11/DE.730/2 (various items).

Trinity College, Cambridge, MS. R.4.42, fos 162-66.

REFERENCE SOURCES

The Dictionary of National Biography: From the Earliest Times to 1900 [*DNB*], ed. Leslie Stephen and Sidney Lee, 22 vols. London: Oxford University Press, 1937-1938.

Dictionary of Scientific Biography [*DSB*], ed. Charles Coulston Gillispie, 18 vols. New York: Scribner, 1970-1990.

VENN, J. and J.A. VENN. *Alumni Cantabrigienses: A Biographical List of All Known Students, Graduates and Holders of Office at the University of Cambridge, From the Earliest Times to 1900*, 10 vols. Cambridge: Cambridge University Press, 1922-54.

WALLIS, R.V. and PETER J. WALLIS. *Biobibliography of British Mathematics and Its Applications. Part II 1701-1760*. Letchworth, 1988.

SECONDARY SOURCES

ALTICK, R.D. *The Shows of London*. Cambridge, Mass.: The Belknap Press of Harvard University Press, 1978.

APPLEBY, JOHN H. "Erasmus King: Eighteenth-Century Experimental Philosopher." *Annals of Science* 47 (1990): 375-92.

ASHTON, JOHN. *Social Life in the Reign of Queen Anne: Taken from Original Sources*, 2 vols. London: Chatto & Windus, 1882.

The A to Z of Georgian London, intro. by Ralph Hyde. Lympne Castle, Kent: London Topographical Society, 1982.

BAILY, FRANCIS., ed. *An Account of the Revd. John Flamsteed, the First Astronomer Royal*. London: Dawsons of Pall Mall, 1966 (first published London 1835-1837).

BLACK, JEREMY. *The English Press in the Eighteenth Century*. London: Croom Helm, 1987.

BREWER, JOHN, and ROY PORTER. *Consumption and the World of Goods*. London: Routledge, 1993.

_____, and J.H. PLUMB, eds. *The Birth of a Consumer Society. The Commercialisation of Eighteenth-century England*. London, 1982.

BROOK, M. "Dr Warwick's Chemistry Lectures and the Science Audience in Sheffield (1799-1801)." *Annals of Science* 11 (1955): 224-37.

BRYDEN, D.J. "Evidence From Advertising for Mathematical Instrument Making in London, 1556-1714." *Annals of Science* 49 (1992): 337-350.

BURKE, JOHN G., ed. *The Uses of Science in the Age of Newton*. Berkeley: University of

California Press, 1983.

CARR-HARRIS, GRANT. "The Ancestry of John Harris (1667-1719)—Father of the Encyclopaedia." *Notes and Queries* (1978): 19-23.

COOTER, ROGER, and STEPHEN PUMFREY. "Separate Spheres and Public Places: Reflections on the History of Science Popularization and Science in Popular Culture." *History of Science* 32(3) (September 1994): 237-67.

COPE, ZACHARY. *William Cheselden 1688-1752*. Edinburgh: E. & S. Livingstone, 1953.

CORSON, DAVID W. "Pierre Polinière, Francis Hauksbee, and Electroluminescence: A Case of Simultaneous Discovery," *Isis* 59 (1968): 402-13.

DAHM, JOHN J. "Science and Apologetics in the Early Boyle Lectures." *Church History* 39(2) (1970): 172-86.

DAUMAS, MAURICE. *Scientific Instruments of the Seventeenth and Eighteenth Centuries and Their Makers*, trans. and ed. Mary Holbrook. London: B.T. Batsford, 1972.

DAVIES, ANDREW. *The Map of London: From 1746 to the Present Day*. London: B.T. Batsford, 1987.

EARLE, PETER. *A City Full of People: Men and Women of London 1650-1750*. London: Methuen, 1994.

_____. *The Making of the English Middle Class: Business, Society and Family Life in London, 1660-1730*. London: Methuen, 1989.

ELLIS, AYTOUN. *The Penny Universities: A History of the Coffee-Houses*. London: Secker & Warburg, 1956.

FARA, PATRICIA. "'A Treasure of Hidden Vertues': The Attraction of Magnetic

Marketing." *British Journal for the History of Science* 28 (1995): 5-35.

FARRELL, MAUREEN. "Rare Items Relating to William Whiston (1667-1752) in the Houghton Library." *Harvard Library Bulletin* 24(3) (July 1976): 349-59.

_____. *William Whiston*. New York: Arno Press, 1981.

FORCE, JAMES E. "Whiston Controversies: The Development of 'Newtonianism' in the Thought of William Whiston." Ph.D. dissertation. Washington University, 1977.

_____ *William Whiston: Honest Newtonian*. Cambridge: Cambridge University Press, 1985.

FREUDENTHAL, GAD. "Early Electricity Between Chemistry and Physics: The Simultaneous Itineraries of Francis Hauksbee, Samuel Wall, and Pierre Polinière," *Historical Studies in the Physical Sciences* 11(2) (1981): 203-12.

GASCOIGNE, JOHN. "A Reappraisal of the Role of the Universities in the Scientific Revolution." In *Reappraisals of the Scientific Revolution*, ed. David C. Lindberg and Robert S. Westman. Cambridge: Cambridge University Press, 1990, pp. 207-60.

_____. *Cambridge in the Age of the Enlightenment: Science, Religion and Politics From the Restoration to the French Revolution*. Cambridge: Cambridge University Press, 1989.

GIBBS, F.W. "George Wilson (1631-1711)." *Endeavour* 12 (1953): 182-5.

_____. "Itinerant Lecturers in Natural Philosophy." *Ambix* 6 (1960): 111-17.

GOLINSKI, JAN V. *Science as Public Culture: Chemistry and Enlightenment in Britain, 1760-1820*. Cambridge: Cambridge University Press, 1992.

_____. "Utility and Audience in Eighteenth-Century Chemistry: Case Studies of

William Cullen and Joseph Priestley." *British Journal for the History of Science* 21(1) (March 1988): 1-31

GOODING, DAVID, TREVOR PINCH and SIMON SCHAFFER. *The Uses of Experiment: Studies in the Natural Sciences*. Cambridge: Cambridge University Press, 1989.

GOWING, RONALD. *Roger Cotes—Natural Philosopher*. Cambridge: Cambridge University Press, 1983.

GREENBLATT, STEPHEN. *Renaissance Self-Fashioning: From More to Shakespeare*. Chicago: University of Chicago Press, 1980.

GUERLAC, HENRY. "Francis Hauksbee Experimentateur au profit de Newton." In Guerlac, *Essays and Papers in the History of Modern Science*. Baltimore: John Hopkins University Press, 1977, pp. 107-19.

_____. "Sir Isaac and the Ingenious Mr. Hauksbee." In *Mélanges Alexandre Koyré*, ed. I. Bernard Cohen and René Taton. Paris: Herman, 1964, 1: 228-53.

_____, and MARGARET C. JACOB. "Bentley, Newton and Providence (the Boyle Lectures Once More)." *Journal of the History of Ideas* 30(3) (1969): 307-18.

GUNTHER, R.T. *Early Science in Oxford*, Vol. 1. Oxford, 1923.

HALL, MARIE BOAS. *Promoting Experimental Learning: Experiment and the Royal Society 1660-1727*. Cambridge: Cambridge University Press, 1991.

HANNAWAY, OWEN. "Laboratory Design and the Aim of Science: Andreas Libavius versus Tycho Brahe." *Isis* 77 (1986): 585-610.

HANS, NICHOLAS A. *New Trends in Education in the Eighteenth Century*. London, 1951.

_____. "The Rosicrucians of the Seventeenth Century and John Theophilus

Desaguliers, the Pioneer of Adult Education." *Adult Education* 7 (1935): 229-40.

HARRIS, MICHAEL. *London Newspapers in the Age of Walpole: A Study of the Modern English Press*. London and Toronto: Associated University Press, 1987.

HARRISON, JOHN. *The Library of Isaac Newton*. Cambridge: Cambridge University Press, 1978.

HAYS, J.N. "The London Lecturing Empire, 1800-50." In *Metropolis and Province: Science in British Culture, 1780-1850*, ed. Ian Inkster and Jack Morrell. London: Hutchinson, 1983, pp. 91-119.

HEILBRON, JOHN L. *Electricity in the 17th and 18th Centuries. A Study of Early Modern Physics*. Berkeley, Los Angeles and London: University of California Press, 1979.

HOLMES, GEOFFREY. *Augustan England: Professions, State and Society, 1680-1730*. London: George Allen & Unwin, 1982.

HUNTER, MICHAEL. *Establishing the New Science: The Experience of the Early Royal Society*. Woodbridge: The Boydell Press, 1989.

_____. *Science and Society in Restoration England*. Aldershot, England: Gregg Revivals, 1992.

_____, and SIMON SCHAFFER, eds. *Robert Hooke: New Studies*. Woodbridge, England: The Boydell Press, 1989.

INKSTER, IAN. "A Note on Itinerant Scientific Lecturers, 1790-1850." *Annals of Science* 25 (1978): 253-6.

_____. "The Public Lecture as an Instrument of Science Education for Adults—The Case of Great Britain, c. 1750-1850." *Paedagogia Historica* 20 (1980): 80-107.

_____, and JACK MORRELL, eds. *Metropolis and Province: Science in British Culture 1780-1850*. London: Hutchinson, 1983.

JACOB, MARGARET C. "The Church and the Formulation of the Newtonian World-view." *Journal of European Studies* 1 (1971): 128-48.

_____. *The Cultural Meaning of the Scientific Revolution*. Philadelphia: Temple University Press, 1988.

_____. *The Newtonians and the English Revolution 1689-1720*. Ithaca: Cornell University Press, 1976.

LAWRENCE, SUSAN C. "Entrepreneurs and Private Enterprise: The Development of Medical Lecturing in London, 1775-1820." *Bulletin of the History of Medicine* 62 (1988): 171-92.

LILLYWHITE, BRYANT. *London Coffee Houses*. London: George Allen & Unwin, 1963.

LOFTIS, JOHN. "Richard Steele's Censorium." *Huntington Library Quarterly* 14(1) (1950-1): 43-66.

MARKLEY, ROBERT. *Fallen Languages: Crises of Representation in Newtonian England, 1660-1740*. Ithaca: Cornell University Press, 1993.

McKENDRICK, NEIL, JOHN BREWER and J.H. PLUMB. *The Birth of a Consumer Society: The Commercialisation of Eighteenth-Century England*. Bloomington: Indiana University Press, 1982.

MILLBURN, JOHN R. *Benjamin Martin: Author, Instrument-maker and "Country Showman."* Leyden: Noordhoff International Publications, 1976.

_____. "The London Evening Courses of Benjamin Martin and James Ferguson, Eighteenth-Century Lecturers on Experimental Philosophy." *Annals of Science* 40 (1983): 437-55.

_____. "James Ferguson's Lecture Tour of the English Midlands 1771." *Annals of Science* 42 (1985): 397-415.

_____. "The Office of Ordnance and the Instrument-Making Trade of the Mid-Eighteenth Century." *Annals of Science* 45 (1988): 221-93.

_____, in collaboration with Henry C. King. *Wheelwright of the Heavens: The Life & Work of James Ferguson, FRS*. London: Vade-Mecum, 1988.

MONEY, JOHN. "Joseph Priestley in Cultural Context: Philosophic Spectacle, Popular Belief and Popular Politics in Eighteenth-Century Birmingham." *Enlightenment and Dissent* 7 (1988): 57-81 and 8 (1989): 69-89.

MORTON, ALAN Q. "Concepts of Power: Natural Philosophy and the Uses of Machines in Mid-Eighteenth-Century London." *British Journal for the History of Science* 28 (1995): 63-78.

_____."Lectures on Natural Philosophy in London, 1750-1765: S.C.T. Demainbray (1710-1782) and the 'Inattention' of His Countrymen." *British Journal for the History of Science* 23(4) (December 1990): 411-34.

_____. "Men and Machines in Mid-18th Century London." *Transactions—Newcomen Society for the Study of the History of Engineering and Technology* 65 (1993-4): 47-56.

_____. *Science in the 18th Century: The King George III Collection*. London: Science Museum, 1993.

_____, and JANE V. WESS, *Public & Private Science: The King George III Collection*. Oxford: Oxford University Press, 1993.

MUSSON, ALBERT EDUARD, and ERIC ROBINSON. *Science and Technology in the Industrial Revolution*. Manchester: University of Manchester, 1969.

NICHOLSON, MARJORIE HOPE, and G.S. ROUSSEAU. *"This Long Disease, My Life," Alexander Pope and the Sciences*. Princeton: Princeton University Press, 1968.

PLUMB, J.H. *The Commercialisation of Leisure in Eighteenth-century England.* Reading: University of Reading, 1973.

PORTER, ROY. *English Society in the Eighteenth Century*. Harmondsworth, England: Penguin Books, 1982.

_____. "Medical Lecturing in Georgian London." *British Journal for the History of Science* 28 (1995): 91-9.

_____. "Science, Provincial Culture and Public Opinion in Enlightenment England." *British Journal for Eighteenth-Century Studies* 3 (1980): 20-46.

_____, SIMON SCHAFFER, JIM BENNET, OLIVIA BROWN. *Science and Profit in 18th-Century London*. Cambridge: Whipple Museum of the History of Science, 1985.

RICHARDSON, MRS. HERBERT. *The Old English Newspaper*. London: The English Association, December 1933. The English Association, Pamphlet no. 86.

ROBINSON, F.G.J. "A Philosophic War: An Episode in Eighteenth-Century Scientific Lecturing in North-East England." *Transactions of the Architectural and Archaeological Society of Durham and Northumberland* 2 (1970): 101-9.

_____. and P.J. WALLIS. "Scientists and Subscription Lists." *British Journal for the History of Science* 6(2) (December 1972): 227-8.

ROUSSEAU, G.S. "The London Earthquakes of 1750." *Journal of World History* 11(3) (1968): 436-51.

_____. "Science Books and Their Readers in the Eighteenth Century." In *Books and*

Their Readers in Eighteenth Century England, ed. Isabel Rivers. Leicester: Leicester University Press, 1982, pp. 323-41.

ROWBOTTOM, MARGARET E. "John Theophilus Desaguliers (1683-1744)." *Proceedings of the Huguenot Society of London* 21 (1968): 196-218.

_____. "The Teaching of Experimental Philosophy in England, 1700-1730." *Actes du Xie Congres International d'Histoire des Sciences* 4 (1965): 46-53.

RUDÉ, GEORGE. *Hanoverian London: 1714-1808*. London: Secker & Warburg, 1971.

SCHAFFER, SIMON. "The Consuming Flame: Electrical Showmen and Tory Mystics in the World of Goods," in *Consumption and the World of Goods*, ed. John Brewer and Roy Porter. London: Routledge, 1993, pp. 489-526.

_____. "Natural Philosophy and Public Spectacle in the Eighteenth Century." *History of Science* 21 (1983): 1-43.

SHAPIN, STEVEN. "The Audience for Science in Eighteenth Century Edinburgh." *History of Science* 12 (1974): 95-121.

_____. "The House of Experiment in Seventeenth-Century England." *Isis* 79 (1988): 373-404.

_____. *A Social History of Truth: Civility and Science in Seventeenth-Century England*. Chicago: The University of Chicago Press, 1994.

_____, and SIMON SCHAFFER. *Leviathan and the Air-Pump: Hobbes, Boyle, and the Experimental Life*. Princeton: Princeton University Press, 1985.

_____, and ARNOLD THACKRAY. "Prosopography as a Research Tool in History of Science: The British Scientific Community 1700-1900," *History of Science* 12 (1974): 1-28.

SMITHERS, PETER. *The Life of Joseph Addison*. Oxford: Clarendon Press, 1954.

SNOBELEN, STEPHEN D. "Eclipses, Comets and Lectures: William Whiston's Public Scientific Lecturing Career, 1712-1750." Unpublished typescript, 1995.

_____. "'Sometime Professor of the Mathematicks:' The Alternative Career Strategies of William Whiston." Unpublished typescript, 1994.

SNYDER, HENRY L. "The Circulation of Newspapers in the Reign of Queen Anne." *The Library* 5th Ser. 23 (1968): 206-35.

STEELE, BRETT D. "Muskets and Pendulums: Benjamin Robins, Leonard Euler, and the Ballistics Revolution." *Technology and Culture* 35(2) (1994): 348-82.

STEWART, LARRY. "Public Lectures and Private Patronage in Newtonian England." *Isis* 77 (1986): 47-58.

_____. *The Rise of Public Science: Rhetoric, Technology, and Natural Philosophy in Newtonian Britain, 1660-1750*. Cambridge: Cambridge University Press, 1992.

_____. "The Selling of Newton: Science and Technology in Early Eighteenth-Century England." *Journal of British Studies* 25 (April 1986): 178-92.

_____, and Paul Weindling. "Philosophical Threads: Natural Philosophy and Public Experiment Among the Weavers of Spitalfields." *British Journal for the History of Science* 28 (1995): 37-62.

SUTHERLAND, JAMES. "The Circulation of Newspapers and Literary Periodicals, 1700-30." *The Library* 4th Ser. 15 (1934-35): 110-24.

_____. *The Restoration Newspaper and Its Development*. Cambridge: Cambridge University Press, 1986.

SUTHERLAND, L.S. and L.G. MITCHELL, eds. *The History of the University of Oxford. Volume V. The Eighteenth Century*. Oxford: Clarendon Press, 1986.

TAYLOR, E.G.A *Mathematical Practitioners of Hanoverian England*. [*MPH*] Cambridge: Cambridge University Press, 1966.

_____. *Mathematical Practitioners of Tudor and Stuart England*. [*MPTS*] Cambridge: Cambridge University Press, 1954.

THACKRAY, ARNOLD. "'The Business of Experimental Philosophy:' The Early Newtonian Group at the Royal Society." *Actes du. XIIe Congres International d'Histoire des Sciences* 3B (1971): 155-9.

TURNBULL, G.H. "Peter Stahl, the First Public Teacher of Chemistry at Oxford." *Annals of Science* 9(3) (1953): 265-70.

TURNER, GERARD L'ESTRANGE. "The Physical Sciences." In *The History of the University of Oxford. Volume V. The Eighteenth Century*, ed. L.S. Sutherland and L.G. Mitchell. Oxford: Clarendon Press, 1986, pp. 659-81.

_____. *Scientific Instruments and Experimental Philosophy 1550-1850*. Aldershot, England: Variorum, 1990.

WALKER, R.B. "Advertising in London Newspapers, 1650-1750." *Business History* 16 (1973): 112-30.

WALLIS, P.J. "Thomas Watts: Academy Master, Freemason, Insurance Pioneer, MP." *History of Education Society Bulletin* 32 (1983): 51-3.

WEBSTER, CHARLES. *The Great Instauration: Science, Medicine and Reform 1626-1660*. London: Duckworth, 1975.

WEINREB, BEN and CHRISTOPHER HIBBERT. *The London Encyclopaedia*. London: Macmillan, 1983.

WESS, JANE. "Lecture Demonstrations and the Real World: The Case of Cart-Wheels." *British Journal for the History of Science* 28 (1995): 79-90.

WESTFALL, RICHARD S. *Never at Rest: A Biography of Isaac Newton*. Cambridge: Cambridge University Press, 1980.

WOOD, PAUL B. "The Scientific Revolution in Scotland." In *The Scientific Revolution in National Context*, ed. Roy Porter and Mikuláš Teich. Cambridge: Cambridge University Press, 1992, pp. 263-87.

WOOLF, HARRY. *The Transits of Venus: A Study of Eighteenth-Century Science*. Princeton: Princeton University Press, 1959.

WORDSWORTH, CHRISTOPHER. *Scholae Academicae: Some Account of the Studies at the English Universities in the Eighteenth Century*. Cambridge: Cambridge University Press, 1910.

APPENDIX I

PROFILE OF FRANCIS HAUKSBEE, SR.'S LONDON LECTURE COURSES

(Based on surveys of the *Daily Courant*, *Tatler*, *Spectator* and *Englishman*)

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEPT	OCT	NOV	DEC
1702												
1703												
1704												
1705	8FJe											
1706	21,28FJe											
1707		7Fe								21Fe	10Fe	
1708			11FJe							16,26FJe		
1709	25,27FJe										25Fe	
1710		9Fe									13Fe	
1711										pFe		
1712	21Fe	11Fe						4FHWJe				
1713	26FWe											
1714												
1715												
1716												

KEY TO TABLE ON FOLLOWING PAGE

KEY TO APPENDIX I

This table represents the advertised starting dates of the experimental lecture course founded by Francis Hauksbee, Sr. and James Hodgson. Hodgson lectured with the elder Hauksbee from 1705 to early 1709, after which Hauksbee continued on his own until January 1712. After this time the elder Hauksbee collaborated with his nephew Francis Hauksbee, Jr., William Whiston, and Humphrey Ditton. The lecturers are represented on the chart as follows: F=Francis Hauksbee, Sr.; J=James Hodgson; H=Francis Hauksbee, Jr.; W=Whiston; U=Ditton. Combinations of letters indicate collaborations. Advertisements for the 1707 courses include Hauksbee's name only (in reference to the venue), but it is still possible that Hodgson was involved. The first unit of information indicates the starting date of the lecture and "p" indicates a proposed lecture without a specific date. The letter "e" indicates that the course was an experimental lecture course. Deferred lectures are probable for January 1706, October/November 1707, October 1708, January 1709 and January/February 1712. This table represents thirteen to fourteen lectures in which Francis Hauksbee, Sr. was involved.

APPENDIX II

PROFILE OF THE LONDON LECTURES OF WHISTON AND HAUKSBEE

(Based on a survey of the *Daily Courant*, *Spectator*, *Englishman* and *Daily Post*)

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1711												
1712	14HUe							4FHWUe				
1713	26FWe cWm		23Wm1,2 18,23WHe	cWm1,2				24Wm cWm				
1714	11WHe cWm	10WHe cWm		14WHe				31WHe		25WHe		
1715		14WHe	*18Wm	*22Wo							14WHe pWa	
1716			*9,15,16Wa cWHe		31WHe					15WHe		
1717		4WHe									18WHe	
1718	27WHe	17WHa						*25,26,27 28,29Wa	*1,2Wa	20WHe	3WHe	
1719	19WHe 26WHa		*30,31Wa	*1Wa							16WHe	
1720	26WHa	8WHe	8Wo 10Wo								16,21, 25WHe	13HCan
1721		1WHa 8WHa	9WHe 28HCan		3Hgu						16HCan	2WHe
1722	15WHe 31HCan	14WHa 28WHa			2Hgu					18WHe 30WHe		
1723	18,21 28WHe	12WHa 28WHa								*29WHa/o	*1,2Wa 6,13WHe	
1724	27WHe	10WHa 17WHa		*21Wa	*11Wo						11WHe 23WHe	
1725		3,10WHe 22WHa	1WHa								8,18WHe	
1726	26WHe	2WHe	22,24WHa			20Ws/r	4Ws/r				9,21WHe	5Wg pWs/r
1727	25WHe	8Wo1,2 pWs/r	8WHe	17Ws/r							13WHe	
1728		5,19 26WHe										
1729							23Wr1 pWr2,3,m4					
1730												

KEY TO TABLE ON FOLLOWING PAGE

KEY TO APPENDIX II

This table presents all the advertised lecture dates—both combined and individual for William Whiston and Francis Hauksbee, Jr. The first unit of information indicates the date of the particular month on which the lecture or lecture series commenced, or one of the following: c=a continuing lecture with no starting date mentioned; nd=a new lecture with no starting date mentioned; p=a lecture that is proposed only, and is contingent on adequate subscribers. The second unit of information refers to the lecturer(s): W=William Whiston; H=Francis Hauksbee, Jr.; F=Francis Hauksbee, Sr.; U=Humphrey Ditton; C=William Cheselden, FRS (anatomist); combinations, such as "WH," indicate collaborations. The third unit of information indicates the main subject of the lecture: e=experimental lectures on mechanics, optics, hydrostatics and pneumatics; a=astronomical lectures; m=mathematical lectures; g=geometry; lo=longitude and magnetism; o=observational lectures, such as an outdoor, commentated viewing of an astronomical event; an=anatomy; gu=gunnery; s/r=a lecture series that combines scientific and religious topics; r=a completely religious topic. The fourth unit of information indicates whether there was more than one lecture course on the particular subject listed, thus 8Wg1,2 indicates that Whiston was starting two separate courses on geometry on that particular date. Entries prefaced by an asterisk indicate a lecture or lecture series that was initiated by astronomical phenomena (that is, the lecture either was planned to coincide with a coming eclipse or was brought on by the unexpected appearance of such things as *aurora borealis*). The exact dates for the three lectures given by Whiston at Easter in 1719 have not yet been proven conclusively. This chart is not a completely exhaustive representation of every scientific lecture Whiston carried out in the years 1712-28, as there is evidence that Whiston did not advertise all his lectures. Nor did Whiston advertise exclusively in the *Daily Courant*—he used other papers such as the *Daily Post* (which began publication in 1719). Accordingly, this chart is supplemented with dates advertised only in the *Daily Post*, which are underlined. Lecture dates advertised in both the *Daily Courant* and the *Daily Post* are double-underlined. Finally, it should be noted that this chart displays advertised starting times only, and that it must not be assumed that every lecture took place.

APPENDIX III
PROFILE OF WILLIAM WHISTON'S LONDON LECTURES
(Based on a survey of the *Daily Courant*, *Spectator*, *Englishman* and *Daily Post*)

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1711												
1712								4R-WUe				
1713	26FWe cWm		23Wm1,2 18,23WHe	cWm1,2				24Wm cWm				
1714	11WHe cWm	10WHe cWm		14WHe				31WHe		25WHe		
1715		14WHe	*18Wm	*22Wo							14WHe pWa	
1716			*9,15,16Wa cWHe		31WHe					15WHe		
1717		4WHe									18WHe	
1718	27WHe	17WHa						*25,26,27 28,29Wa	*1,2Wa	20WHe	3WHe	
1719	19WHe 26WHa		*30,31Wa	*1Wa							16WHe	
1720	26WHa	8WHe	8Wo 10Wo								16,21, 25WHe	
1721		1WHa 8WHa	9WHe								2WHe	
1722	15WHe	14WHa 28WHa								18WHe 30WHe		
1723	18,21 28WHe	12WHa 28WHa								*29WHa/o	*1,2Wa1,2,3,4 6,13WHe	
1724	27WHe	10WHa 17WHa		*21Wa	*11Wo						11WHe 23WHe	
1725		3,10WHe 22WHa	1WHa								8,18WHe	
1726	26WHe	2WHe	22,24WHa			20Ws/r	4Ws/r				9,21WHe	5Wg pWs/r
1727	25WHe	8Wg1,2 pWs/r	8WHe	17Ws/r							13WHe	
1728		5,19 26WHe										
1729							23Wr1 pWr2,3,m4					
1730												

This table presents the advertised dates of Whiston's lectures and courses, and is a reproduction of Appendix II without the courses the younger Hauksbee performed on his own or with someone other than Whiston.

APPENDIX IV

PROFILE OF FRANCIS HAUKSBEE, JR.'S LONDON LECTURE COURSES

(Based on a survey of the *Daily Courant*, *Spectator*, *Englishman*, and *Daily Post*)

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEPT	OCT	NOV	DEC
1711												
1712	14HUe							4FHWUe				
1713			18,23WHe									
1714	11WHe	10WHe		14WHe				31WHe		25WHe		
1715		14WHe									14WHe	
1716			cWHe		31WHe					15WHe		
1717		4WHe									18WHe	
1718	27WHe	17WHa								20WHe	3WHe	
1719	19WHe 26WHa										16WHe	
1720	26WHa	8WHe									16,21, 25WHe	13HCan
1721		1WHa 8WHa	9WHe 28HCan		3Hgu						16HCan	2WHe
1722	15WHe 31HCan	14WHa 28WHa			2Hgu					18WHe 30WHe		
1723	18,21 28WHe	12WHa 28WHa								*29WHa/o	6,13WHe	
1724	27WHe	10WHa 17WHa									11WHe 23WHe	
1725		3,10WHe 22WHa	1WHa								8,18WHe	
1726	26WHe	2WHe	22,24WHa								9,21WHe	
1727	25WHe		8WHe								13WHe	
1728		5,19 26WHe										
1729												
1730												

This table presents the advertised dates of Hauksbee's courses, and is a reproduction of Appendix II without the lectures Whiston performed on his own or with someone other than Hauksbee.

APPENDIX V

PROFILE OF THE WHISTON-HAUKSBEE LONDON LECTURE COURSES

(Based on a survey of the *Daily Courant*, *Spectator*, *Englishman* and *Daily Post*)

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEPT	OCT	NOV	DEC
1711												
1712	(14HUe)							(4FHWUe)				
1713	(26FWe)		18,23WHe									
1714	11WHe	10WHe		14WHe				31WHe		25WHe		
1715		14WHe									14WHe	
1716			cWHe		31WHe					15WHe		
1717		4WHe									18WHe	
1718	27WHe	17WHa								20WHe	3WHe	
1719	19WHe 26WHa										16WHe	
1720	26WHa	8WHe									16,21, 25WHe	
1721		1WHa 8WHa	9WHe									2WHe
1722	15WHe	14WHa 28WHa								18WHe 30WHe		
1723	18,21 28WHe	12WHa 28WHa								*29WHa/o	6,13WHe	
1724	27WHe	10WHa 17WHa									11WHe 23WHe	
1725		3,10WHe 22WHa	1WHa								8,18WHe	
1726	26WHe	2WHe	22,24WHa								9,21WHe	
1727	25WHe		8WHe								13WHe	
1728		5,19 26WHe										
1729												
1730												

KEY TO TABLE ON FOLLOWING PAGE

KEY TO APPENDIX V

This chart contains only the experimental and astronomical lecture courses in which Whiston and the younger Hauksbee collaborated (with the 14 January 1712 Hauksbee, Jr.-Ditton, 4 August 1712 Whiston-Ditton-Hauksbee-Hauksbee, and the 26 January 1713 Whiston-Hauksbee, Sr. experimental lecture series in parentheses). This table can be used to compare with Appendices VI and VII. This chart (excepting the dates in parentheses) represents a total of sixty-four *proposed* (that is, including deferred dates) Whiston-Hauksbee lecture course starting dates. This breaks down to forty-seven starting dates for experimental courses and seventeen for courses of astronomy.

APPENDIX VI

PROFILE OF J.T. DESAGULIERS' LONDON LECTURE COURSES

(Based on a survey of the *Daily Courant*, *Englishman* and *Daily Post*)

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEPT	OCT	NOV	DEC
1711												
1712												
1713	[7De]				14De							14De
1714		8De 12De		5De 7De						11De		
1715										10De		
1716	10De				8De						16De	
1717		18De		30De	1Da						11De	
1718	24De										25De	
1719	21De										2,23De	1DTe
1720	20De										28De	
1721	23De		10De		8De					23De		
1722	19De			18D1e,2a 23D1e,2a							15De	7,8De
1723										21De/o		[16De]
1724	10De		16De 23De								3De	
1725		8De 16,23Da								20,27De		
1726		9De			9De						4De	13De
1727												
1728												
1729												
1730												

KEY TO TABLE ON FOLLOWING PAGE

KEY TO APPENDIX VI

The first unit of information on this table indicates the date of the particular month on which the particular lecture series commenced. The second unit of information refers to the lecturer, with "D" representing Desaguliers, and "T" representing Thomas Watts, who lectured with Desaguliers at Steele's Censorium in December 1719. The third unit of information refers to the content of the lectures: e=experimental lectures on mechanics, optics, hydrostatics and pneumatics; a=astronomical lectures. This chart is not a completely exhaustive representation of every scientific lecture Desaguliers carried out in the years 1713-28, as Desaguliers did not advertise every one of his lectures. Nor did Desaguliers advertise exclusively in the *Daily Courant*—he also used other papers such as the *Daily Post* (which began publication in 1719). Accordingly, this chart is supplemented with references taken from the *Daily Post*, which are underlined. Lecture dates advertised in both the *Daily Courant* and *Daily Post* are double-underlined. Also, the 7 January 1713 starting date is taken from the January 6-8, 1713 edition of *The Post Boy*. Additionally, the 16 December 1723 date is taken from a manuscript note from a course catalogue listed in Wallis and Wallis, *Biobibliography of British Mathematics*, p. 47. These two last mentioned references are included in square brackets on the table. Finally, it should be noted that this chart displays advertised starting times only, and that it must not be assumed that every lecture took place. In all, this chart represents fifty-one lecture course starting dates. This includes forty-six experimental lecture starting dates (with the one course run jointly with Thomas Watts) and five course of astronomy starting dates.

APPENDIX VII

PROFILE OF THE LITTLE TOWER STREET LONDON LECTURE COURSES

(Based on a survey of the *Daily Courant* and *Daily Post*)

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEPT	OCT	NOV	DEC
1711												
1712												
1713												
1714												
1715												
1716												
1717												
1718				2TRe					29TRe		10TRe	
1719	12TRe		4TRe							14TRe	23TRe	1DTe 1TRe
1720	26TRe		9TRe							19TRe	25TRe	
1721	11TRe	1TRe	10TRe							4TRe	10TRe	
1722	10TRe	19TRe								3TRe	14TRe	
1723	16TRe		6TRe							9TRe	15TRe 22TRe	
1724		12TRe								21TRe		
1725		8LBe									10LBe	
1726	26LBe	2LBe									16LBe	
1727	18LBe										1LSe	
1728	10LSe		13LSe 26LSge/a		22LSge/a			28LSe			4LSe	
1729												
1730												

KEY TO TABLE ON FOLLOWING PAGE

KEY TO APPENDIX VII

The first unit of information indicates the date of the particular month on which the particular lecture series commenced. The second unit of information refers to the lecturers involved in the particular series: T=Thomas Watts; R=Benjamin Worster; L=William Watts; B=P. Brown; S=James Stirling (D=Desaguliers for the December 1719 course run by Desaguliers and Thomas Watts at the Censorium). The third unit of information refers to the content of the lectures: e=experimental lectures on mechanics, optics, hydrostatics and pneumatics; ge/a=geography and astronomy (the only example is 26 March 1728). This chart is not a completely exhaustive representation of every scientific lecture the Little Tower Street Academy offered in the years 1718-28, as the Academy probably did not advertise every one of its lectures. Nor did the Academy advertise exclusively in the *Daily Courant*—they used other papers such as the *Daily Post* (which began publication in 1719). Accordingly, this chart is supplemented with references taken from the *Daily Post*, which are underlined. Lecture dates advertised in both the *Daily Courant* and the *Daily Post* are double-underlined. Finally, it should be noted that this chart displays advertised starting times only, and that it must not be assumed that every lecture took place. This chart represents a total of forty-three lecture starting dates for the lecturers of the Little Tower Street Academy in the years 1718-1728 (with only two non-experimental courses).

APPENDIX VIII
COMBINED PROFILE OF LONDON EXPERIMENTAL COURSES, 1705-1728

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEPT	OCT	NOV	DEC
1705	8FJe											
1706	21,28FJe											
1707		7FJe								21Fe	10Fe	
1708			11FJe							16,26FJe		
1709	25,27FJe										25Fe	
1710		9Fe									13Fe	
1711										pFe		
1712	21Fe	11Fe						4FHWDe				
	14HDe											
1713	26FWe		18,23WHe									
	7De				14De							14De
1714	11WHe	10WHe		14WHe				31WHe		25WHe		
		8,12De		5,7De								
1715		14WHe									14WHe	
										10De		
1716			cWHe		31WHe					15WHe		
	10De				8De						16De	
1717		4WHe									18WHe	
		18De		30De	1Da						25De	
1718	27WHe	17WHa								20WHe	3WHe	
	24De										25De	
				2TRe					29TRe		10TRe	
1719	19e,26aWH										16WHe	
	21De										2,23De	1DTe
	12TRe		4TRe							14TRe	23TRe	1TRe
1720	26WHa	8WHe									16,21,25WHe	
	20De										28De	
	26TRe		9TRe							19TRe	25TRe	
1721		1,8WHa	9WHe									2WHe
	23De		10De		8De					23De		
	11TRe	1TRe	10TRe							4TRe	10TRe	
1722	15WHe	14,28WHa								18,30WHe		
	19De			18,23D1e,2a							15De	7,8De
	10TRe	19TRe								3TRe	14TRe	
1723	18,21,28e	2,28WHa								29WHa/o	6,13WHe	
										21De/o		16De
	16TRe		6TRe							9TRe	15,22TRe	
1724	27WHe	10,17WHa									11,23WHe	
	10De		16,23De								3De	
		12TRe								21TRe		
1725		3,10e22a	1WHa								8,18WHe	
		8e16,23Da								20,27De		
		8LBe									10LBe	
1726	26WHe	2WHe	22,24WHa								9,21WHe	
		9De			9De						4De	13De
	26LBe	2LBe									16LBe	
1727	25WHe		8WHe								13WHe	
	18LBe										1LSe	
1728		5,19,26WHe										
	10SLe		13e26LSge/a		22LSge/a			28LSe			4LSe	

SEE KEYS TO APPENDICES I, II, V, VI AND VII FOR CODES TO THIS TABLE

APPENDIX IX
LONDON SCIENCE LECTURE COURSES BY SUBJECT, 1702-1735
(Advertised in the *Daily Courant*)

		EXPER.	ASTRO.	MATH.	CHEM.	ANAT.	GUNN.
1702				1	1		
1703				1	2		
1704				2	1		
1705		1		1	1		
1706		1		3	3		
1707		2		2	4		
1708		2		2	3		
1709		2			3		
1710		2		2	2		
1711		1			2		
1712		3			3		
1713		5		5	5		
1714		8		1	1		
1715		3	1	1	3	1	
1716		3			3	1	
1717		5	1	1			
1718		7	1	1		4	
1719	*DP*	9	1	1		4	
1720		8	1			5	
1721	*DJ*	11	2			6	1
1722		10	3			4	1
1723		7	3			2	
1724		6	2			2	
1725		4	1			2	
1726		5			1	2	
1727		3	1	3	1		
1728	*PB*	1					
1729				1			
1730	*DA*						
1731			1		1		
1732					1		
1733							
1734	*LDP*				1		
1735							

KEY TO TABLE ON FOLLOWING PAGE

KEY TO APPENDIX IX

This table presents the annual number of lecture courses by subject advertised in the *Daily Courant* from 11 March 1702 to 28 June 1735 (when the *Daily Courant* ceased publication). The chart includes only courses and does not include any single night lectures. This table can be used as a guide to advertising patterns in the *Daily Courant* and as a rough guide to lecture course frequency by subject. It is less accurate for the latter purpose from the mid-1720s, however, since a decline in the use of the *Daily Courant* for advertising science beginning in the early 1720s distorts the statistics to an increasing degree. This decline in advertising in the *Daily Courant* is largely attributable to the introduction of competing dailies. For example, as a survey of the *Daily Post* for 1726 reveals, there were actually eleven experimental courses that year, not five as a survey of the *Daily Courant* alone suggests. Also, since it is apparent that some science lecturers held unadvertised lectures, this table is only useful as a guide to trends in *advertised* courses. Furthermore, this chart does not include the science courses of practitioners who advertised courses without dates (these cases are a small minority, however). The dates for the introduction of these other dailies are as follows: *The Daily Post*, 3 October 1719; *The Daily Journal*, 23 January 1721 (N.S.); *The Daily Post-Boy* (formerly *The Post-Boy*), 1728. Two papers devoted primarily to advertising, *The Daily Advertiser* and *The London Daily Post and General Advertiser*, appeared in 1730 and 1734 respectively. The introduction points of *The Daily Post* (*DP*), *The Daily Journal* (*DJ*), *The Daily Post-Boy* (*PB*), *The Daily Advertiser* (*DA*), and *The London Daily Post and General Advertiser* (*LDP*) are marked on the chart.

APPENDIX X
LONDON SCIENCE LECTURE COURSE PRICES, 1694-1736
All Prices in Guineas

	WIL	H/H	BRI	STR	W/H	DES	TOW	PEA	S/H	AND	NIC
1694	3c										
1695											
1696											
1697											
1698											
1699											
1700											
1701											
1702	2½c										
1703	3c/2½c										
1704	2½c										
1705	2½c	2e									
1706	2½c	2e									
1707	2½c										
1708	2½c										
1709	2½c										
1710	2½c										
1711	2½c		2½c								
1712			2½c								
1713		2e	2½c		2e	2e					
1714			2½c		2½e	2e					
1715			2½c		2½e	2½e					
1716			2c	2½c		2½e					
1717											
1718											
1719											
1720						2½e					
1721											
1722							2½e				
1723						2½e					
1724						2½e					
1725					3a	2½e/3e					
1726					3a						
1727							3e	3c			
1728							2ge/a				
1729											
1730											
1731									5c		
1732											
1733											
1734						3e				4c	
1735											
1736											4an

KEY TO TABLE ON FOLLOWING PAGE

KEY TO APPENDIX X

This table tracks lecture course prices with examples from 1694 to 1736. It includes only lecture *series*, and not single night lectures. Also not included in this table are Whiston's religious lectures and scientific tutorials of 1726-31. The lecturers represented in this chart are: WIL=George Wilson; H/H=Francis Hauksbee, Sr. and James Hodgson (except the 1713 entry, which is the elder Hauksbee and William Whiston); BRI=Edward Bright; STR=Dr. Samuel Stringer (a former assistant to Bright); W/H=William Whiston and Francis Hauksbee, Jr.; DES=John Theophilus Desaguliers; TOW=Little Tower Street Academy; PEA=the Chemist Jonathan Pead; S/H=the Chemist Peter Shaw and Francis Hauksbee; AND=the Chemist John Andree; NIC=the Anatomist Francis Nicholls. Each entry includes a price (in guineas) followed by a subject code. The subject codes are as follows: c=chemistry; e=experimental and mechanical; a=astronomical; ge=geography; an=anatomy. When more than one price is given, this reflects a shift in price within a given year. One reference, the Whiston-Hauksbee entry for 1714, is uncertain. This is because the price is taken from their undated manual. It is likely, however, that the price applies to 1714 and that it remained static throughout this period. This table was constructed mainly from prices given in course texts and advertisements in the *Daily Courant*, as well as *The Daily Post*, *The Spectator* and *The Englishman*. One course price, that of George Wilson in 1694, is provided by Gibbs, "George Wilson," p. 184. Another, that of Shaw and Hauksbee in 1731, is provided by Gibbs, "Peter Shaw and the Revival of Chemistry," p. 220. That of Nicholls in 1736, is taken from October 15, 1736 edition of *The Daily Post* (his payment scheme is "four Guineas the first Course, three Guineas the second, and two Guineas every Course after"). The 1722 Little Tower Street price is taken from Worster's *A Compendious and Methodical Account of the Principles of Natural Philosophy*, p. 239. The 1725 three guinea fee for the Whiston-Hauksbee astronomical course is taken from the British Library copy of the syllabus for that course. This syllabus is marked with a manuscript note giving the date of a Monday, 22 February starting date (identified above in this thesis as referring to the year 1725), and it includes an additional manuscript note correcting the originally printed price of five guineas with a fee of three guineas. Three figures for Desaguliers are taken from Wallis and Wallis, *Biobibliography*, pp. 47 and 48. These include Desaguliers' publication

A Course of Mechanical and Experimental Philosophy, which Wallis and Wallis have dated at 1720. This publication includes a reference to the course fee of two and a half guineas. Since one extant copy of this publication contains an annotation giving the course starting date 16 December 1723, but does not correct the price in manuscript, the two and a half guineas price has been taken as still valid for 1723 (p. 47). Finally, Wallis and Wallis (p. 48) list a three guinea course price with their entry for a 1725 edition of *A Course of Mechanical and Experimental Philosophy*. Prices for experimental courses appear to have risen from two to two and a half guineas around 1714, and then from two and a half to three guineas around 1725. With some fluctuations (such as Bright's reduction of his fee to two guineas in 1716 when he was experiencing competition from his former assistant), this chart reveals a gradual rise in lecture course prices. This inflationary trend and strong market did not continue into the mid- and late-eighteenth century. It also appears to reveal that lecturers on chemistry could charge slightly higher prices for their courses than experimental lecturers.

APPENDIX XI
WILLIAM WHISTON'S INCOME FROM SOURCES OTHER THAN SCIENTIFIC LECTURING[1]

PERIOD	*AMOUNT*	*FREQUENCY*	*ACTIVITY*	*SOURCE*
c. 1686	£5	once?	student	John Moore, Bishop of Norwich[2]
1696-1752	unknown	various times	publishing	Monies from subscribers and book sales
1698-1703[3]	£120	per annum	clergyman	Living of Lowestoft cum Kessingland[4]
c.1701-10	£100	per annum	professor	Lucasian Chair of Mathematics, Cambridge[5]
1701(?)-52[6]	£30?[7]	per annum	land-owner	Farm near Newmarket owned by Whiston[8]
1707	£50	once	lecturing	Boyle Lectures[9]
c. 1711-?	unknown	various times	tutoring	Monies generated from private tutoring[10]
1712	15 guineas	once	patronage	Eugene of Savoy[11]
1713	10 guineas	once	defendant	Thomas Pelham-Holles, Duke of Newcastle[12]
c. 1713-?	10*s* a patron	unknown	library owner	Patrons of Whiston's "Primitive Library"[13]
1715	25+ guineas	1715 only	patronage	Patronage during 1715 solar eclipse[14]
1715	unknown	1715 only	publications	Publications sold during 1715 solar eclipse[15]
c. 1719	50 guineas	once	patronage	Thomas Parker, Lord Chancellor[16]
1721	£470 3s. 6d.	once	longitude	Various subscribers[17]
1727-52	£40 (£50?)[18]	per annum	patronage	Queen Caroline (1727-37); George II (1737-52)[19]
c. 1730	20 guineas	once	patronage?	Sir Joseph Jekyll, Master of the Rolls[20]
Aug 1730	£20	once	patronage	Frederick Louis, the Prince of Wales(?)[21]
1736	£10	once	agent	Benefactor of Jews in Duke's Place[22]
1738-52	£20	per annum	will recipient	Sir Joseph Jekyll, Master of the Rolls[23]
c. 1739	£20	once	will recipient	Will of John Baron, Dean of Norwich[24]
1740-1	£175	once	coastal survey	Various patrons[25]
Jan 1741	£500	once	coastal survey	Board of Longitude[26]
unknown	5 guineas	per annum	ex-incumbent	Mr. Tanner, incumbent at Lowescroft[27]
unknown	£50	once	will recipient	Will of Lady Caverly (left to Whiston's wife)[28]
unknown	£20 (Irish)	once	will recipient	Will of Mr. Leigh, "an Irish Gentleman"[29]
unknown	£10	once	will recipient	Will of Mr. Brockman[30]
unknown	unknown	unknown	patronage	Various patrons[31]

NOTES TO APPENDIX XI

1. This appendix presents collected information on Whiston's income from sources not directly derived from entrance fees to lecture courses. Patronage that Whiston received indirectly or directly because he was lecturing is also included. The information presented here is not exhaustive, and should not be read as representing Whiston's entire non-lecturing life income. Many lacunae remain, such as his earnings from the sale of his publications.

2. Bishop Moore presented Whiston with the gift of £5 at some point after Whiston was admitted to Clare Hall, Cambridge. Whiston was admitted as a pensioner, and claims to have been supported primarily through both his degrees by his "mother the widow." Whiston also claims that his expenses for his three and a half years as an undergraduate were not quite £100. William Whiston, *Memoirs of the Life and Writings of Mr. William Whiston*, 2nd ed. (London: Printed for J. Whiston and B. White, 1753), 1: 23-4.

3. Whiston, *Memoirs*, 1: 290.

4. *Whiston, Memoirs*, 1: 108.

5. Richard Westfall, *Never at Rest: A Biography of Isaac Newton* (Cambridge: Cambridge University Press, 1980), p. 206.

6. A comment in Whiston's will of 30 August 1734 may indicate that Whiston's title of the farm dates from August 1701. L.R.O. (Leicestershire Record Office) Conant MSS. DG11/1018.

7. This amount is difficult to confirm. Maureen Farrell gives the amount as "about £40 per year" (Farrell, *William Whiston* [New York: Arno, 1981], p. 33), and John Nichols similarly gives the amount as "near 40*l.* a-year" (Nichols, *Literary Anecdotes of the Eighteenth Century* [London, 1812], 1: 499 n*). Neither Farrell nor Nichols provide sources for their estimates. On the other hand, Whiston in his will of 30 August 1734 mentions that the "Lands belonging to my Farm at Dullingham Lay in the County of Cambridge . . . are of the yearly Value of thirty pounds or thereabouts." L. R. O. Conant MSS. DG11/1018. When Whiston mentions the farm in his *Memoirs* (1: 290), he does not state the amount of the income he received from it. Perhaps the revenue fluctuated.

8. Whiston, *Memoirs*, 1: 290.

9. From the will of Robert Boyle cited in R.E.W. Maddison, *The Life of the Honourable Robert Boyle* (London: Taylor & Francis, 1969), p. 274.

10. We know that Whiston periodically tutored while he was in London. For example, in 1724 Whiston was tutoring a young German Baron Gemmingen. Whiston, *Memoirs*, 1: 270.

11. Whiston, *Memoirs*, 1: 175-6.

12. Newcastle was supporting Whiston during his trials for heresy at this time, which was a period of Tory ascendancy (Whiston, *Memoirs*, 1: 194). Pelham-Holles matriculated at Clare Hall on 9 May 1709 (*DNB*, 15: 702).

13. In 1712 and 1713 Whiston, then living at Cross Street, Hatton Garden, advertised his "Primitive Library," which was intended to "contain all the sacred and primitive Books of the four first Centuries." Everyone who paid Whiston "10*s.* at first, and 5*s.* a year afterward, may use it, and borrow out of it at pleasure." Whiston, *Primitive Infant-Baptism Reviv'd* (London, 1712), cited in Farrell, *William Whiston*, p. 280; idem, *Reflexions on an Anonymous Pamphlet, Entituled, a Discourse of Free Thinking* (London: Printed for the Author, 1713), p. [56]. I have not seen any evidence to suggest how many, if any, used Whiston's Primitive Library. The fact that this offer appears to have been only advertised in 1712 and 1713 may suggest that the scheme was not a great success. However, as the library was in his own home, and as the books presumably were paid for, any fee would have been profitable for Whiston. In other words, it was obviously a low-risk venture. Auditors at lectures held in his home, or those subscribing at his home for his lectures with Hauksbee, may have had opportunity to become aware of the library. Meetings of the Society for Promoting Primitive Christianity were held at Whiston's home in Cross Street as well.

14. Among the gifts were a twenty guinea payment from the Duke of Newcastle and five guineas from Lord Godolphin. According to Whiston, General James Stanhope encouraged Whiston's "numerous and noble audience" to give Whiston "a guinea apiece," but does not say how many did so. Whiston goes on to note that the approximately £120 he gained through lecturing, the sale of his books and charts, along with the above mentioned patronage, "in the circumstances I then was, and have since been, destitute of all preferment, was a very seasonable and plentiful supply: and, as I reckoned, maintained me and my family for a whole year together." This gives us an idea of what Whiston's annual living expenses were in London in the 1710s. Whiston, *Memoirs*, 1: 204-5.

15. An unidentified portion of the £120 Whiston earned from the 1715 solar eclipse came from the sale of publications and astronomical charts. Whiston, *Memoirs*, 1: 204-5.

16. Parker, Whiston's patron on more than one occasion, gave Whiston a roll of fifty guineas to make Whiston "easy" after Whiston asked Parker if he could help secure for him the position of Astronomer Royal, since Flamsteed had recently died. Parker had already spoken to the King on Edmond Halley's behalf (Whiston, *Memoirs*, 1: 252-3). Whiston also speaks of Parker's "other generous benefactions to me" (Whiston, *Memoirs*, 1: 253). Thomas Parker (1666?-1732) had matriculated at Trinity College, Cambridge on 17 December 1685 (which places him at Cambridge during the time Whiston was there), became Baron Macclesfield on 10 March 1716, Lord Chancellor on 12 May 1718, and the first Earl of Macclesfield on 15 November 1721 (*DNB*, 15: 278-9).

17. Whiston, *Memoirs*, 1: 254-5. Whiston lists each subscriber by name. They include King George I, the Prince and Princess of Wales, as well as several prominent Whigs, Thomas Parker (Lord Chancellor), James Brydges (the Duke of Chandos), and Sir Joseph Jekyll (Master of the Rolls), being among the more generous of the subscribers. Whiston notes that this subscription was also taken for the benefit of his family.

18. Although Whiston himself gives the amount as £40 (Whiston, *Memoirs*, 1: 290), his son John Whiston, in a manuscript note published by Nichols in his *Literary Anecdotes* (1: 504 n.), gives the amount as £50 per annum. Additionally, the Conant Manuscripts contain Whiston's receipt for £12 10*s* "one quarter's payment of the pension granted him by the King's warrant, dated March 22, 1737." The receipt is dated April 1740 (L.R.O. Conant MSS. DG11/DE. 730/2, item 129). This, along with the testimony of Whiston's wife Ruth of a payment of £50 from Caroline in July 1730, which Whiston received at court (Ruth Whiston to Sarah Barker, 8 August 1730. L.R.O. Conant MSS. DG11/DE.730/2, item 117B), may indicate that neither the amount nor the payment schedule were fixed.

19. The payments began in 1727, the accession year of King George II and Queen Caroline. George II continued the payments from the death of his wife Caroline in 1737 until Whiston's own death in 1752. This information comes from a manuscript note supplied by John Whiston and cited in Nichols, *Literary Anecdotes*, 1: 504 n.

20. This information relies on the testimony of Francis Lockier (1667-1740), Dean of Peterborough, who is reported to have written the following: "In speaking of Whiston's book, Sir Joseph Jekyll, who you know is a top one, sent to Whiston and gave him twenty guineas not to give him any encomiums in his book" (Lockier, 1-6 September 1730, cited in Joseph Spence, *Observations, Anecdotes, and Characters of Books and Men Collected From Conversation*, ed. James M. Osborn [Oxford: Clarendon Press, 1966], 1: 283). There is no clear indication as to which book of Whiston's Lockier is referring; however, Whiston's *Historical Memoirs of the Life of Dr. Samuel Clarke* (London, 1730), the first edition of which had appeared earlier in 1730, is a likely candidate since it includes references to many associates of both Clarke and Whiston.

21. This £20 is a separate payment from the £50 from Queen Caroline of the previous month, and it came on 21 August 1730 from "y^{e} Prince" via a "Gentleman" (Ruth Whiston to Sarah Barker, 22 August 1730. L.R.O. Conant MSS. DG11/DE.730/2, item 117C). The "Prince" mentioned in Ruth Whiston's letter may refer to Frederick Louis (1707-1751), who had become the Prince of Wales in 1729. At this time, relations between Frederick Louis and his father George II were beginning to deteriorate. Frederick Louis predeceased his father and thus never ascended to the throne.

22. Whiston, whose sympathies for the Jewish people were well known and based in large part on his views of the Jews in biblical prophecy, was called upon by an anonymous donor (who seems to have shared Whiston's prophetic views) to present £100 of relief to some Jews in Duke's Place, by Aldgate, who had been rendered destitute by a fire that had

destroyed most of their dwellings. Whiston received £10 for acting as agent. Whiston, *Memoirs*, 1: 298.

23.Whiston mentions this annuity in his *Memoirs*, but does not mention if it was exclusively the result of being named as a recipient in Jekyll's will (Whiston, *Memoirs*, 1: 290). However, a surviving letter from William, Jr. to George Whiston (both sons of Whiston) dated 30 September 1738, mentions the particulars of Jekyll's will, which named Whiston as the recipient of a £20 annuity for life (L.R.O. Conant MSS. DG11/DE.730/2, item 125). It is possible, given Whiston's own wording in his *Memoirs*, that he was receiving the annuity from Jekyll while the latter was still alive. Also, we have already cited evidence that Whiston received money from Jekyll in 1721 and possibly in 1730. Furthermore, a letter from William Whiston to his son George reveals that the latter was acting as tutor to Jekyll's son in 1735, and that the Master of the Rolls was very pleased with his son's progress under George's instruction. William Whiston to George Whiston, 29 March 1735 (L.R.O. Conant MSS. DG11/DE.730/2, item 122).

24. Whiston, *Memoirs*, 1: 290. John Baron (b. 1677) received his MA (1705) and DD (1733) at Cambridge, and was Dean of Norwich from 1732 to 1739. He died on 11 July 1739. See J. Venn and J.A. Venn, *Alumni Cantabrigienses: A Biographical List of All Known Students, Graduates and Holders of Office at the University of Cambridge, From the Earliest Times to 1900* (Cambridge: Cambridge University Press, 1922), Vol. 1, Part 1, p. 95.

25. The patrons were Sir Charles Wager, First Lord of the Admiralty, the Duke of Cumberland, Lord Wilmington, Lord Baltimore and Mr. Townsend. Whiston, *Historical Preface* (1741) in idem, *The Longitude Discovered by the Eclipses, Occultations and Conjunctions of Jupiter's Satellites* (London, 1738), p. xxvi.

26. R.G.O. (Royal Greenwich Observatory) *Minutes of the Board of Longitude*, Vol. V, p. 3, cited in Farrell, *William Whiston*, p. 170. Whiston later claimed the £500 did not cover his expenses (Whiston, *Memoirs*, 1: 254).

27. Whiston, *Memoirs*, 1: 290. I have not been able to identify Turner.

28. I have not been able to identify Lady Caverly; we only know that she died some years after 1711. Whiston, *Memoirs*, 1: 160.

29. Whiston, *Memoirs*, 1: 290. The only Irishman mentioned in *DNB* for this period is John Leigh (1689-1726), who was for a time a prominent London stage actor (*DNB*, 11: 877). There is also a "John Leigh, Esq." included in the subscription list to John Theophilus Desaguliers' *A Course of Experimental Philosophy* (London: Printed for John Senex, *et al*, 1734), vol. 1, sig. B1^{v}. It is possible that this subscriber is the same "Mr. Leigh" to whom Whiston refers. It is also possible that the actor John Leigh is the same John Leigh whose name is given in Desaguliers' subscription list. Even though the actor died in 1726, and thus long before the first volume of *A Course of Experimental Philosophy* was printed in 1734,

Desaguliers first advertised for subscribers in March 1724 (*DC* Tuesday 31 March 1724, No. 7002).

30. Whiston, *Memoirs*, 1: 290.

31. This includes various unspecified "benefactions from persons still alive," the greatest of which was from "Mr. John Bromley of Horseheath, Cambridgeshire" (Whiston, *Memoirs*, 1: 290). John Bromley, MP for Cambridgeshire from 1707 to 1718, died 20 October 1718. He had been admitted to Clare Hall on 10 October 1700, and may have met Whiston at Cambridge while the latter taught at that University (Venn and Venn, *Alumni Cantabrigienses*, Vol. 1, Part 1, p. 224).

APPENDIX XII
1721 SUBSCRIPTION RAISED FOR WHISTON'S LONGITUDE RESEARCH[1]

In the latter part of this year, 1721, a large subscription was made for the support of my family, and for the carrying on my discovery of the longitude by the dipping needle. It is dated *November* 20, 1721; and ought to be here exhibited, as a memorial of the publick spirited men, and my particular friends at that time: and was, by far, the greatest sum that was ever put into my hands, by my friends, excepting the 500 *l.* for the survey of our coasts, which yet did not pay the disbursements for which it was allotted: of which in my *Historical Preface* to the longitude discovered by Jupiter's Planets, *Preface*, page 60.

	£.	*s.*	*d.*
King *George* I.	100	0	0
Deduct the Treasury Officers Abatements	11	1	6
Received	88	18	6
The Prince of *Wales*,	50	0	0
The Princess of *Wales*,	31	10	0
The Lord Chancellor *Parker*,	21	10	0
The Duke of *Chandos*,	21	0	0
Master of the Rolls Sir *J. Jekyl*,	31	10	0
Mr. *Molyneux*,	31	10	0
Mr. *Cartwright*,	10	10	0
Mr. *Hutton*,	10	10	0
Mr. *Hedges*,	10	10	0
Mr. *Western*,	10	10	0
Col. *Wyndham*,	10	10	0
Lord *Paisley* (a *Terrella*,)	5	05	0
Dr. *Crow*,	10	10	0
Sir *George Markham*,	10	10	0
Duke of *Montague*,	21	00	0
Lord *Islay*,	10	10	0
Mr. *Edgcome*,	10	10	0
Earl of *Derby*,	10	10	0
Mr. *Ward*,	10	10	0
Mr. *Sanbroke*,	5	05	0
Mr. *Folkes*,	5	05	0
Mr. *Thompson*,	5	05	0
Mr. *Edwards*,	5	05	0
Mr. *Parker*,	5	05	0
Mr. *Anson*,	5	05	0
Mr. *Nailor*,	5	05	0
Mr. *Archer*,	5	05	0
Sir *John Guise*,	5	05	0
Duke of *Kent*,	5	05	0
Sum total,	470	3	6

[1]Whiston, *Memoirs of the Life and Writings of Mr. William Whiston* (London, 1753), 1: 254-5.

APPENDIX XIII
SUBSCRIBERS TO DESAGULIERS' *A COURSE OF EXPERIMENTAL PHILOSOPHY*, VOL 1. (1734)[1]

His late Majesty King GEORGE the First
HIS PRESENT MAJESTY
HER PRESENT MAJESTY

A

Allan, Mr. Lionel, Merchant at Rotterdam
Allen, Ralph Esq; Postmaster of Bath
Anderson, James D.D.
Apreece, Robert Esq;
Armstrong, Col. John Surveyor of his Majesty's Ordnance
Arnold, Robert, Teacher of Mathematicks

B

Baldwin, Samuel Esq;
Barker, Mrs. Mary, of Broadwell in Glocestershire
Baron, Rev. Charles A.M.
Beal, John M.D.
Beaumont, Sir George Bart.
Beeldemaker, Gerandus
Bentinck, Rt. Hon. William
Bernard, John of Ashbury, Esq;
Bethel, Hugh Esq;
Betenson, Sir Edward, Bart.
Big, Rev. A.M. F.W. Coll:
Billers, Sir William, Lord Mayor of London
Blackbourn, William Esq;
Bladen, Col. Martin
Blunt, Sir John Kt.
Bond, Dennis Esq;
Booth, Barton Esq;
Booyaunt, Paulus
Bornemannus, Philip Julius, of Holland
Bowles, Mr. John
Boyd, Mr. Robert
Brace, J. Thurloe Esq;
Bradock, Mrs. Frances
Branden, Peter Adrianus van den
Bridges, Brook Esq;
Bridges, John Esq;
Bridges, J--- Esq;
Brooks, Mr. Thomas
Brown, Mr. Thomas Merchant
Brownlow, Rt. Hon. Lady E.
Brownlow, William Esq;
Buchleugh, His Grace Francis, Duke of
Bucler, Mr. John
Bunkenbourgh, Rt. Hon. Countess of
Burlington, Rt. Hon. Earl of
Butler, Rt. Hon. Col. James
Bute, Rt. Hon. James Earl of

C

Capper, -- Esq;
Carr, William Esq;
Carpenter, Rt. Hon. Lord
Cartwright, Thomas Esq;
Caswell, Sir George
Chandos, His Grace James, Duke of
Chamber, William Esq;
Cheney, Rt. Hon. Lord
Chetwind, William Esq;
Christophers, Theodore, Jan
Church, Thomas Esq;
Churchill, Mr. Robert
Churchill, Mr. Robert, Apothecary

---

[1]These names are found in Desaguliers, *A Course of Experimental Philosophy* (London: Printed for John Senex, *et al*, 1734), Vol. 1, sigs. A4^{r}-B2^{v}, C3^{v} (several missed names from the errata on sig. C3^{v} have been incorporated into this list). This publication was first proposed in 1723 and first advertised in 1724. Volume I was published in 1734.

Churchill, Brig. Charles
Churchman, Mr. Walter
Cibber, Colley Esq;
Clarke, Rev. Samuel D.D.
Clare, Mr. Martin, Schoolmaster
Clements, Mr. John
Cleaveland, His Grace Duke of
Cobb, Rev. Dr. Ward. Winch, Coll:
Cobham, Lord Viscount
Conduit, John Esq;
Conway, Rt. Hon. Lady
Cooke, Sir George Kt.
Cope, Charles Esq;
Corsini, Marq. Neri
Costar, Thomas Esq;
Costar, Mr. John
Colbe, Mr. J.L. Mathematical Instrument-maker
Coladon, -- Esq;
Collet, Dr. John
Craufurd, Rt. Hon. Earl of
Crop, Mr. Abraham
Cumming, Sir Alexander Bart.

D

Daniel, Capt. Hugh
Dappe, Mr. John
Darlington, Countess of
Davies, Mr. Meredith
Davis, Mr. -- Shipwright at Amsterdam
Deering, Daniel, Esq;
Dela Faye, Charles, Esq;
Denune, Mr. George
Dickinson, Mr. Ezekiel
Diston, Jo. Esq;
Dobson, Rev. J. D.D. Ward of New Coll.
Dobyns, Col. John
Donnald, Mr. John
Douglass, George M. D.
Dumford, Mr. Richard

E

Earle, Giles, Esq;
Earle, Mr. Timothy
Edens, Mr. Abraham Merchant
Eden, Mr. John
Edgecumbe, Rt. Hon. Richard Esq;
Edwards, Thomas Esq;
Edwards, -- Esq;
Edwin, Charles Esq;
Eglinton, Rt. Hon. Countess of
Elliot, Mr. John
Elliot, Sir Gilbert Bart.
Elton, Mr. Abraham
Everhard, Mr. John
Fairfax, Brian Esq;
Fisher, Mr. Samuel
Fizeaux, Mr. Jean
Fletcher, Mr. Joshua
Folkes, Martin Esq;
Foreman, Mr. George
Frederick, John Esq;
Frederick, Thomas, Esq;
Furly, Mr. Benjohan Merchant
Furnese, George Esq;

G

Garnier, Mons. -- M.D.
Gascoigne, Mr. J---
Gazola, His Excellency Count of
Geelvink, N. Secret.
Gibbs, Rev. Mr. John
Girardot, John Esq;
Glover, Phillips Esq;
Golding, Mr. John
Goodchild, Mr. John
Gordon, Capt. George
Gore, John Esq;
Graham, Richard Esq;
Greenway, Rev. William A.M.
Greenwood, Charles Esq;
Grove, John Esq;
Grundy, Mr. John Surveyor

H

Hales, Rev. Stephen B.D.
Halifax, Rt. Hon. George Earl of
Hall, Stephen M.D.

Halsey, Richard Esq;
Hamilton, Lady Archibald
Hamilton, Lady Margaret
Hamilton, Mr. Archibald Merchant
Hanger, Mrs. Jane
Harvey, John Esq;
Hardwich, Dr. Peter
Harford, Mr. Trueman
Hawkey, -- Esq;
Heath, Ralph Esq;
Hays, Charles Esq;
Haynes, Mr. Thomas
Helot, Mr. John, Clock-maker
Hepburn, Mr. John
Herring, John Esq;
Hewet, Sir Thomas Kt.
Higgins, Dr. Abdias
Hillsbourgh, Rt. Hon. --- Trevor Viscount
Hog, Mr. Roger
Holland, Mr. John
Hooper, Rev. Dr. Francis
Howard, Hugh Esq;
Hunt, Rev. Dr. late Master of B. Coll. Oxon
30 Books
Hunt, Rev. A.M.V.P. of H.H. Oxon
Hutchinson, Rev. Thomas, A.M.
Hutchinson, John Esq;

I

James, Mr. Thomas
Jaumar, Rev. John, Chaplain to his Grace
the Duke of Grafton
Ibervile, Marquis de
Jefferies, John Esq;
Jenkins, Tobias Esq;
Jones, William Esq;

K

Kent, Charles Esq;
King, Mr. James
Kox, Engil
Kingliside, Mr. William
Kirghout, Julius
Kynafton, Mr. Thomas

L

Lambert, Sir Edward
Law, --- Esq;
Leader, Charles, A.M.F.N. Coll.
Leigh, John Esq;
Lippe, Rt. Hon. Countess de la
Lippe, Rt. Hon. Count de la, Sen.
Lippe, Rt. Hon. Count de la, Jun.
Loftus, Rev. Mr. Bartholomew
Longsdale, Lord Viscount of
Lord, Robert Esq;
Loup, Mr. William
Lufnew, --- M.D.
Lynslager, Capt. Henry

M

Macclesfield, late Rt. Hon. Tho. Earl of,
Lord Chancellor
Mackworth, Sir Thomas Bart.
Mackenzie, Sir George
Mathew, George Esq;
Matthew, Capt. William
Mazeres, Peter Esq;
Meads, Peter Esq;
Milbourne, George Esq;
Middlemore, John Esq;
Millner --- Esq;
Mitchel, Mr. Henry
Molewater, Bastiaen Jun.
Montague, His Grace John Duke of
Morgan, Mr. John, of Bristol
Newton, late Sir Isaac Kt.
Niewaart, Cornelius M.D.
Nicholas, John Esq;
Nicholson, Henry M.D.
Norfolk, His Grace the Duke of
Nourse, Charles Esq;
Nyevelt, Harm. Van Zuyle Secr.

O

Oglethorpe, James Esq;
Osborne, Sir John Bart.

P

Page, Thomas Esq;
Page, Hon. Mrs.
Paisley, Rt. Hon. James Lord
Parsons, Col. John
Pawlet, Rt. Hon. William Lord
Pembroke, Rt. Hon. Hen. Earl of, two Books
Phillips, Mr. Robert Bricklayer
Piddocke, Mr. Thomas
Plumpton, Richard Esq;
Popple, Henry Esq;
Preis, His Excellency Joachim, Frederick
Price, William Esq;
Price, Mr. John
Pringle, John M.D.
Prude, Mr. Henry
Purcell, Col. Martin
Pye, Rev. Sir Richard

R

Redding, --- Col.
Reynardson, Samuel Esq;
Rippley, Thomas Esq;
Riva, John Esq;
Robin, Mr. Pieter
Rogers, Mr. Francis
Rooke, George Esq;
Rousfignac, Guy M.D. Lecturer of Anatomy at Surgeons-Hall
Rowel, Mr. John, Glass-stainer after the antient manner at Wickham
Rushout, Sir John Bart.
Rutty, William M.D.

S

Salmon, Dr. William Henry
Sambrook, John Esq;
Samuda, --- M.C.
Sands, Mr. William
Senex, Mr. John, Bookseller
Shepherd, Mr. John
Sherigley, Abraham Esq;
Skreen, Richard Esq;
Skipworth, Sir Fulwar
Schelches, Mr. Andrew
Sloan, Sir Hans Bart.
Smith, Dr. Richard, 2 books
Snellen, Jan Van
Southcoat, Philip Esq;
Stample, Mr. Peter
Stanhope, Charles Esq;
Stanton, Mr. Ward
Stephens, Mr. ---
Steel, Mr. Eugene
Steighertahl, --- M.D.
Stone, Mr. Arthur
Strickland, Sir William
Suffolk, Rt. Hon. Edward Earl of
Sussex, Rt. Hon. Talbot Earl of
Sutton, Sir Robert Kt.

T

Taylor, Brook L.L.D.
Tayleur, John Esq;
Thomond, Rt. Hon. Earl of
Tobin, Sir James
Trevor, John Esq;
Trimble, Mr. Francis Merchant
Truby, Mr. Richard Jun.
Tuffnell, Mr. Samuel
Turbot, Richard Esq;
Tyrconnel, Rt. Hon. John Earl of

V

Valentinois, Duc de
Vanbrugh, Sir John
Vaughan, Gwyne Esq;
Vincent, Mr. William
Vynor, Robert Esq;

W

Wager, the Hon. Sir Charles
Walpole, Hon. Horatio Esq;
Wagg, Mr. Thomas
Wall, William Esq;
Wall, Mr. Tobias
Weddel, Capt. Charles

Wharton, His Grace Philip Duke of
Wharton, George M.D.
Wharton, Edward Jun.
Wilkinson, Andrew Esq;
Woodcock, Thomas Esq;
Woodeson, Mr. ---
Woodhouse, Mr. William
Wyndham, Thomas Esq;
Wyndham, Sir William

Y

Yvonet, John Paul Esq;

Z

Zolicofre, Theod. William Esq;

STATISTICAL ANALYSIS OF SUBSCRIBERS' TITLES

Total number of names in subscription list: 307
Total number of male subscribers: 294 (95.8%)
Total number of female subscribers: 13 (4.2%)

88 (28.66%): Esq.
59 (19.22%): Mr.
13 (4.23%): Sir
11 (3.58%): M.D.
9 (2.93%): No title
8 (2.61%): Rt. Hon. Earl
8 (2.61%): Sir / Bart.
5 (1.63%): Capt.
5 (1.63%): Col.
5 (1.63%): His Grace Duke
5 (1.63%): Mr. / Merchant
5 (1.63%): Rt. Hon. Lord
3 (0.98%): Mrs.
3 (0.98%): Rev. / A.M.
3 (0.98%): Rt. Hon. Countess
3 (0.98%): Rt. Hon. Lady:
2 (0.65%): Hon. Mrs.
2 (0.65%): Lady
2 (0.65%): Lord Viscount
2 (0.65%): Marquis (or Marq.)
2 (0.65%): Rev. Mr.
2 (0.65%): Rt. Hon. Count
2 (0.65%): Secret. (and Secr.)
1 (0.33%): A.M. F.N. Coll.
1 (0.33%): A.M. F.W. Coll.
1 (0.33%): A.M. V.P. of H.H. Oxon.
1 (0.33%): Brig.
1 (0.33%): Col. / Surveyor of his Majesty's Ordnance
1 (0.33%): Countess
1 (0.33%): D.D.
1 (0.33%): Dr.
1 (0.33%): Duc
1 (0.33%): Her Present Majesty
1 (0.33%): His Excellency
1 (0.33%): His Excellency Count
1 (0.33%): His late Majesty King
1 (0.33%): His Present Majesty:
1 (0.33%): Hon. / Esq.
1 (0.33%): Hon. Sir
1 (0.33%): LL.D.
1 (0.33%): M.C.
1 (0.33%): M.D. lecturer of Anatomy at Surgeons Hall
1 (0.33%): Merchant
1 (0.33%): Mr. / Apothecary
1 (0.33%): Mr. / Bookseller
1 (0.33%): Mr. / Bricklayer
1 (0.33%): Mr. / Clockmaker
1 (0.33%): Mr. / Glass-stainer after the antient manner of Wickham
1 (0.33%): Mr. / Mathematical Instrument-maker:
1 (0.33%): Mr. / Schoolmaster

1 (0.33%): Mr. / Shipwright
1 (0.33%): Mr. / Surveyor
1 (0.33%): Postmaster
1 (0.33%): Rev. B.D.: B.D.
1 (0.33%): Rev. / Chaplain to his Grace the Duke of Grafton
1 (0.33%): Rev. D.D.
1 (0.33%): Rev. D.D. Ward of New Coll.
1 (0.33%): Rev. Dr.
1 (0.33%): Rev. Dr. late Master of B. Coll. Oxon.
1 (0.33%): Rev. Dr. Ward. Winch. Coll.
1 (0.33%): Rev. Sir
1 (0.33%): Rt. Hon.
1 (0.33%): Rt. Hon. Col.
1 (0.33%): Rt. Hon. Earl / Lord Chancellor
1 (0.33%): Rt. Hon. Esq.
1 (0.33%): Rt. Hon. Viscount
1 (0.33%): Sir / Lord Mayor of London
1 (0.33%): Teacher of Mathematics

APPENDIX XIV
FRANCIS HAUKSBEE, SR. AND JAMES HODGSON'S SYLLABUS
AN ACCOUNT OF HYDROSTATICAL & PNEUMATICAL EXPERIMENTS[1]

AN
ACCOUNT
OF
Hydrostatical & Pneumatical
EXPERIMENTS.

To be Perform'd in the COURSE, at the House of Mr. *Hauksbee*, in *Wine-Office-Court*, in *Fleet-street*.

By JAMES HODGSON and FRANCIS HAUKSBEE, F.R.S.

Hydrostatical Experiments.

THAT the upper part of all fluids do actually press, gravitate, or weigh upon the lower.

That this pressure is communicated in *Orbem*, as well upwards as downwards, laterally as direct, and is the same in all Directions whatsoever.

That a lighter Fluid may gravitate upon an heavier, as well as an heavier upon a lighter.

That for the Ascension of Water in Pumps, its Flowing thro' Syphons, *&c.* there needs nothing but a competent weight of an external Fluid.

That the weight of Water pressing against the Fund of any Vessel, is to be estimated by a Prism of Water; having for its Base the Fund of the Vessel, and height equal to the perpendicular height of the Water.

That therefore, howsoever differently the Pipes are form'd, yet if their Bases are equal, the Fluids contain'd within 'em ponderate equally.

That a Solid Body, as ponderous as any yet known, (tho' near the top of the Water, it will sink by its own weight) yet if placed at a greater depth than that of twenty times its own thickness, it will not sink; if its descent be not assisted by the weight of the incumbent Water.

That all Bodies being either heavier, equal or lighter, than a like Bulk of Water, will, if let into Water, sink, if they are heavier; if of the same weight, swim, in that station where they shall be placed; if lighter, float above the Surface of the Fluid, and will, before they sink, require a weight to be added to 'em equal to the difference of the weight of the Body,

---

[1]This syllabus, produced sometime between 1706 and 1709, is a full reprint of the copy held by the John Johnson Collection at Oxford. The text is reproduced here with the kind permission of the Bodleian Library. The Oxford shelf mark is John Johnson Collection Entertainment Folder 7. Spelling, italics and capitalization follow the style of the original document. Original pagination is enclosed in square brackets.

and a like Bulk of the Fluid.

[2] The Specifick Gravities of several sorts of Metals, Minerals, Liquors, *&c.* determin'd; whence the absolute Gravity of one being known, the absolute Gravities of the rest may be easily had.

Pneumatical Experiments.

The Pressure of the Air prov'd in general, by shewing, That

Mercury is not to be elevated higher in an open Tube by the greatest Exhaustion, than 'tis at the same time suspended in the Barometer by the pressure of the common Air.

A Glass Vial may be broke, by laying the pressure of the Air on its outward Surface.

A Glass Vial being immers'd and detain'd under Water, may be broke by laying the Pressure of the External Air on the Surface of the Liquid, the Air contain'd in the Vial having been first withdrawn.

The Pressure of the Air may be made sensible to the Touch.

The Pressure of the Air prov'd in opposition to Suction, *by shewing,*

That Water will not succeed the Sucker of a Syringe, unless it be assisted by the Pressure of the External Air.

That when the Pressure of the External Air is taken off, 'tis very easie to draw up the Sucker of a Syringe, tho' the Hole at which the Air or Water should succeed be stopt.

That upon opening of a Syringe, whose Pipe is stopt, in the exhausted Receiver, the Pressure of the Air will lift a considerable weight.

The Pressure of the Air prov'd in opposition to the Funicular *Hypothesis, by shewing,*

That the *Mercury* in the *Torricellian* Experiment will gradually descend as the quantity of the external Air is lessen'd, on the Surface of the stagnant Quicksilver, till at last *in Vacuo* it subsides to near the level of that which is contain'd in the Cistern.

That a Tube, hermetically seal'd at one end, being fill'd full of Water, and its open end immers'd under some of the same Liquid, will (upon the absence of the Air) descend to near the Level of the Surface of that at bottom, in spight of the *Funicular* Power, at such a time to retain so light a Body suspended.

An Experiment tending to shew the Cause of the Rising and Falling of the Mercury *in the common Weather-glass; by shewing,*

That high Winds are capable so to lessen the Pressure of the Air on the Surface of the *Mercury* in the Bason, as to cause the Mercury in the Barometer considerably to descend.

Experiments tending to prove, That the Air is so far from being the

Cause of Gravity, that it is a great Impediment to it, by shewing,

That a piece of Gold and a Feather being included *in Vacuo*, and dropt at the same time from the top of a tall Recipient, the Feather [3] meeting with no resistance from the Air, descends with the same Velocity as the Gold.

That Dust, which in common Air will float a considerable time, *in Vacuo* will descend as a ponderous Body.

The Absolute Gravity of the Air determin'd,

By shewing the proportion of the Weight of Air, to a like builk of Water or Quicksilver.

Several Experiments, demonstrating the Spring of Uncompress'd Air, or its Elasticity, by shewing,

That a little Air being included in the Folds of a Bladder, the Neck of which being closely ty'd, and then convey'd under a Receiver, which being exhausted by the Pump, the small quantity of Air contain'd in the Bladder will so expand itself, as to swell the Bladder to its greatest dimensions.

That a Bladder well blown will be burst *in Vacuo*, by the bare spring of its included Air.

That a quarter-part of as much Air as a Bladder shall naturally hold, being included and confin'd by closely tying its Neck, then a Weight of 20, 30 or a greater number of Pounds, being conveniently placed upon it, and all cover'd with a Receiver, which well exhausted, the Air contain'd in the Bladder will so exert its Spring, as to move and raise the incumbent Weight.

That a Glass Vial, being closely stopt, will (upon the absence of the ambient Air, by the Spring of its included Air) be broke into a multitude of pieces.

That a Glass Vial, being immers'd and detain'd under Water, upon the withdrawing of the Air from the Surface of the Liquid, the Air included in the Vial will so exert its Spring, as to break it violently, notwithstanding the intervention of the Liquid.

A surprizing *Phænomenon*, upon taking the Pressure of the Air from the Surface of warm Water.

That abundance of Particles of Air are discoverable in Common Water, upon the absence of the ambient Air.

Experiments in Compress'd Air.

Sound to encrease, according to the degrees of Condensation. And the contrary.

The breaking of round Glass Vials in compress'd Air, notwithstanding the Resistance from their Form and the included Air.

An Experiment tending to prove,

That the Springs or Constituent Parts of Air, are capable to suffer such disorder by a violent Impulse, as to require Time to recover their Natural Strength again.

The Pressure of the Air prov'd, in opposition to Nature's Abhorrence of Vacuum; by shewing,

That it requires the same difficulty to separate two Hemispheres only [4] upon injecting an Atmosphere of Air on their outward Surfaces, as if their inward or contain'd Air was exhausted from 'em.

That it requires double the difficulty afore-mentioned, upon exhausting the inward Air, and then injecting an Atmosphere of Air on the outward Surfaces of the same Hemispheres.

An Experiment,

Shewing, That the Air's Presence, or at least some degree of it, is absolutely necessary, in the Production of Fire upon the Collision of Flint and Steel.

Several Experiments, shewing the Presence of the Air *to be essentially necessary to the Conservation of Life.*

An Experiment,

Shewing, That the Air's Presence is no way necessary in the Production of that odd *Phænomena*, the seeming-spontaneous Ascension of Water in small Tubes, or between two Glass Planes.

Experiments about Firing of Gun-Powder, Aurum Fulminans, *or any other easie-inflamable Matter, on a Candent Iron.*

Several new Experiments on Electricity, or Attraction of Bodies, viz.

That upon the Attrition of a Glass Tube, light Bodies may be mov'd at a considerable distance from it.

That upon the Attrition of a Globe Glass, Threds that are conveniently fix'd will tend to the Centre of it, in all manner of Positions. And further, 'tis very surprizing, to see the directed Threds flee the approach of any body, held near 'em.

That upon the Attrition of a Glass or Sealing-wax, Bodies may be mov'd within a Glass, notwithstanding the Interposition of so solid a Body.

Several new and surprizing Experiments, in relation to the production of Light upon the Attrition of Glass Bodies, viz.

That upon the Attrition of a Glass Globe exhausted of its Air, a Light so considerable

will be produc'd, that *Words* in *Capital Letters* may be read by it; with other various *Phænomena* exhibited upon letting in the Air.

That when the Globe is replete with Air, it is very curious to see, that upon the Attrition of it, a Light will be communicated to Bodies at two or three inches distance from it.

NB. *For the Benefit of* Gentlemen *who shall be present at the making the* Experiments, *there will be a Discourse of their Nature and Use.*

Those who desire to be present, must pay Two Guineas; *one at the time of Subscription, the other on the third Night after the Course begins.*

Subscriptions *are taken by Mr.* HAUKSBEE, *at his House, aforemention'd.*

APPENDIX XV
ROGER COTES' SYLLABUS PUBLISHED IN *HYDROSTATICAL AND PNEUMATICAL LECTURES*[1]

The heads of a Course of Hydrostatical and Pneumatical Experiments, as performed at the Observatory in Trinity-college, CAMBRIDGE.

Hydrostatical tryals and conclusions.

THAT fluids gravitate in proprio loco, *the upper parts continually pressing upon the lower; that this pressure is not only propagated downwards, but even upwards and side-ways, according to all possible directions; that a lighter fluid may gravitate upon an heavier, and an heavier upon a lighter.*

That a fluid may sustain a body heavier in specie *than itself, and even raise it up; that a fluid may detain a body lighter in specie than itself, and even depress it; that a competent pressure of a fluid may produce the remarkable phœnomena of the Torricellian tube, pump, syringe, siphon, polished plates, and other effects of the like nature.*

That fluids press according to their perpendicular altitudes, whatever be their quantities, or however the containing vessels be figured; the exact estimate of all manner of pressures; the invention of the center of pressure, upon any proposed plain, reduced to the problem of [A6^{r}] *finding the center of percussion.*

Of the sinking and floating of bodies immersed in fluids, their relative gravities and levities, their situations and positions: the phœnomena of glass bubbles accounted for.

The hydrostatical ballance explained, with the methods of determining the specifick gravities of all sorts of bodies thereby.

The praxis of the hydrostatical ballance; the specifick gravities of several particular bodies actually found out; with an account of the various uses of such enquiries.

Pneumaticks illustrated by experiments for the most part tubular, being such as were wont to be made before the air-pump was invented.

---

[1]This syllabus is reprinted from Roger Cotes, *Hydrostatical and Pneumatical Lectures*, ed. Robert Smith (London: Printed for the Editor, 1738), sigs. A5^{v}-A7^{v}, from the copy held by the British Library and microfilmed by Research Publications. The British Library shelf mark is 537.d.10, and it is reproduced here with the kind permission of Research Publications, Woodbridge, Connecticut, U.S.A. This syllabus appears to represent Cotes' portion of a course Cotes developed with William Whiston at Cambridge in 1707. References in the syllabus to page numbers in the main body of the course text have been omitted. Spelling, italics and capitalization follow the style of the original.

THE several phænomena of the Torricellian experiment exhibited and explained.

Monsieur Pascal's *imitation of the same experiment by water; other experiments of the like nature with fluids variously combined; the pressure of the air, shewn by experiment to be at different altitudes from the surface of the earth.*

[A6v] *The density and spring of the air proved to be as the force which compresses it, and from hence an enquiry is made into the limits and state of the atmosphere.*

The effects of the weight and spring of the air in syringes, pumps, siphons, polished plates, cupping glasses, suction, respiration, &c.

Instruments for determining the state of the weather.

The phænomena of capillary tubes, glass planes, the figures of the surfaces of fluids, and other things relating to the same head, considered.

The more known properties of the air established by the air-pump, and other engines.

THE air-pump, the instruments for condensing and transferring air, their fabrick, operation, and gages explained.

An account of the several successive degrees in which the air is expanded and compressed by the air-pump and Condenser.

A parcel of air weighed in the ballance; its specifick gravity to that of water determined [A7r] *thereby: a second enquiry into the state of the atmosphere.*

The weight, pressure and spring of the air proved several ways; by the sense of feeling, by breaking glass vials, by the phænomena of bladders, glass bubbles, fountains, the gardener's watering pot, the diving bell, &c.

Syphons, syringes, polished plates, the Torricellian tube in vacuo; *quicksilver raised to the usual height of the weather-glass by the bar spring of a little included air;* Otto Guericke's *hemispheres.*

The ebullition of liquors in vacuo, *the quantity of air contained in them, the sustentation of fumes and vapours, the descent of bodies in* vacuo, *the refraction of air.*

The more hidden properties of the air considered by the help of the like engines.

The influence of the air examined as to the causes of magnetism, the elasticity of springs, the sphericity of the drops of fluids, the ascent of liquors in capillary tubes, the reflection of light from the farther surface of glasses, &c.

The influence of the air as to sounds, fire and flame, the consumption of fuel.

[A7] *The effect of rarified and condensed air upon the life of animals.*

A piece of phosphorus in vacuo; *Mr.* Hauksbee's *experiments concerning the mercurial phosphori, and concerning the attrition of bodies in* vacuo.

The same ingenious person's experiments concerning the vitreous phosphori: experiments relating to the electricity of bodies.

Air sometimes generated, sometimes consumed; the nature of factitious airs, explosions in vacuo, *dissolutions, fermentations,* &c.

APPENDIX XVI
FRANCIS HAUKSBEE, JR. AND WILLIAM WHISTON'S SYLLABUS *A COURSE OF MECHANICAL, OPTICAL, HYDROSTATICAL, AND PNEUMATICAL EXPERIMENTS*[1]

A
COURSE
OF
MECHANICAL, OPTICAL, HYDROSTATICAL,
AND
PNEUMATICAL EXPERIMENTS.

To be perform'd by FRANCIS HAUKSBEE; and the Explanatory Lectures read by WILLIAM WHISTON, M.A.

MECHANICKS.

1st DAY. SIR *ISAAC NEWTON*'s Three Laws of Motion, or Nature demonstrated by Experiments.

That the Lines described by falling Bodies, are in the duplicate Proportion of the times of falling. That their Velocity is as the Times.

An Instrument to measure the Force of falling Bodies.

Experiments concerning the Sliding, Rolling, and Falling of Bodies.

That Bodies will ascend as high, as whence they fall by the last Velocity Impress'd, when all Obstacles are removed.

That Bodies by a compound Force go in a Diagonal Line.

2d—The Balance and Stillyard, with all their Properties and Uses shewn and explain'd.

Experiments to demonstrate the different Effects of the same Weight or Power acting in different Directions at the same Point of any Engin.

The Resolution of Forces into those of other Directions.

All the various Kind of Levers explain'd.

All the Phænomena of Pulleys, both single and in all their possible Combinations explain'd.

3d—The Wheel or Axis in Peritrochio explain'd.

The Wedge, with the Method of Computing its Force, deduced from Experiments.

The Screw, with the manner of computing its Force.

A Compound Engin.

4th—An Experiment of Lifting a Weight by a Chain of Inflated Bladders, with its

---

[1]This syllabus is reprinted here from pages 1-3 of the copy of Francis Hauksbee, Jr. and William Whiston's course manual *A Course of Mechanical, Optical, Hydrostatical, and Pneumatical Experiments* (London, 1714) held by the British Library and microfilmed by Research Publications. This syllabus is reproduced here with the kind permission of Research Publications, Woodbridge, Connecticut, U.S.A. The British Library shelf mark is 537.l.23(6). Spelling, italics and capitalization follow the style of the original document. Original pagination is enclosed in square brackets.

Application to Muscular Motion.

The Method of computing the Force of the Air on the Sails of Windmils, and of Ships; and of Water on Water-Wheels, and on the Rudder of a Ship.

Experiments in order to determine the Quantity of Friction in Mechanical Engines.

Experiments to shew the proportional Advantages of large and small Wheels, in all sorts of Carriages, as Coaches, Waggons, Carts, *&c.*

5th—An Experiment in order to answer an Objection against the Motion of the Earth.

[2] An Experiment to shew, that the lateral Motion compounded with the perpendicular Projection, does not alter the Line of Ascent or Descent in the projected Body.

The Experiments upon which the Art of Gunnery does depend, most exactly perform'd.

6th—Experiments concerning Pendulums.

The Cycloidal Cheeks for regulating the Vibrations of Pendulums.

An Experiment to shew the Analogy between the Swings of a Pendulum, and the Waves of the Sea.

Experiments concerning the Expansion of Metals by Heat.

7th—The Laws of Motion in the Collision of Bodies.

Experiments concerning the Centrifugal and Centripetal Forces of Solid and Fluid Bodies in Motion.

Experiments in order to estimate the Centrifugal Forces of Solid Bodies.

Several Magnetical Experiments.

OPTICKS.

8th DAY. Experiments to demonstrate, that in the Rays of Light the Angle of Incidence is equal to the Angle of Reflection in all Sorts of Surfaces.

The Method of tracing the reflected Rays of Light from Plain, Convex, Concave, and Cylindrical Superficies.

Mirrors of all Kinds, or the Phænomena of Reflexions from Plain, Convex, Concave, and Cylindrical Superficies, with all their wonderful Properties and Uses, shew'd and explain'd.

9th—Experiments to shew the Manner of Refraction.

The Sines of the Angles of Incidence and Refraction shewn to be (at all Degrees of Incidence) in a constant proportion to each other.

The Method of tracing the Refracted Rays of Light through Plain, Convex, and Concave Superficies.

The Dissection of the Eye.

The Explication of Vision by the naked Eye, deduced from Experiments.

10th—All the Effects, Properties, and Uses of Plain, Convex, and Concave Glasses, both single and combin'd in Telescopes and Microscopes, are shew'd and explain'd.

Several Kinds of Microscopes and Telescopes, with the Manner of applying them to their respective Objects; together with a Specimen of the Uses of such Microscopes, and Telescopes.

A Multiplying Glass.

The Modern *Camera Obscura.*

The Magick Lanthorn.

11th—An Instrument to measure the Refraction of Fluids.

A particular *Apparatus* to manifest and

measure the Refraction of Air.

12th—The Theory of Light and Colours, as delivered by Sir *Isaac Newton*, demonstrated by some of his principal Experiments.

The Archbishop of *Spalato*'s Experiment, which discovered the Cause of the Rainbow.

Experiments concerning the blending of Colours by Motion.

HYDROSTATICKS.

13th DAY. THAT Fluids gravitate *in proprio loco*, the upper Parts continually pressing upon the lower: That this Pressure is not only propagated Downwards, but even Upwards, and Sideways, according to all possible Directions; That a lighter Fluid may gravitate upon a heavier, and an heavier upon a lighter; That a Fluid may sustain a Body heavier *in Specie* than it self, and even raise it up; That a Fluid may detain a Body lighter *in Specie* than it self, and even depress it. A general Experiment to prove, that a competent Pressure of Fluid may produce the remarkable Phænomena of the Torricellian Tube, the Pump, Syrynge, Siphon, polished Plates, and other Effects of the like Nature.

14th—That Fluids press according to their perpendicular Altitudes, whatever be their Quantities, or however the containing Vessels be figured. The exact Estimate of all manner of Pressures. That the Velocity and Quantity of Fluids running out at a given Hole, is in the subduplicate Proportion of their perpendicular Altitudes. Several Sorts of Pumps. Of the sinking and floating of Bodies immers'd in Fluids; their relative Gravities and Levities; their Situations and Positions. The Phænomena of Glass Bubbles accounted for.

15th—The Hydrostatical Balance explain'd, with the Methods of determining the Specifick Gravities of all Sorts of Bodies, whether solid or fluid, thereby. The Praxis of the Hydrostatical Balance. The Specifick Gravities of several particular Bodies actually found out. Some Account of the various Uses of such Enquiries.

[3] PNEUMATICKS *illustrated by Experiments for the most part Tubular, being such as were wont to be made before the Air-Pump was invented.*

16th DAY. THE several Phænomena of the Torricellian Experiment exhibited and explained. Other Experiments of the like Nature, with Fluids variously combined. Several Sorts of Barometers, Thermometers, and Hygroscopes. The Pressure of the Air shewn by Experiment to be different at different Altitudes from the Surface of the Earth.

17th—The Density and Spring of the Air proved by several Ways to be as the Force which compresses it; and from hence an Enquiry is made into the Limits and State of the Atmosphere.

18th—The Effects of the Weight and Spring of the Air in Syringes, Pumps, Siphons, polished Plates, Cupping-Glasses, Suction, Respiration, *&c.* The Figures of the Surfaces of Fluids, and other Things relating to the same Head, considered. That the Air may be so disorder'd by a violent Impulse, as to require Time to recover its Strength and Elasticity again.

The more known Properties of the Air established by the Air-Pump, and

other Engines.

19th DAY. THE Air-Pump; the Instruments for condensing and transferring of Air; their Fabrick, Operation, and Gages explain'd.

20th—A Parcel of Air weighed in the Balance; its Specifick Gravity to that of Water determined thereby; and that high Winds may make the Barometer sink much and suddenly.

21th—The Weight, Pressure, and Spring of the Air prov'd several Ways; by the Sense of Feeling; by breaking Glass Vials; by the Phænomena of Bladders, Glass-bubbles, Fountains; the Gardiner's Watering-pot; the Diving-Bell, *&c.*

22d—The Torricellian Tube *in Vacuo*; Quicksilver raised to the usual Height of the Weather-Glass, by the bare Spring of a little included Air; *Otto Gerick*'s Hemispheres; and that dense Air has the same Advantage over common Air, as that has over a *Vacuum.*

23d—The Ebullition of Liquors *in Vacuo*; the Quantity of Air contain'd in them; the Sustentation of Fumes and Vapours; the Descent of Bodies *in Vacuo.*

The more hidden Properties of the Air considered by the help of the like Engines.

24th DAY. THE Influence of the Air examined as to the Causes of Magnetism; the Elasticity of Springs; the Cohæsion of the Parts of Matter; the Sphericity of the Drops of Fluids; the Ascent of Liquors in capillary Tubes, and between Glass-Planes; the Reflection of Light from the farther Surface of Glasses.

25th—The Influence of the Air, as to Sounds, Fire, and Flame; the Consumption of Fuel; the firing of Gunpowder; the Effects of rarified, condensed, and burnt Air upon the Life of Animals.

26th—A Piece of Phosphorus *in Vacuo*; new Experiments concerning the Mercurial Phosphori; the Collision of the Flint and Steel *in Vacuo*; Experiments concerning the vitreous Phosphori; Experiments relating to the Electricity of Bodies.

Every Subscriber *is to pay Two Guinea's and a Half, One Guinea at the Time of Subscription, and the Remainder, the Third Day after the* Course *is began.*

SUBSCRIPTIONS *are taken in at Mr.* Whiston's *the lower End of* Cross-Street, Hatton-Garden; *and at Mr.* Hauksbee's *House in* Crane-Court *near St.* Dunstan's *Church in* Fleetstreet, *where the* Course *is to be perform'd.*

APPENDIX XVII
FRANCIS HAUKSBEE, JR. AND WILLIAM WHISTON'S SYLLABUS *A COURSE OF MECHANICAL, MAGNETICAL, OPTICAL, HYDROSTATICAL, AND PNEUMATICAL EXPERIMENTS*[1]

A
COURSE
OF
Mechanical, Magnetical, Optical, Hydrostatical,
AND
Pneumatical EXPERIMENTS.

To be perform'd by FRANCIS HAUKSBEE; and the Explanatory Lectures read by WILLIAM WHISTON, M.A.

MECHANICKS.

1st DAY. SIR *ISAAC NEWTON*'s Three Laws of Motion, or Nature, demonstrated by Experiments.

That the Velocity of Falling Bodies is as the Times of Falling, and the Lines of Descent in the Duplicate Proportion of those Times.

An Instrument to measure the Force of falling Bodies.

Experiments concerning the Sliding, Rolling, and Falling of Bodies.

That Bodies will ascend as high, as whence they fall by the last Velocity impress'd, when all Obstacles are removed.

That Bodies by a compound Force go in a Diagonal Line.

2d—The Balance and Stillyard, with all their Properties and Uses shewn and explain'd.

The Method of estimating the *Momentum*, or Quantity of Motion in any given Body.

The general Principle of Mechanicks established upon this Method.

Experiments to demonstrate the different Effects of the same Weight or Power acting in different Directions at the same Point of any Engine.

The Resolution of Forces into those of other Directions.

All the various Kind of Levers explain'd.

3d—All the Phænomena of Pulleys, both single and in all their possible Combinations explain'd.

The Power of the Wheel or Axis in Peritrochio explain'd.

The Wedge, with the Method of

[1]This syllabus is reprinted here from pages 1-3 of the copy of Francis Hauksbee, Jr. and William Whiston's course manual *A Course of Mechanical, Magnetical, Optical, Hydrostatical, and Pneumatical Experiments* ([London], c. 1725) held by the Bodleian Library in Oxford. This edition of Hauksbee and Whiston's experimental lecture syllabus differs from the earlier pre-1722 edition reprinted as Appendix XVI, with the chief alteration being the addition in days eight and nine of a treatment of magnetism. The addition in content is also reflected in the title. This syllabus is reproduced here with the kind permission of the Bodleian Library. The Bodleian Library shelf mark is Rigaud d. 185. Spelling, italics and capitalization follow the style of the original document. Original pagination is enclosed in square brackets.

Computing its Force, deduced from Experiments.

The Screw, with the manner of computing its Force.

A Compound Engine.

4th—An Experiment of Lifting a Weight by a Chain of Inflated Bladders, with its Application to Muscular Motion.

Galilæo's Demonstration concerning the Strength of the Bones, Timber, *&c.* reduced to Experiment.

The Method of computing the Force of the Air on the Sails of Windmills, and of Ships; and of Water on Water-Wheels, and on the Rudder of a Ship.

Experiments to shew the proportional Advantages of large and small Wheels, in all sorts of Carriages, as Coaches, Waggons, Carts, *&c.*

5th—An Experiment to shew, that the lateral Motion compounded with the perpendicular Projection, does not alter the Line of Ascent or Descent in the projected Body.

The most considerable Objections against the Motion of the Earth, answered from this Experiment.

[2] That the Line Described by a Projectile is a Parabola.

The Experiments upon which the Art of Gunnery does depend, most exactly perform'd.

6th—Experiments concerning Pendulums.

The Description and chief Properties of the Cycloid, and the Application of Cycloidal Cheeks for regulating the Vibrations of Pendulums.

An Experiment to shew the Analogy between the Swings of a Pendulum, and the Waves of the Sea.

Experiments concerning the Expansion of Metals by Heat.

7th—The Laws of Motion in the Collision of Hard and Elastick Bodies.

Experiments concerning the Centrifugal and Centripetal Forces of Solid and Fluid Bodies in Motion.

Experiments in order to estimate the Centrifugal Forces of Solid Bodies.

MAGNETICKS.

8th DAY. Attractive and Directive Powers of Loadstones.

The Form or Position of Filings of Iron at the Poles and Equator of a Loadstone.

Magnetick Power acts thro' all Bodies but Iron.

The Attraction of different, and Repulse of corresponding Poles.

The manner of touching and untouching of Needles.

The Law of Magnetick Attraction discover'd.

9th—The Phænomena of *Terrellæ*, or Spherical Loadstones.

The Direction of Magnetick Needles on the Surfaces of *Terrellæ* nearly towards the Poles.

Their Variation *East* and *West.*

The Inclinary or Dipping-Needle, with the Law of the Alteration of that Inclination on the Surface of a *Terrella.*

The Terrestrial Magnetism consider'd.

The Application of the Dipping-Needle to the Discovery of the Longitude and Latitude of Places by Land and Sea.

OPTICKS.

10th DAY. Experiments to demonstrate, that in the Rays of Light the Angle of Incidence

is equal to the Angle of Reflection in all Sorts of Surfaces.

The Method of tracing the reflected Rays of Light from Plain, Convex, Concave, and Cylindrical Superficies, with all their wonderful Properties and Uses, shew'd and explain'd.

11th—Sir *Is. Newton*'s Reflecting Telescope exhibited, and its Construction explain'd; together with some Specimens of its Uses in observing the Planets and Fixed Stars.

12th—Experiments to shew the Manner of Refraction.

The Sines of the Angles of Incidence and Refraction shewn to be (at all Degrees of Incidence) in a constant proportion to each other.

An Instrument to measure the refraction of Fluids.

The Method of tracing the Refracted Rays of Light thro' Plain, Convex, and Concave Superficies.

13th—An artificial Eye, in which all the Coats and Humours are curiously represented.

The Dissection of the Eye.

The Explication of Vision by the naked Eye, deduced from Experiments.

14th—All the Effects, Properties, and Uses of Plain, Convex, and Concave Glasses, both single and combin'd in Telescopes and Microscopes, shew'd and explain'd.

Several Kinds of Microscopes and Telescopes, with the Manner of applying them to their respective Objects; together with a Specimen of the Uses of such Microscopes, and Telescopes.

A Multiplying Glass.

The Magick Lanthorn.

15th—A particular *Apparatus* to manifest and measure the Refraction of Air.

The *Camera Obscura*.

The Theory of Light and Colours, as delivered by Sir *Isaac Newton*, demonstrated by some of his principal Experiments.

The Archbishop of *Spalato*'s Experiment, which discovered the Cause of the Rainbow.

Monsieur *Hugen*'s Experiments, which discover the Causes of Halo's, of the Mock Suns and Moons, and of inverted Rainbows.

Experiments concerning the blending of Colours by Motion.

HYDROSTATICKS.

16th DAY. THAT Fluids gravitate *in proprio loco*, the upper Parts continually pressing upon the lower: That this Pressure is not only propagated Downwards, but even Upwards, and Sideways, according to all possible Directions; That a lighter Fluid may gravitate upon a heavier, and an heavier upon a lighter; That a Fluid may sustain a Body heavier *in Specie* than it self, and even raise it up; That a Fluid may detain a Body lighter *in Specie* than it self, and even depress it. A general Experiment to prove, that a competent Pressure of Fluid may produce the remarkable Phænomena of the Torricellian Tube, the Pump, Syringe, Siphon, polished Plates, and other Effects of the like Nature.

[3] 17th—THAT Fluids press according to their perpendicular Altitudes, whatever be their Quantities, or however the containing Vessels be figured. The exact Estimate of all manner of Pressures. That the Velocity and Quantity of Fluids running out at a given Hole, is in the subduplicate Proportion of

their perpendicular Altitudes. Several Sorts of Pumps. Of the sinking and floating of Bodies immers'd in Fluids; their relative Gravities and Levities; their Situations and Positions. The Phænomena of Glass Bubbles accounted for.

18th—An Instrument to find out the Specific Gravity of all Liquors. The Hydrostatical Balance explain'd, with the Methods of determining the Specifick Gravities of all Sorts of Bodies, whether Solid or Fluid, thereby. The Praxis of the Hydrostatical Balance, whereby the Specifick Gravities of several particular Bodies are actually found out. Some Account of the various Uses of such Enquiries.

PNEUMATICKS *illustrated by Experiments for the most part Tubular, being such as were wont to be made before the Air-Pump was invented.*

19th DAY. THE several Phænomena of the Torricellian Experiment exhibited and explained. Other Experiments of the like Nature, with Fluids variously combin'd. Several Sorts of Barometers, Thermometers, and Hygroscopes. The Pressure of the Air shewn by Experiment to be different at different Altitudes from the Surface of the Earth.

20th—The Density and Spring of the Air proved by several ways to be as the Force which compresses it, and reciprocally as the Spaces into which it is compress'd. From hence an Enquiry is made into the Limits and State of the Atmosphere.

21st—The Effects of the Weight and Spring of the Air in Syringes, Pumps, Siphons, polished Plates, Cupping-Glasses, Suction: Respiration explained by artificial Lungs; That the Air may be so disorder'd by a violent Impulse, as to require Time to recover its Strength and Elasticity again.

The more known Properties of the Air established by the Air-Pump, and other Engines.

22d DAY. THE Air-Pump; the Instruments for Condensing and Transferring of Air; their Fabrick, Operation, and Gages explain'd.

23d—A Parcel of Air weighed in the Balance; its Specifick Gravity to that of Water determined thereby; an artificial Storm, shewing that high Winds may make the Barometer sink much and suddenly.

24th—The Weight, Pressure, and Spring of the Air prov'd several Ways; by the Sense of Feeling; by breaking Glass Vials; by the Phænomena of Bladders, Glass-bubbles, Fountains; the Gardiner's Watering-pot; the Diving-Bell, *&c.*

25th—The Torricellian Tube *in Vacuo*; Quicksilver raised to the usual Height of the Weather-Glass, by the bare Spring of a little included Air; *Otto Gerick*'s Hemispheres; and that dense Air has the same Advantage over common Air, as that has over a *Vacuum*.

The Ebullition of Liquors in *Vacuo*; the Quantity of Air contain'd in them; the Sustentation of Fumes and Vapours; the Descent of Bodies *in Vacuo*.

The more hidden Properties of the Air considered by the help of the like Engines.

26th DAY. THE Influence of the Air examin'd as to the Causes of Magnetism; the

Elasticity of Springs; the Cohæsion of the Parts of Matter; the Sphericity of the Drops of Fluids; the Ascent of Liquors in capillary Tubes, and between Glass-Planes in the Curve of the Hyperbola, both by the Attractive and Repulsive Power of the Glass.

27th—The Influence of the Air, as to Sounds, Fire, and Flame; the Consumption of Fuel; the firing of Gunpowder; the Effects of rarified, condensed, and burnt Air upon the Life of Animals.

28th—A Piece of Phosphorus *in Vacuo*; new Experiments concerning the Mercurial Phosphori; Experiments concerning the Electricity of Bodies.

Every SUBSCRIBER *is to pay Three Guineas; One Guinea at the Time of Subscription, and the Remainder, the First Day of the* Course.

SUBSCRIPTIONS *are taken in at Mr.* Whiston's, *in* Great Russel-Street; *and at Mr.* Hauksbee's, *in* Crane-Court *in* Fleetstreet; *where the* Course *is to be perform'd.*

APPENDIX XVIII
JOHN THEOPHILUS DESAGULIERS' SYLLABUS
A COURSE OF MECHANICAL AND EXPERIMENTAL PHILOSOPHY[1]

A COURSE of
Mechanical *and* Experimental
PHILOSOPHY.

Whereby any one, altho' unskill'd in Mathematical Sciences, may be able to understand all those Phænomena *of Nature, which have been discovered by* Geometrical Principles, *or accounted for by* Experiments; *and Mathematicians may be diverted in seeing those Machines us'd, and Physical Operations perform'd, concerning which they have read.*

Given by JOHN-THEOPHILUS DESAGULIERS, LL. D. *Chaplain to his Grace the Duke of* Chandos, *and F.R.S. at his House* in Channel-Row, Westminster.

THIS Course consists of *Four Parts*. In the First are laid down the Principles of *MECHANICS*, and Laws of Motion, and the several Operations of Engines shewn.

In the Second, the Nature of *FLUIDS* is explain'd, the Laws of *Hydrostatics* are rationally demonstrated, and its Paradoxes or most surprizing *Phœnomena*, shewn, and experimentally accounted for.

[4] The Third Part takes in the Properties of *AIR*, and all the *Phœnomena* which depend upon its Pressure and Elasticity; its Condensation and Rarefaction by Engines; the manner how it is vitiated, and how purified; with great Variety of Experiments upon the *Air-Pump*.

The Fourth Part treats of OPTICS; considering, 1*st*, Direct Vision or Perspective. the Nature and Affections of Light: 2*dly*, Catoptrics, or reflex Vision 3*dly*, Dioptrics, or refracted Vision; in which the Make of the Eye is consider'd; with the Faults of and Helps for bad Eyes. Lastly, Sir *Isaac Newton*'s Theory of Light and Colours, prov'd by his Experiments, and confirm'd by some new ones, which may be done even by Candle-light.

N.B. *The Method of this Course is wholly Mathematical,* viz. *a Chain of Propositions proving each other; but instead of* Definitions, Axioms, *and* Postulata, *purely Geometrical, the* Experiments *made at the First Lecture, prove the* Precepts *given at the Second, and so on: Things which otherwise would be merely speculative, being by this means render'd Objects of the Senses, and better understood in a Month or six Weeks, than in a Year's close application to Books only.*

[5] *A* CATALOGUE *of the* Experiments *made use of in the foregoing Course, to prove the* Precepts.

---

[1]The English portion of this bilingual English and French syllabus is reprinted here with the kind permission of the Bodleian Library. The Bodleian shelf mark is Ms.Rawl.D.871., fos 141^{r}-147^{v}. This document dates from around 1725. Manuscript alterations on page 14 of the Bodleian copy of this syllabus have been reproduced here as well. The text reproduced here begins on page 3 of the syllabus (pages 1 and 2, unnumbered in the original, are the title page recto and verso). Spelling, italics and capitalization follow the style of the original document. Original pagination is enclosed in square brackets.

MECHANICS.

Concerning Matter, its Extension and Divisibility, *&c.*

Of Vacuum.

Experiments to prove a Vacuum.

The universal Law of Gravitation explained.

The Law of Cohesion, or the Attraction of the small Parts of Bodies, deduced from the Ascent of Fluids in small Tubes, and between Glass Plates; with Variety of other Experiments.

Both these distinguish'd from electrical Attraction.

Experiments relating to electrical Attraction and Repulsion.

The electrical Phosphorus.

Mercurial Phosphorus.

Liquid Phosphorus.

Solid Phosphorus.

The Light of Phosphorus augmented in Vacuo, and diminished in compress'd Air.

Concerning Motion in general.

Experiments to distinguish Motion from Velocity.

Of absolute and relative Gravity.

Experiments to explain the Nature of, and to find the Center of Gravity in all Bodies, and to distinguish it from the Center of Magnitude and Center of Motion.

[6] The Experiment of the double Cone rolling upwards, by its own Gravity.

A Cylinder rolling upwards in the same manner, and a rolling Lamp.

A heavy Body, which of it self would fall from a Table, hinder'd from falling, by adding a heavier Body to it.

Experiments about the Falling, Sliding, Rolling, of heavy Bodies.

Concerning the Distance and Line of Direction of a Weight and Power.

Experiments to shew the whole Mystery of the Feats done by *Sampsons*, or strong Men.

Of simple Machines.

Of Balances, which are either Scales or Still-yards.

Of the several Kinds of Levers.

Of Pullies single and combin'd.

Of the Wheel and Axle.

Of the Wedge.

Of the Screw.

Sails of Ships, Wind-mills, Watermills, *&c.* explain'd on these Principles.

Experiments to shew how Men or Horses of unequal Strength may be made to carry, or draw, a Burden, in proportion to their Strength.

A compound Engine, made up of all the simple Machines.

Experiments to shew the Advantage of great and small Wheels according to different Circumstances, in Coaches, Cars, *&c.*

[7] Sir *Isaac Newton*'s first Law of Motion demonstrated.

Experiments to shew that the Composition of Forces in several Directions, not contrary to each other, produces a new Direction in a Diagonal Line.

Some curious Experiments, made by a new Machine, for explaining the Composition of Forces.

An Experiment to shew, that the Line of the Relative Ascent and Descent of a projected Body is the same, whether the Place from whence 'tis thrown be continually at rest, or in continual uniform Motion.

Objections against the Motions of the Earth, solv'd from this Principle.

The centripetal and centrifugal Forces of solid and fluid Bodies in Motion, explain'd and demonstrated by Experiments; with

some surprizing Phænomena arising from those Forces.

Monf. *Des Cartes*'s Vortices exploded.

Introduction to the Theory of Projectiles, and Motion of the heavenly Bodies.

How a Body will move when its projectile Force either yields to, overcomes, or exactly balances that of Gravity.

Sir *Isaac Newton*'s second Law of Motion demonstrated.

An Experiment to shew, that the Velocity of Falling Bodies is as the Times, and the Spaces [8] gone through, as the Squares of the Times of Falling.

The Force of resisting Mediums consider'd.

A curious Experiment to explain the Foundation of the Art of Gunnery.

The Nature of Fortification, explain'd from a large and curious Plan.

The Moon's Motion, explain'd from the Doctrine of Projectiles.

The Motion of the Planets and Comets, deduc'd from the same Principle.

The solar System explain'd.

The Phases of the Moon, Tides, and Eclipses, demonstrated.

Experiments with the Loadstone.

New properties and Experiments of the same.

Experiments concerning the Descent of Bodies on inclin'd Planes, being an Introduction to the Theory of Pendulums.

Experiments concerning Pendulums.

Center of Oscillation explain'd.

A Cycloid describ'd.

Cycloidal Checks for Pendulums.

The Motion of Pendulums alter'd by Heat and Cold.

Experiments to shew, that the Motion of Waves in the Sea answer to the Motion of a Pendulum.

A curious Piece of Clockwork, which measures Time to the 16th Part of a Second, very useful in astronomical Observations.

[9] Sir *Isaac Newton*'s third Law of Motion demonstrated.

Flying and Swimming accounted for.

How to destroy the Elasticity of some Metals.

A curious Experiment concerning the tremulous Motion of sounding Bodies.

Experiments concerning the Laws of the Communication of Motion in hard and elastic Bodies.

HYDROSTATICS.

Concerning Fluids in general.

Experiments to prove, that Fluids gravitate upon Fluids of the same Kind.

That Fluids of different Kinds gravitate upon each other.

That Fluids press in all Manner of Directions at the same Time.

That the Quantity of that Pressure, in all Fluids, is proportional to the perpendicular Height of the Fluid, in all Parts of the containing Vessel.

That a Pint of Water may be made to press with as great a Force as several Gallons.

To raise any given Weight by the Force of a Man's Lungs only, provided he blows through a Hole proportionably small.

An Experiment of lifting a Weight by a Chain of inflated Bladders, applied to muscular Motion.

Several other Experiments to explain the Hydrostatical Paradox.

[10] Experiments to shew how high, and why Water will rise in Fountains and

oblique Jets, and the best Way of making Spouting Pipes.

Several Sorts of curious Fountains.

The Expence of Water spouting from equal Holes at any given Depth below the Surface computed, and shewn to be as the square Roots of those Depths.

The working of Syphons; sucking, forcing, and lifting Pumps, explain'd.

Experiments to shew the Fulminating of Water, rarify'd by Fire.

A Model of the Engine for raising Water by Fire.

Experiments to shew, that Bodies heavier than Water, when weigh'd in Water, lose as much of their Weight, as is equal to their Bulk in Water; and Bodies lighter than Water, will so swim in it, that a Quantity of Water, equal in Bulk to the Part immers'd, will be equal in Weight to the whole Body.

That upon these Principles Lead, or any Metal, may be made to swim in Water, and even be rais'd up by it.

That a Body lighter than a Fluid will be kept down, and even depress'd by it.

The Hydrometer, or Water Poise.

The hydrostatical Balance, to determine the Specifick Gravity of all Solids and Fluids.

[11] The Rising and Falling of Images and Glass Bubbles accounted for.

PNEUMATICS.

Experiments concerning the Nature of Air in general.

That the Density and Spring of the Air is as the Force that compresses it.

That the Pressure of the Air decreases, according to its Distance from the Surface of the Earth.

Cupping Glasses.

Artificial Lungs.

How to find what Quantity of Air presses upon our Bodies at any time.

The diving Bell.

The Rising and Falling of the Quicksilver in the Weather-Glass explain'd and accounted for.

The different Sorts of Barometers.

Thermometers and Hygrometers of several Kinds.

The Effect of high Winds on the Barometer, shewn by an artificial Storm.

The Air-Pump, and manner of its working, explain'd.

Several Experiments, which directly prove the Weight, Pressure, and Spring of the Air, by breaking Glass Viols, by the Sense of Feeling, the Phænomena of Bladders, Glass Bubbles, *&c.*

Fountains in Vacuo.

Barometers in Vacuo.

Experiments made in a condensing Engine.

[12] An Experiment to shew, that as great Weight is requir'd to draw two Brass Hemispheres asunder, when the Density of the Air on the outside of them is doubled, (tho' the Air between them be of the same Tenor with the common Air) as when there is a Vacuum made between them.

Another Experiment, shewing that if the Air in the Vessel containing the said Hemispheres, be made three times more dense than the Air between them, they will require twice as much Weight to draw them asunder.

A Bottle broken by condensing the Air on the outside of it.

Experiments to prove, that Sound can't be convey'd without Air; and that 'tis increas'd or diminish'd, according as the Air is

rarify'd, or condens'd.

The surprizing Motion of several sorts of Liquors in Vacuo.

That Fire and Flame are fed by the Air.

That Gunpowder is fir'd in Vacuo without any Explosion.

The Effects of rarify'd, condens'd, and burnt Air, upon the Life of Animals.

With several other curious Experiments by the Air-Pump.

OPTICS.

Concerning the Nature and Motion of Light.

Of Vision in general.

How a Picture is the Representation of Objects.

[13] Experiments proving the great Principle of Catoptricks, *viz.* That when Rays of Light are reflected, the Angle of Incidence is equal to that of Reflection.

Of Plane Mirrors.

The several Reflections from the two Surfaces of Looking-glasses consider'd.

Of concave and convex Mirrors.

A concave cylindric Mirror.

A Picture, optically deformed, seen in just proportion by Reflection from a cylindric Mirror.

The Cause and Law of Refraction explained by Experiments.

How to measure the Refraction of any sort of Liquors.

Multiplying Glasses.

Experiments to shew the Nature of Convex and Concave Glasses, and the manner of the Rays of Light passing through them, and uniting their Focus's.

How to find the Focus of a Lens, and whether it be truly center'd.

Water made to burn, by collecting the Sun's Rays into a Focus.

The Camera Obscura.

The Magick Lantern.

The Dissection of the Eye.

An Instrument to shew the Manner of Vision.

The Faults of Vision shew'd by Instruments.

Experiments to shew how the short-sighted and old Eyes may be help'd.

[14] Experiments to shew the Difference between *Looking* and *Seeing*.

Why Beams seem to dart from a Candle.

To make two Candles seem one.

To shew why both Eyes see things only single.

An aerial Speculum.

The Nature, Use, and several Kinds of Microscopes and Telescopes.

A new and most curious Experiment to shew the Circulation of the Blood in the Lungs of a Frog.

An Experiment to measure the Refraction of the Air.

Sir *Isaac Newton*'s Theory of Light and Colours, prov'd by Experiments.

Experiments to shew the Cause of the Rain-bow.

THE charge of going thro' this course is ~~Two Guineas and a half, but any Set of Gentlemen that desire a private Course, are to pay~~ Three Guineas ~~each~~: Or if the Lectures be in French, *the Price is likewise Three Guineas.*

N.B. One Guinea is to be paid at the time of Subscription, and the Remainder the first Day of the Course.

APPENDIX XIX
THE LITTLE TOWER STREET ACADEMY'S SYLLABUS
A COURSE OF EXPERIMENTAL PHILOSOPHY[1]

A
COURSE
OF
Experimental Philosophy.
CONTAINING,

I. *Demonstrations of the Universal Laws of Motion and the Force of all simple and compound Machines.*
II. *The wonderful Effects of the Gravitation of Fluids.*
III. *The peculiar Properties of the Air, consider'd as an* Elastick *Fluid.*
IV. *The Principles of Opticks, explaining the Nature of Vision, of Reflecting and Refracting Glasses, and of Light and Colours, according to Sir* Isaac Newton*'s Principles.*

NB. That the Course will contain not only all that is usual, but likewise some considerable Experiments which are entirely new; and that the *Apparatus* itself is new and complete, and everything contriv'd according to the latest Improvements. The whole being very diverting and useful, not only for those who have learnt the *Mathematicks*, but for such as are not at all acquainted with that Study, by which they may with Ease and Pleasure come to the Knowledge of those Things which cannot be attain'd any other way without great Labour and Application.

To be perform'd by Benj. Worster, *A.M. and* Tho. Watts, *at the* Academy or Accomptant's Office *for qualifying young Gentlemen for Business, in* Little Tower-Street.

[231] *MECHANICS.*

Concerning the Universal Properties of Bodies.
Of Matter and *Vacuum*.
Experiments to prove a *Vacuum*.
The Universal Law of Gravitation explained.
The Law of Cohesion, or the Attraction of the small Parts of Bodies, deduc'd from the Ascent of Fluids in small Tubes, and between Glass Plates, and Variety of other Experiments.
Experiments concerning the Repulsion of the Particles of Matter.
Of Electrical Attraction and Repulsion.
Experiments relating to Electrical Attraction.
The Electrical *Phosphorus*.
Mercurial *Phosphorus*.
Liquid *Phosphorus*.
Solid *Phosphorus*.
The Light of *Phosphorus* augmented *in Vacuo*.
Concerning Motion in general.
Experiments to distinguish Motion from Velocity.
Experiments to explain the Nature of, and to find the Center of Gravity in all Bodies,

[1]This syllabus is reprinted from Benjamin Worster, *A Compendious and Methodical Account of the Principles of Natural Philosophy* (London: Printed for the Author, 1722), pp. 230-9, from the copy held by the British Library and microfilmed by Research Publications. The text is reproduced here with the kind permission of Research Publications, Woodbridge, Connecticut, U.S.A. The British Library shelf mark is 537.b.23. Spelling, italics and capitalization follow the style of the original. Original pagination is enclosed in square brakcets.

and to distinguish it from the Center of Magnitude.

The Experiment of the Double Cone rolling upwards.

[232] A heavy Body, which of itself would fall from a Table, hinder'd from falling, by adding a heavier Body to it.

Experiments about the Falling, Sliding, and Rolling of heavy Bodies.

Concerning the Center of Motion.

Concerning the Distance and Line of Direction of a Weight and Power.

Experiments to shew the whole Mystery of the Feats done by *Sampsons*, or Strong Men.

Of Simple Machines.

Of Balances, which are either Scales or Steel-yards.

Of the four Kinds of Levers.

Of Pullies, single and combin'd.

Of the Wheele and Axle.

Of the Inclin'd Plane.

Absolute and Relative Gravity.

Of the Wedge.

Of the Screw.

Compound Engines.

Sails of Ships, Wind-Mills, Water-Mills, *&c.* explain'd on these Principles.

Experiments to shew how Men or Horses of unequal Strength may be made to carry or draw a Burthen in Proportion to their Strength.

Experiments to shew the Advantage of great and small Wheels in Coaches, Carts, *&c.*

A general Method to determine the Quantities of Friction in all Engines.

[233] Sir *Isaac Newton*'s first Law of Motion demonstrated.

That the Composition of Forces in several Directions, not contrary to each other, produces a new Direction in a Diagonal Line.

An Experiment to shew, that the Line of the Relative Ascent and Descent of a projected Body, is the same; whether the Place from whence 'tis thrown be continually at Rest, or in continual uniform Motion.

Objections against the Motion of the Earth, solv'd from this Principle.

The Centripetal and Centrifugal Forces of solid and fluid Bodies in Motion, explain'd and demonstrated by Experiments.

Monsieur *Des Carte*'s *Vortices* exploded.

Introduction to the Theory of Projectiles and Motion of the Heavenly Bodies.

How a Body will move, when its Projectile Force either yields to, overcomes, or exactly balances that of Gravity.

Sir *Isaac Newton*'s second Law of Motion demonstrated.

An Experiment to shew that the Velocity of Falling Bodies is as the Times, and the Spaces gone thro' as the Squares of the Times of Falling.

The Force of Resisting Mediums considered.

[234] A curious Experiment to explain the Foundation of the Art of Gunnery.

The Nature of Fortification explain'd from a large and curious Plan.

The Moon's Motion explain'd from the Doctrine of Projectiles.

The Motion of the Planets and Comets deduc'd from the same Principle.

The Solar System explain'd.

The Tides, and Phases of the Moon demonstrated.

Experiments with the Load-stone.

Experiments concerning the Descent of Bodies on inclin'd Planes, being an Introduction to the *Theory of Pendulums*.

Experiments concerning Pendulums.

Center of Oscillation explain'd.

A Cycloide describ'd.

Cycloidal Cheeks for Pendulums.
The Motion of Pendulums alter'd by Heat and Cold.
That the Motion of Waves in the Sea answers to the Motion of a Pendulum.
Sir *Isaac Newton*'s third *Law of Motion* demonstrated.
Flying and Swimming accounted for.
Of the Nature and Cause of Elasticity.
How to destroy the Elasticity of some Metals.
Concerning the tremulous Motion of sounding Bodies.
Experiments concerning the Laws of Communication of Motion in hard and elastic Bodies.

[235] *HYDROSTATICS.*

Concerning Fluids in general.
Experiments to prove that Fluids gravitate in the Fluids of the same kind.
That Fluids of different Kinds gravitate upon each other.
That Fluids press in all manner of Directions at the same time.
That the Quantity of that Pressure in all Fluids is proportional to the perpendicular Height of the Fluid in all Parts of the containing Vessel.
That any given Quantity of Water, tho' never so small, may be made to press with a Force equal to any given Weight, tho' never so great.
To raise any given Weight by the Force of a Man's Lungs only, provided he blows thro' a Tube proportionally small.
An Experiment of Lifting a Weight by a Chain of inflated Bladders, apply'd to Muscular Motion.
Several other Experiments to explain the Hydrostatical Paradox.
Experiments to shew how high, and why Water will rise in Fountains and oblique Jets, and the best way of making spouting Pipes.
The Expence of Water spouting from equal Holes at at [*sic*] any given Distance from the [236] Surface computed, and shewn to be as the square Root of those Distances.
The Working of Syphons, sucking, forcing, and lifting Pumps explain'd.
Experiments to shew that Bodies heavier than Water, when weigh'd in Water, lose as much of their Weight as is equal to their Bulk in Water; and Bodies lighter than Water will so swim in it, that a Quantity of Water equal in Bulk to the Part immers'd, will be equal in weight to the whole Body.
How upon these Principles Lead, or any Metal, may be made to swim in Water, and even rais'd up by it.
The Hydrometer.
The Hydrostatical Balance to determine Specifick Gravities.
Glass Bubbles accounted for.

PNEUMATICS.

Experiments concerning the Nature of the Air in general.
That the Density and Spring of the Air is as the Force that compresses it.
That the Pressure of the Air decreases, according to its Distance from the Surface of the Earth.
Cupping Glass.
The Raising and Falling of the Quick-Silver in the Weather Glass, explain'd and accounted for.
The different Sorts of Barometers.
[237] Thermometers and Hydrometers of several Kinds.
The Effect of high Winds on the Barometer, shewn by an artificial Storm.
The Air-Pump, and Manner of its Working, explain'd.
Several Experiments, which directly prove

the Weight, Pressure and Spring of the Air, by breaking Glass-Vials, the Sense of Feeling, the *Phænomena* of Bladders, Glass Bubbles, Fountains of several sorts, and the Diving Bell.

Barometers in *Vacuo*.

The famous Experiments, with the Hemispheres.

Wind Gun.

The surprizing Motion of several Sorts of Liquors in *Vacuo*.

Experiments with the Condensing Engine.

Experiments to prove, that Sound can't be convey'd without Air, and that 'tis increas'd or diminish'd, according as the Air is rarify'd or condensed.

That Fire and Flame are fed by the Air.

That Gun-powder is fir'd *in Vacuo*, without any Explosion.

The Effects of rarify'd, condens'd, and burnt Air upon the Life of Animals.

The force of rarify'd Vapours in raising Water by Fire, *&c.*

With several other curious Experiments by the Air-Pump.

[238] *OPTICS.*

Concerning the Nature and Motion of Light.

Of Vision in general.

That when Rays of Light are reflected, the Angle of Incidence is equal to that of Reflection.

Of Plane Mirrors.

The several Reflections from two Surfaces of Looking-Glasses consider'd.

Of Concave and Convex Mirrors.

A Concave Cylindric Mirror.

A Convex Cylindric Mirror.

Cylinder and Picture.

The Cause and Law of Refraction, explain'd by Experiments.

Multiplying Glasses.

Experiments to shew the Nature of Convex and Concave Glasses, and the manner of the Rays of Light passing through them, and uniting in their *Focus's*.

How to find the *Focus* of a *Lens*, and whether it be truly center'd.

Water made to burn, by collecting the Sun's Rays into a *Focus*.

Camera obscura.

The Magic Lanthorn.

The Dissection of the Eye.

The Faults of Vision Shew'd by an Instrument.

[229] Experiments to shew how the short-sighted, and old Eyes, may be help'd.

To shew why both Eyes see things only single.

The Nature and Use of Microscopes and Telescopes.

How to measure the Refraction of any sort of Liquors.

An Experiment to measure the Refraction of the Air.

A new and most curious Experiment to shew the Circulation of the Blood in the Lungs of a Frog.

Sir Isaac Newton's Theory of Light and Colours prov'd by Experiments.

Experiments to shew the Cause of the Rainbow.

The Charge of going the Course is two Guineas and a Half, one on Subscription, the Remainder the third Day of the Course.

There will be frequent Courses, and Subscriptions continually taken in at the Place of performing, at Mr. Inny's, *Bookseller, near S.* Paul's Church, *and at Mr.* Clarke's, *Stationer, in* Birchin-Lane, *near the* Royal-Exchange.

Those that are desirous may go over the Course again for one Guinea and a Half; and afterwards as often as they please gratis.

APPENDIX XX
WILLIAM WHISTON AND FRANCIS HAUKSBEE, JR.'S SYLLABUS *AN EXPERIMENTAL COURSE OF ASTRONOMY* (c. 1718-1722)[1]

AN EXPERIMENTAL
COURSE
OF
ASTRONOMY;
PROPOSED by
Mr. WHISTON, and Mr. HAUKSBEE.

I. THE *Ptolemaic*, *Tychonic*, and *Copernican Systems*; with the Demonstration of the Falsity of the Two former.

II. The Truth and Certainty of the *Copernican* System demonstrated.

III. The *Motions* of all the *Celestial Bodies*, in the *Solar System*, about their Common *Center* of Gravity, shew'd and explain'd.

N.B. These Three will be *Preliminary Lectures* to the rest of the Course.

IV. The *Places* of the *Planets* in *Longitude* and *Latitude*, with their *Aspects*, *Directions*, *Stations* and *Retrogradations*, explained.

N.B. The *Telescopes*, *Quadrants*, *Micrometers*, and other *Astronomical Instruments* used in this *Course*, will be shewn and explain'd, as they come to be applied in Practice.

[2] V. The *Construction* of *Celestial Globes* demonstrated.

VI. The principal *Stars* in the several *Constellations*, shew'd upon the *Celestial Globe*, and in the Heavens.

VII. The *Altitude* of the *Pole*, or *Latitude of Places*, and the manner of determining the *Equinox*, demonstrated.

---

[1]This syllabus is reprinted here from the copy held by the Bodleian Library, and dates from between February 1718 (when Whiston and Hauksbee first advertised their astronomical course) and February 1722 (the last time Whiston and Hauksbee advertised this course while Whiston lived at Cross Street, Hatton Garden). The text is reproduced here with the kind permission of the Bodleian Library. The Bodleian Library shelf mark is Antiq. c. E. 9 (108). Spelling, italics and capitalization follow the style of the original document. Original pagination is enclosed in square brakcets. The copy held by the Bodleian is slightly mutilated, and lucanae in the text are filled within square brackets.

VIII. The *Refraction of the Rays of Light* out of *Vacuum* into *Air*; and consequently the *Refraction* of the *Sun*, *Moon*, and *Stars* thence demonstrated.

IX. The *Parallax* of the *Moon* explain'd, and the Manner of observing it shew'd; and its great Use in *Astronomy* demonstrated.

X. Directions to find a true *Meridian* to set *Dials* by; with some of the easy *Foundations of Dialling* explain'd.

XI. The several *Ways* of discovering the *Distance* of the *Sun*, *Planets*, and *Fixed Stars*, explain'd.

XII. The several *Methods* of *determining* the *Diameters* of the *Sun* and *Moon* by Observations; from which and their Distances, their *Magnitudes* will be determin'd.

XIII. The apparent *Diameters* of the *Planets* observ'd by several *Methods*; from which and their Distances (before found) the *Magnitudes* of them will be determin'd.

XIV. The Manner of computing Solar and Lunar Eclipses, particularly by Mr. *Whiston*'s Copernicus, illustrated by Examples of Eclipses past, and to come.

XV. *Jupiter*'s *Belts* observ'd, and the *Motions* and *Eclipses* of his *Planets* computed, exhibited, and observ'd.

N.B. The *Velocity of the Rays of Light* will hence be demonstrated.

XVI. The *Appearances* of Monsr. *Hugens*'s *Planet* about *Saturn*, with the Situation of his *Ring*, computed and observ'd.

XVII. The *Spots* of the *Sun*, if any appear, observ'd and delineated.

[3] XVIII. The several *Phases* and *Librations* of the *Moon*, with its *Se*[*a*] and *Land*, *Mountains* and *Valleys*, computed, observ'd and compar'[d] with *Hevelius*'s *Maps*.

XIX. The Height of the *Lunar Mountains* observ'd and computed.

XX. The *Eccentricity* of the *Earth*'s and *Moon*'s *Orbits*, and Inequ[a]lity of their *Motions*, with the Manner of observing them, explain'd.

XXI. The *Phases* of *Venus* computed and observ'd.

XXII. The *new* and *strange Appearance*, which may be called the *Su*[*n*'s] *Milky Way*, observ'd.

XXIII. Several *New Stars*, and particularly those which appear [by] *Turns*; as also the various *strange Phænomena*, and *Luminous Spac*[*es*] noted by Monsr. *Hugens* and Dr. *Halley*, observ'd.

XXIV. The *Theory* and *Motions of Comets* explain'd.

XXV. The *Height of the Clouds* measur'd at several times.

XXVI. The *Principal Phænomena* of the *Tides* demonstrated.

N.B. That both when the *Air* proves cloudy, so as to hinder any of these *Observations*, and whilst the *Instruments* are preparing for the same; Parts of the *usual Course* of *Mechanic*, *Optic*, *Hydrostatic* and *Pneumatic* Experiments, as defir'd by any of the *Company*, shall be interpos'd.

Every SUBSCRIBER *to give Five Guineas for going this* Course:
To be paid at the Time of Subscription.

SUBSCRIPTIONS *are taken in at Mr.* Whiston's, *the Lower End of* Cross-Street, Hatton-Garden; *and at Mr.* Hauksbee's *in* Crane-Court, *near St.* Dunstan's *Church in* Fleetstreet.

APPENDIX XXI
WILLIAM WHISTON AND FRANCIS HAUKSBEE, JR.'S SYLLABUS *AN EXPERIMENTAL COURSE OF ASTRONOMY* (c.1722-1725)[1]

AN EXPERIMENTAL
COURSE
OF
ASTRONOMY;
PROPOSED by
Mr. WHISTON and Mr. HAUKSBEE.

I. THAT the earth is a Globe or Sphere, proved by several Arguments. Its Dimensions stated. Why the Heavens, tho' not Spherical, are justly represented by a Globe, as well as the Earth.

II. *Ptolemy*'s System explain'd, and demonstrated to be false.

III. *Tycho*'s System explain'd, and demonstrated to be false; [and? / as also?] that which is called the *Semitychonick*.

IV. The *Copernician* System explain'd, and demonstrated to b[e true;?] and that both as to the Diurnal and Annual Motions of the Eart[h.]

V. Sir *Isaac Newton*'s Improvements upon the *Copernician* Syst[em;] particularly the Motions of all the *Celestial Bodies* about their com[mon] *Centre* of *Gravity*, shew'd and explain'd.

[2] VI. The chief Circles of the Sphere; as also the *Places* of the *Planets* in *Longitude* and *Latitude*, with their *Aspects*, *Directions*, *Stations* and *Retrogradations*, explained.

N.B. The *Telescopes* of the common Sort; and reflecting *Telescopes*, *Quadrants*, *Micrometers*, and other *Astronomical Instruments* used in this *Course*, will be shewn and explain'd, as they come to be applied in Practice.

VII. The *Construction* of *Celestial Globes* demonstrated, and the several *Constellations* noted thereon, explain'd.

---

[1]This syllabus is reprinted here from the copy held by the British Library, and microfilmed by Research Publications. It was printed sometime between late 1722 (when Whiston moved to Great Russell Street) and 22 February 1725 (when the manuscript notes were written). The text is reproduced here with the kind permission of Research Publications, Woodbridge, Connecticut, U.S.A. The British Library shelf mark is 537.l.23.(4.). Spelling, italics and capitalization follow the style of the original document. Original pagination is enclosed in square brackets. The copy held by the British Library is slightly mutilated, and lucanae in the text are filled within square brackets (accompanied by a question mark where uncertain). Manuscript additions are printed in a script font where they occur on the original.

VIII. The principal *Stars* in the several *Constellations*, actually shew'd in the Heavens.

IX. The *Altitude* of the *Pole*, or *Latitude* of *Places*, actually shew'd in the Heavens.

X. The *Refraction of the Rays of Light* out of *Vacuum* into *Air*, and out of *Air* into *Vacuum*, actually found; and consequently the *Refraction* of the *Sun*, *Moon* and *Stars*, thence demonstrated.

XI. Directions to find a true *Meridian* to set *Dials* by; with some of the easy Foundations and Curiosities of *Dialling* explain'd.

XII. The *Parallax* of the *Moon* explain'd, and the Manner of obser[v]ing it shew'd; and its several Uses in *Astronomy* demonstrated.

XIII. The several *Ways* of discovering the *Parallax* and *Distance* of [the *S*]*un*, *Planets*, and *Fixed Stars*, as also of the *Clouds*, explain'd.

[XIV.] The several *Methods* of *determining* the *Diameters* of the *Sun*, [*Moon* an]d *Planets*, by Observations; from which and their Distances, [their *Ma*]*gnitudes* will be determin'd.

[XV.] An Account of the Nature of Eclipses, both of the Sun and [Moon.?]

[XVI.] The Manner of computing Solar and Lunar Eclipses, and of [predicti?]ng the same by Mr. *Whiston*'s Copernicus, illustrated by Ex[amples] of the Two Famous Total Eclipses of the Sun, *April* 22. 1715. [and *Ma*]*y* 11. 1724.

[3] XVII. *Jupiter's Belts* observ'd, and the *Motions* and *Eclipses* of his *Planets* computed, and observ'd.

N.B. The *Velocity of the Rays of Light* will hence be demonstrated.

XVIII. The Appearances of Monsr. *Hugen*'s *Planet* about *Saturn*, with the Situation of his *Ring*, exhibited, computed and observ'd.

XIX. The several *Phases* and *Librations* of the *Moon*, with its *Sea* and *Land*, *Mountains* and *Valleys*, computed, observ'd, and compar'd, with *Hevelius*'s *Maps*.

XXI. The *Eccentricity* of the *Earth*'s and *Moon*'s *Orbits*, and Inequality of their *Motions*, with the Manner of observing them, explain'd; as also the *Phases* of *Venus* computed and observ'd.

XXII. The *new* and *strange Appearance*, which may be called the *Sun*'s *Milky Way*;

as also several *New Stars*, and particularly those which appear by *Turns*; with the various *strange Phænomena*, and *Luminous Spaces*, noted by Monsr. *Hugens*, and Dr. *Halley* observ'd and explain'd.

XXIII. The *Theory* and *Motion* of *Comets* explain'd.

XXIV. The *Principal Phænomena* of the *Tides* demonstrated.

XXV. *Parker*'s Ephemeris of the Celestial Motions explain'd.

Every SUBSCRIBER *to, give ~~Five~~ Pay Three. Guineas for going this* Course:
To be paid at the Time of Subscription.

SUBSCRIPTIONS *are taken in at Mr.* Whiston's, in Great Russel-Street; *and at Mr.* Hauksbee's *House in* Crane-Court *near St.* Dunstan's *Church in* Fleetstreet.

[To] begin on Monday Feb^r. 22^d. at Six in y^e Evening

VITA

Surname: Snobelen **Given Names:** Stephen David

Place of Birth: Victoria, British Columbia, Canada

Educational Institutions Attended:

University of Victoria	1990-1995
University of Waterloo	1988-1990

Degrees Awarded:

B.A. (Honours)	University of Victoria	1993

Honours and Awards:

University of Victoria

History Department Fellowship	1994-5
History Department Fellowship	1993-4
The Margaret L. Desantis Memorial Scholarship	1993
Ontario Graduate Scholarship*	1993
The Grotius Award in Modern History	1993
The President's Scholarship	1992
The University of Victoria Faculty Scholarship	1992
The Royal United Services Institute of Vancouver Island Book Prize in Military History	1992

University of Waterloo

Arts Faculty Upper Year Scholarship	1991
Dean's Honours List	1990
Arts Faculty Upper Year Scholarship	1990
Dean's Honours List	1989

*Declined due to accepting a graduate position outside the province of Ontario

Academic Papers and Publications:

Papers:

25 March 1995	"'A More Sure Word of Prophecy:' Scientific Prophetic Hermeneutics From Napier to Newton." Paper presented at the Pacific Northwest Renaissance Conference, Banff, Alberta, Canada.
4 February 1995	"The Rise of the Seventeenth- and Eighteenth-Century Argument From Prophecy." Paper presented at the "Qualicum" History Conference, Parksville, B.C., Canada.
13 October 1994	"The Argument Over Prophecy: William Whiston and Anthony

Collins on Biblical Prophecy." Paper presented at the "Reason and Unreason" Conference of the Canadian Society for Eighteenth-Century Studies, University of Saskatchewan, Saskatoon, Saskatchewan, Canada.

26 February 1994 "Charting the Apocalypse: Cosmic Maps of Past, Present and Future." Paper presented at the University of British Columbia Renaissance Seminar, Green College, UBC, Vancouver, B.C., Canada.

5 February 1994 "Newton Versus Newton: Competing 'Newtonianisms' in the Enlightenment and Beyond." Paper presented at the "Qualicum" History Conference, Parksville, B.C., Canada.

Publications:

January 1994 "'The Wise Will Understand:' Prophetic Certainty and Early Modern Thought." *Blurred Genres* 2 (1994): 1-22

PARTIAL COPYRIGHT LICENSE

I hereby grant the right to lend my thesis to users of the University of Victoria Library, and to make single copies only for such users or in response to a request from the Library of other university, or similar institution, on its behalf or for one of its users. I further agree that permission for extensive copying of this thesis for scholarly purposes may be granted by me or a member of the University designated by me. It is understood that copying or publication of this thesis for financial gain shall not be allowed without my written permission.

Title of Thesis:

Selling Experiment: Public Experimental Lecturing in London, 1705-1728

Author: [redacted]

Stephen David Snobelen
28 April 1995