

This article discusses the extensive extra-mural adult education classes on Natural Philosophy given by Professor Patrick Copland in Aberdeen from 1785 until 1813. His course was widely recognised both locally and nationally as improving the education of artisans and tradesmen in particular and he was awarded a Royal Pension in 1803 for his efforts. The article was first published in the proceedings of a conference on "Aberdeen and the Enlightenment" held in Aberdeen (Aberdeen University Press, 1987).

Late Eighteenth-Century Adult Education in the Sciences at Aberdeen: the Natural Philosophy Classes of Professor Patrick Copland

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Beginning in 1785, fifteen years before George Birkbeck, Patrick Copland delivered an evening course of some seventy lectures a year, aimed specifically at those involved in the mechanical and other professions. The course was repeated roughly once every two years over the next twenty-seven years, representing a greater and more sustained effort than any of his con-temporaries in the field. This was an impressive venture, rightly deserving the tag of 'pioneering'¹.

Even without the introduction of evening classes, there was already pro-vision at Marischal College (as at Glasgow and Edinburgh) for citizens to attend the regular academic course in natural philosophy. At Marischal this consisted of about 300 lectures given by Copland and called the 'public' course. Any man could simply enroll along with the official university students. There was no entrance examination, and expenses totalling about £4 for the entire course were within reach of the savings of many. Quite a number made use of this opportunity, as can be seen from the accompanying Table 1; they were known as 'ungowned' students and generally fell in with the discipline of the gowned class. Admirable though the arrangement was, it required a commitment on the part of the ungowned student to attend during the daytime sixteen hours of teaching each week, continuously for five months from November until April. In addition, the lectures did have the unwritten prerequisite of a modest mathematical knowledge. On both these counts they were therefore unsuitable for most artisans.

The teaching and practice of natural philosophy had radically changed at the beginning of the eighteenth century, with the introduction into teaching of apparatus specially designed to demonstrate principles that had previously been explained by philosophical and

TABLE I

Year	ug	tot	Year	ug	tot	Year	ug	tot	Year	ug	tot	Year	ug	tot
			1780	1	13	1790	1	19	1800	4	26	1810	10	52
			1781	2	28	1791	2	21	1801	7	48	1811	11	58
			1782	3	30	1792	7	39	1802	6	37	1812	8	49
			1783	2	26	1793	1	27	1803	11	30	1813	9	44
			1784	7	39	1794	4	27	1804	10	34	1814	9	66
1775	7	36	1785	6	39	1795	6	30	1805	13	50	1815	15	58
1776	7	25	1786	3	32	1796	3	34	1806	10	47	1816	6	60
1777	4	37	1787	4	28	1797	4	31	1807	8	57	1817	8	64
1778	4	26	1788	(3	28)	1798	6	41	1808	6	43	1818	13	60
1779	7	34	1789	2	38	1799	8	34	1809	10	43	1819	11	84

For the academic session beginning in the years shown, the table shows the number of ungowned students (ug) taking classes in Copland's year, and the total number of students in that year (tot). The expression 'ungowned' is that used by Knight in AUL, MS M 114, p.2325. As ungowned students the table counts those who appear in the college records only for the tertian year. This is probably unduly strict for there were also an appreciable number of students taking only two years study out of four, one being Copland's year. The years cover Copland's tenure, though in 1779 Robert Hamilton took the natural philosophy class and Copland the mathematics class. In 1788 the roll was not recorded, for some reason, but that year 26 students took the second mathematics class and hence likely figures for 1788 are as shown. For the 47 years there were a total of 2238 students of whom 324 were ungowned. The figures are not absolutely precise because in addition to the students of 1788 some other students are known to have attended the course without appearing on the register. See the evidence of Professor Knight, 19 September 1827, in *Evidence, Oral and Documentary, taken and received by the Commissioners Appointed by His Majesty George IV, July 23rd, 1826; and Reappointed by His Majesty William IV, October 12th, 1830 for visiting the Universities of Scotland, vol. IV, University of Aberdeen*, pp.93 and 291 (HMSO, London, 1837), and P.J. Anderson, *Fasti Academiae Mariscallanae Aberdonensis* (Aberdeen, New Spalding Club, 1908), vol. II, pp.345-442. The 1788 figures are from AUL, MS M. 388/1.

mathematical argument. In 1783 Copland obtained a three-year grant to employ an instrument maker, John King, to furnish him with a set of working models to illustrate the application of mechanical principles to industrial and agricultural practice.² These models were to be additional to Copland's own demonstration apparatus. By the autumn of 1785 the project was sufficiently well advanced for Copland to place an advertisement in the *Aberdeen Journal* announcing that he would begin a private evening class directed towards those 'engaged in the mechanical professions, or to such gentlemen as are inclined to renew their acquaintance with those studies'. He continued:

*In this course, the Principles of Mechanics, Hydrostatics, Electricity, Magnetism and Astronomy, together with the late discoveries on the different kinds of air will be illustrated, chiefly by experiments, and reasonings deduced from them.*³

The spirit of this advertisement echoes the unsuccessful 1726 proposals of Marischal College to establish a formal course on 'Experimental Philosophy'.⁴

Copland's course was to be given on Tuesdays, Thursdays and Saturdays at 7 o'clock, days used the previous year for Mr. French's private chemistry course. French changed his days to alternate with Copland's. The price of the course was one guinea, a substantial sum in 1785, representing about a week and a half's pay for a journeyman. Nonetheless it was a pretty good bargain for a course of 70 lectures illustrated by a range of models and apparatus that far exceeded the stock in trade of an itinerant lecturer. The typical charge of an itinerant giving a few lectures (aimed at the middle classes) was one to two shillings a lecture. By comparison the local newspaper cost 6d in 1800; a seat at the theatre, one or two shillings. Copland's charge remained at one guinea until 1806/1807 when it was

increased to two guineas. He seems to have given the course on fourteen occasions over a twenty-seven year period. Once it had become established, the advertisements shrank to a few lines of intimation, always emphasising the mechanical content and occasionally suggesting a change in the supporting topics.⁵

Although Copland can rightly be considered one of the real pioneers of serious scientific education for tradesmen, he was by no means operating in a vacuum. Professor Hamilton of Marischal College advertised mathematics classes in 1781, 1782 and 1783 aimed at 'those Subjects which are useful in different Departments of Life; Geography, Navigation, Fortification, Perspective, Astronomy and the like'.⁶ French's evening class begun in 1782 was directed at 'the application of Chemistry to Manufactures, Arts and Agriculture', with lectures also on the preparation of medicines.⁷ It was given on at least thirty occasions and probably every year over a thirty-six year period, and continued thereafter by his assistant Dr William Henderson. French was appointed the first Professor of Chemistry at Marischal College in 1793 and his evening course, although open to the public, became the official chemistry course of the college.⁸ It never acquired the astonishing popularity achieved by Thomas Hope's chemistry course in Edinburgh.⁹ Dr Livingstone, Professor of Medicine at Marischal College, offered an early evening class on tropical and military diseases as one of several medical classes available; Professor Kidd offered classes in Latin and elementary Arabic. In the 1790s in particular, there was a remarkable enthusiasm among the Marischal College professors for extra-mural teaching.

Outside the college Andrew Mackay, whom Copland had appointed as Superintendent of the Castlehill Observatory, gave lessons on navigation and surveying, astronomy and geography.¹⁰ As David Gavine has discovered, private tuition in these subjects and in mathematics was widely available in Scotland in the second half of the eighteenth century.¹¹ In Aberdeen in the late eighteenth century, private classes could be found with relative ease on several modern languages, the classics, dancing, music making and other social accomplishments. Aberdonians were not content to have two universities about a mile apart; there was a belief, which seemed to take root in the population at large in the eighteenth century, that further education was a valuable investment. Indeed, the spirit of self-help so essential to the spread of education in the nineteenth century was clearly present in late eighteenth-century Aberdeen.

Aberdeen was unusual in that it had to provide this education almost entirely from its own ranks, for its geographical isolation in all but the last decade of the eighteenth century discouraged itinerant lecturers. In the year after Copland started, a Mr. Clarke (probably Cuthbert Clarke) did make the trip north through the east coast towns, giving his course of lectures on natural and experimental philosophy at various stops.¹² Upon reaching Aberdeen, and hearing of Copland's course, he gave only one lecture there. Two other itinerants appeared during Copland's time: J. Fleming, a member of the London Philosophical Society whose ten lectures on the Elements of Natural Philosophy in 1812 were more concerned with metaphysics and morals; and T. Longstaffe, who gave in 1815 a course of popular lectures on astronomy, illustrated by appropriate apparatus and the phantasmagoria.¹³ This was nothing compared with the itinerant and private activity in Edinburgh, for example, where in 1802 a friend of Copland's remarked in a letter 'the Professors are very much alarmed at the increase of private classes'.¹⁴ The relative lack of itinerant activity in Aberdeen is confirmed by John Cable, whose survey of eighteenth-century itinerant lectures in science in Scotland finds virtually nothing in Aberdeen.¹⁵

II

In a letter to the Danish scholar Grimur Thorkelin, Copland remarked in 1790 that his course:

*has been attended by a much greater number of Mechanics (such as Millwrights, Watchmakers, Carpenters, Joiners, Smiths &c) besides Merchants and private Gentlemen in Town, than I could have hoped for.*¹⁶

However, if Copland kept a record of his attendees, it has not come to light. Professor Knight, Copland's successor to the chair at Marischal College, implies in his evidence to the Royal Commission which investigated Marischal College in 1827 that a typical attendance at Copland's course was about sixty.¹⁷ Knight himself ran a private class on chemistry and natural history for five years between 1811 and 1816.¹⁸ A meticulous man, he has left us a list of the participants and, in many instances, their professions. In the absence of direct information on Copland's audience, it is worth looking briefly at Knight's list. In his first year he attracted 95 paying participants, including 20 clergymen, physicians and lawyers; 42 gentlemen, manufacturers and merchants; and 33 college students. In addition 7 free tickets were given as a courtesy to friends. In 1812/1813, the year that Copland gave his last course on alternate days with Knight, there were 37 gentlemen, merchants, etc; 27 college students; and 2 free tickets, including one to Copland's eldest son, Alexander. In 1813/1814, 58 paid and 2 were free, including Copland himself; in 1814/1815, 50 paid and 2 were free; in 1815/1816, 48 paid and 6 were free. Knight's lists are a cross-section of early nineteenth-century middle-class Aberdonians, with many trades represented. Copland's own audience would have contained artisans particularly interested in the applications of mechanics, plus a good number from Knight's list or its equivalent in earlier years.

The only known documented case of a student at Copland's class gives us some further insight into private classes in Aberdeen. The student was Joseph Clement (1779-1844), one of the best mechanical engineers of his day, noted for his development of the lathe and other tools, and his work as the engineer in charge of Babbage's calculating machine.¹⁹ Among the papers in Clement's effects was found a ticket for Copland's lectures in the session 1812/1813. In 1812 Clement had been employed as a designer and maker of power looms by Leys, Masson & Co. in Aberdeen, at a wage of three guineas a week (a good wage for a mechanic). What Clement's biographer does not relate is that in the winter of 1812 Clement set himself up as a teacher of 'Geometrical and Perspective drawing; the principles of Mechanics and Architecture; the method of Drawing ornaments for friezes and capitals; and the method of shading them by Geometrical Principles'. He must have left Leys, Masson & Co., for he offered a day class at hours suited to clients and an evening class 'for young mechanics' on Mondays, Wednesdays and Fridays from seven to nine.²⁰ He was therefore going to Copland's lectures on Tuesdays, Thursdays and Saturdays, while giving his own on the alternate days. In 1813 he left Aberdeen for London, where he made his reputation. The fact that Clement kept his ticket for thirty years suggests that he had some regard for Copland's lectures.

III

Copland's course usually began in the second week of November and continued uninterrupted at the rate of three lectures a week until towards the end of April, a little longer than the academic session. This made it just over 70 lectures. In his letter to Thorkelin in 1790, he confirms this figure with the comment:

*The Course consists of about seventy Lectures from one and a half to two hours each, according as I see the attention of my hearers continue.*²¹

Two volumes of Copland's manuscript notes have recently come to light, put together by one of his grandsons, Charles Murchison (1830-1879).²² Volume 1 has been labelled by Murchison as Copland's private course notes and though there is internal evidence that some are so, it is not clear that the division of notes between academic and private courses is as simple as Murchison implies. Unfortunately, identification can now be made with less certainty than might be expected, for the notes confirm that Copland did not follow the custom of his day and deliver his course from written lectures but spoke, for the most part, *extempore*. His academic course was likewise presented.

Although the lure to tempt the practical man into the audience was utilitarian, the lectures were not merely maxims for mechanics. Their aims were to broaden the mind of the listener and to provide him with the principles, concepts and applications of physics. In the opening lecture, Copland outlined the reasons why his audience should listen: natural philosophy is 'a pursuit of the highest utility', but in addition it produces leisure and independence, augments the stock of human knowledge, gratifies curiosity, improves our reasoning powers and 'leads us to a knowledge of the wisdom of the Supreme Being in the construction of the Universe; and thus lays the best foundations for Natural Religion'.²³ It was with similar broad motives that scientific and technical education was promulgated in the nineteenth century.²⁴

The time spent on each subject cannot be reconstructed from the notes with certainty but the following table is an attempt:

Mechanics	- 23 lectures
Kepler, Galileo and Newton	- 1 lecture
Hydrostatics and Hydraulics	- 6 lectures
The Earth	- 2 lectures
Pneumatics	- 9 lectures
On Various Airs	- 9 lectures
Magnetism	- 2 lectures
Electricity	- 12 lectures
Optics	- 7 lectures
Optics first appeared in the advertisement in 1798	

What is clear from the notes is the sheer effort put into the course by Copland, involving hundreds of demonstrations of the principles and applications of physics, using a collection of working models, scientific apparatus and diagrams that were the development of a lifelong interest. An inventory of his stock made at his death numbered over 500 items.²⁵ On the whole he avoided the purely entertaining demonstrations such as had been developed by Guyot, and popularly described by Hooper, and concentrated on the now classic demonstrations of phenomena that were developed by Desaguliers, Ferguson, Adams and others in the eighteenth century.²⁶ However, he obviously enjoyed shocking his audience

with his electrostatic generator, discharging the college electrical cannon, filling the room with pungent blue smoke to exhibit the properties of oxygen, baffling the audience with magnetic deceptions and such like diversions. It was clearly no less important two hundred years ago than nowadays to leaven a serious public lecture with entertainment. Perhaps not wishing to admit this aspect, Copland's own justification was:

*let us not then despise what can at present, only gratify curiosity, seeing as...someone may afterwards arise who shall turn it to a **usefull** purpose.*²⁷

On a more serious note, the scientific methodology advocated by Copland represented a mature evolution of the Newtonian principles so widely broadcast at the beginning of the eighteenth century. Strong emphasis was placed on the value of experiment as a driving force for innovation and generalisation, and as an arbiter between theories. The application of Newton's edict 'hypothesis non fingo', embodying an unwillingness to speculate on unproven concepts, is evident throughout the course. The debt to Newton is freely acknowledged for he receives several panegyrics:

*His inimitable work, the Mathematical Principles of Natural Philosophy, contains the true philosophical faith, and those who reject its principles are worse than heretics, as they shut their eyes against the clearest of all lights, Demonstration.*²⁸

Such language is not typical of the lecture notes as a whole, which concentrate on the exposition of purely physical ideas.

It is salutary to be reminded by Copland of the social hopes which were entertained for the mechanical sciences two hundred years ago, hopes which are today proffered for different technologies on the strength of similar ideals. Apparently following Adam Smith's arguments, he developed the themes that both mechanisation and specialisation of labour improve the competitiveness of the country's economy. The discussion concluded with an optimism verging on the romantic:

*Scarce any Man, and rarely any Nation is permitted to be sufficient for itself, or to be able to supply all its own wants: and the innumerable infirmities, diseases, and wants to which human nature is subjected, require innumerable supplies from the various Arts, Sciences, Manufactories, and occupations exercised throughout the Earth-for from these alone arises the Wealth of the World-whatever is necessary, usefull, commodious-whatever conduces to the convenience;-delight,-or happiness of mankind. Hence the burr of Reels, Wheels and Looms; the sound of Hammers, Files and Forges; the shouts of Vintage and the songs of Harvest.*²⁹

In the largely rural Scotland of Copland's youth (the 1750s), most families did live close to the poverty level. In his lifetime he witnessed how industrialisation brought diversity and specialisation, a skill for many men and respect for their abilities, merchandise in every household undreamt of by previous generations. Copland certainly aimed to promote such a trend. Whether he was aware of the dangers some of his contemporaries had foreseen is not clear. With hindsight, we can see that this recipe for improving the 'delight and happiness of mankind' was ingenuous, though utterly sincere. His unpolished lecture notes convey this sincerity with a revealing freshness.

There is no question that Copland's lectures made an outstanding impression locally. Not only does the period over which he gave such a substantial course bear witness to this, but in 1803, upon the death of the poet and philosopher James Beattie, half of Beattie's royal pension of £200 was obtained through Lord Sidmouth for Copland 'as a reward for the great service he had been in that part of the Country to Tradesmen and to the public by his lectures and his skill in forwarding the public improvement of the Town'.³⁰ Upon Copland's death in 1823, the *Aberdeen Journal* gave him an unusually lengthy obituary, noting of his private classes that 'these were always numerously attended, and served to diffuse a knowledge of true philosophical principles among all ranks'.³¹

It is also possible that, in spite of their lack of recognition by historians, Copland's lectures did leave their mark. He showed how such lectures could be given successfully. His ingredients were motivation, a good set of models, demonstrations and diagrams, a clear lecturing manner in language intelligible to the audience, regularity of time and place, and a moderate fee for an extensive course. He must also have demonstrated that the gains far outweighed the political misgivings of some in the 1790s who feared that educating any of the lower classes might cause Britain to follow the revolutionary path of France. It is quite likely that these political fears helped to delay the introduction of similar educational programmes in England. Thomas Webster (1722-1844) claimed to be the first in England to provide a 'school for mechanics', sometime in the late 1790s.³² Webster was by then a trained architect working in London and his school contained about a dozen students, 'chiefly of the building class'. He is worthy of mention here because he was an undergraduate pupil of Copland's in the late 1780s and was intimately involved with the Royal Institution in its formative years. Webster relates: 'At Marischal College, I was a favourite pupil of Professor Copland, the well known and justly celebrated Professor of Natural Philosophy-I made many drawings for his lectures'.³³ Webster joined Count Rumford in 1799 in the project to establish the Royal Institution, because he was persuaded that it would provide an effective forum for educating working mechanics, 'a class of men whose deficiency in knowledge proves one of the greatest drawbacks to the progress of art'.³⁴ Webster was influenced because, in his own words, he knew 'from previous experience what it was possible to effect in their improvement'.³⁵ This remark could at least in part refer to his knowledge of Copland's evening class.

Webster claimed to have designed the Royal Institution's famous lecture theatre, the chemical laboratory later used by Davy and an artisans' gallery served by a separate stairway (subsequently removed). He stayed until a few months after Thomas Young was appointed as Professor at the Royal Institution. Young himself had visited Copland in 1795 and been much impressed by Copland and his apparatus.³⁶ He wrote to him in May 1802 remarking how he aimed to follow Copland's precedent in trying:

*to form a connecting link between abstract science and mechanical practice, and to direct the efforts of speculative men to the improvement of the inconveniences of life.*³⁷

Webster and Young form an interesting link between Copland and developments at the forefront of popular lecturing in London. Locally, there is no doubt that Copland's contribution was timely and relevant. He and French were lecturing during a period of immense improvement to the City of Aberdeen and the County of Aberdeenshire. In the town there were major projects to improve the water supply, sanitation, roads, paving, street-lighting, harbour buildings and other public amenities; in the countryside, land

drainage, stone clearance and cultivation developed Aberdeenshire into the premier cattle breeding county and raised the living standard considerably above the poverty level of the mid-eighteenth century. These social changes rested on the application of science to technological development. To accelerate the process there was a need for educated people who could apply scientific principles to the design and construction of machinery that would improve the effectiveness of human effort. Copland in particular, and also French and Knight, provided in Aberdeen an education for the expanding class of skilled workers, both manual and professional.

All these social improvements were paid for by the successful commerce of the town, based in the early nineteenth century on the well established woolen manufacturers, the introduction of linen and cotton manufacture, the rise in the granite trade and papermaking, the expansion of the fishing fleet and various smaller enterprises. These industries, too, developed because scientific principles were intelligently applied to create machinery that was much superior to any previously available. These industries created a large pool of skilled and semi-skilled workers in a part of the country where education was considered a desirable social pursuit, even among the genuinely poor sections of the community. A Trades School was founded in 1808, and the Aberdeen Academy, which taught technical subjects, ten years later. For self-improvement, Aberdeen could boast a public library with 'a collection of books superior to that of any Provincial Institution of a similar nature in the Kingdom' by the time Copland stopped lecturing.³⁸ It is not at all surprising that upon the foundations laid by Copland and his contemporary adult education lecturers in science, Aberdeen was one of the earliest towns to establish a Mechanics Institute-inaugurated in April 1824, after preliminary meetings in 1823.³⁹ Unlike the fate of Mechanics Institutes in some cities, Aberdeen's survived the depression of the 1830s, making a notable contribution during the nineteenth century to adult education in the town.

For their local importance alone, Copland's natural philosophy classes must be considered a significant feature of Scotland's social history, bringing Enlightenment from the elite to the people in a manner that was characteristic of the best Scottish educational practice.

Notes

1. For Birkbeck see Thomas Kelly, *George Birkbeck: Pioneer of Adult Education* (Liverpool, Liverpool U.P., 1957), chapter 2. Copland is not mentioned even in such well researched works as Kelly's *A History of Adult Education in Great Britain* (Liverpool, Liverpool U.P., 1970). Many semi-entertaining lectures, mostly aimed at a middle-class audience, were given by itinerant lecturers like Benjamin Martin, for whom see John R. Millburn, *Benjamin Martin: Author, Instrument-Maker and Country Showman* (Leyden, Noordhoff, 1976), pp.35-64, and *Benjamin Martin: Supplement* (London, Vade-Mecum, 1986). Ian Inkster, 'Scientific culture and scientific education in Liverpool prior to 1812-a case study in the social history of education', in M.D. Stevens and G.W. Roderick, eds, *Scientific and Technical Education in Early Industrial Britain* (Nottingham, Nottingham U.P., 1981), pp.28-47, shows that public lectures by peripatetics and local teachers thrived from the 1720s onwards. No lectures of these kinds were primarily vocational, except perhaps those of Professor John Anderson of Glasgow; see James Muir, *John Anderson Pioneer of Technical Education and the College He Founded* (Glasgow, John Smith & Son, 1950).
2. John S. Reid, 'The Apparatus of Professor Patrick Copland at Marischal College, Aberdeen' in preparation for *Annals of Science*.
3. *Aberdeen Journal*, 17 October 1785, p.3, cols 2-3.
4. AUL, MS 3017/10/18.

5. Advertisements in the *Aberdeen Journal*: 17 October 1785, p.3, cols 2-3; 14 November 1785, p.3, col.3; 9 October 1786, p.2, col.4; 9 October 1787, p.3, col.1; 13 October 1788, p.3, col.3; 4 October 1790, p.3, col.1; 25 October 1790, p.3, col.3; 14 October 1793, p.3, col.3; 4 October 1796, p.4, col.2; 15 October 1798, p.4, col.2; 13 October 1800, p.4, col.2; 29 September 1802, p.4, col.1 (*); 13 October 1802, p.4, col.3 (*); 3 November 1802, p.4, col.1; 3 October 1804, p.4, col.1 (*); 10 October 1804, p.1, col.2 (*); 17 October 1804, p.1, col.1 (*); 24 October 1804, p.4, col. 1 (*); 8 October 1806, p.4, col.2; 27 September 1809, p. 1, col.5 (*); 4 October 1809, p.1, col.1 (*); 11 October 1809, p.1, col.2 (*); 1 November 1809, p.1, col.2; 7 October 1812, p.1, col.4; 4 November 1812, p.1, col. 1. Dates marked (*) are only two-line intimations.
6. *Aberdeen Journal*, 15 October 1781, p.4, col.1; 7 October 1782, p.4, col.2 and 6 October 1783, p.3, col.2.
7. From advertisements in the *Aberdeen Journal*, French gave his chemistry course in at least thirty winters, between 1783 and 1819. His course was about 60 lectures. The advertisement on 18 October 1784, p.3., col. 1 gives a synopsis of the course; that of 29 September 1795, p. 1, col.4 a slightly different flavour. As Professor of Chemistry, he was obliged to keep going in the five winters of 1811-1815 in spite of the appearance of Mr. Knight (later Professor Knight, Copland's successor in 1822) offering an evening chemistry course, with natural history, covering the same topics, to be delivered at clashing times in a public room above the Athenaeum that could hold considerably more than the small Marischal College room used by French.
8. Alexander Findlay, *The Teaching of Chemistry in the Universities of Aberdeen* (Aberdeen, AUP, 1935).
9. Anand C. Chitnis, *The Scottish Enlightenment: A Social History* (London, Croom Helm, 1976),p.142.
10. John S. Reid, 'The Castlehill Observatory, Aberdeen' *Journal for the History of Astronomy*, XIII (1982), pp.84-96.
11. David M. Gavine, 'Astronomy in Scotland 1745-1900' (Open University, Ph.D. thesis, 1982).
12. *Aberdeen Journal*, 2 October 1786, p.3, col.3, and 16 October 1786, p.3, col.3. The second mention corrects the name to Clarke and details that his Aberdeen lecture will be on vegetation, ploughs and wheel-carriages, 'for each of which subjects, he has been honoured with premiums from the SOCIETY of ARTS in London'. The description of two improved ploughs by Cuthbert Clarke, at least one of which was awarded a premium in 1766, are given in William Bailey, *The Advancement of Arts, Manufactures, and Commerce; Descriptions of the Useful Machines and Models contained in the Repository of the Society for the Encouragement of Arts, Manufactures, and Commerce: &c* (London, Privately printed, 1772).
13. *Aberdeen Journal*, 14 October 1812, p.4, col.2, and *Aberdeen Journal*, 25 October 1815, p.2, col.5; 8 November 1815, p.3, col.3; 15 November 1815, p.3. col.1.
14. James Clarke to Patrick Copland, 28 October 1802, in the private collection of P.A. Copland (North Waltham). The author is most grateful to Patrick Alexander Copland, a direct descendant of Professor Copland, for the access given to his family's archives.
15. John A. Cable, 'Popular lectures and classes on science in the eighteenth century' (Glasgow University, M.Ed. thesis, 1971), chapter 4, pp.34-73. Cable fails to mention Copland.
16. Patrick Copland to G.J. Thorkelin, 2 August 1790, Edinburgh University Library, La 111, 379.167.
17. See Table 1.
18. Knight advertised his chemistry course twice before beginning each year. The first advertisements occur in the *Aberdeen Journal*, 23 October 1811, p. 1, col.5; 30 September 1812, p.4, col.3; 20 October 1813, p.3, col.2; 26 October 1814, p.3, col.2; and 25 October 1815, p.2, col.4. They give some detail of his intentions. He planned to continue in 1816 (*Aberdeen Journal*, 9 October 1816, p.3, col.3) but cancelled the classes upon being appointed Professor of Natural Philosophy at Belfast (*Aberdeen Journal*, 6 November 1816, p.1, col.1). Knight records (AUL, Knight MS M. 118, section IV) that the first two years' classes contained respectively 63 and 61 lectures on chemistry, and natural history. He subsequently divided his material into two courses of about 35 chemistry lectures and 30 natural history lectures. Knight also gave classes on 'popular chemistry' in the late winter and early spring which were well attended by ladies (including Mrs. Copland and her daughter in 1813). He lists these as being given in 1813, 1815, 1818, 1819, 1820 and 1822. Presumably the last four were given in Belfast. The Aberdeen course was 20 lectures and was attended by about 70 people in the first year and 35 in 1815.
19. Samuel Smiles, *Industrial Biography: Iron Workers and Tool Makers* (London, John Murray, 1863), p.240.
20. *Aberdeen Journal*, 11 November 1812, p.4, col.2, where his name appears as 'Joseph Clemmet'.
21. See note 16 above.

22. 'Manuscript Notes of Popular Course on Natural Philosophy delivered at Aberdeen by Professor Patrick Copland of Marischal College 1807? collected and arranged by his grandson Dr. Charles Murchison 1856', AUL, MS 3123/1. It is possible that Murchison came by his grandfather's notes upon the death of Copland's wife in 1852. He settled in London late in 1855 after having spent two and a half years in the East India Company. Although Murchison attended University at Aberdeen from 1845 to 1847 he did not stay to take the third-year natural philosophy course himself but left to obtain a medical education at Edinburgh. He therefore had no first-hand experience of the teaching of natural philosophy at Aberdeen. There is no record in the rolls of alumni of either Marischal College or King's College of Murchison's enrolment, only that of his brother John attending Marischal College eight years earlier. The notes are bound together in one volume of 439 folio pages, a full page containing about 20 lines at approximately seven words per line.
23. *Ibid.*, ff.8-30. Lecture 1 is fairly fully written out. In one paragraph Copland says that in the last two courses astronomy has been dropped. Knight in AUL, MS. M 111, pp. 1215-1217 mentions that astronomy was dropped after the first course, which would date this lecture to 1788 or 1790.
24. See, for example, J.V. Smith, 'Manners, morals and mentalities: reflections on the popular enlightenment of early nineteenth-century Scotland', in *Scottish Culture and Scottish Education 1800-1980*, eds W.M. Humes and H.M. Paterson (Edinburgh, John Donald, 1983), pp.25-54.
25. See note 2 above.
26. Gilles Edmé Guyot, *Nouvelles récréations physiques et mathématiques*, 4 vols (Paris, Gueffier, 1769); W. Hooper, *Rational Recreations, in which the Principles of Numbers and Natural Philosophy are Clearly and Copiously elucidated, by a series of Easy, Entertaining, Interesting Experiments*, 4 vols (2nd edition, London, L. Davis, 1783).
27. AUL, MS 3213/1, f.15. 28. *Ibid.*, f.158r.
29. *Ibid.*, f.136v.
30. According to a note by his son Charles in the private collection of P.A. Copland (North Waltham).
31. *Aberdeen Journal*, 20 November 1822, p.3, col.4.
32. Autobiography by T. Webster, signed and dated 6 July 1837, bound in the Webster MSS, cat. no. 121A-121B, p.4 in the Archives of the Royal Institution. 33. *Ibid.*, p.3.
34. Thomas Webster to Thomas Garnett, presumed August or September 1800, quoted by Nicholas Edwards, 'Some correspondence of Thomas Webster (circa 1772-1844), concerning the Royal Institution', *Annals of Science*, 28 (1972), p.51. 35. H. Bence Jones, *The Royal Institution: its Founder and its First Professors* (London, Longmans, Green & Co., 1871), p.3.
36. George Peacock, *Life of Thomas Young, M.D., F.R.S., &c* (London, John Murray, 1855), p.67. Although barely 22 when he visited Aberdeen, Young was already a Fellow of the Royal Society.
37. Thomas Young to Patrick Copland, 17 May 1802, in the private collection of P.A. Copland (North Waltham).
38. *Aberdeen Journal*, 13 October 1813, p.3, col.5.
39. AUL, Knight MS M. 167 'Original Papers' contains 11 rules and objectives of the proposed Aberdeen Mechanics' Society dated 5 December 1823. It also contains a 6-page account of the early history of the Aberdeen Mechanics Institution (as it was called upon being formally inaugurated in 1824) from 1824 to 1832, including mention of the formation of a dissenting rival body, the 'Aberdeen School of Arts', in 1824.

JSR