

Lessons from the Scottish Enlightenment

Biennial Lecture of the Faculty of Actuaries

23 November 2009

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Introduction

When I moved to Edinburgh twelve years ago I immediately fell under the spell of this beautiful city with its medieval streets beneath the castle, the New Town alongside Princes Street Gardens, its many hills dominated by Arthur's Seat and Holyrood Park. But, behind the architecture, there is the history and the culture: the great names from its past. It was impossible not to sense that this was the home of the Scottish Enlightenment, that remarkable period in the late 18th century when this small country outshone its larger neighbours and contributed so generously to the intellectual history of the western world.

When, in 2005, I was elected President of the Royal Society of Edinburgh, which was founded in 1783 and embodied the spirit of the Scottish Enlightenment, I felt myself being absorbed by this great cultural heritage, occupying a post filled 200 years earlier by Sir Walter Scott. So I was delighted when I was invited to give this lecture on a theme related to the Scottish Enlightenment. Of course, I am not a professional historian but sometimes there are advantages in not being a narrow specialist. One of the characteristic features of 18th century Edinburgh was the way it reached out in all directions: lawyers talking to scientists, physicians talking to writers – all being philosophers in the broad sense. As a mathematician I think I would have felt at home in that milieu and perhaps my vantage point is one that is appropriate to an audience of fellow actuaries.

Different scholars have different views on the defining dates of Edinburgh's great intellectual era. Some would narrow it down to just three or four decades around 1760; others would be more generous and stretch it out in both directions. We mathematicians know enough about figures not to be too impressed by them. We know such choices are somewhat arbitrary. I prefer to take a relaxed attitude on dates and two natural boundary points are 1745, the date of the last Jacobite rebellion, and 1832, the year of Walter Scott's death. But, as I shall argue, the idea that Scotland had a brilliant cultural outburst that came from nowhere and disappeared abruptly is totally misleading – so even these extended dates are just convenient stopping points.

Since I am not a historian I thought I should carefully check my dates and other facts by consulting some standard works of reference, so I relied on the Encyclopaedia Britannica and the Dictionary of

National Biography (DNB), though my son thinks I should just rely on Google. I was pleasantly surprised to find that the Encyclopaedia Britannica proudly announces on its front page that

*It was first published in 1768 by a
Society of Gentlemen in Scotland*

As the lawyers would say, I rest my case. I then checked the DNB and, lo and behold, it was founded in 1882 by one George Smith who also turned out to be a Scot, though established in London.

Having admitted my biased references, I will start by recalling the great names of the period.

The Great Names

In the social sciences, Adam Smith and David Hume remain as famous now as in their day, though we should remember that, while Smith is viewed as the father of economics, he saw himself also as a philosopher. Similarly, David Hume, the great philosopher, was a highly regarded historian, and all this was done in his spare time since he had to earn his living as a diplomat.

In the natural sciences, Joseph Black, the chemist, discovered CO₂ (much in the news these days) and James Hutton revealed the scale of geological time.

In literature, Walter Scott had to compete in fame with Robbie Burns. Some may question whether the peasant-poet was an Enlightenment figure – he was not really at home in Edinburgh society – but I will come back to that later.

In the arts, there was the Adam family of architects while portrait painting could boast Allan Ramsay and Henry Raeburn.

I confess that my enthusiasm for 18th century Edinburgh has sometimes become excessive. I was telling a German friend of mine that, during this period, Edinburgh was the intellectual and cultural centre of Europe. After listening to my claims he quietly asked: what about music? I was chastened to realise that Mozart was a contemporary of Adam Smith, and even I could not argue the musical merits of the bagpipes against that kind of competition! So we have to confess that even Edinburgh had its limitations.*

In addition to the internationally famous names I mentioned, there were many more of slightly lesser note who played an important part locally.

As an illustration of the lack of specialisation among Edinburgh intellectuals, let me just briefly mention two judges who, besides being eminent in their profession, also had much wider interests and were at the centre of society. One was Henry Home, who became Lord Kames and wrote extensively on philosophy. Let me quote this passage about his early life, which clearly shows both his energy and the wide scope of his learning.

“He thereupon set to work to repair the defects of his early education, and having applied himself to the study of mathematics, natural philosophy, logic, ethics and metaphysics, as well as law, was called to the Scottish Bar on 19th January, 1724.”

* David Forfar has reminded me of two Scottish composers with European reputations: Sir John Clerk (1684–1755) and Thomas Erskine, 6th Earl of Kellie (1732–1781).

The other judge, James Burnett (later Lord Monboddo) was even more energetic in his spare time, writing first a six volume work on the origin and progress of language and then another six volume work on ancient metaphysics. He was also an eccentric with a great admiration for the ancient Greeks. Since they had not used carriages he also declined such luxury and would regularly make the long journey from Edinburgh to London on horseback. In pre-Darwinian days he was brave enough to consider man as related to the orang-utan. The Encyclopaedia Britannica of the 1870s had this to say about him.

“His views about the origin of Society and language and the faculties by which man is distinguished from the brutes, afforded endless matter for jest by the wags of his day, but readers of this generation are more likely to be surprised by the scientific character of his method and acuteness of his conclusion than amused by his eccentricities.”

I also rather like the DNB’s comment that

“During the temporary cessation of business owing to the rebellion of 1745 Burnett paid a visit to London where he made the acquaintance of many of the literary characters of the day.”

I find it fascinating to enter the Edinburgh society of the time by reading about these interesting characters and their social interactions, the dinners they shared in their taverns and clubs, where conversation covered the whole range of intellectual topics. They all had a remarkable stamina for both claret and philosophy, as recounted by James Boswell, and often walked many miles to their homes after these extended entertainments.

But my purpose tonight is not to regale you with stories of the night-life of Edinburgh two centuries ago, but to reflect on how it came about that this small cold northern outpost of civilisation became such a prominent centre of intellectual life. What were its origins? Why did it flourish and what was its long-term influence? What can we learn from its history that has lessons for our present and future? Edinburgh has frequently been called the ‘Athens of the North’. Is it then, like modern Greece, just a small country glorying in its ancient history, or is the Enlightenment still at the core of our life, driving us forward?

I shall approach these questions in three different contexts, which I will label:

- (a) Historical – what came before and what followed. It is here that we will see that precise dates blur and are replaced by a vague continuum.
- (b) Geographical – the relation with England, the Continent, America and the British Empire.
- (c) Social – the integrated nature of Edinburgh society that I have referred to, with no disciplinary barriers.

But, before going down this route, I will spend some time on the fundamental topic of education which, then as now, underpins all aspects of society.

Education

Although there is no simple explanation for the remarkable developments of 18th century Scotland, one fact is undoubtedly crucial. Scotland had the most literate general population of any country in Europe (and probably the world). For this we have to thank John Knox and the Reformation*,

* Hans Buehlmann has drawn my attention to the parallel role of Calvin in Switzerland. Calvin, like Knox, encouraged primary school education so that the Bible could be read. In both countries, practice was slow to follow legislation, but Scotland appears to have been more diligent. The comparison deserves a more thorough examination, which should also include the Catholic schools.

which emphasized the direct access of each individual to God through the Bible. The Presbyterian Church established primary schools so that children could learn to read. Universal primary education therefore came to Scotland several centuries before it was adopted in England. It is difficult to over-emphasize the importance of such widespread education. For example, it explains how Robert Burns, a farmer's son, received the education that nourished his poetic genius. In this sense he belongs to the Enlightenment.

However, the Scottish educational advantage was not restricted to primary school. Far from it. I remind you that Scotland had four universities established by the 16th century:

St. Andrews	1412
Glasgow	1451
Aberdeen	1494
Edinburgh	1583;

while England (with its much larger population) had, until the 19th century, only Oxford and Cambridge. This alone explains how Scotland produced so many graduates who made their mark on the outside world. You could say that an educated class was, for hundreds of years, Scotland's main export.

Herein lies the first lesson, still highly relevant to our present time. Education, all the way from primary school to post-graduate work, is the main hope of a small country like Scotland. But in the 21st century, other countries are rapidly catching up and it will be no easy task for Scotland to maintain its traditional advantage. Two things are in its favour: the high quality of its education and the long timescale of educational change. The education of a child can last these days for 20 years, and teachers are in post for over 40 years. Educational institutions are like great ocean-liners which change course very slowly. Beyond that, the general culture of a society has deep roots and outlives individual generations. So Scotland's cultural heritage, its education in the broadest sense, still has momentum, which, if properly harnessed, can keep it going a while longer. I will return to this theme later in my lecture.

While the four Scottish universities all made their contribution, by the 18th century the University of Edinburgh was the largest and most important and it played a central role in the Enlightenment. Two related things were in its favour. First, Edinburgh, as the capital, was by far the largest and wealthiest city in Scotland. Second, Edinburgh University was not an ecclesiastical foundation, beholden to a bishop. The City Council of Edinburgh had established the University and there were few religious barriers for admission. Unlike Oxford and Cambridge, which remained firmly under the Anglican Church until the 19th century, Edinburgh presented the world with a free market. This, at least, was the position by the 18th century. I have passed rapidly over the turbulent times preceding that. The Reformation, which led to universal primary education, also started with an extremist uniformity from whose clutches the University did not fully escape till the early 18th century. But by this time the University was thoroughly reorganised by several enlightened principals. Professors in specialist fields were appointed to lecture and students chose those they wanted to attend, with few regulations. However, they had to pay a fee for each course of lectures and this went to the professor giving the course. Professorial stipends were low and the student fees provided the main income of the professors. You may be interested, but not surprised, to know that Adam Smith agreed with Principal Robertson:

“...that it would be undesirable to increase the salaries of the Professors, a move which might render them less attentive to the instruction of their students, or independent of the involvement arising from a diligent performance of their duties.”

This policy of incentives worked well, as Smith had predicted. The professors, who were all distinguished scholars carefully selected by the Principal, gave brilliant lectures, attracting students in great numbers from far and wide. The university grew in size and reputation.

By contrast, Oxford and Cambridge were at their lowest point, illustrated by the story that the Regius Professor of History at Oxford had not given a single lecture in 150 years. As actuaries you will have worked out that this did not refer to just one man, but to the post.

A central role in the University was played by medicine. Not only did it provide a professional training for future physicians but, in those less specialised times, it also had close links with the other sciences, such as chemistry. Professors frequently switched their chairs (towards the more popular and lucrative ones) and medical students often went on to other scientific careers. It is indeed notable how many famous scientists, including Charles Darwin and that polymath Thomas Young (who demonstrated the wave nature of light and also helped Champollion to decipher the Rosetta Stone), came to science via medicine.

In an earlier phase of my life, when I was President of the Royal Society (occupying Newton's chair) and Master of Trinity College (Newton's Cambridge base), I, naturally, was an enthusiast for 17th century England. The same questions concerning the origins and future of this intellectual flowering arise a century before those we are examining in Scotland. In astronomy, where Newton made his name, Newton's great predecessor was Galileo who, conveniently for historians, died in 1642, the year of Newton's birth, thus passing on the scientific torch from Italy to England. But there was more than individual genius involved here. Famously, Galileo had to face a hostile Catholic Church, whereas Henry VIII had removed England from the orbit of the Pope, so science in England could flourish without worrying too much about the Church.

But there is another question which has always intrigued me. English science was blossoming exactly at the time of the Civil War, a long and bloody contest which one might think would be inimical to intellectual progress. On the contrary, science flourished and the Royal Society was formally established, under royal auspices, at the Restoration. How does one explain this paradox? Does a civil upheaval help the progress of ideas? Perhaps it does so by undermining authority. Significantly, the Royal Society motto is '*Nullius in Verba*', which is usually interpreted as "do not trust the word (of authority)" – or, more simply, "do not believe all that you are told". Certainly, religious diversity, which lay behind the Civil War, reduced the heavy hand of religious conformity. It is also true that the leading scientists survived the War, unlike the situation in France, a century later, where Lavoisier was sent to the guillotine. English scientists were more fortunate, and politically more skilful. Some, like John Wallis (a predecessor of mine as Savilian Professor of Geometry at Oxford), were too valuable to Royalists and Cromwell alike, as experts in secret codes, rather like the German rocket scientists after 1945.

But if the Civil War did indeed assist the flowering of English science, what happened after the death of Newton? Why did it decline? Several reasons suggest themselves. First, the dominance of Newton, and the controversy with Leibniz, cut English mathematical science off from the great progress that took place in France and Germany. Second, Oxford and Cambridge reached their lowest point in the 18th century and contributed little to intellectual life. Finally, the Royal Society, the focal point of English science, fell under the sway of Joseph Banks, the great botanist who sailed to Australia with Captain Cook (and after whom the Banksia plant is named). Unfortunately Banks presided over the Royal Society for 42 years – much too long a period. As a botanist he was not

sympathetic to the more mathematical sciences which were emerging and which were held back until Banks's death in 1820. It was not until the 19th and 20th centuries that English science recovered its leading position.

Meanwhile the field was left open for Scotland. The Act of Union of 1707 transformed the economic situation and opened up the opportunities offered by the expanding British Empire. The move of Parliament to Westminster diverted able young men from the pursuit of politics to the professions of law, medicine and education, preventing a potential brain drain. By the time the railways had appeared, bringing London much closer to Edinburgh (without those long horse-back rides of Monboddoo), Edinburgh had an established and thriving cultural life which could compete with London.

But here, again, we can see a lesson for the present. If Scotland is to maintain its high intellectual standard it will have to work to prevent a brain drain of its talent not only to England but to the rest of the world. Exporting ideas and people is an important role for Scotland in an increasingly interconnected world, but this must not become a flood. Conditions here should remain attractive for those who want to stay, as well as those from other countries who wish to settle here.

A word about the defining dates of the Scottish Enlightenment. The argument for 1745 is that, with the Jacobite threat finally removed, the Scots were no longer viewed with the same suspicion as potential subversives. They enjoyed the freedom and prosperity that encouraged art and science and that blossomed in the second half of the century. While there is some truth in these views, it is also true that you cannot jump-start social change. Education has a long gestation period and the universities had been advancing for some decades before 1745, as I have tried to indicate. Without such an educational foundation, the political and economic opportunities would not have had the same spectacular consequences.

Perhaps here I can come back to our own times when the importance of education is universally recognised but grossly misunderstood. When I was President of the Royal Society in London I had fairly frequent contact with the Ministers of Education. I think I had to deal with three Ministers in my 5-year presidency. The post was usually regarded as a stepping stone to higher office and each incoming Minister was in a hurry to make his (or her) name and move on. Constant reform, change, and assessment were the order of the day, totally ignoring the long-term nature of education.

Scotland always had its own educational system and now, with devolution, has its own Minister. It may avoid the worst of the Westminster musical chairs, but as long as education remains a political football, it will continue with a 5-year horizon – the unit of political time. If Scotland is to have the education it needs to maintain its place in the world, this has to be put at arm's length from party politics and given the breathing space it requires.

Having just argued that even the early date of 1745 does not by itself herald the dawn of enlightenment, let me now examine the other end-point, the date of 1832 with the death of Walter Scott. While it is true that, by this time, England was beginning to recover its earlier standing, it is a serious mistake to believe that Scottish intellectual progress came to an abrupt halt with the death of Scott. In the sciences its greatest days were just beginning with Lord Kelvin and James Clerk Maxwell dominating the field of physics. While Kelvin, who was partly an engineer, with his role in the transatlantic cable, lived to a ripe old age and was given a peerage by Queen Victoria, Maxwell was the greater scientist whose fame grew after his early death. He is now widely regarded as the greatest physicist between Newton and Einstein and the greatest scientist produced by Scotland.

Nor should the era of Kelvin and Maxwell be considered as a new period unrelated to the Enlightenment. The universities that trained them were those which grew to maturity in the previous century and there are even personal links. Maxwell's father was a friend of Scott and sought his advice on what school his son should attend. Ironically, Scott was a supporter of the new Edinburgh Academy which had been set up by those who, like himself, thought that the older High School was neglecting the classics in favour of trendy subjects like the sciences. So Maxwell was sent to the Academy which was firmly devoted to the classics. Fortunately, genius surmounts such minor obstacles.

As you will have gathered, I am an enthusiastic devotee of Clerk Maxwell and it was a matter of great satisfaction to me that I persuaded the Royal Society of Edinburgh to commission a statue of Maxwell which now graces a prominent site on George Street, just opposite the Standard Life building, which is no doubt familiar to actuaries.

Maxwell's work on electro-magnetism not only provided the scientific foundations for the technological marvels that now surround us but it also underpins all subsequent physical theory. In this sense, the Scottish Enlightenment never ended: it continues its influence to the present time.

While Kelvin lived on into the 20th century, even Maxwell is not so far back in time. For example, my maternal grandfather was a Scot born around 1860 at a time when Maxwell was still a young man.

As a great scholar said, "history is about chaps and geography is about maps", so let me now move on to examine the geographical context of the Scottish Enlightenment.

Geographical Context

I have already alluded to the Newtonian era of English science and, while these new ideas landed on stony ground in France and elsewhere on the Continent, they were rapidly adopted in Scotland. Two notable Scottish mathematicians, who were Newtonian disciples, were David Gregory and Colin Maclaurin. The latter, after whom your own building is named, is well-known to actuaries because of his pioneering work on widows' pensions.

Gregory was one of a large and prominent Scottish family, who eventually went to Oxford and became Savilian Professor of Geometry. In looking up all the Gregorys in the DNB I found out one reason why they were so prominent. Even by the standards of the time they were remarkably prolific. David's father had 32 children (by only two wives), so it is not surprising that this included a few with mathematical talent.

In fact, one can trace a continuous development of Scottish mathematics from Napier to Gregory and Maclaurin, followed by names like Playfair in the 18th century to Clerk Maxwell in the 19th. There are no sharp discontinuities, and of course mathematics played a central role during the Enlightenment.

At a time when travel by sea was easier and faster than by land, Scotland had firm direct links with countries like France and the Netherlands. The French connection was of course a key part of Scottish history but the Netherlands had a greater influence on universities. Leyden had the famous medical school where all aspiring students went and the early professors at Edinburgh would have learnt their medicine at the feet of the great Boerhaave. But, in due course, Edinburgh took over this role from Leyden.

pursue their medical education. He advised and assisted many young men in this way, helping some from his own pocket. His efforts were so successful that around 10% of the medical students at Edinburgh were American, and they returned to found the main medical schools of Philadelphia, New York and elsewhere. When I was in Philadelphia a few years back to celebrate Franklin's tercentenary I was taken aback to find these medical pioneers identified as English, and hastened to correct my hosts.

Incidentally, when I was going through immigration at Newark airport and was asked the purpose of my visit, I rather facetiously said that I was going to a birthday party. When the inquisitive official asked "whose birthday?", I replied "Benjamin Franklin". The well-informed and straight-faced reply was: "I thought he was dead."

Franklin was of course famous for his work on lightning and lightning conductors. One of his letters to Hume, published by the Royal Society of Edinburgh,⁺ was on this subject. However, there was some controversy on the best shape of lightning conductors. Should they be pointed, as advocated by Franklin, or round? King George III set up a committee of the Royal Society to investigate this question. This was chaired by a Scot, Sir John Pringle, the President at the time. In due course, Pringle reported back in favour of Franklin's view. The King was not amused; Franklin was a rebel, and so he must be wrong. Pringle was sacked⁺⁺ by the King, but he had the last word:

"Your Majesty can alter the laws of the land but cannot alter the laws of nature."

As we move on into the 19th century, we find the Scots taking full advantage of the growth of the British Empire, building railways in exotic places and leaving their mark wherever they went. I came across an amusing example of this some years ago when I was taken to a hill-station high in the mountains south of Mumbai at a place called Mahabaleshwar, a favourite retreat for the British in the hot season. I was shown the sights, including a magnificent look-out point, with a spectacular view, that gloried in the name of "Arthur's Seat". The legendary King Arthur was clearly transported across space and time by some Scottish officer. I found it a nice thought that one might climb our local "Arthur's Seat" to escape the oppressive heat of an Edinburgh summer!

But it was not only the Empire beyond the seas that attracted the Scots; some went south to England. Many, like James Watt, played a notable part in the industrial revolution but there is another group who made an enormous contribution and who are much less known. These are the civil servants who were responsible for the vast improvement in public health in 19th century England with the notable reduction in mortality which, I am sure, your actuarial tables record. The leaders were mainly Scots and again products of the Edinburgh medical school.

These few remarks show the worldwide influence of the Scots, from the 18th century onwards, all children or grandchildren of the Enlightenment. This demonstrates convincingly that there were no boundaries in space or time to the benefits flowing from the Scottish Enlightenment. The past leads into the present and prepares us for the future.

Let us move now to what I have labelled 'the social context', the way the different strands of life and ideas were woven together.

⁺ Actually by one of the earlier societies which merged into the RSE.

⁺⁺ The DNB very diplomatically says that Pringle resigned because of "ill-health". This is reminiscent of modern Cabinet Ministers who decide "to spend more time with their families".

The Social Context

One of the most remarkable features of 18th century Edinburgh was how compact it was. Until the development of the New Town, the city was centred on the medieval streets adjoining the Royal Mile, from the Castle to Holyrood Palace. Like Manhattan two centuries later there was no way to expand except upwards, which led to the buildings we can still see with innumerable storeys frequently facing different ground levels, back and front. People literally lived on top of one another, with notoriously insanitary conditions. Uncomfortable and unhealthy it must have been, but it also generated a closely-knit society which produced great men and great ideas. It was said with pride and only modest exaggeration that “*you could stand at the Mercat Cross and, in half an hour, shake 50 men of genius by the hand*”.

The outcome was that Edinburgh had a vibrant and diverse intellectual society that was all-inclusive. A prominent role was played by the lawyers, both advocates and judges, whose learning, as I indicated earlier, was not confined to the law. Then there was the medical profession, centred round the prominent medical school of the University. Other branches of the University also flourished – with mathematicians, scientists, historians and philosophers. Boundaries were fluid and professors often exchanged chairs. They would sometimes acquire their specialist knowledge after appointment rather than before. The whole atmosphere encouraged the free exchange of ideas and there was little to inhibit it. The days of rigid orthodoxy were over. Nothing demonstrates this better than the case of David Hume. Although his religious scepticism was widely known he was an admired and central figure of Edinburgh society. It is true that he never got a university chair, but on several occasions he was a serious candidate. This was a major step forward when one considers that the last witch in Scotland was burnt at the stake during his lifetime.

So this was the multi-faceted society that attracted Benjamin Franklin and gave birth to the Royal Society of Edinburgh of which Franklin was the first foreign member. Attending its meetings I feel a close kinship with 18th century Edinburgh and, although the world has changed enormously in those 200 years, the RSE attempts to preserve the unity of knowledge and culture, maintaining the bridge from the sciences to the humanities and social sciences. We still have judges who enjoy the company of scientists and mathematicians (and even actuaries!).

Is the attempt to maintain a unified intellectual front a hopeless task, one that increasing specialisation makes impossible? Or is there still a role for the unity of knowledge?

I would argue strongly that, even as knowledge deepens within each field, we have to maintain the horizontal cross-links. In science, the days of the narrowly defined departments of physics, chemistry and biology have long since gone and been replaced by interdisciplinary subjects like biochemistry or molecular biology, titles which in their turn will give way to newer ones. Moreover, the impact of science and technology on modern society means that we have to face problems which are not confined to any one area. Climate change and energy are just two of the most topical, while medical advances raise ethical, as well as actuarial, problems of increasing importance. More than ever we need the collective wisdom and experience that is spread across society. We may not all be able to meet at the Mercat Cross, but we should look back to the Enlightenment for inspiration. Nor should we ignore the stimulus that good food can provide for intellectual conversation.

Final Thoughts

The galaxy of talent that flourished in 18th century Edinburgh always raises the question: was this simply a coincidental emergence of individual genius or the result of historical forces? In other contexts this has been debated at length. Was Napoleon a military genius who changed the face of Europe or was he simply the inevitable product of the French Revolution? Tolstoy (being a Russian) played down the individual role of Napoleon and opted strongly for the latter view.

If you are a gardener, it is hard to deny that seeds will only germinate successfully in the right soil and weather conditions; so genius needs the proper environment in order to develop its full potential. What would Isaac Newton have achieved if he had been born in the Stone Age? Perhaps it was someone like him who first invented the wheel? I rather liked the Punch cartoon published during a controversy about university research, which showed two Stone Age men discussing another who was passing by, with the comment: “*I know he discovered fire, but what has he done since?*”

A poignant and poetic reflection on this theme is contained in the famous lines of Gray’s *Elegy Written in a Country Churchyard*.*

“*Some mute inglorious Milton here may rest,
Some Cromwell guiltless of his country’s blood.*”

It is tempting for Scots to believe it was Scottish genius that changed the 18th century, something peculiar to the Scottish people. But this is dangerous ground – one small step to Hitler’s view of Aryan superiority. But if genius does not lie in Scottish DNA then the Scottish Enlightenment seems just a random accident of history. In particular, it will not happen again and the five million present-day Scots will be no match for the billions of Indians and Chinese with whom we now have to compete. This is a depressing thought, so let me try to cheer you up.

As I have tried to indicate, the Scottish Enlightenment was not just a flash in the pan of a few decades. It had deep roots, a long life and a continuing future. We today are its inheritance and those three hundred years of cultural evolution, rather than our DNA, define present-day Scotland. This continues to give us an advantage, and no country can shake off its past and transform itself in a fundamental way in one generation.

This brings us to my final point. For human civilisation the unit of time is not marked by the clock, or in centuries, but in generations. Living people carry their knowledge and experience with them through life. But, as you actuaries are aware, this unit is changing rapidly. Lifespans are increasing hourly. In fact, during this lecture of approximately fifty minutes, you will be pleased to hear that your life expectancy has increased by ten minutes. As the supermarkets say, buy five, get one free.

In addition, modern technology, with its high speed of communication, packs more into your life, so making it richer. The unit of life, the generation, is thus becoming both longer and richer. How will these two factors affect the flow of history? Since the audience is expert in such matters, I will leave you to decide.

The President (Mr R. S. Bowie, F.F.A.): Thank you very much, Sir Michael. Sir Michael has offered to take comments and questions for a few minutes on the basis of his provocation to you to be the new Enlightenment.

* Gray is, in my view, somewhat unfair to Cromwell.

Mr D. C. Mason, F.F.A.: I wonder, Sir Michael, whether you would do us the favour of taking a couple of minutes to extend it from the Edinburgh Enlightenment back to the Scottish Enlightenment? Particularly, the Aberdeen school of philosophers probably gets forgotten more than Glasgow's, where you have Thomas Reid, Gerard and Beattie, all operating out of Aberdeen and contributing their own unique part to the 18th century.

Sir Michael: I only comment to agree. This lecture takes place in Edinburgh, a city I know well, and Edinburgh was the capital and played the biggest role. Obviously, other parts of Scotland also played a significant role. Not everybody was born and bred in Edinburgh. Adam Smith came from Kirkcaldy. I have mentioned Witherspoon. So other parts of Scotland – and I mentioned all the universities – all played their role. If I had time and knowledge I would elaborate on all their contributions.

It is a small country and obviously people moved around and there was connection between different institutions and different people. I talked only about Edinburgh because of my own ignorance, the shortage of time and the fact that we are here in Edinburgh. I apologise to Aberdeen, although I have to say that Aberdeen has a black mark on its reputation as the only university that sacked James Clerk Maxwell!

Mr J. M. Macharg, F.F.A.: I have often thought it interesting that the Scottish Enlightenment really got going some decades after our Parliament had moved to London. There did seem to be a sort of inverse correlation there in the sense that the further you are from Parliament, the greater the clarity of thought.

I am wondering if there is a lesson here for our own time and indeed for the future. Perhaps if we moved Parliament further away, say to Brussels, we might be able to get the same results.

Sir Michael: I did of course allude to that when I said the move of the Parliament to Westminster may have meant that politics was no longer a competing attraction. Talent was therefore diverted into more productive areas. Whether politics still has the same attraction I am not sure. But those who want power will gravitate to power.

Professor A. D. Wilkie, F.F.A.: May I comment on another aspect? You did not very much mention the involvement of the Ministers. But one of the early people, an actuary, Wallace, was a Minister and was involved in setting up the Church of Scotland Pension Scheme. And a namesake of mine, the Rev David Wilkie, wrote a book on compound interest and annuities, and constructed life tables. He was also the father of the painter of yet again the same name, so naturally I have an interest in these people, though they are no relation whatsoever.

Sir Michael: Well, I did refer to John Witherspoon, and of course, at the time, Ministers were everywhere and very prominent in all respects, but I could have identified more. Yes, you are right.

Mr D. Eadie, F.F.A.: You have explained the considerable intellectual contribution of various people during that Age. One thing I do not understand fully is where all the money came from. These intellectuals seemed to live a charmed life, in grand houses, and with no shortages. The financial system worked for them – that was surely an essential condition for the success of the Age of Enlightenment.

Sir Michael: I am neither an historian nor an economist. Of course people will tell you there were a lot of sugar plantations down in the West Indies which kept Scotland going. The wealth came through Glasgow to Scotland and was substantially on the backs of slaves, so that is a slightly embarrassing fact.

To put it more generally, the British Empire provided the economic opportunities which, following Adam Smith's precepts, were taken up fully. That was certainly a source of Scotland's wealth, but whether you needed great wealth to have a few good lecturers at university, I am not sure.

The President: There are a few people in Edinburgh, for example at the Royal Bank of Scotland, wondering where all the money came from as well – or, at least, where it has all gone, anyway. Nothing much has changed.

Mr W. B. McBride, F.F.A.: Sir Michael, towards the end you asked whether there is a role for the unity of knowledge. Leaving aside the possibility of that unity being achieved by the Large Hadron Collider causing us all to disappear simultaneously into a black hole, I did not quite see how you felt there still could be a role for that unity given the diversity of the types of knowledge. Could you say a bit more about that?

Sir Michael: Well, the increased specialisation and depth of knowledge means, of course, that no individual covers the same scope as before. Nevertheless, it is possible at a higher level to exchange ideas across borders between different fields, particularly when they are interconnected at a social or economic level. So, all these questions about global warming, and so on, involve all possible types of expert, including economists and politicians. They get together at various fora and exchange ideas about how to act.

It is certainly possible at the right level. You cannot exchange ideas of technical, detailed knowledge, but you can in terms of impact of ideas and the connection between different fields. It is at a higher level of abstraction. You cannot just talk in the marketplace; it is talking about the impact of ideas on society as a whole. It is vital that we do not go into our separate silos, close the doors and say, "Sorry, I cannot help you because that is not my field." That would be a disaster.

Dr D. J. P. Hare, F.F.A.: Sir Michael, if the Scottish Enlightenment had happened at a time when there were worldwide web chat rooms and the easy access to knowledge and discussion worldwide, who would you have liked to see in other parts of the world at the time taking part in the Enlightenment discussions in the chat rooms, and what do you think might have been the result?

Sir Michael: Well, Benjamin Franklin and David Hume were chatting. They wrote letters. It took longer of course. People did communicate; it was just slower. And perhaps because of that it was in greater depth. You did not just chat, you thought! But it is true. Think of the poor historians of the future. Now people look back to see what David Hume and Benjamin Franklin wrote to each other in their beautiful copper plate writing. Now what have you got? Lots of chit-chat on the web. It is hard to find, and when you do find it, it is just a lot of silly, stupid comments. The historians of the future will have no idea what really went on behind the scenes.

The President: We will draw to a close. When Faculty Council had the initial idea of inviting Sir Michael to speak, and had the idea that "Lessons from the Scottish Enlightenment" might be a suitable title – one which Sir Michael seized on with great enthusiasm – we were in the dark days of

the financial crisis. In a way we were looking to you, Sir Michael, to give us some insight, some inspiration, as to how we might get out of these dark financial times. You know the joke that went round at the time: How do you buy a small Scottish bank? Buy a big one...and wait.

We were looking to you for insight and inspiration as to how we, in our small profession, might play a part in getting perhaps not the glittering enlightenment that you have shown us here tonight, but at least some small chink of light at the end of what seemed at that time to be a very dark tunnel.

You have, Sir Michael, exceeded all our expectations, which, based on your reputation, were already high. You have shown yourself not only to be a great mathematician but also an accomplished historian with a sideline in pay and conditions for professors, which I am sure will have gone down very well with the people in the front three rows here, many of whom fit that bill. And you have done so in a charming and engaging way, and one that puts things in context. Although a number of the things you said tonight were things that I had learned at school or subsequently, I had not seen them all knitted together in the way that you have done. So we thank you for that.

Faculty Council seeks in Scotland to build what we are describing as a triangle, with the profession on one corner, academia on another and business and commerce on the third. It is hoped we will achieve this with the blessing of the Scottish Government, and we are working hard on that. There is much more we can do. We recognise that some of what went wrong in the credit crunch was precisely the silo point that you describe. Some individuals in banks knew a huge amount about overdraft risks, other individuals knew a lot about credit risks, and so on. Yet nobody was taking the overview that saw all the different risks in some kind of context or saw the common thread of risk, liquidity and credit that ran through all of them. So nobody was on the bridge; everybody was down in the engine room.

We hope that the Actuarial Profession, in part because of our new qualifications, and in part because of the efforts that we are making to develop people skills, might play a part on that bridge and make the financial waters a bit safer in the future. Whether or not we succeed in that quest will be down to us; but to you, Sir Michael, we are very grateful for the insight and the inspiration to encourage us to do it.

I would like, firstly, the audience to show their grateful thanks to you for your inspiring talk tonight. Secondly, I would like you to accept this paperweight with the Faculty crest on it as a small token of our appreciation for what you have done tonight. Lastly, a small token of our gratitude to Lady Lily, who has, once again, given up her husband for the evening for the greater good of science and humanity.