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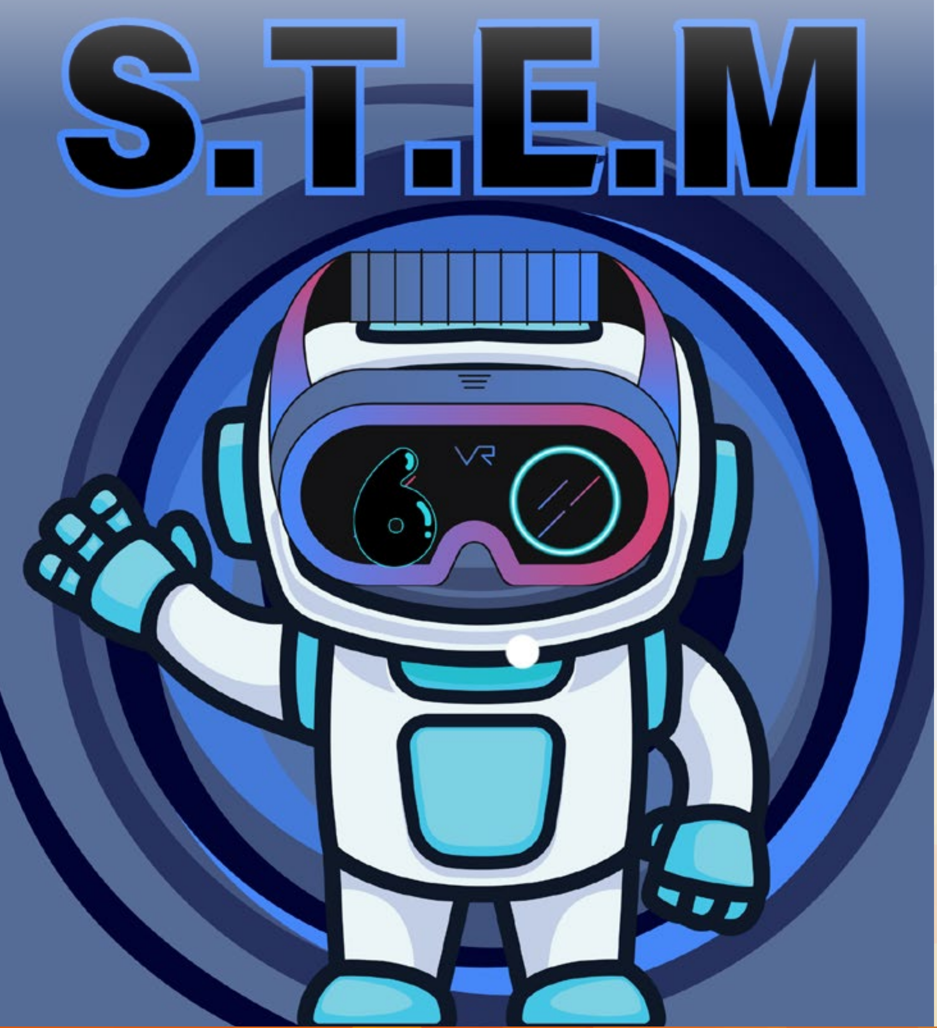
60 YEARS ANNIVERSARY

sserc

Bulletin

Special bulletin celebrating 60 years of SSERC



In this edition:

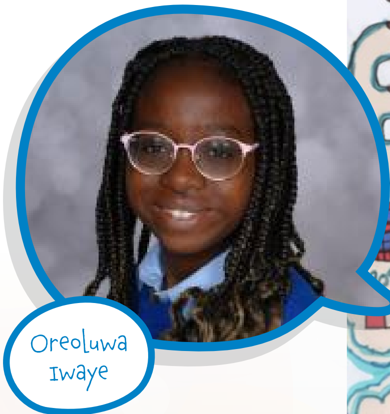
SSERC 60th anniversary competition

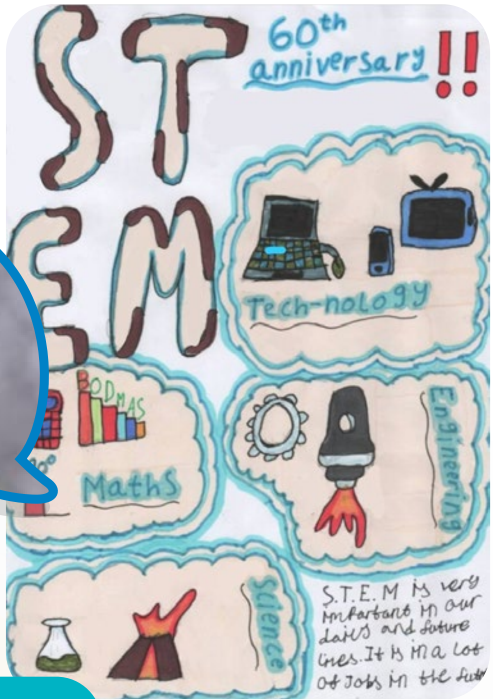
Design an image for the SSERC 60th Anniversary Special Edition Bulletin

To celebrate our 60th Anniversary, we invited learners to design an image that would feature in our 60th Anniversary Special Edition.

The front cover image was designed by Matthew Hamilton, a Primary 7 learner from Stoneywood School, Greenburn Road, Bucksburn, Aberdeen.

The back cover image was designed by Primary 7 learner Oreoluwa Iwaye from St Joseph's Primary School, Gate side road Whitburn West Lothian





Congratulations to both winners, who each receive a £60 Amazon voucher.

Message from the Chair

Alistair Wylie • Chair, SSERC Board of Directors and Trustees

As Chair of the Board of SSERC, it is a privilege to join in the celebrations marking our 60th anniversary. This significant milestone offers a wonderful opportunity to reflect on the dynamic spirit and remarkable achievements that define SSERC's past, present and future, a sentiment I know is s hared by our Chief Executive and the entire team behind the organisation.

SSERC's enduring presence, since its founding in 1965, is a profound testament to its unparalleled resilience and foresight. Our unique and vital role in underpinning STEM education and training across Scotland has been consistent, even as the educational landscape continuously evolves. We have consistently adapted, providing highly specific and complex services – from our renowned Career Long Professional Learning for teachers and technicians, to our expert Advisory Service, and our pivotal role in coordinating and developing a range of STEM enrichment activities including the STEM Ambassador and Young STEM Leader programmes in Scotland.

The collective efforts that drive our successes, from the dedicated staff and senior management team to the robust governance provided by the Board, are at the heart of our decisions and operations. It has been an honour for the Board to oversee an organisation with a reputation for excellence and a far-reaching impact that extends well beyond our national borders. We are particularly proud of SSERC's continuous innovation, exemplified by the expansion of its portfolio and initiatives like the Leadership in STEM Education course, ensuring we remain at the forefront of supporting practitioners and learners.

As SSERC looks to the future, our shared vision is one of continued relevance and international recognition as a centre of excellence. We remain committed to fostering an environment where practical work in STEM thrives, and where every learner in Scotland can be inspired by the wonders of science, technology, engineering, and mathematics. The foundations laid over six decades and the forward-looking trajectory set by the current leadership, position SSERC for an even more impactful future.

Message from the CEO

Alastair MacGregor • CEO SSERC

The continued operation of SSERC 60 years after its founding is a testament to its ability to adapt to the ever-changing landscape of STEM education and training. This success is also a reflection of the organisation's resilience in navigating challenges, from financial pressures to national crises like the pandemic.

Such longevity is no doubt the result of effective governance by the SSERC Board of Directors and Trustees, a dedicated and driven senior management team, and a professional, passionate staff committed to supporting STEM practitioners. Their collective efforts have made a lasting impact on learners in Scotland and beyond.

The reflections of those who have served in senior roles within SSERC– both executive and non-executive – can be found in the "Memory Lane" section of this anniversary publication. I began my term as Chief Executive Officer in September 2017, and since then, the organisation has continued to grow, expanding its portfolio of products and services, all aimed at supporting STEM education and training in Scotland. The infographic below highlights the significant changes that have taken place during my tenure, ensuring SSERC's ongoing relevance in the ever-evolving STEM landscape.

With a focus on staying relevant and meeting the needs of STEM education practitioners in Scotland and beyond, SSERC should be well-positioned to celebrate its 100th anniversary in 2065.

SSERC 60th anniversary competition

Write a short story or narrative of SSERC using only 60 characters

To celebrate our 60th Anniversary, we invited those associated with SSERC to write a story or narrative about SSERC using only 60 characters. Here are some of the best entries – and a 60th Anniversary pen will be on its way to you soon.

60 YEARS ANNIVERSARY sserc

COMPETITION

Hemingway was once challenged to write an impossibly short story – a narrative in six words. His answer? "For sale: baby shoes, never worn."

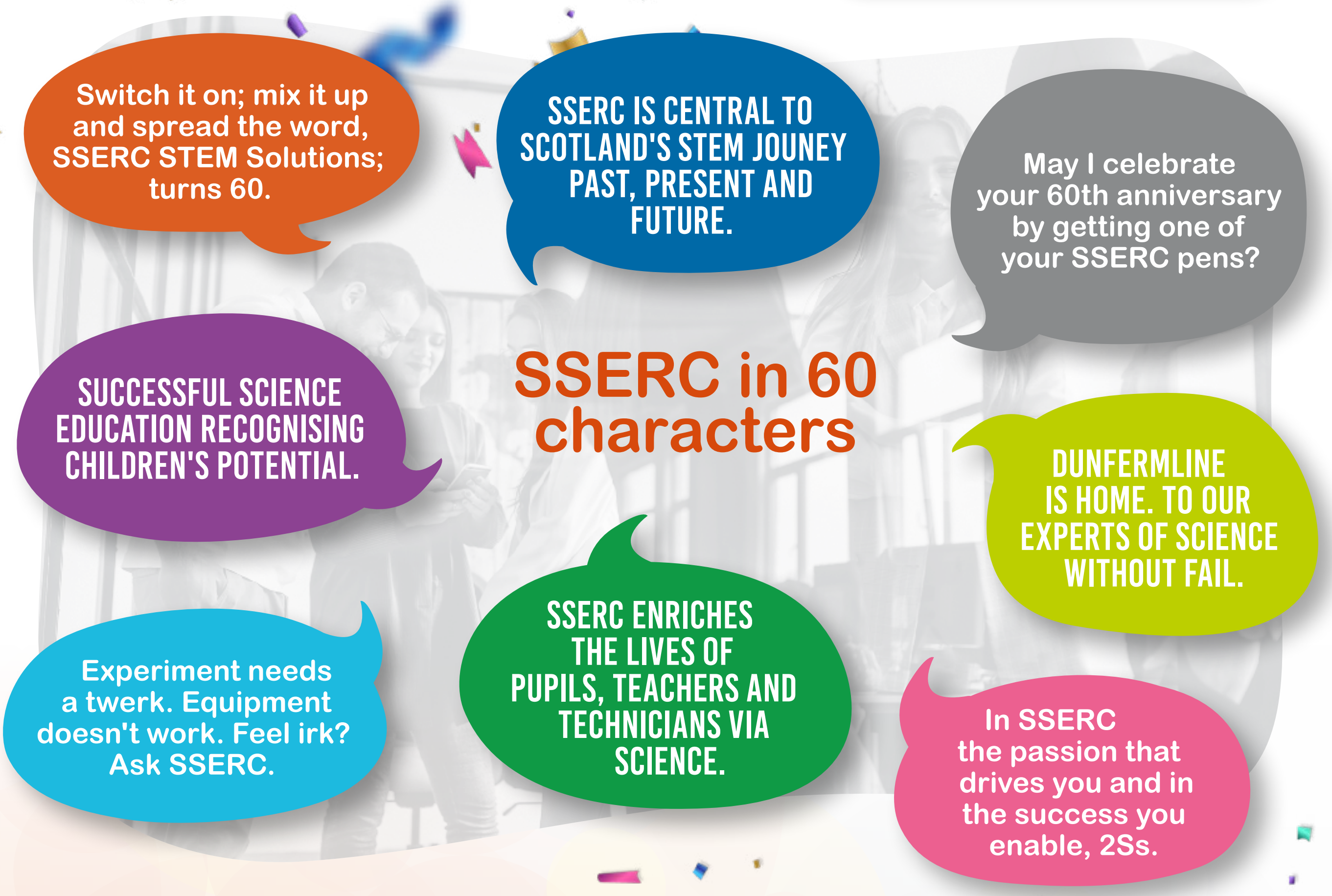
We have made this competition slightly easier.

To celebrate SSERC's 60th Anniversary, we want those associated with SSERC to write their short story or narrative of SSERC in 60 characters*.

The best narratives will be published in the SSERC Special Anniversary Bulletin and the writers will receive a special 60th anniversary SSERC pen.

All entries emailed to SSERC60@sserc.scot by 30th April 2025

*60 characters is **between 10 words and 20 words**. A character can be any letter, number, punctuation or special character, but spaces are not included in the character count. The narrative must have exactly 60 characters.



Isolation and characterisation of pollen grains from honey

Honey can be an inexpensive but storyfull substance to explore in classrooms.

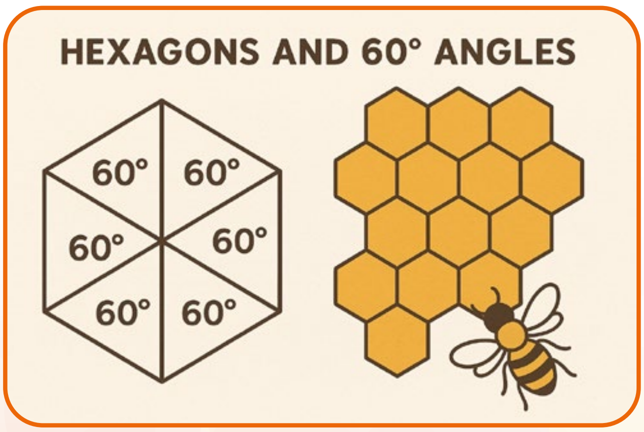
Introduction

Microscopy remains one of the most important skills we as biology educators can promote to our students, however, it can be a challenging activity in which to allow students to take the lead. Peering into the microscopic world of pollen offers students a chance to do just that. With some inexpensive chemical dyes and some supermarket honey, students can begin to understand the relationship between nature and food, the significance of pollinators, and the variation that exists within plant biology.

As a way into more challenging topics such as ecology and climate science, comparing grains from different environments or linking pollen morphology to pollination strategies can be a memorable exercise for students to undertake. Monofloral (or single-pollen) honeys can be particularly fun to examine as bees follow instructions very poorly and it is very common to find stray, contaminant pollens in such products. In some cases, these techniques have been used to identify fraud within the industry [1].

Going strong at 60...

As SSERC is celebrating its 60th anniversary in 2025, we are celebrating the successes and strengths that the organisation finds itself enjoying at this milestone. As it happens, 60 is also a number that equates to strength in the world of apiculture, pollen, and honey!



Angles - sweet Geometry: each hexagon in a honeycomb uses 60° angles to create a strong, space-saving structure that bees – and mathematicians – agree is brilliantly efficient.

The 60° angles found in each corner of a honeycomb cell form perfect hexagons, a shape that offers the ideal balance of strength, efficiency, and economy. Hexagons fit together seamlessly without leaving gaps, unlike circles or pentagons, allowing bees to store the maximum amount of honey using the least amount of wax. The 60° internal angles are key to this snug, interlocking design, giving each cell the structural stability to hold weight while using minimal material. Engineers and mathematicians have long marvelled at this natural blueprint, where geometry and biology align with precision [2].

Extraction of pollen from honey

Step 1

Dissolve the honey by weighing approximately 20 g of honey into a clean beaker and adding 40 ml of warm water. However, ensure that the water is not boiling as this will damage delicate grains. You may wish to stir or mix runny honey products before using them, as pollens can sometimes settle within these items (as shown Figure 3.

Pollen sediment - over time grains can begin to settle out of runny honeys.

Step 2

Stir gently until fully dissolved then transfer the contents to a centrifuge tube.

Step 3

Spin at 4500–5000 rpm for 10-15 minutes in order to separate the pollen from the wider mixture. If a centrifuge is unavailable, specimens can be left undisturbed over night and pollen will settle to the bottom of the tube.

Centrifugation - pollen grains can be seen in yellow affixed to the side of the tube.

Step 4
Gently decant or extract the liquid, leaving the pollen adhering to the centrifuge tube. You should find that the pollen will remain undisturbed (particularly if the centrifuge method was used) and is clearly visible as a yellow substance. As centrifugation works on the principle of relative densities, in which denser particles (like pollen grains) experience a stronger force and move faster toward the bottom of the tube, it is often the case that pollen will adhere to the side of the tube as it is itself suspended in quite a dense mixture of honey and water.

Step 5
Using a dropper, rinse the interior of the tube with a small volume of acetone, ethanol or isopropyl alcohol to detach the pollen from the side. This has the added benefit of dislodging pollen from other grains and sugars to which it is adhered, making identification and visualisation easier. A dilute detergent can be used to achieve a similar effect if necessary.

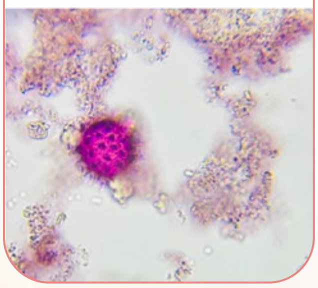
Step 6
Regardless of the reagent used, add a similar amount of water before proceeding in order to prevent the pollen from being damaged from prolonged contact with this substance.

Step 7 (optional)
Add a few drops of a suitable chemical dye to the mixture and allow binding to occur for approximately 15 minutes in order to achieve clear staining. A comparative description of various suitable dyes can be found below. Although not necessary, contrast under the microscope can be significantly improved after staining by repeating steps 4-6 in order to create a colourless background against which the now-stained grains are visible.

Step 8 (optional)
Place a small drop of pollen solution onto the center of a clean microscope slide, add a coverslip gently to avoid air bubbles, then view the slide under a microscope starting at low magnification and increasing incrementally.

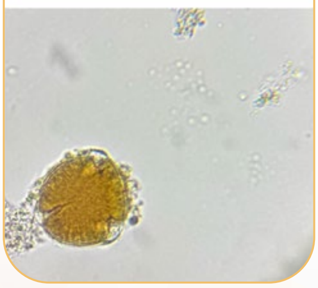
Safranin -

A red biological stain commonly used in plant histology that highlights lignified cell walls, helps to visualise the exine (outer wall), and the spikes of pollen grains that aid them in anchoring to pollinators and stigmas in nature.



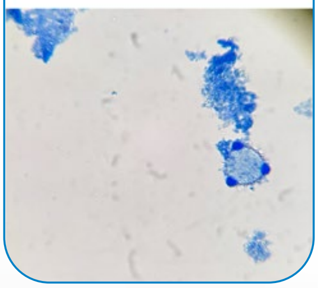
Gram's Iodine -

A reagent used in the microbiological Gram staining process, it will not interact strongly with the pollen exterior but can help to visualise interior contents, particularly their starch-rich energy stores used during germination.



Lactophenol Cotton Blue -

A stain that binds to chitin-like polysaccharides in pollen cell walls; making surface patterns clearly visible. Three large germ pores are clearly visible. Although not chitin-rich, these areas of the surface are thin so dye penetrates easily.



All of the above images show pollen extracted from a single sample of wildflower blossom honey, prepared at the SSERC Campus Laboratory in Dunfermline. Each has been stained with a different visualisation dye to highlight distinct features.

References
[1] Tsagkaris, A. S., Koulis, G. A., Danezis, G. P., Martakos, I., Dasenaki, M., Georgiou, C. A., & Thomaidis, N. S. (2021). Honey authenticity: analytical techniques, state of the art and challenges. RSC advances, 11(19), 11273–11294.
[2] Tóth, G. (1964). What the bees know and what they do not know. American Scientist, 52(1), pp.64–72.

Chemistry and 60

There were a couple of important chemical discoveries in the same year the SSERC was founded: Kevlar was developed at DuPont by Stephanie Kwolek and it was also the year of the first synthesis of Insulin.

More widely, the number 60 has a few connections in chemistry.

Atomic number

The element with atomic number 60 is **Neodymium**. This element is a transition metal and one of the so-called "rare-earth" elements. In itself, there is nothing of huge interest but it is a name well-known to most of us via its use to make high strength, neodymium magnets.

Effect of a magnet on electrolysis

While this is not easy to link directly to any curriculum area, it is interesting to see the effect.

A sodium sulphate solution has some universal indicator solution added and the pH is adjusted to make the solution green and it is placed, in a Petri dish, over a magnet (see Figure 1).

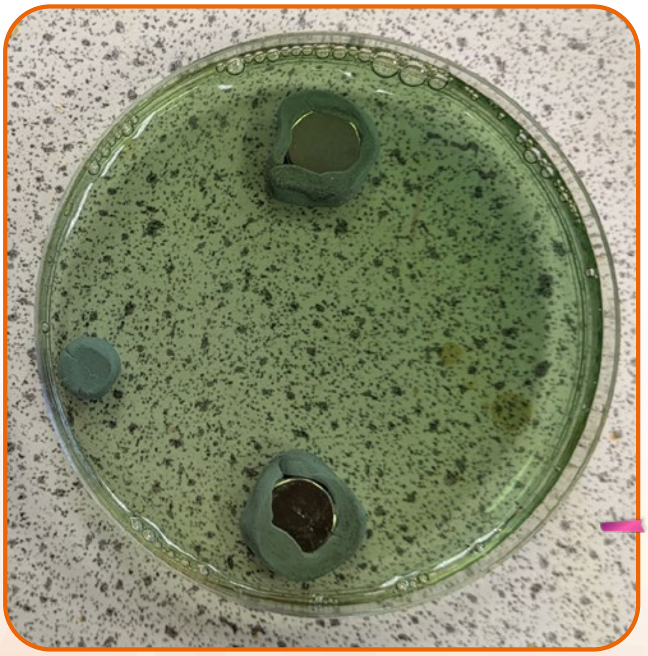


Figure 1 - Solution before electrolysis.

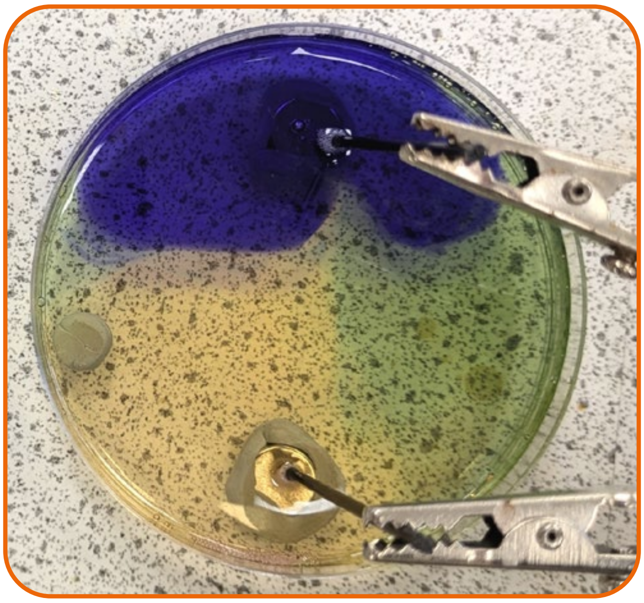


Figure 2 - Solution after electrolysis.

A current is passed through the solution and you can clearly see that the colours formed at each electrode move in a circular fashion around the two electrodes, one clockwise, one anticlockwise (see Figure 2).

Electrolysis forms hydrogen and hydroxide ions and these charged particles interact with the magnetic field, hence the movement.

Atomic/Molecular mass

Elements: There is no element with an atomic mass of exactly 60 but the three closest are Cobalt (58.93), **Nickel** (58.69) and Copper (63.55).

All three do have isotopes with atomic mass of 60. Co^{60} and Cu^{60}, however, are unstable, synthetic isotopes but Ni^{60} is a stable, naturally occurring form making up 25% of the atoms of nickel. So we will focus on that.

Magnetism

We are familiar with iron being magnetic but various other metals, and their compounds, are show forms of magnetism too.

Nickel in fact displays ferromagnetism – similar to iron -in that it can retain its magnetism. In fact a lot of commercial magnets are made from Alnico – an alloy of aluminium, nickel and cobalt.

Some nickel salts, however, display a different phenomenon – paramagnetism.

Demonstrating the paramagnetism of nickel sulphate

Set up a platform on the pan of a 3dp balance – the idea is that it needs to be high enough that the neodymium magnet does not affect the reading on the balance.

Place a small amount of nickel sulphate (solid) in a container on top of the platform. I used a bottle top. Note the mass.

Bring a neodymium magnet as close to it as you can without touching. See what happens to the reading.

Nickel salts are generally paramagnetic. This arises from the electronic configuration of Ni^{2+}, which has two unpaired electrons in its d-orbitals. The strength of the effect can vary depending on the specific nickel salt and its crystal structure, as the surrounding ligands can influence the energy levels of the d-orbitals.

Nickel complexes

Nickel ions in solution are normally green due to the presence of the hexaaqua Ni^{2+} ion ($[Ni(H_2O)_6]^{2+}$. Additionally, they react with ammonia in a similar way to copper. Initially a precipitate of nickel(II) hydroxide is formed but on the addition of more ammonia this dissolves to form a deep blue hexaammine complex $[Ni(NH_3)_6]^{2+}$.

Slightly more interesting are the complexes formed with ethane 1,2-diamine (elthylenediamine), a bidentate ligand. And appropriately for the theme of this article, ethane 1,2-diamine has a molecular mass of 60!

Nickel complexes with ethane 1,2-diamine

Prepare the following solutions:

a) 0.1 mol l^{-1} solution of nickel(II) sulphate (or any other soluble nickel salt)

b) 0.2 mol l^{-1} ethane 1,2-diamine (1.2 g in 100 cm^3)

Place 3 cm^3 of the nickel solution into each to 4 test tubes.

Tube 1 – Leave alone – this is your control

Tube 2 – Add 1 cm^3 of ethane 1,2-diamine solution

Tube 3 – Add 2 cm^3 of ethane 1,2-diamine solution

Tube 4 – Add 5 cm^3 of ethane 1,2-diamine solution

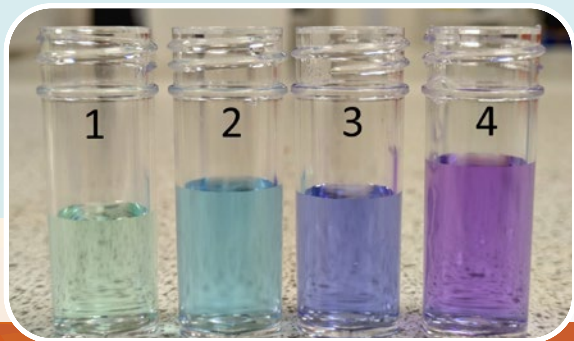
Observe the colours

Tube 1 is the green hexaaqua complex - ([Ni(H2O)6]2+

Tube 2 – is a light blue colour. 2 water molecules have been displaced by ethane 1,2-diamine to produce $[Ni(en)(OH_2)_4]^{2+}$

Tube 3 is a dark blue. 4 water molecules have now been replaced by ethane 1,2-diamine to produce $[Ni(en)_2(OH_2)2]^{2+}$

Tube 4 is violet and now all the water molecules have been replaced by ethane 1,2-diamine $[Ni(en)_3]^{2+}$

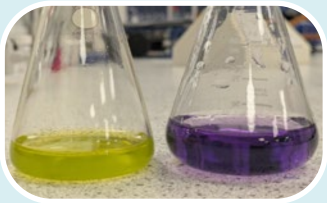


If you add a more concentrated solution of ethane 1,2-diamine then the violet complex is precipitated but it is not very easy to isolate. An easier complex to make is nickel ethane 1,2-diamine perchlorate but, like most perchlorates, it has a tendency to explode!

Estimation of nickel

The concentration of nickel in solution can, like many transition metals, be determined by titration with EDTA.

The method used is very similar to that for determination of calcium.



- Take a 20 cm^3 aliquot of your nickel solution
- Add 20 cm^3 of pH 10 buffer and some murexide indicator.
- Titrate against EDTA solution (the concentration depends on the concentration of your nickel solution) until the indicator suddenly goes violet.

More chemistry of 60

Buckminsterfullerene is a complex form of carbon in the form of a hollow 'ball' of 60 carbon atoms – also referred to simple as C60.

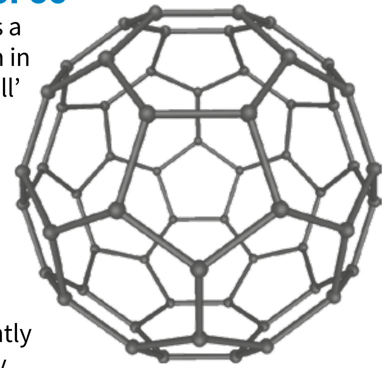


Image by Mstroeck from Wikipedia under a CC BY-SA 3.0 license.

It is expensive to buy so is not really of much relevance to schools although it can apparently be isolated from soot by heating the soot in an organic, non-polar solvent such as toluene. Unlike 'normal' carbon, C60 dissolves to give a purple solution.

Methyl methanoate (methyl formate) is an ester that has a molecular mass of 60 too. It can be prepared by reacting methanol and methanoic acid with sulphuric acid as a catalyst. However, it boils at only 32°C which makes it harder to isolate and, coupled with the toxicity of methanol, we would suggest that other ester syntheses are preferable.

60 years of computer games

Teaching computing science through games

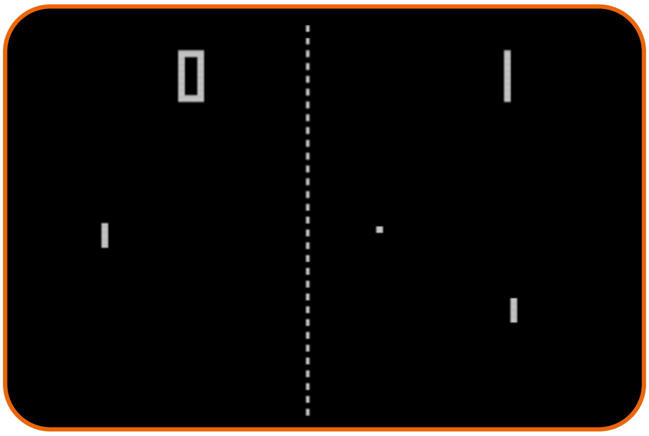
Introduction

At SSERC Digital we are currently developing a PL opportunity to encourage Computing Science (CS) engagement through creating computer games in the classroom. So, in conjunction with SSERC's 60th anniversary, we decided to consider how over the last 60 years, computer games have shaped not just the entertainment industry, but also the way we teach and learn CS. Today's learners can build their own games like never before, using tools like Scratch and Microsoft MakeCode Arcade to gain hands-on understanding of coding principles and engaging with the creative process.

This article explores the evolution of computer game design, from early experiments to modern educational platforms, and the impact on inspiring and teaching learners in the classroom.

Humble beginnings: from experiments to Pong (1960s–1970s)

Computer games started in academic labs, where researchers looked to demonstrate new computer technologies and programming capabilities. The first video game is generally considered to be Tennis for Two, created in 1958, which was displayed on an oscilloscope and simulated a game of tennis. In 1962, a group of MIT students created Spacewar! on a PDP-1 minicomputer, which was one of the first interactive video games.



Ten years later, Atari released Pong, a simple but revolutionary arcade game. Though basic by today's standards, Pong's game logic, ball movement, score tracking and win conditions demonstrated foundational computing concepts still taught in classrooms to this day.

Classroom activity

Learners can:

1) Watch this tutorial and follow along to create a basic Pong style game on Scratch.
2) Access a pre-programmed version on MakeCode arcade here, and then use the 'Edit Code' button, and the PRIMM method to tinker and adapt your own version of Pong.

Learning through home computers (1980s–1990s)

The 1980s saw the rise of home computers like the Commodore 64 and ZX Spectrum, which brought games, and programming, into students' homes.

Magazines such as 'Crash' published game code in languages like BASIC, encouraging young readers to type them in, debug, and experiment, giving many their first taste of programming.

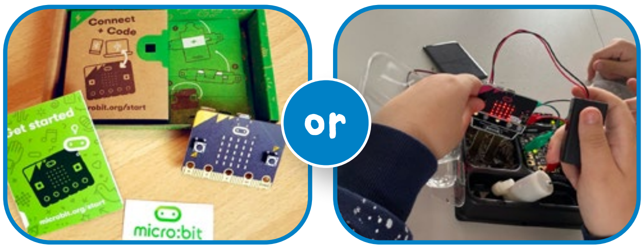
For many learners in the UK during the 1980s, the BBC Micro became their first exposure to Computing Science in the classroom. The device was robust, fast for its time, and designed to be programmable. Through the BBC BASIC language, students could explore:

- **Loops and conditions**
- **Procedures and functions**
- **Simple graphics and sound**
- **Control of peripherals**

Teachers used BBC Micros for lessons on problem solving, algorithms, and logic; often with engaging applications like simple arcade games or turtle graphics, and the BBC Micro's role in education helped promote programming in schools.

You can access examples on the BBC Micro emulator here.

Even today, the evolution of the BBC Micro, the micro:bit, is used in over 60 countries across the world to engage learners with CS, through a host of fantastic cross curricular lessons, projects and initiatives.



Bridging the gap: from 16-Bit home computers to console culture (1990s–2000s)

As the 1980s gave way to the 1990s, home computing entered a new era. Machines like the Commodore Amiga became popular in the UK, and introduced the idea of multimedia programming; blending graphics, sound, and logic in accessible ways to allow users to build side-scrollers, simulations, and even 3D-style games. This period continued to develop the foundations for modern Computing Science education with loops, sprite management, input control, and sound handling.

At the same time, the 1990s saw the rise of gaming consoles, starting with the Nintendo Entertainment System (NES) and Sega Master System, quickly evolving into the SNES, Mega Drive (Genesis), and Nintendo 64. Though these consoles were closed systems without access to programming, they influenced a generation's understanding of game design through experience. When programming on MakeCode arcade and following guided tutorials, we still see the familiar 'Mario' platformers and 'Zelda' RPG style games inspired by this generation of gaming.

While direct programming was unavailable, games could still be 'tinkered' with and explored through using devices like the Game Genie or Action Replay, which offered ways to peek behind the curtain of game logic and change some of the conditions of play in these games. When delivering E-Sports sessions in recent times, educators often encourage tinkering with games like Rocket League and altering conditions to affect gameplay. It is a fun and effective way of exploring gameplay and how altering conditions can have a pronounced effect.

From consumers to creators (2000s)

By the early 2000s, the line between consuming games and making them began to blur. While fewer young people coded directly on their consoles, the creative curiosity sparked by those games laid a vital foundation. This inspiration would flourish with the rise of tools like Scratch, Game Maker, and later MakeCode Arcade, bringing game creation back into the hands of learners. Powerful game engines like Unity and Unreal Engine were developed for professionals, but also influenced computing education by highlighting what skills would need to be embedded at the foundational level to succeed when using such tools.

At the same time, block-based programming, which was first developed in 2003 with the creation of Scratch at MIT, was designed to make coding more accessible to beginners, especially children, by using graphical blocks that can be dragged and dropped to create programs.

Scratch was, and continues to be, one of the most impactful platforms and introduced drag-and-drop coding to millions of children around the world.

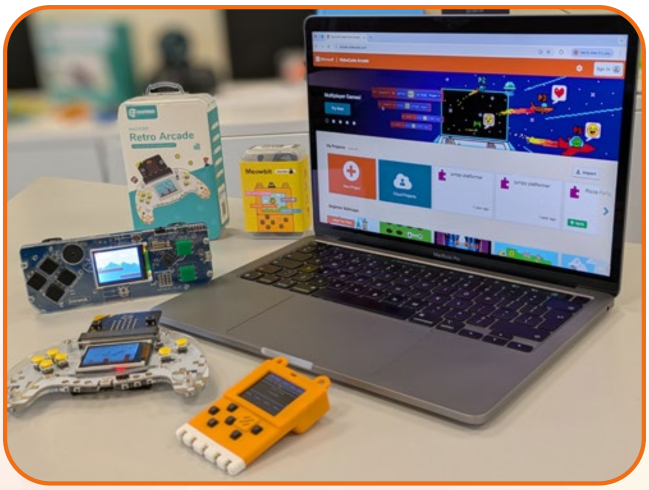
- **2003:** Initial prototype (Scratch 0.1) developed.
- **2007:** Scratch 1.0, the first publicly released version, was launched.
- **2013:** Scratch 2.0 was released.
- **2019:** Scratch 3.0, the current version, was released.

A new era: Microsoft MakeCode Arcade and accessible game development

Today, teachers have powerful, classroom-friendly tools to teach coding through game creation. Chief among them is Microsoft MakeCode Arcade, along with Scratch.

MakeCode Arcade is a free, browser-based platform for creating 2D games using either block-based programming (ideal for primary aged learners) or JavaScript/Python (for more advanced students).

Games can be played online, shared via links, or downloaded to hardware like the Meowbit, Kitronik Arcade or Elecfreaks Retro Arcade for real-world interaction. These tools, while not essential, take creating a video game to the next level and allow learners to download their game to a console type device for others to play.



Platforms such as MakeCode Arcade and Scratch prove effective in the classroom because:

- There is no installation required and can be run from any browser.
- Supports differentiation with tutorials and demos available, as well as access to the full coding platform.
- Offers cross-curricular opportunities (e.g. art, maths, storytelling).
- Learning outcomes are provided to help guide the teaching of CS.

Classroom activity

Try the MakeCode Arcade 'Skillmaps' tutorials to introduce game coding step by step.

Create your own: inspiring young minds

Giving pupils the opportunity to create games helps them build computational thinking skills, understand logical problem-solving, and engage more deeply with digital literacy.

By designing their own game worlds, they naturally learn principles like sequencing, debugging, repetition, selection and data handling. Along with this, their skills in problem solving, collaboration, creativity and logical thinking are all naturally enhanced through the process of creating games.

Conclusion

For over 60 years, games have advanced alongside Computing Science. From early innovations like Spacewar, to accessible platforms like MakeCode Arcade, games offer a powerful way to teach programming, making complex concepts tangible, creative, and fun.

By embracing these tools in the classroom, teachers can empower the next generation, not just to play games, but to build them, understand them, and explore the possibilities of computing, making it more of a reality than ever for our learners to become the game designers of the future.

Exploring space through practical STEM

This year, SSERC celebrates 60 years of supporting STEM education across Scotland. Over the same period of time, scientists and engineers from across the globe have collaborated, and sometimes competed, to explore our Solar System and beyond. These missions inspire young learners and continue to provide rich opportunities to bring STEM learning to life. In this article, we consider how we can use space as a context to engage learners in STEM.

Solar System exploration over the past 60 years

1969 – First Moon landing
Apollo 11 landed on the Moon, allowing humans to walk on its surface for the first time.

1971 – Mars 3 and Mariner 9 go to Mars
NASA's Mariner 9 became the first spacecraft to orbit another planet, sending back information about Mars' canyons and volcanoes. The Soviet Mars 3 made the first successful landing on Mars.

1977-1989 – Voyager 2 explores the outer planets
Launched in 1977, Voyager 2 sent back images and data from the outermost planets in the Solar System and their moons.

2003 – Chandrayaan lunar exploration programme commences
India successfully launched Chandrayaan-1 to explore the Moon in 2008 and the programme is ongoing, with plans to launch Chandrayaan-4 to collect and return samples from the Moon's surface.

2004 – Cassini-Huygens explores Saturn
The Cassini probe orbited Saturn for over 13 years, sending back views of the rings and discovering moons such as Enceladus. ESA's Huygens lander touched down on Titan, Saturn's largest moon.

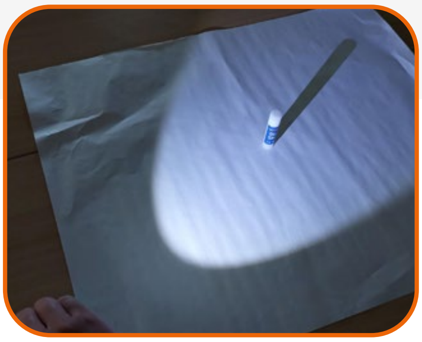
2012 – Curiosity Rover lands on Mars
This mobile science lab has been exploring the surface of Mars ever since, studying the environment and paving the way for future human missions.

2018 – Parker Solar Probe launches
The Parker Solar Probe is flying close to the surface of the Sun, helping scientists to understand solar activity and its effects on Earth.

2020 – Tianwen-1 launches
China's Tianwen-1 Mars mission launched with further missions planned to study a range of objects across the Solar System.

2021 – Perseverance Rover and Ingenuity Helicopter land on Mars
Perseverance continues the search for signs of past life on Mars, while Ingenuity made the first powered flight on another planet – an engineering first.

2025 – planning for Artemis Moon Missions
The Artemis III mission aims to return astronauts to the Moon, including the first woman and first person of colour to walk on its surface.



Practical ideas for learning about space

Space is the perfect context to inspire your learners to become the next generation of scientists and engineers. We have provided some practical Space activities below.

Changing shadows

As the Earth spins on its axis, different parts of its surface are exposed to sunlight. From our view here on Earth, the Sun appears to move across the sky during the day. At school, we can observe that shadows look different in the morning, the middle of the day and the afternoon. Standing in the same position in the playground each time, groups of learners trace their own shadows using chalk, observe the direction of the shadows and measure their length, recording their observations. We can explain changing shadows by using a torch to represent the Sun, moving the torch to the perceived different positions of the Sun in the sky, and observing and tracing the shadows made by a simple item such as a gluestick onto a large sheet of paper as shown in the photos above.

When learning about the changing seasons, a similar activity could be used to investigate why shadows appear shorter at midday in summer, when the Sun is higher in the sky, and why they appear longer at midday in winter, when the Sun is lower in the sky.

Handy Solar System

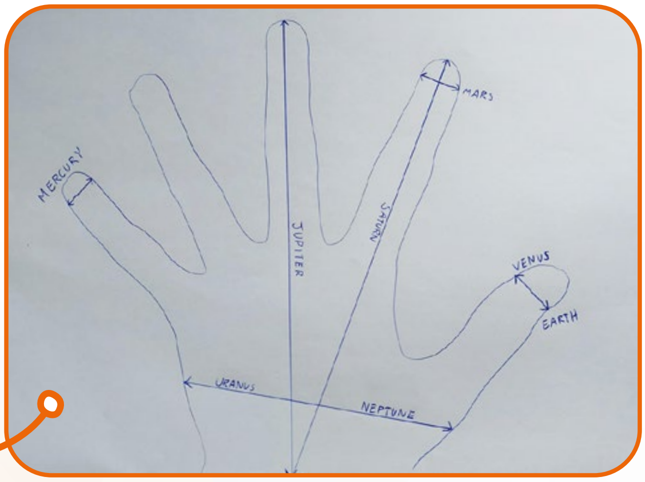
This simple activity from the Royal Observatory Edinburgh asks learners to use different parts of their hand to appreciate the size and scale of different planets: Handy Solar System.

Craters TAPS activity (Teacher Assessment in Primary Science)

Learners drop a range of meteors (represented by different balls) into a tray of sand, and observe and measure the resulting impact crater diameters, developing Science Enquiry skills such as recording and presenting data. Learners could investigate different variables such as height of drop, size of meteor, or type of sand. See the full lesson plan and some example results tables from the TAPS resource.

ESERO Primary Space resources (European Space Education Resource Office)

SSERC is an ESERO-UK Space Champion – please follow this link for a range of ESERO primary Space resources.



CfE links

- I have experienced the wonder of looking at the vastness of the sky, and can recognise the sun, moon and stars and link them to daily patterns of life – *SCN 0-06a*.
- I can talk about science stories to develop my understanding of science and the world around me – *SCN 0-20a*.
- By safely observing and recording the sun and moon at various times, I can describe their patterns of movement and changes over time. I can relate these to the length of a day, a month and a year – *SCN 1-06a*.
- I have contributed to discussions of current scientific news items to help develop my awareness of science – *SCN 1-20a*.
- By observing and researching features of our Solar System, I can use simple models to communicate my understanding of size, scale, time and relative motion within it – *SCN 2-06a*.
- By exploring reflections, the formation of shadows and the mixing of coloured lights, I can use my knowledge of the properties of light to show how it can be used in a creative way – *SCN 2-11b*.
- Through research and discussion, I have an appreciation of the contribution that individuals are making to scientific discovery and invention and the impact this has made on society – *SCN 2-20a*.
- I can report and comment on current scientific news items to develop my knowledge and understanding of topical science – *SCN 2-20b*.

Looking ahead

The future of space exploration offers a range of exciting possibilities, with topical STEM links to new projects and missions. Developments in space tourism promise to make space more accessible, inspiring the next generation to see themselves as future explorers and innovators. Advances in sustainable space technologies, such as reusable rockets, are fuelling progress not only in how we explore space, but in how we live on Earth. From the construction of lunar habitats and missions to Mars, to satellite systems that monitor climate change, space exploration is increasingly connected to global challenges and opportunities. This opens up further contexts for engaging with STEM and Sustainability in our classrooms.

60 Years of LASERS and LEDs in education

The invention of the MASER came about when Charlie Townes required a coherent, powerful source of microwaves for spectroscopic purposes. He realised that shorter wavelengths of electromagnetic radiation would prove to be even more powerful tools for spectroscopy and discussed with Schawlow how to go about building such a device. In 1958 they published the theory of the LASER.

Townes was brought up in the Southern Plain tradition as his father, though a practising lawyer, had a bit of fertile land they farmed. His father thought it good for his kids to help with picking the cotton or milking the cows.

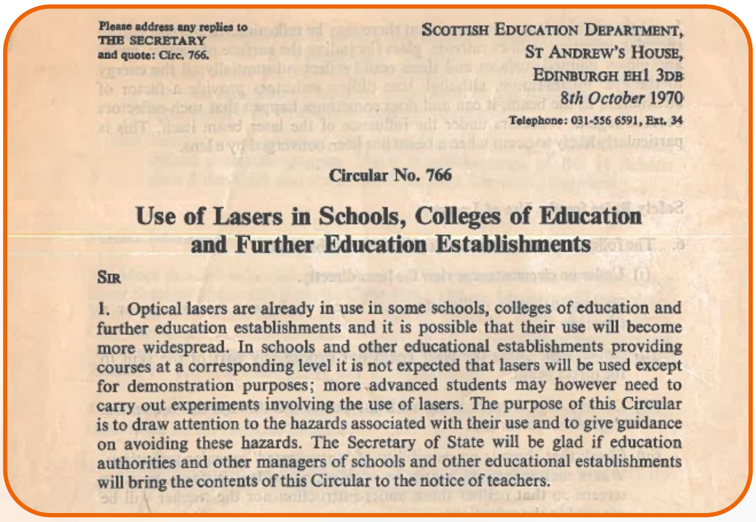
This environment trained Towns to solve practical problems, fix machinery a0.nd led him to study science. Townes said, "farms and small towns are a good training ground for experimental physics."[1]

He graduated from his local university, Furman, and went to Duke for his Master's degree. His supervisor had bought two Van de Graaff generators with a view to starting a nuclear physics program at Duke, but had not got them to work! Townes set about getting them to work. He succeeded in getting them working in his first year, he reckons his upbringing helped. He was told that was enough for his Masters, but nobody had done one in a year so he would have to wait to graduate. Townes then moved to Caltech and again fixed equipment and got his PhD. The Great Depression of the 1930s meant there were few academic jobs, so Townes went to MIT. Here he worked on radar as the war required it. This gave Townes the chance to study microwave radiation. This work led to the invention of the MASER as a result of his practical skills, and his profound understanding of spectroscopy in the microwave region of the spectrum.

The first laser light was generated in 1960, but it was not until 1965 that a sufficient number of firms were building lasers for the publication, "Laser Focus," to start, and for the price of a laser to become affordable for some schools. The 1969 Griffin catalogue, the oldest SSERC has, has a Ferranti He-Ne laser in it for £149 (Figure 1).

The Scottish Education Department released a circular in 1970 concerning the use of lasers in schools (Figure 2). It states, "Optical lasers are already in use in some schools, colleges of education and further education establishments and it is possible their use will become more widespread." Jim Jamieson along with others wrote the guidance for schools. Initially goggles had to be worn when using lasers [2]! This is kept up to date by SSERC [3].

Figure 1 - 1969 Griffin catalogue laser.



Please address any replies to
THE SECRETARY
and quote: Circ. 766.

SCOTTISH EDUCATION DEPARTMENT,
ST ANDREW'S HOUSE,
EDINBURGH EH1 3DB
8th October 1970
Telephone: 031-556 6591, Ext. 34

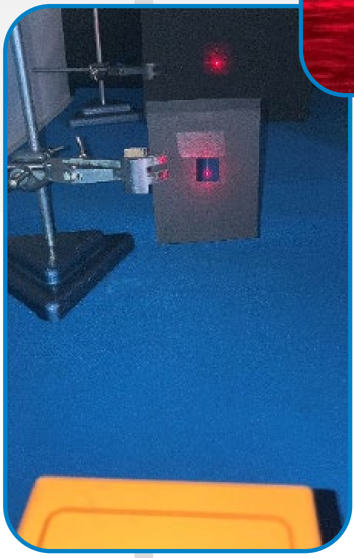
Circular No. 766

Use of Lasers in Schools, Colleges of Education and Further Education Establishments

SIR

1. Optical lasers are already in use in some schools, colleges of education and further education establishments and it is possible that their use will become more widespread. In schools and other educational establishments providing courses at a corresponding level it is not expected that lasers will be used except for demonstration purposes; more advanced students may however need to carry out experiments involving the use of lasers. The purpose of this Circular is to draw attention to the hazards associated with their use and to give guidance on avoiding these hazards. The Secretary of State will be glad if education authorities and other managers of schools and other educational establishments will bring the contents of this Circular to the notice of teachers.

Figure 2 - Government circular 766.



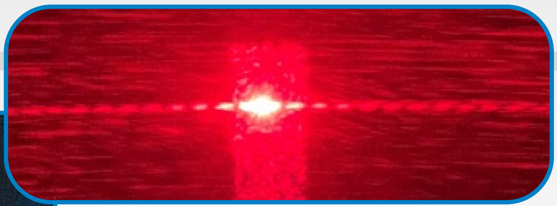
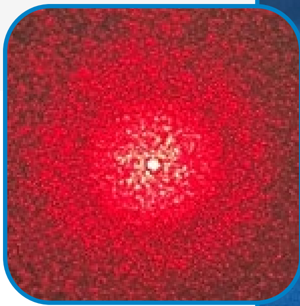


Figure 3 - The diffraction pattern produced by a human hair positioned in the laser bear beam.



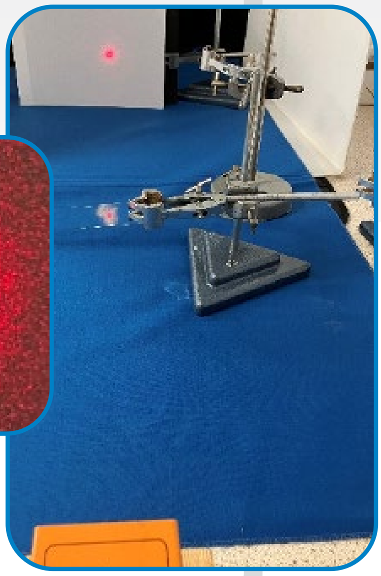


Figure 4 - Lycopodium powder diffraction pattern seen when lycopodium power is stuck to a microscope slide and laser light is shone through it.

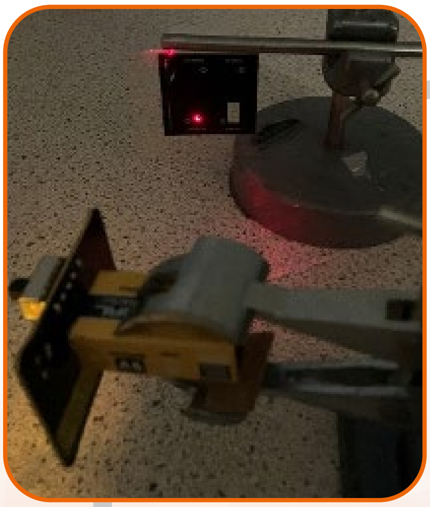
Most schools have a He-Ne laser. It is required for doing experiments such as measuring the width of a human hair, or the size of Lycopodium powder (pollen grains) [4] (Figures 3 and 4). Its beam quality is better than the solid state lasers in, for example, the Photonics Explorer kits.

Many optical experiments became quick to do, so could be set up in a lesson, enabling discussion as to why the distances used are chosen.

For example, Young's slits can be set up very quickly with a Photonics Kit laser, as it is a coherent source of light (Figure 5).

Use of the opensource software "Tracker" enables a plot of the interference fringes to be shown (Figure 6).

Experiments with an "Educational" diffraction grating can be done with a class and the spacing between the orders compared for the different grating spacings (Figure 7). Care must be taken that the laser beam is well below eye level so no learner could accidently look into the beam.



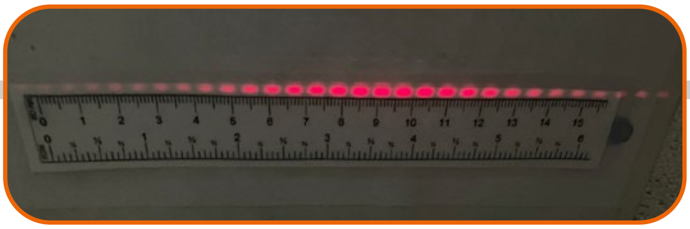


Figure 5 - Young's slits set up and the interference fringes seen on the screen when using the Photonics Explorer Kit double slit.

Figure 6 - Tracker analysis of the interference fringes produced by the Photonics explorer kit's double slit. A He-Ne laser gives a clearer plot.

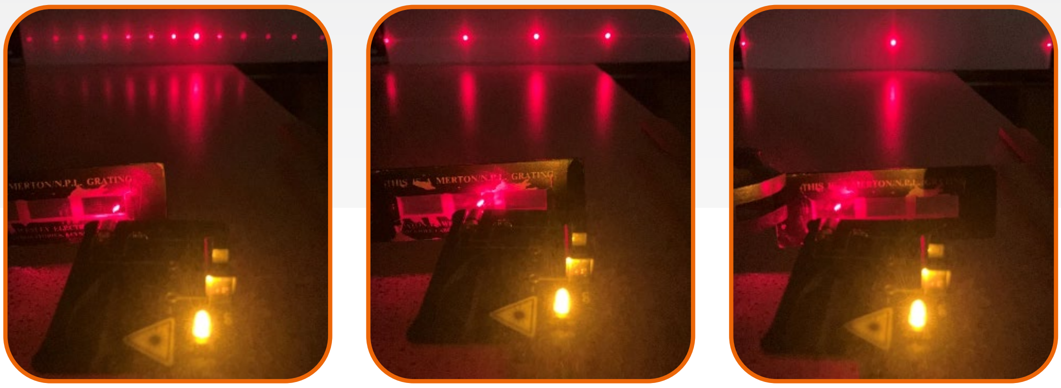


Figure 7 - Educational diffraction grating using 100, 300 and 600 lines per mm gratings from left to right.

The difference between the wavelength of light in water and in air can easily be shown by passing laser light through both water and air. The refractive index of water can also be calculated. To enable this the laser beam must be made into a line. This is done by passing the beam through a glass rod (Figures 8 and 9).

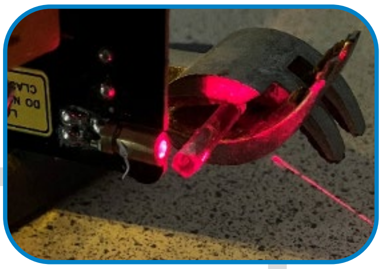


Figure 8 - Making the laser beam into a line using a glass rod.

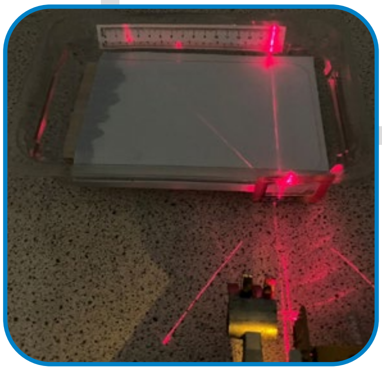


Figure 9 - Passing the laser beam through water and air. The first order in water is closer to the axis than the first order in air.

The grating formula is:
$n\lambda = d\sin\theta$, where n is the order, d is the grating spacing and λ is the wavelength of the light used. For first order $\lambda = d\sin\theta$. The tangent of the angle is easily found since the opposite and adjacent sides can be measured. The small angle approximation is not valid here so the sine must be calculated from the tangent.

The width of the plastic food container used was 15.6 cm giving:

$$\tan\theta_{air} = \frac{13}{15.6}, \ \tan\theta_{water} = \frac{8.5}{15.6}$$

$$\frac{\lambda_{air}}{\lambda_{water}} = \frac{\sin\theta_{air}}{\sin\theta_{water}} = \frac{0.640}{0.478} = 1.3$$

Newton's Rings can be demonstrated using one LED. If the school does not have Newton's rings apparatus it can easily be constructed from cardboard and two microscope slides act as the beam splitter and optical flat respectively [5] (Figure 10). A plano or biconvex lens of focal length ~ 100 m.

Figure 10 - Newton's rings apparatus made from cardboard and two microscope slides.

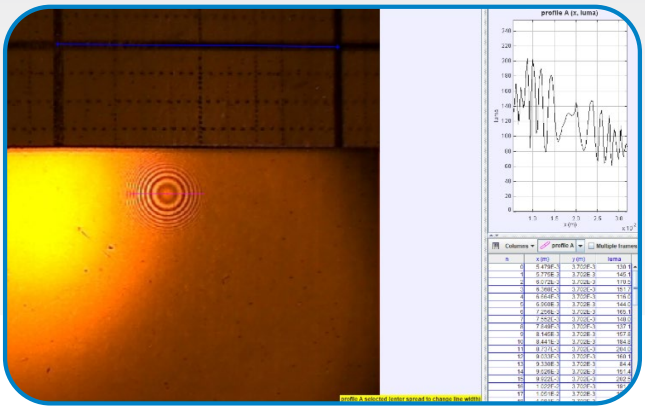


Figure 11 - Newton's rings using one LED and air in the gap between the plano-convex lens and the optical flat.

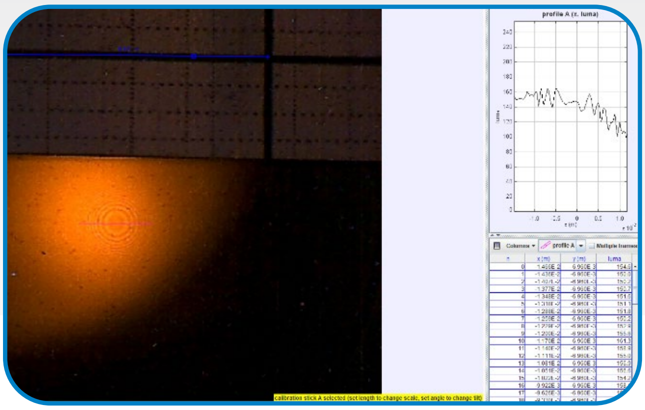


Figure 12 - Newton's rings using one LED and water in the gap between the plano-convex lens and the optical flat. The rings are not as clear.

Diameter of ring (m)	Ring number	Diameter² (m²)
5.61E-04	1	3.15E-07
1.15E-03	2	1.33E-06
1.57E-03	3	2.45E-06
1.89E-03	4	3.57E-06
2.19E-03	5	4.78E-06

Diameter of ring (m)	Ring number	Diameter² (m²)
3.69E-04	1	1.36E-07
9.79E-04	2	9.58E-07
1.33E-03	3	1.77E-06
1.62E-03	4	2.64E-06

In this example the wavelength of the LED was 620 nm. To illuminate the plano-convex lens used for Newton's rings, a biconvex lens of focal length 10 cm is placed 10 cm from the LED, to give a parallel beam of light. A diffuser is required in front of the LED, 2 pieces of tracing paper worked well. A beam splitter directs light down onto the plano-convex lens. With this light source five rings were obtained with air between the lens and the optical flat and four when water was introduced into the gap between the lens and the optical flat (see Figures 11 and 12).

Using "Tracker" the ring diameters can be measured accurately. The relationship between the ring diameter (d) and the wavelength of light (λ) is:

$(d_m)^2 = (4R\lambda)m$, where R is the radius of curvature of the lens, and m is the fringe number from the centre.

Graphs are plotted of $(d_m)^2$ against m for both (see below).

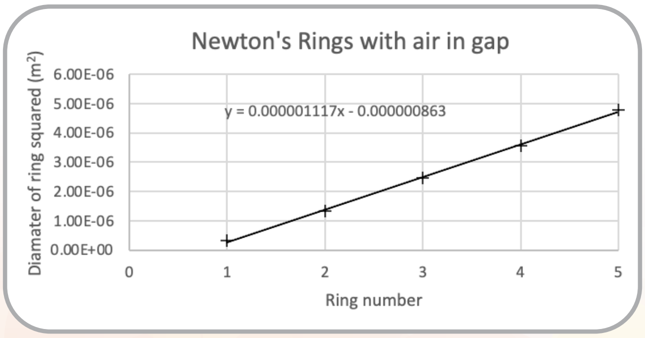
The gradient of the graph is = Rλ

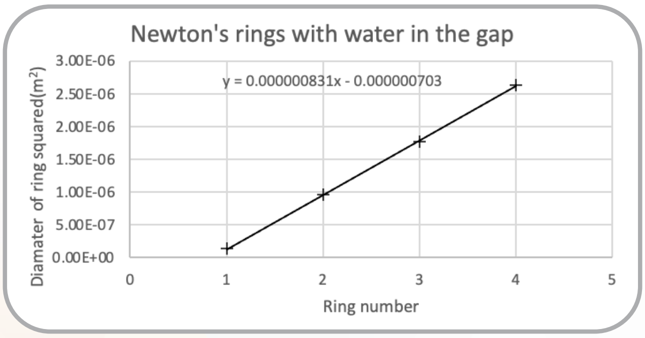
Taking the ratio of the gradient of the graph for air in the gap to the gradient of the graph for water in the gap between the lens and the optical flat gives a value for the refractive index of water.

$R\lambda_{air}/R\lambda_{water} = n_{water} = 1.34$

Taking the ratio of the gradients avoids needing to measure the radius of curvature of the plano-convex lens.

Lasers and LEDs have made optics experiments in schools much more accessible since the time to set up the standard experiments is greatly reduced.





References

[1] How the Laser Happened adventures of a scientist, Charles H Townes, ISBBN 0-19-512268-2.
[2] SSERC Bulletin **188**, Summer 1996.
[3] SSERC Bulletin **231**, Spring 2010.
[4] SSERC Bulletin **191**, Summer 1997.
[5] SSERC website Experiments on a Budget.

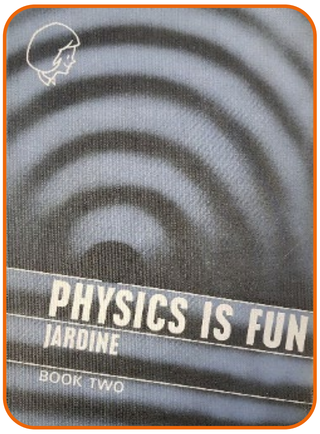
1965: A big year for Scottish education and physics

1965 was a year that saw significant changes in Scottish education and the field of physics. All the events detailed below took place in 1965.

The Scottish Education Department Circular 600 of October, 1965 was published 'inviting' local authorities to submit their plans to end selection and introduce comprehensive education thus ending the process whereby pupils were selected for a particular type of secondary school, effectively determining a certificate or non-certificate education, at the end of primary school age 11 or 12.

In Hansard volume 792: debated on Wednesday 26 November 1969 a Mr W. H. K. Baker records the affects in his constituency of Banffshire. "It was eventually decided that there would be built in the county three large comprehensive schools, one each at Keith, Banff and Buckie, each being fed from a large catchment area around those three main towns".

The Teaching Council (Scotland) Act 1965 established the GTCS and describes its general functions among which was "a duty to keep under review the standards of education, training and fitness to teach appropriate to persons entering the teaching profession and to make to the Secretary of State from time to time such recommendations with respect to those standards as they think fit" and a "duty of the Council to establish and keep a register containing the names, addresses and such qualifications and other particulars as may be prescribed, of persons who are entitled under the following provisions of this section to be registered therein and who apply in the prescribed manner to be so registered." The 1965 Nobel physics prize was awarded jointly to Sin-itiro Tomonaga, Julian Schwinger and Richard Feynman for the explanation of the Lamb-shift. The award ceremony speech notes that "Their work is, however, much more general and of deep general significance to physics."



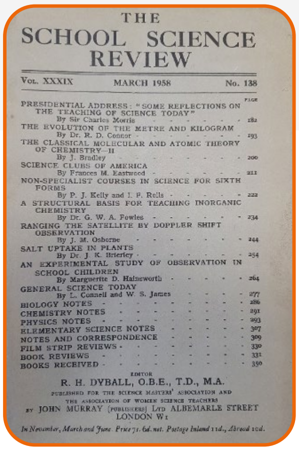
Radio astronomers Arno Penzias and Robert Wilson "accidently" discovered cosmic microwave background radiation. Scientists considered this evidence for the 'Big Bang Theory'. This discovery manifests itself in the current Higher Physics Skills, knowledge and understanding for the course assessment statement "Knowledge of evidence supporting the Big Bang theory and subsequent expansion of the Universe: cosmic microwave background radiation..."

On the 18th March 1965 Soviet cosmonaut Alexei Leonov performed the first space walk in human history. Later that year the Soviets placed the first radio telescope in space, America launched the first multi person spacecraft and performed the first orbital rendezvous.

Physics is so much fun that in 1965 Jim Jardine publishes 'Physics is Fun book 2' with books 3 and 4 published in subsequent years.

Irwin & Partners Ltd, Croydon were advertising a Foucault pendulum with a price of £13 5s 6d (equivalent of over £320 in 2025).

SSERC was founded.


THE
SCHOOL SCIENCE
REVIEW

Vol. XXXIX — MARCH 1958 — No. 138

EDITOR
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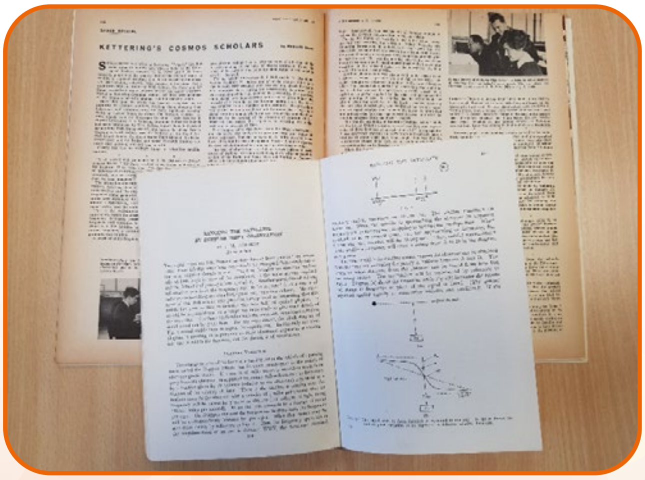
A two-page article in the 'space special' edition of Flight International (1s 6d), dated 22nd July 1965, titled "Kettering's Cosmos Scholars", written by Kenneth Owen features the Kettering grammar school satellite tracking group.

Kettering Grammar physics master Geoffrey Perry stated, "It all started with an article by J.M Osbourne in School Science Review" (The School Science Review Vol. XXXIX March 1958 No. 138 Ranging the satellite by doppler shift observation by J (John) M. Osbourne Stowe School).

The Flight International article opens by describing how, in October 1964, satellite signals had been received from a newly launched Russian satellite before the launch had been officially announced, before Jodrell Bank had received signals and before the British tracking network was aware of a new satellite in orbit. Russian voices were recorded on the satellites third orbit.



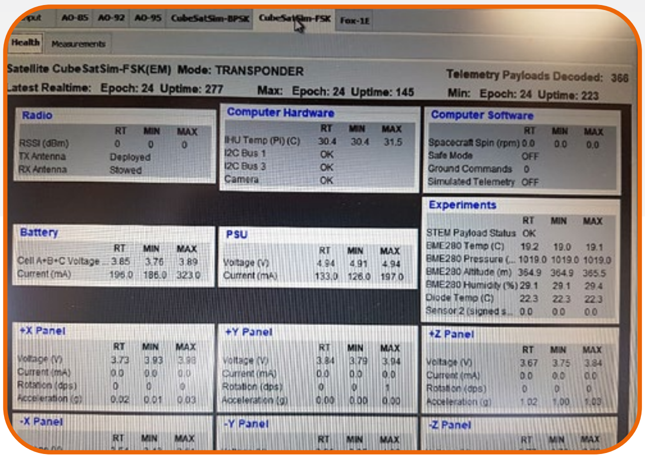
The article also mentions how "The Doppler curve was drawn from the timed observations and the curve was analysed to give the time and range of closest approach". By the end of June 1965, it was reported that, in addition to the 550 observations of the Echo 2 satellite (launched Burn's night 1964) the group had made 368 visual observations of 24 satellites and 892 radio observations of 41 satellites.

A brief study of Mr Perry's 'Boots Scribbling' desk diary for 1965 shows continued satellite observations both visual and by radio, staff meetings at 8pm, school play rehearsals (love's labour's lost), ASE meetings and Saturday detentions! What a fortunate coincidence that a satellite pass occurred during the Saturday detention! Three years later Kettering physics teacher Geoffrey Perry wrote an article titled "A school satellite tracking station as an aid to the teaching of physics" in Physics Education. G E Perry 1968 Phys. Educ. 3 281

Continuing the satellite theme, a browse in late 2023 through the AMSAT-UK online shop offered a set of three printed circuit boards designed by AMSAT to construct your own CubeSat simulator for £45. The CubeSat simulator was billed as "a new tool for education and demonstrations. It can be used in a classroom or training setting to introduce the basics of satellites, or it can be used to teach STEM (Science Technology Engineering and Math) concepts, or it can be a stepping stone in a project to build and launch an actual flight model CubeSat."

Some goals of the project were:

- Make all hardware and software freely available through open source.
- Have a robust design that makes maintenance simple.
- Have a look and feel that is as close to a CubeSat engineering model as possible.
- Have functionality that emulates a real CubeSat.
- Have a modular design that allows different subsections to be swapped out for alternatives.
- Build a community to support and extend the design.



The Cube Sat simulator consists of four main sub-systems: The solar power management board which monitors the solar panel current and voltages for telemetry, the Raspberry Pi Zero W control board which runs the software to control the simulator, the battery management board which controls the charging of the on-board NiMH battery and the transmitter board which transmits telemetry to the 'ground station'.

A STEM 'payload' board, a camera, solar panels, a long list of components, batteries, an antenna and a 3D printed frame complete the materials required to construct the simulator.

Many hours of construction and a few hundred pounds later we had completed the build and had a CubeSat simulator whose status was 'nominal'.

If you would like to try plotting your own satellite Doppler curve then look out for our pre-recorded tutorial which will be broadcast on Thursday 4th September 2025 during our 'Anniversary' week.

A 60 year history of school technicians in Scotland

Over the past six decades, school technicians in Scotland have undergone a remarkable transformation – from largely invisible support staff to highly skilled professionals central to the delivery of science, technology, and digital education. Working behind the scenes in science labs, technical workshops, and ICT suites, school technicians have adapted to evolving curricula, technologies, and educational priorities. This article traces the history of school technicians in Scotland over the last 60 years, highlighting key developments, institutional support, and the long road towards professional recognition.

1960s: foundations in practical rducation

The 1960s were a formative decade for school education in Scotland. Post-war educational reforms expanded secondary schooling, and with it came a focus on practical, skills-based subjects such as science, woodwork, metalwork, and domestic science. Schools began to employ laboratory assistants and technical support staff to help teachers deliver these hands-on lessons.

These early technicians were often former tradespeople or individuals with backgrounds in industry or university laboratories. However, there was no formal training or professional structure for them. Their duties varied by school but typically included preparing materials for experiments or practical classes, maintaining equipment, and ensuring basic safety standards.

In this period, technician roles were localised and fragmented, with little recognition or strategic oversight across Scotland's then-education authorities.

1970s–1980s: role expansion and the first signs of structure

As the 1970s ushered in a period of curriculum modernisation, including an emphasis on science and technical subjects, the technician role grew in complexity. The rise of O-Grades and later Standard Grades meant that practical coursework became an integral part of assessment, requiring even more technician support.

It was during this time that job titles began to standardise across schools into distinct categories:

- **Science Technicians:** focused on biology, chemistry, and physics.
- **Technical Technicians:** supported design and technology (formerly craft) departments.
- **Home Economics Technicians:** a more niche but essential group assisting in food and textile preparation.

By the early 1980s, some local authorities began creating senior technician roles, particularly in larger schools or clusters. Still, most technicians remained unrepresented and lacked access to formal training. Their work, though essential, was often undervalued.

1990s: the emergence of professional support and training

The 1990s brought more visibility to the role of school technicians. As science and technology education became more central to the curriculum, the need for trained and knowledgeable support staff grew. In Scotland, SSERC which had been founded in the 1960s as a resource hub for science teachers – began to expand its remit to include support for science technicians.

SSERC began offering:

- Professional development courses.
- Health and safety training.
- Equipment handling and risk assessment guidance tailored to technicians.

Elsewhere in the UK, organisations such as CLEAPSS and the Association for Science Education (ASE) were already active in advocating for school technicians, but SSERC became the primary Scottish institution supporting this workforce.

At the same time, Scottish local authorities began to evaluate technician job roles through Single Status Agreements, aligning them with broader local government pay structures.

2000s: Curriculum for Excellence and digital expansion

The launch of Curriculum for Excellence (CfE) in the mid-2000s marked a significant shift in Scottish education. CfE's emphasis on interdisciplinary learning, scientific inquiry, and technology-driven approaches placed increased demands on technicians. Science technicians needed to support more open-ended investigations, while technical and ICT technicians were tasked with keeping up with new software, 3D printers, CAD/CAM tools, and networking systems.

During this period:

- SSERC broadened its training programmes to reflect CfE priorities.
- Unions such as Unison and GMB became more vocal about technician workloads, pay parity, and conditions.
- Some local authorities experimented with whole school technician models, where one technician supported several departments.

In parallel, ICT technicians emerged as a distinct category, responsible for everything from installing interactive whiteboards to maintaining online learning environments. Their work became increasingly vital, but often lacked clear professional standards or training routes.

2010s: professional recognition and networks

The 2010s brought a significant shift toward the professionalisation of the technician workforce in Scotland. Several key developments characterised this decade:

1) **SSERC's technician CPD framework:** SSERC introduced a structured programme of Continuing Professional Development (CPD) courses for school science technicians. Topics ranged from chemical handling to microbiology, electronics, and COSHH regulations. These courses were instrumental in elevating technicians' confidence and competence.
2) **National technician networks:** technician networking events and online forums began to link technicians across local authorities, creating professional communities where none had existed before.
3) **Increased union engagement:** Unison and other public sector unions began campaigns specifically highlighting the need for:
   - Properly evaluated job descriptions.
   - Career progression (e.g. from Assistant to Senior Technician).
   - Safe staffing levels and fair pay.
4) **Professional registration opportunities:** technicians in Scotland began seeking registration through UK-wide bodies such as the Science Council, which introduced the Registered Science Technician (RSciTech) designation. Though uptake was slow, it provided a pathway to national recognition of technician competence.

2020s: pandemic response

The COVID-19 pandemic in 2020 placed unprecedented pressure on school technicians. As schools pivoted to remote learning and later returned to in-person instruction under strict health regulations, technicians played key roles in:

- Setting up and maintaining digital learning platforms.
- Preparing classrooms for safe practical work.
- Managing PPE and chemical inventories under new hygiene protocols

The pandemic highlighted the versatility and resilience of technicians – but also exposed the precarious nature of the workforce. Many technicians lacked access to home-working equipment, consistent CPD, or representation in school leadership teams.

Toward a recognised and resourced profession

From their informal beginnings in the 1960s to their current roles as safety specialists, digital facilitators, and STEM enablers, school technicians in Scotland have travelled a long road. Supported increasingly by institutions such as SSERC, and backed by union advocacy, technicians still don't have the recognition they deserve, but their influence on STEM is undeniable.

Challenges that remain:

- Pay and career progression are still inconsistent across Scotland's 32 local authorities.
- Recruitment is difficult in areas where technicians can earn more in industry.
- There is no national professional framework defining technician roles, competencies, and training.

Looking ahead, there is growing consensus that Scotland's technician workforce is essential not just for today's classrooms, but for building the country's future STEM capability. With investment in training, clearer professional pathways, and more strategic national coordination, school technicians can take their place as a recognised and respected profession at the heart of Scottish STEM education.

SSERC professional learning courses

We offer professional learning (PL) courses and events for teachers in both primary and secondary settings, school technicians, and other educators. Many of our PL offers are heavily subsidised through funding from external organisations e.g. Scottish Government. All PL courses for teachers are endorsed by the GTCS.

Courses available for online booking include:

COURSE NAME	RESIDENTIAL?	DATES	CLOSING DATE	SECTOR
SSERC Meet – Ad Higher Biology	Online	18 September 2025	10 September 2025	Secondary Biology**
Introductory Physics	Face-to-face	29-30 October 2025	19 September 2025	Secondary Technicians
Health and Safety	Online	3, 10, 17 Nov 2025	30 September 2025	Secondary H&S
Working with Radioactive Sources	Face-to-face	5 November 2025	26 September 2025	Secondary H&S**
Safe Use of Fixed Workshop Machinery	Face-to-face	5-6 November 2025	26 September 2025	Secondary Technicians*
Hot & Cold Metal Forming	Face-to-face	11-12 November 2025	26 September 2025	Secondary Technology**
Safety in Microbiology for Schools	Face-to-face	11-13 November 2025	26 September 2025	Secondary Technicians
Intermediate Physics	Face-to-face	19-20 November 2025	24 October 2025	Secondary Technicians
Safe Use of Fixed Workshop Machinery (refresher)	Face-to-face	26 November 2025	24 October 2025	Secondary Technicians*
Technology Probationers	Face-to-face	3-4 December 2025	31 October 2025	Secondary Techology
Laboratory Science Nat 5	Blended	10-11 December 2025	7 November 2025	Secondary Science **
Science Probationers Residential	Face-to-face	16-17 December 2025	14 November 2025	Secondary Science
Science Probationers Residential	Face-to-face	14-15 January 2026	28 November 2025	Secondary Science
Safe Use of Fixed Workshop Machinery	Face-to-face	14-15 January 2026	28 November 2025	Secondary Technicians*
Safe Use of Fixed Workshop Machinery	Face-to-face	21-22 January 2026	5 December 2025	Secondary Technicians*
Senior Phase Chemistry for Technicians	Face-to-face	24-25 February 2026	16 January 2026	Secondary Technicians
Wood Turning	Face-to-face	25-26 February 2026	9 January 2026	Secondary Technology**
Maintenance of Fixed Workshop Machinery	Face-to-face	3-5 March 2026	6 February 2026	Secondary Technicians
Electrical Safety and PAT Testing	Face-to-face	5-6 March 2026	6 February 2026	Secondary Technicians
Centre Lathe Turning	Face-to-face	24-25 March 2026	20 February 2026	Secondary Technology**

* May also be suitable for secondary teachers.
** May also be suitable for secondary technician.

Please check our website pages at https://www.sserc.org.uk/professional-learning/professional-learning-calendar/ for the most up-to-date details on our professional learning calendar.

YOUNG STEM leader led by sserc

Young STEM Leader Programme

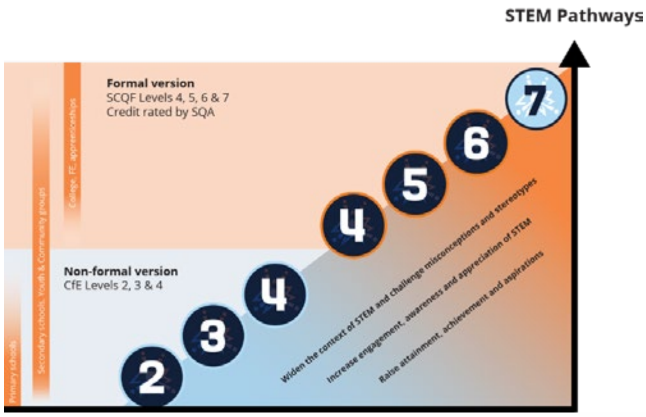
In 2019 SSERC began developing the Young STEM Leader Programme (YSLP), fully funded by the Scottish Government. The programme philosophy aligned perfectly with SSERCs mission to inspire, enthuse and support educators for the benefit of all learners.

A programme was rolled out that offered training to educators, called Tutor Assessors training. Tutor Assessor training supports educators to deliver and verify the Young STEM Leader Programme (YSLP), enabling them to scaffold young people as they develop and lead their own STEM activities.

Young STEM Leader Level 2 (YSL2) and YSL6 were the first levels of the programme to be developed for the pilot phase during academic year 2019/2020. The original plan was to have a primary school, secondary school and community group participating however, the positive demand for participation led to over 70 centres taking part, representing 23 local authorities. By June 2020, 155 young people had completed the programme.

Click here to find out more!

With the continued support from Scottish Government, the programme has gone from strength to strength and currently there are seven levels of the programme available, from Curriculum for Excellence Level 2 (YSL2) to SCQF STEM Leader Level 7 (SL7). STEM Leader 7 is generously powered by Ocean Winds.



Currently over 35 000 young people have engaged in the programme and over 3500 Tutor Assessors have been trained across all 32 Local Authorities in Scotland. As well as Primary, Secondary and Community Learning and Development practitioners, the YSLP acts to build a community of excellence in STEM leadership. YSLP collaborates with partners across the country to support delivery of the Award. To date we have formalised partnerships with a range of organisations and warmly thank those involved in the development and evolution of the Young STEM Leader Programme as we look to the next 60 years.

YSL Programme Partnerships

- North Lanarkshire Council Leadership Academy (STEM) at National 5 carries an Auto-Award for YSL5.
- North Lanarkshire Council Leadership Academy (STEM) at Higher carries an Auto-Award for YSL6.

Schools Air Race Challenge carries Auto-Awards for YSL2 and YSL3.

East Lothian Council Foundation Apprenticeship in Scientific Technologies carries an Auto-Award for YSL6

Aberdeenshire Council Foundation Apprenticeship in Scientific Technologies, carries an Auto-Award for YSL6.

- Industrial Cadets Gold Project carries an Auto-Award for YSL6.
- Industrial Cadets Bronze Project carries an Auto-Award for YSL4 (Non-Formal).
- FunSTEM Programme carries an Auto-Award for YSL2.
- Insight Into Apprenticeships Programme carries an Auto-Award for YSL5.

#DigiInventors Challenge (Primary) carries an Auto-Award at YSL2.

Saturday school carries an Auto-Award at YSL3.

Supported development of YSLP interactive learning modules that can used to achieve digital badges to support the Award.

- Primary Class carries an Auto-Award for YSL2.
- Entry Class carries an Auto-Award for YSL3.
- Development Class carries Auto-Awards for YSL4, YSL5 and YSL6.
- Professional Class carries Auto-Awards for YSL5.

Offer a YSLP £100 grant that is open to YSLs apply to if they are leading an activity, event or interaction related to physics.

Completing a Formal YSLP award can satisfy the *Skills and Volunteering* component of a Duke of Edinburgh Bronze, Silver or Gold award providing the activities take place over the prescribed DofE timescales.

Supported development of SL7 in 2023/2024 and ongoing delivery of the programme.

The Climate Smarter and Carbon Capture and Storage projects both carry Auto-Awards for YSL2.

To celebrate 60 years of SSERC, we invited Young STEM Leaders and STEM Ambassadors to imagine the world 60 years from now. What will science, technology or life on Earth (or beyond) look like in 2085? Young people and STEM Ambassadors were asked to share their vision around five key themes, including Space, Power, Health, Gadgets and Planet Earth.

A selection of STEM Ambassadors supported the themes, looking back at the last 60 years in their field:

Space

The Apollo Programme was one of the most exciting space exploration events in history! It took years of testing, engineering and collaboration to allow humans to step on to the Moon' s surface. Incredibly much of this was done with hand calculations and minimal computing power, compared to present day. It's incredible to think it was just over 100 years ago that humans took their first flight; within 70 years we took our first steps on the moon. Imagine where will we be at the end of this century!

Hannah Nisbet & Steven Gray – Aero Space Kinross

Power

In the late 1950s, the Zero Energy Thermonuclear Assembly (ZETA) project was on the front-page of newspapers: 'A breakthrough towards unlimited energy, a scientific advance for Britain greater than the recently launched Sputnik had been for the Soviet Union.' At the time, the majority of the UK's electricity was generated by burning coal, and fusion held the possibility of unlimited clean energy. Its legacy lives on in the fusion reactors I work with today.

Holly McElhutton

Health

Heart rate, blood oxygen levels, sleep quality, and even how many times you stand up in a day: these metrics aren't just numbers; they're biological breadcrumbs that can hint at everything from heart health to chronic stress. In the past, we could only collect this information by using expensive and heavy pieces of equipment in healthcare settings like hospitals. Wearable technology is transforming how we track and understand our health. Sometimes innovation is about discovering bold new science and developing something new from scratch, but often it looks more like taking what already exists and making it easier to work with and cheaper to buy.

Johnathan Doran – SSERC

Planet Earth

In 1965, for the first time, a president of the United States of America was warned about the dangers of burning fossil fuels, detailing the direct ways society was polluting air, land, and water, describing carbon dioxide from fossil fuels as 'the invisible pollutant': "Through worldwide industrial civilisation, man is unwittingly conducting a vast geophysical experiment, which would modify the heat balance of the atmosphere to such an extent that marked changes in climate, not controllable through local or even national efforts, could occur." The developments in the 60 years since this first warning, predicting that temperatures across land, air, and our oceans would be rising, show us just how much of an impact carbon dioxide has had.

Kirsty Crawford – Marine Conservation Society

Gadgets

60 years ago, we didn't have smartphones and even most computers were the size of cars! Back then, when people talked about "artificial intelligence" or AI, it was mostly a dream. AI was in its very early stages as computers were much less powerful than today. Scientists were just starting to explore if machines could "think" like us. They wrote programs that could play simple games like checkers or solve basic math problems, but it felt more like clever tricks than real intelligence.

Rebecca Davie – CreateFuture

Selected entries were collated in a digital gallery and will be sealed in a Time Capsule, held in SSERC HQ, to be opened in 2085 by the Young STEM Leaders and STEM Ambassadors of the future.

There will be another opportunity to add your thoughts and consider 'What will the world look like in 60 years?' by sharing your ideas on social media during **#YoungSTEMLeaderWeek2025 – 27-31 October 2025**.

Work with STEM Ambassadors

Are you interested in having a STEM Ambassador visit your classroom, in person or online, to help bring the curriculum to life and inspire learners to see where STEM can take them? Register on the STEM Learning website as an Educator by clicking on the top right icon here, which will allow you to post requests for STEM Ambassadors and view offers available near you.

Online information sessions

We deliver 30-minute information sessions for educators and community group leaders to learn more STEM Ambassadors, show you how to use the digital platform, and give you some guidance on how to engage with volunteers. You can browse the session dates and times on the STEM Learning Eventbrite and sign up for the session that suits your schedule here.

Still turning, still teaching

SSERC's workshop marks 60 years of practical STEM with heritage and high tech

In celebration of its 60th anniversary, SSERC is looking not only to the future but also proudly to the past – a past that's still very much alive in its bustling workshop. Amongst the sleek outlines of laser cutters, 3D printers, and CNC routers, stand machines that have supported STEM education for decades – some dating as far back as the 1950s, and still in daily use.

Most iconic among these are the five Union Jubilee lathes, originally manufactured between 1957 and 1963, that were fully refurbished by SSERC around five years ago. Upgraded to meet modern PUWER safety regulations, they continue to provide high-quality, hands-on training in woodturning skills – proving that smart refurbishment can outshine replacement in both cost and quality.

Originally introduced in the late 1930s by the Harrison Company, the Union Jubilee lathe was designed specifically with education in mind. Compact, robust, and safe for school environments, it became a staple in technical departments across the UK. When production ended in the mid-1960s (with the more superior "Graduate" lathe being available), the final retail price stood at £96 per unit – a modest cost even then, but a wise investment given the machine's quality.

SSERC workshop (corner) Broughton Street Terrace cira 1965-1989 (1st SSERC premises).

Fast-forward six decades, and finding new lathes with similar durability and simplicity – at an affordable price – is increasingly difficult. Modern equivalents with comparable build quality and educational suitability now range between £2,000 and £2,500 each. This reality made the decision to refurbish rather than replace an easy one – not just financially, but in alignment with SSERC's commitment to sustainability and circular economy principles.

SSERC workshop in Bernard Terrace cira 1989 (2nd SSERC premises).

Over the course of four months, SSERC's technical team carried out an extensive, careful refurbishment of all five lathes. Each machine was fully stripped down to its base components and then methodically brought back to life.

The process included:
- Thorough cleaning and degreasing of all mechanical parts.
- Mechanical repairs and re-machining where required.
- Replacement of bearings, belts, and bushes to restore smooth, safe operation.
- Installation of modern switchgear and up-to-date electrical systems, replacing original wiring and control boxes.
- New safety features installed to comply with current PUWER and HSE regulations.
- Full repainting in the original Union Jubilee colour scheme, preserving their classic appearance.

Machines after nearly 55 years in service.

During stripped and paint prepping stage.

Freshly painted and undergoing refit.

Each restored lathe now functions as reliably as the day it left the factory – but with the added safety, efficiency, and compliance required in today's education environments. The cost per refurbishment was between £100 and £150 for parts/materials – offering a saving of over £12,000 when compared to purchasing five new machines.

But the Union Jubilee lathes are just part of a remarkable line-up of heritage equipment still in use. A Harrison L5 centre lathe from 1966 – a true classic of British engineering – continues to deliver accurate, reliable performance. Alongside it, a range of Boxford centre lathes from the late 1980s brings slightly more modern control systems while still maintaining the durable build of its predecessors.

SSERC's metalwork area also boasts welding machines ranging from the 1970's right through to 2025 with digital controls and modern invertor technology, which, like the lathes, have been maintained to remain compliant and operational. The presence of these machines speaks not only to engineering quality but also to the importance of preservation and sustainability in educational practice.

And then there are the hand tools – some of them passed down from generation to generation. Mallets, gauges, chisels, precision tooling and vices with decades of history still earn their keep alongside the most modern gear. These tools hold stories, and they still perform their job as well as they did 40 or 50 years ago.

Yet SSERC's workshop is far from stuck in the past. Alongside these classic machines is a suite of cutting-edge digital tools for modern design and manufacturing:

- Laser cutters for precision prototyping.
- 3D printers for additive manufacturing.
- CNC routers for computer-controlled cutting and shaping.
- Sublimation printing equipment for transferring digital designs to real-world objects.

This dynamic transformation has been significantly shaped by leadership. Since Duncan Lamb took on the role of Technology Education Manager and Chris Kerr stepped in as Education Officer in 2017, the SSERC workshops have undergone a substantial revitalisation. Their combined vision and practical expertise have modernised the training environment, balancing the value of traditional tools with the capabilities of cutting-edge technologies.

Their work has been strongly supported by Alastair MacGregor, SSERC's Chief Executive, whose ongoing commitment to STEM education and sustainable investment has enabled long-term planning and ambitious development. Together, this team has ensured that SSERC's facilities not only honour their heritage but also prepare educators for the future of technology and design in Scottish schools.

Newly refurbished Union "jubilee" wood lathes.

Back in action!

As one project finishes, another begins. The next restoration challenge on the horizon is the refurbishment of three 1964 Elliott S1 pillar drills – another robust, education-focused design from a golden era of British engineering. Like the Jubilees, these drills are still structurally sound but in need of modernisation. The upcoming work will see them completely stripped, mechanically overhauled, upgraded to meet modern electrical and PUWER standards, and returned to service for another generation of learners. It's another clear signal of SSERC's commitment to sustainability, value for money, and the long-term role of heritage equipment in STEM education.

In many ways, the workshops reflect SSERC itself: grounded in strong educational values, yet always evolving. As the organisation celebrates 60 years of supporting teachers, technicians and students, the machines that have travelled that journey alongside them – and the smart, sustainable decisions to keep them running – tell a powerful story of innovation, resilience, and the circular economy in action.

60 years in, and they're still turning!

My SSERC journey

by Fred Young • Past CEO at SSERC

When I arrived at Moray House in 1999 for interview, the warm welcome I received meant that, in no time, I was talking science with staff, exploring the resources and the interview nerves took a back seat. What struck me was the vast collective knowledge of the staff and that the mission to support safe and exciting practical science and technology education was shared by the whole team. To this day, when I drop in for a coffee, I'm still blown away by the staff and what SSERC is achieving.

Apart from the ever present issue of funding, the first major challenge that I faced during my time at SSERC, was our eviction from Moray House by the University of Edinburgh who planned to redevelop the site. It quickly became clear that the organisation could not afford to remain based in Edinburgh. During this time, the SSERC Board came into its own, with Councillors and LA officers involved in the search for new premises. This included accompanying me driving around looking at the good, bad and ugly of what was on offer - at times, I'm sure, looking like we were casing the joint! Fife Council then stepped in and the move to Pitreavie Unit 2 was result.

Relocation to Fife was a great move for the organisation, since an increasingly positive relationship with the Scottish Government and the Chief Scientific Officer for Scotland meant that new opportunities opened up for SSERC. At Pitreavie Court, SSERC now had the facilities to develop and host CPD events, the space to grow from eight to around thirty staff and could therefore take advantage of these opportunities.

A rising interest in SSERC CPD programmes from UK and overseas organisations and governments soon followed, naming but a few: STEM Learning, PSTT, RCUK and STEM Ambassadors. Developing close working relationships with several of these organisations led to additional support, which allowed for the development of a career long CPD programme (outlined by Paul Beaumont). A significant element in the success of these programmes was the collaborative nature of their development and delivery. The Primary Cluster Programme was conceived with input from ADES, HMIE, and Science Advisors. At the heart of the Technicians' programme, the driving force was the Scottish Technicians Advisory Group (STAG).

Additionally, the strong links developed through the core service with LAs, schools, head teachers, teachers, technicians, universities and Learned Societies informed most other programmes.

Expansion of any service is not without risk. I was fortunate to work with a team who were very committed and always up for a challenge. As SSERC expanded, we were able to persuade the Wellcome Trust that it would be a good investment to support the acquisition and refurbishment of Unit 1, so that we could better support the teaching of practical primary science education in Scotland. A happy by product of this was that we were also, with support from STAG, able to create space for technology workshops.

When Health and Safety is mentioned there is often a collective moan in the room! In fact, some most memorable events during my time at SSERC were Health and Safety related. It was the knowledge within SSERC that managed to persuade the Home Office (actually MI5!) that school chemical stores were not a major source of bomb making materials for terrorists. The MOD were a bigger challenge when, after removing a chemical that it had deemed dangerous from schools all over England and blowing it up, they turned their sights on Scotland! Fortunately, with support from the Scottish Government, we were able to persuade the MOD that not only did we have a technician service in Scotland with the skills to store the chemical properly but that they could also dispose of it without the theatrics! It would be fair to say that we sent them homewards tae think again!

I feel privileged to have been with SSERC for both the 40th and 50th anniversary and I congratulate all involved in the continued success of the organisation.

Celebration and reflection

by John Richardson • Former Director

Firstly, let me congratulate the current board and staff of SSERC at a time for celebration and reflection on the achievements of the Centre.

I joined the staff of SSSERC (third S for Science), in 1973 as a temporary replacement for a secondee who didn't return. I stayed until 2006 when I retired. It's a cliché but: If you love your job, you never really have to work.

The 1973 SSSERC was rooted in curriculum support. It was a time of international major reforms in science education. Scotland was in the van of some developments with ties to initiatives such as the Nuffield Science Project. We sought out suitable new equipment for modern science courses. We tested it, wrote reports and published market surveys, advising on selection and purchase. If a piece of kit was needed but unavailable; we designed and made it. Because we tested equipment, we knew how to use it - safely. We could troubleshoot. We fixed things, invented stuff. Panels of teachers advised us on programmes of work. If a teacher or technician telephoned or wrote seeking help, possibly with an idea for development, that took priority. Care and quality were expected. Director Joe Stewart, would stress that teachers could make their own mistakes. They didn't need help with that.

John Richardson (right) with the Secretary of State for Scotland, Ian Lang.

The emphasis slowly shifted. SSERC also became active in 'staff training' (then) 'career long personal development' or whatever now. Because we could use and fix equipment, we learned to teach others to do so. We knew how to use electrical kit, ionising radiation, chemicals and living organisms safely. Practical courses were developed, travelling exhibitions staged, codes of practice written. Staff gained qualifications in occupational health and safety. Practical work in science faced serious threat. Risks were assessed by some so as to avoid them; rather than for control. Suitable and sensible risk management meant deploying hazardous, but highly educational, procedures effectively. There's nothing like a bit of "crash, bang wallop!" and children are "naturally venturesome and curious" [1].

There was early involvement in supporting curricular endeavour; from the "Alternative" syllabuses of the Sixties through TVEI [2] and support for Technological Studies, where SSERC blossomed as a pioneer of school electronics teaching. The Centre then went on to manage collaborative, multi-agency projects on microelectronics, biotechnology, Primary Science and Environmental Studies 5-14. Those 5-14 projects were my professional 'swan song'. I was seconded to manage those collaborative CPD initiatives whilst successor Fred Young led the core team.

If SSERC has secret ingredients for longevity; they are the enthusiasm, plus adaptability, of its staff and board. During my tenure, SSERC moved four times – adapting premises each time. It was founded as a co-operative venture under the old Royal Boroughs and County Councils. Legally, it was just an unincorporated club. The first Local Government shake-up saw formation of a Company Limited by Guarantee and educational charity. A second Local Government disruption meant a cessation of trading, avoiding insolvency until enough of the new councils came on board. In each of these 'crises' SSERC was saved by the active support of practitioners – teachers, technicians, advisers and inspectors – all valuing the organisation's 'bottom up', needs and outcomes-driven, approach.

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So, here's to the next sixty years of such fruitful, practical endeavour.

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[1] From a DES publication on Science and Safety in Schools.
[2] Technical and Vocational Education Initiative.

Some reflections

by Paul Beaumont

In common with many people I suspect, I am struck by the breadth of work which has been delivered since SSERC's establishment in 1965. In this short article I propose to focus on SSERC's role in the delivery of professional development (referred to throughout as professional learning or PL) - one of its three current, core functions.

In the broadest sense, SSERC has always been engaged in PL through its support for teachers and technicians (see John Richardson's article in this issue of the SSERC Bulletin) by offering opportunities for individuals to gain greater understanding of practical activities across STEM subjects.

Probably, SSERC's first foray into formalised PL took place in the late 1990s with the provision of a series Biotechnology and Biosciences Summer Schools. These 5-day residential events, for teachers and technicians, offered places for up to fifty attendees. Financial support from the University of Edinburgh, The Scottish Executive, SSERC and Science and Plants for Schools (SAPS) allowed delegates to attend at no cost to their institutions. Evaluations of these summer schools were always very positive so much so that their format and content was adopted by the Wellcome Trust as the initial basis for programmes run by the National Science Learning Centre (NSLC). It was not long before similar events were offered by SSERC's Physics, and Chemistry teams and the model continues across STEM secondary subjects.

It's not possible here to give a full account of the various strands of PL with which SSERC has been involved. Consequently, I offer a list of what I consider to be six highlights - my list will not be the same as others would choose and for that I can only apologise.

1) Supporting Scottish Science Education through CPD

In 2005, SSERC was appointed the fundholder for the *Support for Science Education through CPD* initiative which relied heavily on a grant from the Scottish Executive Education Department. The grant provided aspects of central support for a partnership of effective PL providers. The core partners in the initial phase included the DUSC (Development to Update School Chemistry) Project, the SAPS Biotechnology Scotland Project, SIBE (Scottish Initiative for Biotechnology Education) and SSERC. Other bodies (including the Institute of Physics and ASE Scotland) joined shortly after the initial funding had been secured.

Through its secondary PL programmes SSERC aspired to offer secondary teachers opportunities to participate in true Career-Long Professional Learning, with programmes available for PGDE students, moving into specialist sessions for probationers, followed by a range of subject-relevant, curriculum-supportive courses and, ultimately 'Leadership' for aspiring or in-post Faculty Heads. All SSERC's PL sought to offer attendees the expertise and resources to allow implementation of learning-enhancing activities in their classrooms. Feedback from participants, continuing demand for places on courses, and independent evaluation indicated that the approach which SSERC was taking was meeting the needs of teachers and furthermore having impact on students. An important feature of SSERC's approach was the development of working partnerships with a wide range of organisations.

2) Scottish Universities Science School (SUSS)

Following discussions with colleagues in the Teacher Education Institutes (TEIs), it was agreed to extend SSERC's involvement with Professional Graduate Diploma in Education (PGDE) students to include subject coverage across the sciences and offer support for practical work and in 2005 SUSS was developed. Briefly (for more details see [1]) we sought to bring together all chemistry, biology and physics PGDE students from the TEIs in Scotland in a two-day residential event to offer, inter alia:

- experience in a range of activities not usually available during initial teacher education programmes;
- opportunities to develop expertise in teaching topics outside a student's subject specialisms;
- networking opportunities with other teachers of science from across Scotland;
- an introduction to high quality PL.

At its peak upwards of 240 PGDE students attended SUSS annually. Changes in funding priorities and the advent of COVID-19 meant that SUSS in January 2020 was its final outing.

3) The Primary Cluster Programme (PCP)

Once it became clear that SSERC could be relied upon to provide high quality, experiential PL, the Scottish Government invited us to put forward a proposal to offer opportunities to reach each and every primary school teacher in Scotland. Purely on the numbers of teachers involved (estimates vary but it was of the order of 25,000) this was going to require two things before implementation of PCP would be possible – (i) a significant increase in budget, and (ii) a significant increase in the size of the SSERC team and to be fair both these demands were met but not to the extent required. However, the SSERC team was able to formulate a plan that would, over a 12-year period (2012-2024), allow some 24,000 interactions with practitioners to be achieved. The PCP is a model that has been emulated in several locations across the UK. An important initiative which spawned out of the PCP was the design and delivery of so-called SSERC_Meets. These were online sessions during which up to 100 participants could follow a range of practical activities using equipment/resources provided to the schools involved. In the 'early days' IT challenges were occasionally a problem, but these were gradually resolved so much so that when the emergence of COVID-19 essentially stopped all face-to-face PL SSERC was able to step almost seamlessly into the space. Since that time SSERC_Meets have become a significant tool in respect of PL provision across both primary and secondary programmes. A fuller analysis of the PCP and its success has been published [2].

4) Bringing cutting edge science into the classroom

In relation to academic research, it has long been argued that Research Institutes and Universities in Scotland 'punch above their weight' and this is particularly true across the STEM disciplines. In the period 2009-2010 and 2013-2018 Research Councils UK (RCUK) provided funding to encourage links between researchers and secondary teachers / tutors in the FE sector. SSERC was appointed as the 'centre of choice' in Scotland for these so-called RCUK courses. The basic premise of these courses was to link researchers with teachers/tutors and thereby explore how aspects of research could be used to enrich the curriculum especially at a time of significant changes to the content of Higher and Advanced Higher programmes. In terms of UK-wide activities SSERC-led *RCUK* courses were consistently the most popular and highly regarded by teachers/tutors and researchers. Each secondary science team at SSERC (Biology, Chemistry, and Physics) ran on average, two one-day courses each year. The breadth of the courses offered was impressive from Astrophysics, Particle and Quantum Physics, Biomedical Engineering, to Plant Science (and many other topics in between!). The links created between SSERC and the Research Institutes have, in many cases, continued and input across many of our senior phase courses from researchers continues to be the norm.

5) Technology provision

One area of experiential PL which was 'missing' from SSERC's portfolio was support for senior phase teachers of technology. The acquisition of Unit One (later renamed the Rosalind Franklin Building) afforded us the space in which technology provision could be envisaged and developed. Over the past decade or so SSERC has been able to deliver an impressive portfolio of courses for teachers and technicians in areas such as Welding, Hot and Cold Metal Forming, Safe use of Workshop Machinery, Engineering Bench Skills, and Wood Turning. The foregoing list is by no means exhaustive but hopefully gives a flavour of what has been achieved. In a parallel development with SUSS, the Technology Team at SSERC have offered residential courses for PGDE students across the technology sector.

6) General Teaching Council for Scotland (GTCS) Accreditation

On the evidence of participants' evaluations and external review, SSERC has always believed that it offers high quality PL opportunities for educational practitioners. Further validation of our assertion came in 2018 in the form of endorsement by GTCS who awarded SSERC with the 'GTCS Quality Mark as a Professional Learning Organisation'. The award was established to celebrate organisations which support and promote teacher PL and identifies those which aim through their work: 'to develop and enhance teachers' knowledge, expertise and skill; develop their professionalism, and to impact positively on learning experiences and outcomes of children and young people. SSERC always believed that the PL which we offer is of high quality but this formal recognition by GTCS further consolidated our position as the provider of choice across the STEM subjects.

When running courses at SSERC I often cited Barth [3]:

"Nothing within a school has more impact on students in terms of skills development, self-confidence, or classroom behaviour than the personal and professional growth of teachers."

For me this sentiment continues to be as true today as it was when first written. Of course, in the context of STEM education other groups of educational practitioners within schools/colleges (e.g. technicians, classroom assistants) must be added to the mix since without their contribution little, or no, practical work would be undertaken or indeed be possible.

As an occasional visitor to SSERC since I retired at the end of December 2019, I am happy to be able to report that PL for the STEM sector in Scotland is in safe hands.

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SSERC is unique

by Iain Stephen • Former Director

It was in the late 1990's, when the Head of Service at Aberdeenshire Council popped his head round my office door and to my surprise asked if I would like to be a Company Director. He went on to explain the service that SSERC provided and I indicated that as an accountant, my knowledge of science was zero. I was advised that as a company limited by guarantee with charitable status, SSERC needed a variety of skills on its board and that hopefully, I could contribute positively.

So, it was with some trepidation that I caught the train to Edinburgh for my first board meeting. Walking from Waverley station to the SSERC office at St Mary's land, part of Edinburgh University, I was not sure what to expect. On arrival, I received a warm welcome from staff but noted the level of facilities was fairly basic with, worst of all, no secured tenure. The uncertainty around accommodation continued for a considerable time until we finally settled at Pitreavie Court, a superb facility. Prior to the 1995-1996 local government reorganisation, the local government umbrella organisation, COSLA, had the responsibility to link with certain third-party organisations and make recommendations to local authorities regarding the quality of the service they provided. This then influenced councils as to whether they would pay for the service or not.

After reorganisation this process stopped and a considerable number of these organisations ceased to function as Local Authorities withdrew support. SSERC was one of the exceptions for the very simple reason that it provided the highest quality service and support to Local Authorities, schools, head teachers, teachers and technicians. It was clear to most that this service could not be replicated locally throughout Scotland. Some Local authorities considered ceasing their subscriptions but soon changed their minds when it was pointed out to them the support they would lose.

SSERC is unique and, whilst adapting to an ever-changing world, its core service will ensure a long and prosperous future. An organisation is, however, only as good as its staff and SSERC are able to attract the highest quality individuals.

It was a privilege being involved with SSERC for over 20 years. During this time, I was lucky enough to become Vice Chair and was involved in interviewing several senior positions including two Chief Executives and a Senior Finance position.

I wish the organisation and its staff all the best for the future.

SSERC and IOP working together

by Stuart Farmer • Learning and Skills Manager, IOP Scotland

The Institute of Physics (IOP) and SSERC have a long history of working together to provide high-quality subject-specific professional learning in physics, an aim shared between the two organisations. The 'flagship' event in recent decades has been the Physics Teachers' Summer School (PTSS).

It was originally set up as a fairly informal initiative by an enthusiastic group of volunteers which included Jim Jamieson from SSERC and was supported by Catherine Wilson, then in charge of IOP's education activities and based in London. However, it gradually evolved into a more formal partnership between IOP and SSERC managed by a small committee including SSERC's physics lead, the IOP Scotland Education Manager and a few others including a series of academics recruited through IOP's wider networks such as Miles Padgett from Glasgow, Bill MacPherson from Heriot-Watt and Bruce Sinclair from St Andrews. This ensured a thread of cutting-edge physics and visits to university facilities was included in the PTSS programme each year. After around a decade of the PTSS being held at the beginning of the summer holidays it moved to exam study leave time in May to coincide with the IOP's Stirling Physics Teachers Meeting which then also became one of the days of the PTSS for its delegates, but continued to use the Summer School name.

IOP Institute of Physics Scotland

SSERC has always had a presence at the Stirling Meeting, both showcasing practical work in the exhibition and contributing on occasions to the main programme. Few present in the Logie Lecture Theatre in Stirling shortly after Gregor Steele joined Jim Jamieson at SSERC will have forgotten them demonstrating that they both had the appropriate hairstyles to substitute for a van de Graaff dome by demonstrating aluminium pie cases flying off their charged bald heads. Jim Jardine videoed it but alas the recording has been lost.

Gerry Paterson helps a delegate at the 2010 PTSS.

Gregor Steele and 2011 PTSS delegates on the bus to Whitelee Windfarm.

Gregor Steele and Bob Kibble at the 2011 PTSS Erskine Bridge Hotel.

Gregor Steel at the Royal Observatory Edinburgh in 2015.

The Photonics Explorer kit.

Delegates using the Photonics Explorer kit at the 2012 PTSS.

Collaborative working between SSERC and IOP has been particularly strong since 2003 when IOP set up its teacher network. IOP Scotland Teacher Network Co-ordinators and Coaches have contributed to a range of SSERC events. For example, Tom Clark and Brian Redman contributed many workshops on topics like electricity and forces as part of SSERC's Primary Cluster Programme. Stuart Farmer regularly contributed sessions to SSERC's Physics Residential courses and subsequently SSERC's Blended Learning courses which combined online sessions as well as a residential component at the end. This meant that many of these SSERC courses had inputs on the resources from the Perimeter Institute in Canada thanks to Stuart and several of the IOP Scotland Coaches having attended the EinsteinPlus summer school in Canada and events organised by IOP Scotland when educational outreach staff from the Perimeter Institute came to Scotland, one of which was hosted by SSERC in 2019.

Perhaps the most significant, but largely unseen, partnership was that between Gregor Steele and Stuart Farmer to enable access to the Photonics Explorer kits produced by a team at the Vrije Universiteit Brussel. Stuart had been on the advisory and testing group for the project during its development phase and developed the professional learning for those conducting the field testing of the kits in the UK. When this was completed, access to the kits could only be through a recognised organisation providing professional learning on their use, and provided the kits were sponsored and free of charge to the professional learning participants. Gregor arranged for SSERC to be the organisation through which kits were imported into Scotland and helped secure the sponsorship required for many workshops on the kits over subsequent years. Thanks to sponsorship funding from IOP Scotland and other organisations, several hundred kits have been imported through SSERC and can now be found in Scottish schools.

IOP looks forward to continuing to work in collaboration with SSERC to provide high-quality professional learning in physics through its next 60 years.

Norman Bethune helps a delegate at the 2017 PTSS.

Gregor Steele and Gordon Doig in an evening session in the King Malcolm Hotel at the 2016 PTSS.

Norman Bethune and Drew Burrett at the 2023 PTSS.

Stuart Farmer modelling curved spacetime at the 2017 PTSS.

Jennie Hargreaves leads a practical session in the SSERC lab at the 2023 PTSS.

The history of SSERC Bulletins

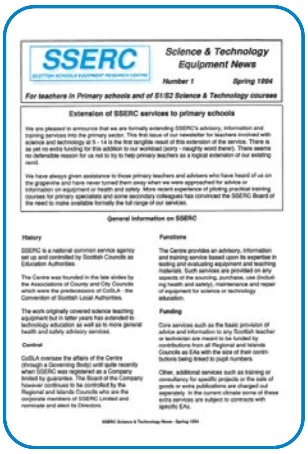
The first ever SSERC (or SSSERC as it was known then) Bulletin was published in September 1965.

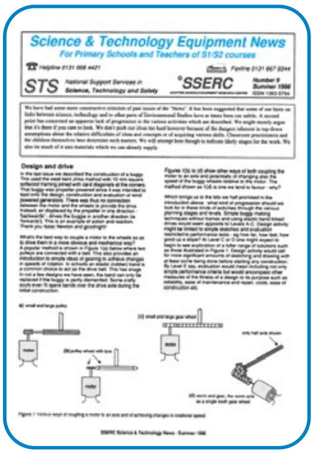
The first SSSERC Bulletin with ISSN was in April 1985.

By September 2025, we will have published
282 SSERC Bulletins

In April 1985, SSERC Bulletin Issue 145 displayed an ISSN (International Standard Serial Number), a process which has continued since then.

The first bulletin targeting the primary school sector, and S1/ and 2 science and technology curriculum was published in the spring of 1994.





By September 2025, we will have published
100 SSERC Primary Bulletins

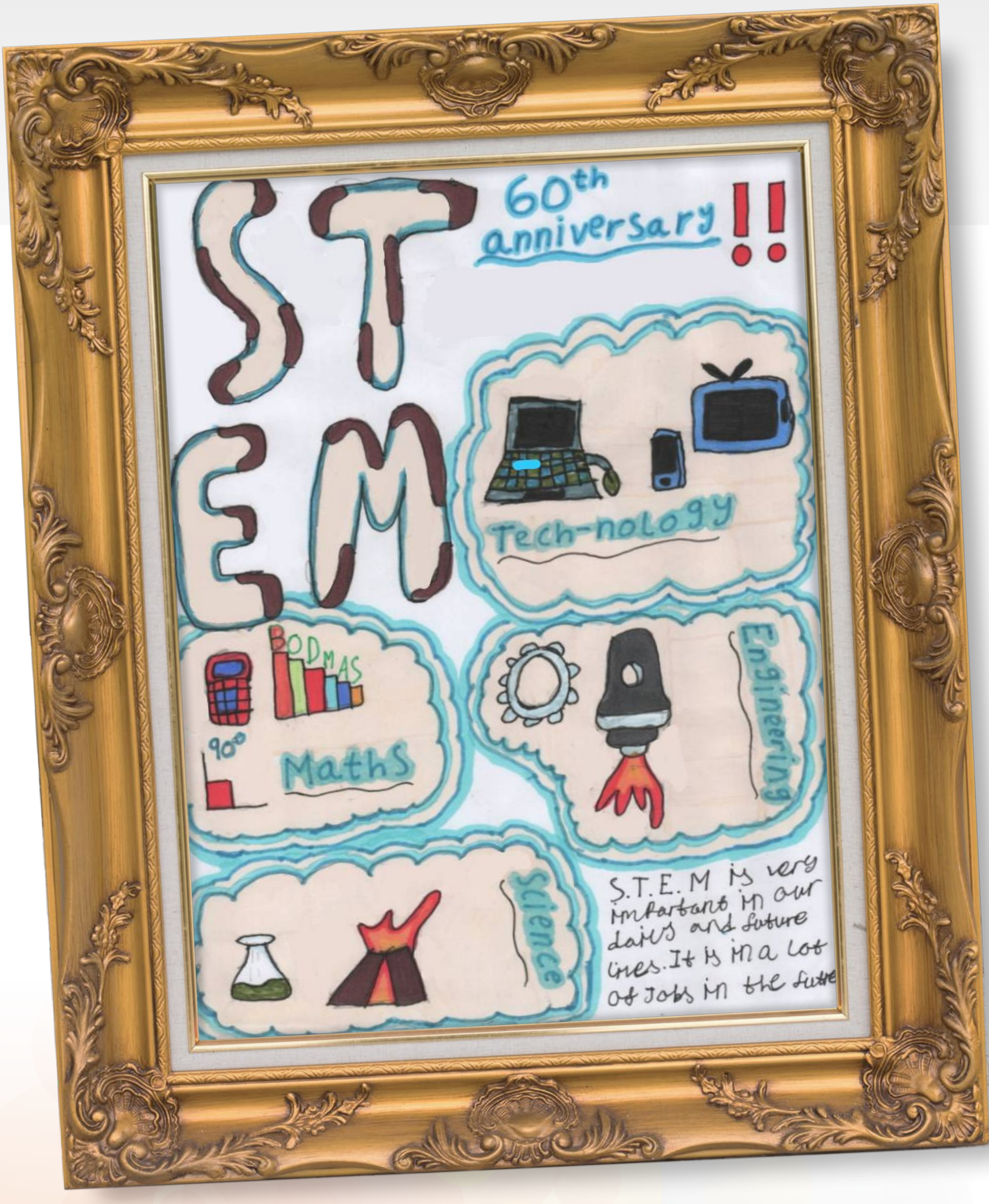
In the summer of 1996, the SSERC primary Bulletin displayed an ISSN, a process that has continued since then.

Our newest bulletin, the School STEM Technician, was first published in December 2021 and, like the others, displays an ISSN.

By September 2025, we will have published
8 School STEM Technician Bulletins

If you are a member of SSERC, you can access all our Bulletins at SSERC|Bulletins.

If you are not a member of SSERC, don't worry; you can purchase a copy of any of the Bulletins via the SSERC Online Bookshop at the SSERC Bookshop.



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