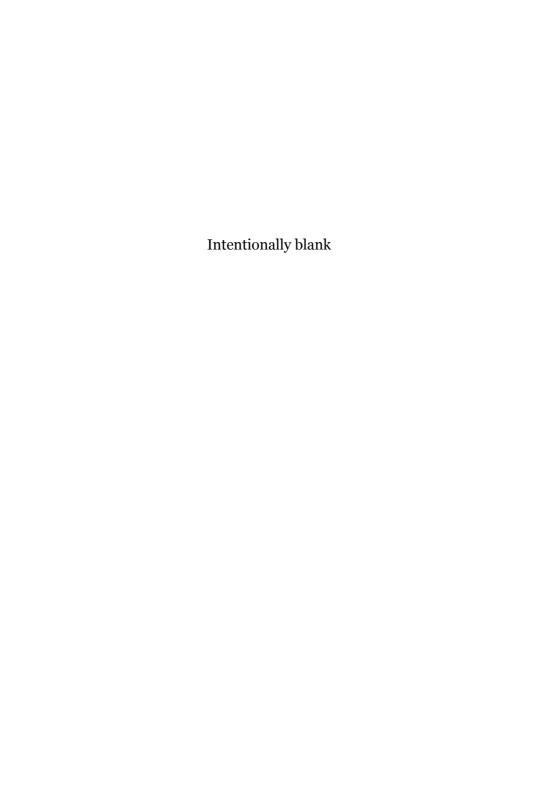
SHOWCASING SCOTLAND'S SCIENCE, TECHNOLOGY AND INNOVATION



Commemorating the Vicentenary of The Royal Scottish Society of Arts





The Royal Scottish Society of Arts

Bicentenary 1821-2021

SHOWCASING SCOTLAND'S SCIENCE, TECHNOLOGY AND INNOVATION

www.rssa.org.uk

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Eminent Fellows of the Royal Scottish Society of Arts



Rev Dr Thos, Chalmers Fellow

LORD FRANCIS JEFFREY THOMAS SHANKS Original Fellow 1821 Engineer, Johnston, 1843

Sir David Brewster LL.D., F.R.S. First Director 1821

THOS, STEVENSON, C.E. R. L. STEVE
President 1859
Keith Prizeman Society's Med

Hon, Lord Newton Fellow and Office-bearer

ALEX. KIRKWOOD, Sr. EDWARD SANG, LL.D., Fellow F.R.S.E., Fellow 1828 Secretary 1868-89

JOHN BEATSON BELL SIT JAMES Y SIMPSON F An Active Fellow Physician (Life Fellow



R. L. STEVENSON Awarded Society's Medal 1871

Prof. PIAZZI SMYTH Astron. Royal. Fellow 1855. Lived15 Royal Ter.

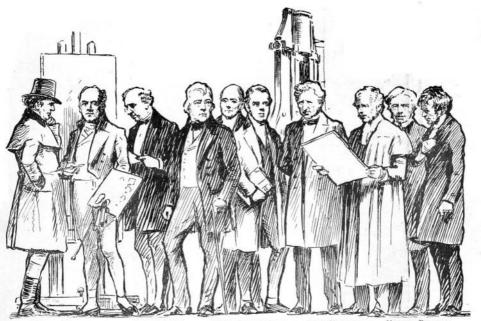
ALEXANDER FRASER Printer Fellow 1850

FLEEMING JENKIN Professor C.E. Fellow 1868

And, Beatson Bell. Fred, Jas, Ritche Advocate James Ritche Fellow 1859 Clockmakers

s Y. Simpson Heriot Currie Karl Fröbel.
ysician Chief Engineer Teacher
Fellow of the Pharos

CHARLES COWAN JOHN HORSBURGH D. BRUCE PEEBLES H.R.H.PRINCEOPWALS
Paper Maker, Penicuik Photographer Engineer Hon, Fellow 1880
President 1868 Fellow 1861
Patron as King Edward



THOMAS TELFORD Bridge and Road Maker Original Counsellor 1821

James Tod, w.s. Secretary 1827 Framed the Rules

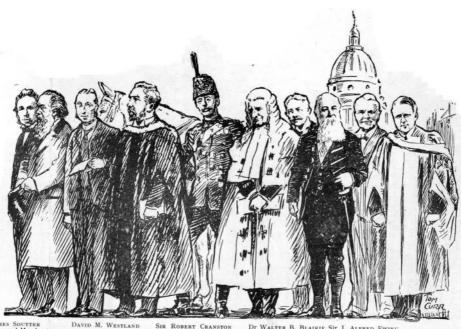
Built Bell Lighthouse Vice-President 1831-32

James Nasmyth Exhibited Steam Carriage 1827

Scientist Hon. Fellow 1830

Sir Henry Raeburn Portrait Painter Original Counsellor 1821

Sir Walter Scott, Bt., Leonard Horner, 1821 Rev. John Thomson David O. Hill, R.S.A.
F.R.S.E., Original Fellow A Founder of the Academy and Counsellor 1821 And Watt College Landscape Painter Counsellor 1821



James Soutter Furner and Merchant Fellow 1865-79

ALEX. MELVILLE BELL Life Fellow 1850 Father of Dr Grah, Bell

M.INST.C.E. Fellow 1879

SIR ROBERT CRANSTON Elected Fellow 1876

DrDawson F.D. Turner A President

Rt. Hon. LORD KINGSBURGH President 1890

Dr Walter B. Blaikie Sir J. Alfred Ewing Printer Principal of University Vice-President 1890 Fellow and Hon. Pres.

Daniel W. Kemp, J.P. Fellow 1873 Vice-President 1885-6

Prof. HENRY BRIGGS Inventor Medalist and President

Foreword by the President Dr Alison Morrison-Low

It has been an honour and my pleasure to have been the incumbent President of the Society during this period in which we have celebrated our Bicentenary, and I would like to thank Council in particular, and the Bicentenary Sub-committee especially, for all their help and support.

This has been a particularly unusual and elastic time, as the world closed down and shrank to individual households thanks to the pandemic. We all learned how to attend the regular Lecture series on Zoom, but sadly the immense amount of planning that had gone into a lunch to be attended by our Royal Patron eventually came to naught, partly because of circumstances beyond our control, and finally because of the sad death of Her Late Majesty Queen Elizabeth II.

As the Society's representative, I was present at the Scottish Parliament for the "Motion of Condolence for H.M. The Queen" on 12 September 2022, and a few days later, with Council Member Professor Beverly Bergman, I met with H.R.H. The Princess Royal to discuss Her Late Majesty's patronages.

This small booklet records and celebrates the Society's activities in commemoration of its Bicentenary, notwithstanding all the unexpected challenges of the last three years. May the next two hundred years be just as worthwhile celebrating!

Alison Morrison-Low President

Frontispiece

Edinburgh-born Tom Curr (1887-1958) was one of Scotland's most successful commercial artists. He produced this sketch of "A Few Fellows throughout the Long History of the Society 1821-1934", used as the cover of a pamphlet produced in 1936.

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Office-Bearers in 2021

Patron:

Her Majesty the Queen

President:

Dr Alison Morrison-Low

Immediate Past President:

Professor Stuart Monro OBE

Vice-Presidents

Professor James Floyd, Brigadier Joseph d'Inverno

Councillors:

Professor Beverly Bergman OBE, Mr Stuart Brown, Mr John Lovell, Dr Carol Marsh OBE, Professor Ian Robson, Mr Neil Short

Secretary:

Mr Peter Jones

Treasurer:

Mr Graham Rule

Programme Secretary:

Brigadier Ian Gardiner

Excursion Organiser:

Mr Peter Jones

Webmaster:

Mr Graham Rule

The Bicentenary Committee

Dr Alison Morrison-Low

Mr Peter Jones

Professor Beverly Bergman OBE

Brigadier Joseph d'Inverno

Mr John Lovell



The Royal Scottish Society of Arts in the 21st Century

The Royal Scottish Society of Arts (RSSA) was founded in 1821 as 'The Society for the Encouragement of the Useful Arts in Scotland' and incorporated by Royal Charter in 1841. It was concerned with the fields that we would now describe as science, technology, engineering and manufacture, but which were then known as the useful arts, as opposed to the fine arts, for example music and painting.

Today, in the 21st Century, the Society's remit is to showcase Scotland's Science, Technology and Innovation, through a range of activities comprising a series of lectures during the winter months, whilst summer excursions for Fellows are arranged to places of special and current scientific interest.

The lectures, which are also open to members of the public, are given by expert and distinguished speakers on a wide range of scientific and technological subjects. The original aim of the Society is maintained, with particular emphasis on relevance to the modern Scotland in which we live. Recent subjects have included the human genome, gravitational waves, precision medicine, the use of high-powered lasers and the James Webb Space Telescope, as well as topical issues such as climate change, energy and the availability of critical minerals. Visits that have been made include the FloWave Centre and Bayes Centre at the University of Edinburgh and the National Museum of Flight at East Fortune.

The Society also awards annually two prizes, to the students in Scotland with the highest marks in the SQA examinations in Higher Engineering Science and Advanced Higher Engineering Science.

For the Bicentenary, the Society is launching a Travel Scholarship to enable a $3^{\rm rd}$ year undergraduate to obtain experience over and above

that which they would normally be expected to obtain in the course of their undergraduate studies, the project being undertaken either abroad or in the UK.

Fellowship of the Society is open to all who have an interest in science and its place in society. Intending applicants require to be proposed and seconded by current Fellows of the Society and are asked to complete an application form that should be sent to the Secretary secretary@rssa.org.uk for consideration by the Council. Successful applicants are asked to attend in person at the meeting at which their election will be confirmed by acclamation.

The Society's Rules allow for the election of up to 10 people "Distinguished in the Science of the Applied Arts" as Honorary Fellows. Details of the Honorary Fellows are shown below.

Honorary Fellows

Professor Dame Anne Glover DBE FRS FRSE FASM Biologist and former Chief Scientific Adviser for Scotland

Professor Catherine Heymans MPhys DPhil FRSE Astronomer Royal for Scotland

Professor Peter Higgs CH BSc MSc PhD FInstP FRS FRSE Theoretical physicist and Nobel Laureate

Professor Sir James Hough OBE FRS FRSE FInstP FRAS Physicist who was integral in the detection of gravitational waves

Professor Malcolm Longair CBE FRS FRSE Physicist, astronomer and former Astronomer Royal for Scotland

Professor Stephen Salter MBE FRSE Professor of engineering promoting wave energy and geoengineering

The Bicentenary Year Lecture Programme

25 January 2021

Dr Alasdair William Clark

Whisky Tasting using a Nanoscale Optical Tongue

22 February 2021

Craig Clark

Mission: Scotland in Space

29 March 2021

Professor Keith Bell

Powering Past Fossil Fuels: Electricity and Net Zero

26 April 2021

Professor Siddarthan Chandran

What are the prospects for Regenerative Neurology?

7 June 2021

Professor Ian Robson

The Pluto Story: Demise of a Planet!

27 September 2021

Dr Bradley Harper

Sherlock Holmes as Science Fiction

25 October 2021

Professor Lorna Dawson

Natural Justice and a Sense of Place: How Soil can be Used as Intelligence and Evidence

29 November 2021

Professor Ian Robson

The Changing Scene in Astronomy

The COVID-19 Pandemic

The COVID-19 pandemic, which began in the Orient as 2019 drew to a close and spread rapidly to involve the entire global population, had a profound impact on the Royal Scottish Society of Arts and its planned Bicentenary commemorations. Many events had to be postponed or cancelled owing to the need to limit the spread of infection, through restrictions on the number of people who could gather, the requirement for social distancing, and the understandable reluctance of people to expose themselves to risk by attending public events.

Some events which had been planned for the Bicentenary year of 2021 were rescheduled for 2022, including the Bicentenary Seminar which was initially scheduled for December 2021, accompanied by glühwein and mince pies, but eventually took place in June 2022 with "bubbly" and strawberries & cream! A full report of the Seminar and transcript of the President's lecture begins on p.24.

By late 2022, a semblance of normality was beginning to emerge, and the first tentative steps were taken towards resuming inperson lectures, although a "hybrid" option using simultaneous streaming by Zoom online technology was also offered. This not only enabled those who were still taking COVID precautions to "attend" the lectures virtually, but also facilitated participation by Fellows who were physically unable to attend lectures, whether through distance, restricted mobility or other issues. At the time of writing it seems likely that this popular option will be retained.

In keeping with the Society's focus on leading-edge technology, the COVID pandemic has also provided the stimulus for the inclusion of expert lectures on immunology during the 2022-2023 Session.

The Bicentenary Coat of Arms

On 11 May 1978, the Royal Scottish Society of Arts was granted its coat of arms by the then Lord Lyon King of Arms, Sir James Monteith Grant. The arms are blazoned:

Or, between two eagle owls heads affrontée Proper a torch Sable paleways enflamed Gules, on a chief Azure a saltire Argent, all within a bordure Ermine, and on a wreath of the Liveries Sable and Or is set for the Crest the head of the goddess Athena contournée helmeted Proper, and in an escrol over the same this Motto "PRO SCIENTIA ET ARTE," and on a compartment below the Shield are set for Supporters, dexter a scientist and sinister an artisan both in the habit of the early 19th century, the former bearing in his dexter hand a balance and the latter in his sinister hand a perpendiculum.

The original version, as painted on the Letters Patent issued to the Society in 1978, is shown opposite, top.

The heraldic artist Mark Dennis, formerly Ross Herald Extraordinary at the Court of Lord Lyon, kindly agreed to develop a commemorative version of the coat of arms for the Bicentenary. Such a version is heraldically permissible provided that the coat of arms itself continues to adhere to the blazon as reproduced above. The result was the spectacular image on the right, which has been used throughout the Bicentenary year on the Society's website, letter headings and other correspondence, and on the Bicentenary mug (see page 16). As the postponed Bicentenary commemorations continued, so the commemorative arms continued to be used to the full.

The Society is extremely grateful to Mark Dennis for his important and valued contribution to the Bicentenary.





Commemorative Mug

The coat of arms was used as the basis for a commemorative mug, which was sent to every Fellow. Produced by Stupid Tuesday of Windsor, they proved very popular and many Fellows ordered additional mugs at £10 each.



Lapel Pin Badge

The Bicentenary Committee agreed that a commemorative lapel pin badge should also be obtained and sent to every Fellow. The design was to be based on the President's badge of office, which in turn is derived from the Society's crest as borne on the coat of arms. It features the head of Minerva or Athena, the Classical goddess of wisdom.

Professor Beverly Bergman took on the task of designing and sourcing the badges. High-quality photographs of the President's badge of office had already been obtained, and from these, an image of the head of Minerva was extracted which could be used to produce a 3D badge.



3D mould for the head of Minerva



The finished lapel pin

The head of Minerva was to be in gold-coloured metal, on a dark red enamel background with "RSSA 200" and "1821-2021" in gold-coloured characters. The company chosen was i4c of Coventry, and the result was very fine indeed. A badge was sent to every Fellow free of charge, and additional badges could be obtained at £2 each.

The Society's Tartan

A suggestion that the Society should have its own tartan was met with widespread approval by Council. Opening up the design to a competition among the Fellows, or among students or schoolchildren, was discussed but rejected as it would be time-consuming, and it would be difficult to administer during the pandemic lockdown when schools and colleges were struggling to maintain even normal classes, and when people generally had other priorities. Accordingly, Lochcarron tartan manufacturers, who operate a design service, were asked to produce a range of designs, using predominantly the colours of the Bicentenary coat of arms.

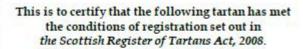
Of the six alternatives that they produced, one stood out and was the unanimous choice of the Bicentenary Committee, subsequently endorsed by Council. Its shades of green and brown, with highlights of white, blue and yellow, are redolent of the landscapes and coasts of Scotland and call to mind the Agricultural Revolution in Scotland

which preceded the formation of the Society in its original form as "The Society for the **Encouragement of** the Useful Arts in Scotland". It has been registered with the Scottish Register of Tartans in the name of The Royal Scottish Society of Arts; hence, it is not limited to the Bicentenary.





The Scottish Register of Tartans



The Royal Scottish Society of Arts

Registration Number: 13,301

Thread count details W/6 G34 B6 T6 LG6 T6 LG12 T12 Y/6 (Half sett, full count at pivots)

Colour Details W=WHITE; G=GREEN; B=BLUE; LG=LIGHT GREEN; Y=YELLOW; T=BROWN;

> On behalf of the Keeper of the Scottish Register of Tartans

Patricia M Todd

21 September 2021





The Tartan Scarf

The Society's tartan will be available to be woven into a wide variety of items which will be considered in the future. However, with the approach of winter, Council decided that a scarf would have the

greatest appeal!
Accordingly an order was placed with Lochcarron; the arrival of the beautifully-presented scarves at only £15 each, just before Christmas 2021, solved the perennial question of Christmas presents for friends and family for many Fellows!





The scarf in the RSSA tartan, expertly modelled by Mrs Isobel d'Inverno

The RSSA Medals

Over the years, the RSSA has awarded various medals to encourage innovation and achievement in the "useful arts" of Science and Technology.

The RSSA's **Bronze**Medal is currently
awarded to students
taking Scottish
Highers
examinations. Two
awards are made





annually; to the student with the highest marks in the SQA examination for **Higher Engineering Science**, and to the student with the highest marks in the SQA examination for **Advanced Higher Engineering Science**. The Society also awards a **Silver Medal**, of the same design, for special services rendered.







RSSA Awards given historically include the **Keith Medal** (left), the **Makdougall Brisbane Medal** (centre), the **Reid & Auld Prize** (p.44) and the **John Stewart Hepburn of Colquhalzie Medal** (right).

The Travel Fellowship

In keeping with its commitment to promoting education in STEM subjects, the Society instituted an undergraduate Travel Fellowship to commemorate its Bicentenary. The first award was to have been made in 2022, but the ongoing disruption to higher education resulting from the pandemic years meant that it was not practical to invite applications until early 2023.

The quality of the applications received was impressive, and as a result, Council took the decision to award two Travel Fellowships to students this year. Both receive £2,000 towards their studies.

The successful applicants were:



Mac Walker, University of Edinburgh (Mathematics), for a project entitled "Improving public transport efficiency in Edinburgh using modern deep learning techniques", which will take him to the JTL Urban Mobility Lab in Boston, USA. His project will involve collecting data from a wide range of reported measures published by the Scottish Government and then studying modelling techniques in Boston, where he will be able to learn from experts in the field, using graph neural networks and other techniques. On his return to Edinburgh, Mac will train the model on the Edinburgh dataset, which should then be able to predict traffic patterns under different conditions to inform policy and planning. The project has the potential to benefit the whole community in Edinburgh, as well as providing Mac with a valuable learning experience.

Ann-Kathryn Hoffmans, University of Edinburgh

(Chemistry) to study synthesis of chiral nitroxides as catalysts for

the dynamic kinetic resolution of alcohols, at the Arctic University of Norway in Tromsø, Norway. This is a topic which has important applications in field such as pharmaceuticals, and Ann-Kathryn's project will enable her to gain practical experience of techniques that she has only been able to study in theory. This will feed into her 5th year project and beyond. She will also



benefit from working with international experts, in a field which she is passionate about.



The Bicentenary Seminar

On Thursday 16 June 2022, the Society's flagship Bicentenary Seminar, looking back to the roots of the Society and forward into the future, took place at the Royal Scots Club, Edinburgh. Through the technical skills of RSSA Treasurer Mr Graham Rule, it was also recorded for the future benefit of those who could not attend in person. The event had been rescheduled from December 2021, when COVID-19 restrictions had precluded its being held. Around 40 Fellows and guests attended in person, and were welcomed with a glass of "bubbly". The Seminar was opened by RSSA Councillor and



Past President Professor Ian Robson, who described how he had become a Fellow on his return from working in Hawaii! He then introduced the first speaker, RSSA President Dr Alison Morrison-Low. The President took on the daunting task of encapsulating 200 years of the Society's history in a 45 minute lecture. With great skill, she demonstrated the vital

part that the Society has played in bringing together great minds and disseminating knowledge at the cutting edge of science and technology. After a short break, during which the audience was served with strawberries and cream, Immediate RSSA Past President Professor Stuart Monro took the Chair and introduced Professor Dame Anne Glover, Immediate Past President of the Royal Society of Edinburgh (RSE), former Chief Scientific Adviser for Scotland and first Chief Scientific Adviser to the President of the European Commission, who took to the stage to describe the work of the RSE's Post-COVID-19 Futures Commission, which she chaired and which has been exploring how Scotland can be helped to emerge as positively as possible from the pandemic. Themes she identified included building national resilience; data evidence and science; inclusive public service; and public debate and participation.



Two Hundred Years of 'The Useful Arts' In Scotland

Address by the President Dr Alison Morrison-Low at the Bicentenary Seminar

This lecture celebrates two hundred years of the Royal Scottish Society of Arts. As a warning about the approximation of this anniversary, I would like to quote a colleague of mine, Emeritus Professor Jim Bennett, who prefaced his remarks last summer marking the 40th meeting of the Scientific Instrument Commission by reminding his audience that bodies such as his and ours do not spring fully-formed - appropriately enough - like the goddess Minerva from the head of Jupiter. London's eminent Royal Society, for instance, did not just come to life in 1660 London: indeed, its early historian Thomas Sprat took care to look backwards to its roots, in Oxford and elsewhere, during the Interregnum and before. Thus, our somewhat less venerable Society did not just spring into being in 1821.

The talk will look at where the Society came from; how its first, and well-documented, century passed, by using a number of themes which are particularly interesting; and then explain how it reformed after the First World War into something rather more appropriate for changing times; and once again, has managed to remodel itself, putting youth and the future in a more prominent place, "Showcasing Science, Technology and Innovation".

The Enlightenment Years

Enlightenment Scotland was fizzing with ideas, and practical ways of putting these into operation. Sir John Graham Dalyell, a lawyer and antiquarian, in his Presidential speech to this Society in November 1840, suggested that, looking back, "agriculture

promoted certain branches of mechanics". "An Agricultural Society," he claimed, "had been established in 1723; and a thrashing



machine appeared in 1735 ... between 1750 and 1760 a great impetus to improvement was given by the 'Edinburgh Society for Encouragement of Arts, Sciences, Manufactures, and Agriculture', which sometimes offered 120 premiums annually. Individuals also lent their aid ... many advantages ensued; inventions and improvements originated everywhere over Scotland ... At length the institution of our 'Society for

Encouragement of the Useful Arts' has given more systematic patronage to genius."

This eighteenth century "Society for Encouragement of Arts" was set up in 1755 by members of the Select Society - established the previous year by the painter Allan Ramsay. Earlier, the Philosophical Society of Edinburgh was established in 1737, growing out of the Society for the Improvement of Medical Knowledge. In 1783, the Philosophical Society was absorbed into the newly formed Royal Society of Edinburgh which continues to this day as Scotland's national academy.

Science for Aristocrats - and for the Public

The Royal Society of Edinburgh, as finally established after a series of false starts, had of course an exclusively male fellowship, consisting of aristocrats and members of the upper classes, essentially and for the most part those who did not have to work for their living, although there were a few notable exceptions. Public

lectures on scientific subjects had already proved popular in London, and these were sometimes given in Scottish cities. James

Ferguson, born in 1710, came from Keith in north-east Scotland. From an impoverished background, he managed to make his way south to Edinburgh, making his living by painting portrait miniatures while being scientifically educated. From there, he eventually made his way to London, where he made his home from 1743. Five years later, he began travelling all around Britain, lecturing on experimental philosophy to the paying public. His fascination with



his subject, his clear explanations, his ingeniously constructed diagrams and mechanical apparatus turned him into one of the most successful lecturers on scientific subjects of his generation.

A generation younger than Ferguson, another famous itinerant lecturer was a man from Kirkcaldy, known, as he lost his sight thanks to smallpox at the age of three, as Blind Henry Moyes. Having impressed no less a person than the economist Adam Smith, Moyes obtained the patronage of David Hume and Thomas Reid for his education. But his blindness meant that he required assistance for his demonstrations - these were mainly in chemistry and optics - and latterly his helper was the younger William Nicol, subsequently inventor of the prism that bears his name. Moyes travelled extensively, holding public lectures all over Britain; he also went to Ireland, and at one point during the 1780s to the United States. He died in 1807, on one of his circuits, at Doncaster; and his place was taken by William Nicol, who also inherited his lecture apparatus.

Science and the Universities

These two examples of 18th century travelling lecturers demonstrate that there was a popular demand for science as entertainment, if not as education, and not only in Scotland. Generally, science in Scotland was based around the universities, or at least in those cities which housed such seats of learning. St Andrews, where the oldest university was established in 1410, was always too small and remote a settlement to support extra-mural scientific teaching until the reforms of the late 19th century. Interestingly, under the statutes of 1727 the University of Glasgow's professor of natural philosophy (what we would call physics) was obliged to give a course on experimental philosophy especially designed for the general public. John Anderson, professor from 1757 until his death in 1796, turned this into a course in applied science for the "Manufacturers and Artificers in Glasgow". The course met four times a week during term time, costing a guinea a head (using a currency converter, this is about £107 - not exactly the price of a pint of beer). Nevertheless, this apparently proved extremely popular, at a time when Glasgow's importance as a commercial and industrial centre was booming. Anderson claimed that it was attended by the "Town's people of almost every rank, age and employment": free tickets were distributed by the professor to "gardeners, painters, shopmen, porters, founders, bookbinders, barbers, tailors, potters, glassblowers, gunsmiths, engravers, brewers and turners."

Anderson spent much of his time at the University of Glasgow quarrelling with his colleagues; and subsequently left his substantial estate to fund a rival establishment. Initially known as the Andersonian Institution, then the Royal College of Science and Technology, we know it today as Strathclyde University. Its first professor of natural philosophy was an Edinburgh-educated Yorkshireman named Thomas Garnett, amongst whose duties was to deliver morning and evening public lectures on natural philosophy and chemistry, with particular reference to the useful arts and manufactures. After Garnett left to join Count Rumford's Royal Institution in London in 1799, his place was taken by another Edinburgh-educated Yorkshire doctor, George Birkbeck.

Birkbeck required a new set of apparatus for his lectures, and found himself in the maker's shop with a circle of workmen gathered inquisitively around a model of a centrifugal pump. He asked himself: "Why are these minds left without the means of obtaining that knowledge which they so ardently desire, and why are the avenues of science barred against them because they are poor?"

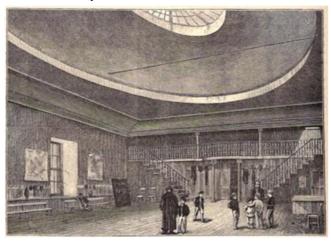


Thus prompted, he began a special course of free lectures on the "mechanical properties of solid and fluid bodies" - with 75 attending on the opening night. Four lectures later, some 500 mechanics were in attendance. The course was spread over three months, and was repeated each year until 1804 when Birkbeck left for London. The course was continued by Birkbeck's successor at the Andersonian, Dr Andrew Ure - and Glaswegians will tell you that it inspired the first fully-fledged mechanics' institute, the Edinburgh School of Arts.

The Mechanics' Institutes

This general lack of technical and scientific education available for workers was not just felt in Glasgow. One day, the linen merchant and social reformer Leonard Horner was discussing this problem with his friend the clockmaker Robert Bryson, who was finding it difficult to provide training, especially mathematical instruction for his apprentices. From this discussion, in Bryson's Edinburgh premises, the pair decided to do something about it themselves. With the support of several wealthy Edinburgh citizens, such as the novelist Sir Walter Scott, the lawyer Lord Cockburn, and the Craig family of Riccarton, who agreed to give annual subscriptions to help pay for the cost of classes, they set up evening classes with affordable fees for working men.

On 16 October 1821 the Edinburgh School of Arts "for the instruction of mechanics in such branches of physical sciences as are of practical application in their several trades" held the first lecture in chemistry at St Cecilia's concert hall in the Old Town.



Despite criticism from the establishment fearing that educating the lower classes would lead to revolution, the School received support from the *Scotsman* newspaper, and within a month 452 students had been enrolled. Its first aim was to provide for working men systematic courses of lectures, especially chemistry, mechanics and mathematics. It also developed classes for more elementary

instruction, a library and a collection of models and apparatus for experiments, all hallmarks of the later mechanics' institutes. Sad to say, nothing remains today of the collection of models and apparatus, except a Watt copying machine, and some surveying instruments. The School itself has also survived the years, becoming first, Heriot-Watt College in 1885, and from 1966 the Heriot-Watt University we know today.

David Brewster and the Birth of the RSSA

However, reasonably straightforward as this may sound, there was a complication. As early as 1819, there was a proposal to set up a new forum for practical mechanics for the working classes in



Edinburgh by, amongst others, the young David Brewster, Sir John Robison and Guthrie Wright as the "Society for Encouraging the Useful Arts in Scotland". This was no doubt prompted by the then huge legacy left by Alexander Keith of Ravelston and Dunottar, who was an antiquary, friend of Sir Walter Scott, and Fellow of the Royal Society of Edinburgh, of which society he was the first treasurer. He died in 1819, leaving

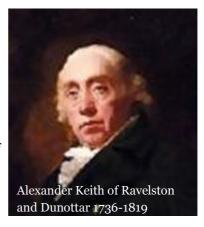
£1000 (worth about £57,000 today) for the promotion of science: and in due course his trustees (Brewster and Dr Keith of Edinburgh) allocated £600 of this to the Royal Society of Edinburgh for a biennial prize to be published in their *Transactions*, and the remaining £400 to be put towards a new foundation, to be called Society of Arts.

Brewster was an ambitious and energetic populariser of science, who had been producing a rival encyclopaedia to *Britannica* since 1808, with somewhat mixed results, but this endeavour meant that

he was extremely well-connected with a European-wide network of scientists. Not only was he interested in scientists and their work, and scientific education generally, he was interested in scientific instruments and their development - he wrote a book entitled *New Philosophical Instruments* in 1813, but is perhaps best remembered for his 1817 invention of the kaleidoscope (or rather, the row that went with his attempts to patent this device).

Possibly prompted by the £400 Keith legacy as a pump-priming device, the new Society was promising in its literature by December 1819, to "encourage the mechanical and chemical arts, by awarding prizes, either in the form of money or honorary medals, to the

authors of useful inventions or valuable processes; by assisting inventors in securing the just advantages of their labours; by performing useful experiments, or making trials of machinery, when the inventors themselves have not the means of carrying their ideas into effect; by depositing models of new inventions and interesting machines in a Hall erected for that purpose; and by disseminating useful knowledge among the



industrious classes of society." Inspiration may have also come from the London-based Society of Arts, which offered similar premiums. Further funding for the Scottish society would come from the members, who paid a subscription of one guinea annually.

In a complicated episode, teased out some years ago by the historian of science, Steven Shapin, David Brewster appears to have been involved with Leonard Horner in setting up the Edinburgh School of Arts, the first of many "mechanics' institutes" set up for the scientific education of local artisans around the country at this

period. This was, in Shapin's words, "an instant success, with over 450 students in its first year". However, in an almost inexplicable move - Shapin suggests that Brewster had somehow convinced himself that Horner's School was merely temporary - Brewster set out in 1822 to establish a similar body, more closely linked to the Society of Arts, with the same name and the same lecturers, and very nearly managed to destroy both. There was a public meeting; explanations were made; Brewster had formed another implacable enemy.

Nevertheless, by 1822 the Society of Arts was itself "regularly organised", as a report (probably written by Brewster) stated. By now there were over 200 members. There were committees on accounts, laws and regulations, the chemical arts and the mechanical arts - mostly made up of middle class professionals. The great and the good, starting with the Royal Patron (His Majesty the King, at this point George IV) and six Presidents, noblemen all, had nothing to do with the daily running of the enterprise.

Communications were heard at meetings, sent to the relevant committee, and then reported upon at subsequent meetings, with recommendations for medals and prizes presented at the end of each session.

The new Society's manifesto proclaimed that its objects were: "To stimulate and reward genius and mechanical industry, and to afford a ready and useful medium of intercourse among men of all ranks, who were engaged either in the pursuits of Science or in the various practical departments of the Arts". Its proceedings were reported annually in a journal which at the time was co-edited by Brewster, the *Edinburgh Philosophical Journal*, published by the Edinburgh publisher Constable. Unfortunately, Brewster fell out with the other editor, the eminent and strong-minded natural historian Robert Jameson, and by 1824, Brewster had managed to persuade the publisher Blackwood to support his rival *Edinburgh Journal of Science*, which survived until 1832. From 1824, a list of the Society

of Arts' proceedings appeared in this latter journal, and they were also noted from 1837 in the re-named *Edinburgh New Philosophical Journal*.

As an aside, Edinburgh at this period was full of rival publishers of encyclopaedias, periodicals, books, newspapers, all helped by a revolution in the steam-driven printing presses and stereotyping; there is sufficient background material to providing a literate public with an apparently insatiable demand for reading matter for a separate lecture.

The Royal Charter

In 1841, the Society obtained its Royal Charter, and changed its name from the cumbersome "Society for Encouraging the Useful Arts in Scotland" to the snappier "Royal Scottish Society of Arts", giving something of a clue to its ambitions. That same year, 1841, it began to publish ("Printed for the Society by Neill & Co.") its own series of *Transactions*, and in the first volume there is a copy of the Charter of Incorporation (in both English and Latin), a list of its 440 members, and a summary of its laws.



Encouraging Inventions

My own interests, as a former curator at National Museums Scotland, are very much biased towards new or modified scientific instruments. In the twenty-odd year period before the publication of the *Transactions* a number of instruments were presented or described. At the meeting of 27 December 1822, there were 12 communications, amongst which was one by Professor William Wallace, describing his new mechanical device for scaling drawings, named the eidograph; he was awarded a gold medal for this by the Society in 1825. Co-incidentally, another pantograph-related item for the same purpose, Andrew Smith of Mauchline in Ayrshire's apograph was also discussed at the same meeting. A local Edinburgh instrument-maker, Peter Hill, presented an idea for "an improved saccharometer", an instrument which measures the amount of sugar in a liquid (usually an alcoholic liquid, and thus of interest to the Excise for taxation purposes), but further details of this have not emerged. And David Brewster produced another item close to my heart, "a method of constructing large lenses for lighthouses or for burning glasses": in effect, a form of the Fresnel lens - but that's another story.

John Adie, of the celebrated Edinburgh instrument-making family, first discussed an "improved cistern for barometers" before the Society on 15 April 1829, and a paper describing this was published in Brewster's *Edinburgh Journal of Science* that September. Slightly earlier, Adie had presented improvements in dew-point instruments before the Royal Society of Edinburgh (Brewster was Secretary there), and the paper was also published in Brewster's *Journal*. This explains the dual award stated on his gold medal of 1830.

John Adie, who was at the start of his career during the 1820s, frequently worked with his father Alexander, head of the instrument-making firm Adie & Son, and with William Galbraith, a mathematics teacher with an interest in practical science, especially

surveying. Their investigations into the heights of mountains, magnetic variation and compilations of the resulting tables were frequently publicised through the meetings of the Society of Arts. Galbraith's final commission from John Adie was in 1836, for a New Pocket-Box Circle (essentially a form of portable surveying instrument), exhibited at their April 1826 meeting, at which it won a silver medal. There is an example of this in the collections at St Andrews University.



The Transactions of the Society

The first volume of the Society's *Transactions* - initially the fascicules, produced quarterly, were given away free to members of the Society - was bound together at the end of 1841. Contents included (amongst many others) improvements on carpet manufacture, aspects of joinery, drainage, railways, chemistry, as well as a report by a committee on the best alphabet and method of printing for the use of the blind. It is not possible to cover all the subjects for the rest of the nineteenth-century; but many of them, written by figures who later became historic players of some significance, can be found here. For instance, John Scott Russell, a

civil engineer of subsequent international standing, presented papers in our first volume on bridge construction, the rotary steam engine and buildings, and was a vice-president of the Society; later, he was to collaborate with Isambard Kingdom Brunel in the building of the steamship *Great Eastern*.

The early stages of the reception of photography were documented and demonstrated before the Society, in part because of the personal contacts of those in charge. Photography was invented in two forms: first, the French daguerreotype, a sensitised metal plate rendering a reversed single pin-sharp positive, was announced to the world in early 1839. Sir John Robison, president for 1841-42, happened to be in Paris, and was able to visit the inventor, Louis Jacques Mandé Daguerre, and see for himself, and report to the Society "that the pictures produced by his process have no resemblance to anything which, as far as I know, has yet been produced in this country." The second form of photography, experimented upon by the Wiltshire landowner, William Henry Fox Talbot as early as 1835, and then laid aside as he pursued other avenues of research, was conveyed to Sir David Brewster, at this point based at St Andrews University. Talbot had been prompted into publication of his method of photography through Daguerre's



announcement in the newspapers. His process came to be known as the calotype, and used sensitised paper for both negative and positive: it was the ancestor of all photographic processes until the advent of digital photography. The chemistry lecturer, Dr Andrew Fyfe, President for 1840-41, discussed critically and demonstrated both methods to the Society and to the public generally, as there was such a popular interest in these new pictures.

Scottish Lighthouses and the Society

Another thematic strand that can take us through most of the nineteenth century is that of Scottish lighthouse illumination, because the Society became a forum for the discussion of improvements in this specialist area through the Scottish dynasty of lighthouse engineers, the Stevensons. Robert Stevenson, always a



believer in education, was a founding member of this society. Of course, this event had come long after Robert Stevenson had built his masterpiece, the Bell Rock lighthouse, first lit in February 1811; he was, however, still writing the book with which he hoped to make his name, in emulation of the builder of that other great rock lighthouse, that on the Eddystone Rock, off Plymouth, completed by John Smeaton in 1759. Robert Stevenson sat on a number of committees examining the "new Inventions, Models, and

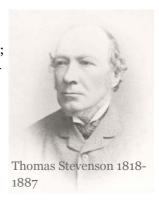
Drawings" laid before the Society, including that in 1838 which examined Edward Sang's "Dioptric Light erected at Kirkcaldy Harbour". This entire lecture could be devoted to Edward Sang, who was a most interesting man; Professor of Mechanical Science in Constantinople in 1854, and our President in 1857-58. Robert Stevenson, together with the surveyor William Galbraith and instrument maker Alexander Adie, found Sang's method of

"grinding annular surfaces ... novel and ingenious"; and Alan Stevenson, Robert's eldest surviving son, in discussing his innovation of diagonal astragals, mentioned with approval the Kirkcaldy light as being the only light in Britain not suffering from interference from vertical astragals. Sadly, time does not permit covering Sang's important mathematical work, nor his gyroscope.

Robert Stevenson's third surviving son, David Stevenson FRSE, Civil Engineer, whose lighthouse activities are always (and perhaps unfairly) considered alongside his younger brother Thomas, was elected a Fellow of this Society in 1838 (Thomas was elected in 1847, a year after their first cousin, William Swan, and both of these figures are discussed below). David served as president twice, once in 1854, and again in 1869. In the Society's thirty-third session in 1853-54, David Stevenson's presidential address was a "brief recapitulation of the history of our Society". No doubt long-lived Fellows would have put their president right over detail before he came to work up his address for publication, although by this time his father Robert Stevenson had been dead for two years. The lessthan-straightforward beginnings to the Society have been mentioned above, but things did indeed get underway by 1824. David Stevenson explained that early meeting were intermittent; but by January 1824 "regular meetings [were held] once a fortnight; and these meetings have, since that date, been continued without intermission [for the past two decades]". He then clarified that the constitution had originally allowed for the election of an honorary president, often chosen from among various local and interested noblemen, but by 1836 the fellowship elected to choose a president from among their own working cohorts. David Stevenson's 1853 presidential address then did what presidents normally do at their annual general meetings, and gave a brief review of the preceding vear, in which he notes that the fellowship stood at 397, and listed deceased Fellows. Amongst the awards was that of the Keith Medal - which at this point was the highest accolade that the Society could present - and amongst the winners was his brother "Mr Thomas

Stevenson, for his holophotal system of illuminating lighthouses."

Thomas Stevenson, fourth and youngest of this generation of Stevenson brothers - Alan, the eldest, did not stand for election; and Robert, the second, became a doctor - perhaps outshone his elder brother David for his engineering skills. He was elected in 1847, and used the Society's forum to discuss many of his optical papers. A tribute to him written by his famous only son, Robert Louis Stevenson, is worth quoting for what it says both about



Thomas and the entire family in its professional capacity:

"Two things", [wrote Louis, just after his father's death in an essay entitled "Thomas Stevenson, Civil Engineer", published in 1887], "must be said: and, first, that Thomas Stevenson was no mathematician ... and he must fall back on the help of others, notably on that of his cousin and lifelong intimate friend, emeritus Professor Swan, of St Andrews, and his later friend, Professor P.G. Tait. ... The second remark is one that applies to the whole family. and only particularly to Thomas Stevenson from the great number and importance of his inventions: holding as the Stevensons did a Government appointment they regarded their original work as something due already to the nation, and none of them has ever taken out a patent. It is another cause of the obscurity of the name: for a patent not only brings in money, it infallibly spreads reputation; and my father's instruments enter anonymously into a hundred light-rooms, and are passed anonymously over in a hundred reports, where the least considerable patent would stand out and tell its author's story."

Nevertheless, it has been emphasised that Thomas Stevenson's undoubted abilities, together with his brother David's solid

engineering skills made an effective partnership that produced inspired work, amongst which were three rock lighthouses: North Unst (today known as Muckle Flugga), Dubh Artach, and Chicken Rock, off the coast of the Isle of Man. Thomas Stevenson published at least fourteen papers that were first read before the Royal Scottish Society of Arts, winning commendations and medals on a number of occasions. Not all were concerned with lighthouses: he was interested in meteorology, harbour engineering, experiments on the force of waves, and other subjects. His first cousin was William Swan, who became a gifted optical worker, and was elected to the Society in 1846. Together he, Thomas Stevenson and the instrument maker John Adie worked on the practical development of prisms and lenses, using the Society as a forum for their activities. Through the patronage of Sir David Brewster, Swan, who had managed to make a living through teaching mathematics, was able to fill the appointment of professor of natural philosophy at the University of St Andrews from 1859. He made his mark in the new science of spectroscopy by devising a new prism in 1844, and by pioneering the use of a collimator in his astronomical spectroscope in 1856. Much of his prize-winning lighthouse work was published alongside that of his cousin, Thomas Stevenson; and he, too, served as President of the Royal Scottish Society of Arts for the session 1882-83.

Thomas's only child, later known to the world as the great writer Robert Louis Stevenson, was destined by his father to follow into the family business; but it was not to be. Louis (as he preferred to be known) just could not bring himself to the application necessary to become an engineer. Despite this, with his father's encouragement, he gave a paper, "On a New Form of Intermittent Light for Lighthouses" before the Society in March 1871. After discussion, the paper was sent to committee, and it was in due course awarded the Society's silver medal, value, three sovereigns. But even this encouragement failed: Louis cared for nothing other than literature. His connection with the Society ended then, and his

relationship with engineering remained ambivalent: "I ought to have been able to build lighthouses and write 'David Balfours' too." His public, however, was perhaps better off with the inspired writings of the author of *Treasure Island*, *Kidnapped*, *Dr Jekyll and Mr Hyde* than they would have been with the resultant works of a reluctant engineer.



The "good little boys", as their first cousin Louis somewhat unkindly named them, the sons of David Stevenson, David A. and Charles Stevenson were elected to the Society in 1879 and 1881 respectively. After graduating as engineers from the University of Edinburgh in 1875 and 1877 (they were only eighteen months apart in age), they joined the family firm, still known as D. & T. Stevenson until after Thomas's death in 1887. They each gave papers before the Society, David

A. in March 1881, "On Coast Fog Signals", and Charles in February 1882, on "A New Form of Seismograph"; but it is safe to say that by now it was essential for the recently professionalised career of civil engineer to reach a broader audience outside the local one based in Edinburgh; and besides, Scotland's long and treacherous coast was fairly well lit by the end of the 19th century. The brothers tended to publish their papers elsewhere.

A Gold Mine of Scientific History

It is important to stress that the run of our Society's *Transactions* reflect a large input of original thought across the spectrum of science and technology of the period: historians are now finding it a gold mine of information for developments in a number of areas.

Clocks could be mentioned - the Edinburgh clock-maker, Frederick Ritchie, was particularly interested in the application of electricity to clocks. There was a showing of the BBC Antiques Roadshow before COVID-19 in which a Ritchie descendant showed a tea service that incorporated the silver medals awarded to Ritchie: the Reid and Auld Prize for 1859, and the same for 1878.



Thomas Reid was a talented and innovative eighteenth-century Edinburgh clockmaker, who took his stepson William Auld into partnership in 1806. Their astronomical regulators - there is one on Calton Hill, and another in the National Museum, from the private observatory at Kinfauns, outside Perth - were highly sought-after. In 1842, William Auld left a bequest of £200 to the Society, to be invested, to encourage clock and watchmakers with an annual prize. Other benefactors who left bequests for similar but more general purposes were Sir Thomas Makdougall Brisbane in 1856; Sir John S. Hepburn in 1862, and the legacy mentioned at the start of this talk, the Keith Prize, which finally reached the Society in 1833. In 1900, the RSSA found that it was unable to administer this particular fund and had to go to the Court of Session - successfully to relax the conditions imposed by the Keith trustees. All these bequests have now been incorporated into the general funds of the Society.

By the time the new century dawned and the old Queen died, the world was a different place to that of the 1820s. Volume 18 of our *Transactions* demonstrates that international cutting-edge technologies were being discussed at meetings - the disaster to the St Lawrence cantilever bridge during its building in 1907, developments of the Lumière photographic colour process, liquid

fuels for motor car engines, the flying machine. Medals and prizes were now awarded for their communications to professional engineers and scientists, as opposed to the earlier "ingenious mechanics". Numbers of the Society had declined to



154 by November 1913. Edward VII, and then George V became our Royal Patrons - and then came the Great War.

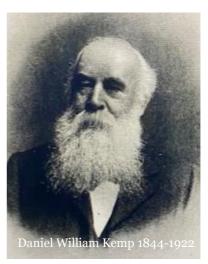
Volume 19 of the *Transactions*, published in 1927 but containing very few papers from 1914 to 1925, has a few words of introduction. It starts, baldly: "During part of the period of the Great War and following years (1916-1921) the ordinary activities of the Society were entirely suspended." It was decided by Council that a small bridging volume should appear, covering the period from the start of the war until the appearance in October 1926 of the Edinburgh Journal of Science, Technology and Photographic Art. This contained material from both the RSSA and the Edinburgh Photographic Society and, with other partners, continued to publish up until volume 13 in 1939. Again, suspended for a second World War, this ceased publication altogether in 1952. The reason for wanting to start up publication again after the First World War was that, like many other small learned societies, we were able to exchange our publications and thus build up and maintain a working library, and, says the note: "through the recent

munificence of the Carnegie United Kingdom Trust, is now so housed, bound, and catalogued as to be readily available to the Fellows, but also by serious students in any part of Scotland who may be desirous of availing themselves of the facilities provided."

Reviving the Society

Daniel William Kemp, the Society's Secretary from 1889 to 1906, and President from 1908 till 1911, sent a message to Fellows before

their Special Meeting on 27 June 1921 suggesting that the Society needed to adapt to the present day, and increase membership. An unknown individual, possibly Kemp himself, has done a calculation in pencil in the margins of the list of members for 1913 that I consulted, and reckoned that numbers were reduced from a healthy 154 to a low point of 88. Thus, the Special Meeting agreed that there should be a strenuous membership drive, a lowering of subscriptions - and



in a casual sentence that says so much about its time, "It was also decided that the existing laws covered the election of ladies as Fellows or Associates of the Society."

D.W. Kemp became a Fellow in 1872, and had a life-long association with the Society; as did his son, C. Norman Kemp who died in 1979. This long family association with the Society meant that when the younger Kemp began to fail, the Society's papers were in his house, and that two young science curators from the Royal Scottish Museum, both Fellows, were able to deposit the Society's papers in the National Library, and once again, revive the Society with high-profile lecturers, which from the 1990s were held for a time in the Lecture Theatre of the National Museums of Scotland.

The Society's Premises

Early meetings were held at the Royal Institution (now the Royal Scottish Academy), regularly from about 1826 to 1842 - rent was paid to the Society of Antiquaries for the use of their rooms, but eventually proved too expensive; and the Society moved around with various addresses until 1861, when we were able to rent the Hall at 117 George Street, where we resided until 1929. Then we were based at a private house at 16 Royal Terrace, which housed the Library, committee rooms and other facilities. This came to an end in 1952, when the Library was amalgamated with the stock at the City Library on George IV Bridge. The Society's Museum of models, a collection started by the Society from its beginnings and initially housed in 1837 at 63 Hanover Street, was mislaid, as we say in museum circles. In April 1949 the President wrote to the *Scotsman*: "The Edinburgh Directory carries the entry till 1842. The Society met at 51 George Street in 1856, when a museum caretaker was still employed; the museum may have been there. Not one article from this museum has been traced for a century." And so it remains: the lost museum. If any Fellows have ideas as to where items from the Museum might be, the President or Secretary would be pleased to hear from them.



Two Hundred Years at the Leading Edge

It has not been possible to do justice to the Royal Scottish Society of Arts' two hundred year history in a brief 45-minute summation. What was the Society for? Initially, it was an attempt to keep up Britain's role (especially North Britain's contribution to this) as the leading nation in industrial progress. The eighteenth century had seen agricultural improvement, followed by mineral exploitation; and here in Scotland we were blessed with a relatively small but well-educated male population - parish schools after the Reformation had ensured that most of the boys were literate. Thus, the creation of a Society in the 1820s that offered premiums as a reward formed a focus for bright ideas across society, and brought these to the attention of those who could promote them in terms of patronage. And to some extent this worked. By the end of the nineteenth century, science and technology had professionalised, but the Society still had a role to play in promoting these subjects. The hiatus caused by the First World War allowed women to join the ranks and for the Society to regroup; which it did again after the Second World War in 1945. By 1971, with Dr Alastair Thomson of the Royal Scottish Museum as President and his colleague Dr Robert Anderson as Secretary, the Society was able to reform again, very much in the shape we know it today, with weekly lectures in the winter, providing medals and book tokens for prize-winning schoolchildren in the engineering sciences, putting on lectures concerning the STEM subjects open to everyone interested; and thus demonstrating that Scotland is still providing cutting-edge leadership in these subjects.

May the next two hundred years be as inspiring!



Presidential Medallion on the Chain of Office

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