“The Purest of Institutes?”

Reflections celebrating the formation of the first Institute of Mechanics in 1821 that became Heriot-Watt University.

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The year 2021 marks the bicentennial landmark of the establishment of the first Institute of Mechanics, first known as the Edinburgh School of Arts. This pioneering educational movement truly transformed the world in a way that is barely perceived today. Whilst much has been written on political, psychological, religious and economic drivers for the establishment of education in the nineteenth century, my assessment is that a range of intensely local circumstances gave rise to a plethora of initiatives – rather than an orchestrated controlled ‘movement’ of education. This essay explores and celebrates aspects around the origin of the first institute caused by the meeting of Leonard Horner with Robert Bryson, a clockmaker in Edinburgh that subsequently led to the formation of Heriot-Watt University. Around the world the explosion of thousands of Institutes of Mechanics was a remarkable global phenomena. This has a legacy in the talent of people of several generations and in the economies and communities they served. The legacy also lies in the creation of many other universities from such institutes. For Heriot-Watt University, the pioneering global reach of the first Institute of Mechanics and its focus on widening access to education to those in work remain embedded values. As we approach the 200th Anniversary we specialise in reaching over 170 countries with significant physical campus bases in three continents. Heriot-Watt’s remarkable development as an integrated global university won the accolade as International University of the Year in 2018 from the Sunday Times and The Times newspapers. The University has a focus on enabling entry from learners from unconventional backgrounds as full time students or for work-based learning whilst employed. This was the simple vision of the first Institute of Mechanics in Edinburgh which was referred to as being “the purest Institute”, based on its straightforward focus on technological education to serve society.

The Formation of the First Institute of Mechanics – The Edinburgh School of Arts

Leonard Horner was one of those truly extraordinary individuals who did not complete a formal university education yet largely self-taught and acquired deep knowledge of society, geology and significant proficiency in French, Dutch, German, Italian and Latin. The notion of
a ‘formal’ education needs to be seen in the context that in the late 1700s students paid to
attend lectures by professors, and they were in effect offered great choice and exotic
pathways of study. Whilst at Edinburgh, Horner took great pleasure in learning chemistry,
mathematics and philosophy, but left aged 19 to join the family business. This was a period
where science was expanding horizons and feeding intellectual and practical endeavours.
Horner was an avid reader and debater and in 1804 was well acquainted with Adam Smith’s
book *The Wealth of Nations* and associated debates of this enlightenment period that was
such a feature of life in Edinburgh. He was soon to move to London and later returned to
Scotland after some ten years, subsequently travelling widely over Europe in part as an
underwriter for Lloyd’s Insurance and also later as a linen trader. As we look back, his
legacy was to be profound not only in the establishment of inaugural Institutes of
Mechanics in Scotland and England, but also as a driver of education and industry and a
geologist of repute. His passion for education ensured that the industrial revolution giving
rise to manufacturing factories across UK was not executed at the expense of child labour.
He was the overseer of the Factory Act (1833) for over a quarter of a century. He was a
President of the Geological Society of London and took great delight in geological field work
and discovery of earth and natural sciences. He is also known as the first warden of the
University of London. His life has been the subject of several accounts, most notably the
biography by O’Farrell ¹ (2010), a staff member of the Heriot-Watt University’s ‘Edinburgh
Business School’.

I draw attention to Horner’s passion and journey as a backdrop to my assertion that the
development of the first Institute of Mechanics, described below, arose from the warmth
and concern for the development of human talent to meet local business needs, not from a
political or religious movement or other external drivers. Horner has been described as a
force that set out to humanise urban capitalism – and indeed from my reading this describes
him well. It was this intense passion that became ignited on the meeting of Horner and an
Edinburgh clockmaker Robert Bryson.

![Figure 1: (a) The author with a Bryson grandfather clock, housed in Hermiston House at Heriot-Watt University and (b) Bryson’s rolling ball clock, housed in National Museum of Scotland.](image-url)
When Horner called into 8 South Bridge Street in Edinburgh’s Old Town he spoke to the owner Robert Bryson about his relatively new clock making business. Bryson was an inventor of scientific instruments and an horologist. They had much in common since Bryson had an interest in the cosmos and designed a sidereal clock (used to enable astronomers to locate celestial objects at the Carlton Hill Royal Observatory in Edinburgh). He knew about the deployment of gravity using mercury and weighted wind-up clocks and novel clocks such as the rolling ball clock (Figure 1). He had an eye for precision and also developed compact pressure barometers in the family business. They talked of the difficulty of developing mathematical skills in employees, since knowledge of physics and maths was so important to the design and manufacture of these technical objects. There were two issues, the cost for the individuals and also the timing of existing classes in mathematical education. As Horner developed the concept, Bryson was highly supportive of the notion of a new night school for technical arts. Within just a few weeks Horner had develop the plan with a wider group that met on 19th April 1821. They then published a prospectus for fund raising.

The spirit of the business plan was to enable wide access to a scientific education but with students being expected to contribute something towards the costs and the wider business community providing the start-up and some operational funds. The prospectus was published and through the network of the enlightenment a strong list of subscribers emerged, supported by wealthy Edinburgh citizens such as Sir Walter Scott, Lord Cockburn, Robert Stevenson, Alexander Naysmith, William Playfair and the Craig family of Riccarton. Many agreed to give annual subscriptions to help pay for the cost of classes and so to set up evening classes with fees that working men could afford. It is interesting to scan some of the well-known names in the full list of subscriber provided in the first Annual Report2 in May 1822 (Figure 2). One might also comment that such reports were very full in length and detail, suggesting the voracious appetite and dedication to reading in that era. Following the rapid raising of funds, notices appeared advertising the new classes. Prospective students purchased tickets in instalments (from Bryson’s shop) and within a month over 450 students had enrolled. The institute had been established in just a few months!

So on 16th October 1821 the School of Arts of Edinburgh “for the instruction of mechanics in such branches of physical science as are of practical application in their several trades” held the first lecture in chemistry at St Cecilia’s concert hall in the Old Town, the home of the Grand Lodge of the Freemasons of Scotland. It was indeed a grand location for the new students (Figure 3). The curriculum was resolutely focused on mechanics, physics and chemistry (that included earth sciences). Later it included a broad range of mathematics. Attendees could also borrow books. This the first Mechanics Institute has a simple curriculum that focused on this scientific curriculum. Some have commented that it was ‘not applied’ or based on ‘speculative philosophy’. For this reason the Edinburgh institute has been called the purest expression of the original idea of a Mechanics Institute 3. My examination of the curriculum would draw a slightly different conclusion, since with subjects such as farriersonship, smithery and the motion of machines these were all issues of direct relevance to the emerging life of the industrial revolution. The education was focused on practical professions. Whatever the taxonomy, it was clear the education had an impact. Within 30 years there were 700 Mechanics Institutes in Britain.
Figure 2: (a) The cover of the first report on the School of Arts of Edinburgh in May 1882 and (b) a section of the subscribers list detailed in the report. (Courtesy: Heriot-Watt University Museum.)
There was chatter, and in some parts real concern, about opening access to education. Since knowledge was (is) power there were some political concerns that learners might somehow become disruptive or even revolutionary to society. Some held a view that minds bound up in the wonderment of science might be distracted from religious endeavour. These views on Mechanic Institutes in general have been the source of academic papers comparing and contrasting perspectives, some extensive. To me, such lengthy postulations do not always seem to catch the spirit of the local community and drive of human endeavour in those communities. There is no doubt that educated society loved a good debate and used such debates to take action. In this context Henry Brougham’s (1825) pamphlet book on ‘Practical Observation upon the Education of the People’4 played a role in seeking to further catalyse the Mechanics movement. There seemed little evidence that a ‘Luddite-like’ explosion was imminent, but it would appear that the fear of “the loss of control of the working population” was used politically on occasions.

The Development of the Institute into Heriot-Watt University5

Over the years the syllabus was extended to include English, French and drawing. Other significant developments included the first working class representatives joining the School’s Board of Directors in 1835, and in 1837 the School moved to new larger leased premises in Adam Square. As the posters advertising the School showed (Figure 4) the syllabus remained in its purest form and tickets could still be obtain from Bryson’s shop. However as time progressed the School encountered financial difficulties as donations dwindled. A solution was found through a Subscription Fund which was set up in the name of James Watt. The late engineer was considered an inspiration to staff and students, and indeed proved to be a very successful motivation. In 1851 enough revenue was generated to allow the purchase of Adam Square and in 1852 the name was changed to the “Watt Institution and School of Arts” (Figure 5). Watt has become a name of renowned the world over for his work on power systems and engines. His work was very visible in the inaugural years of the School of Arts, as shown powerfully in paintings, such as that in Figure 5, that depicts the arrival on George IV in the port of Leith, arriving in a sailing ship that is being tugged into the

Figure 3: The location of the School of Arts was in the Freemason’s Hall, St Cecilia’s Hall where the first lectures were held in October 1821.
The University has one of the oldest alumni societies known, The Watt Club, formed in 1854.

Figure 4: A copy of the advertising poster announcements for 1835 entry to the Institute of Arts.
(Courtesy: Heriot-Watt University Museum).

Figure 5: With funding from Watt’s legacy the newly named ‘Watt Institution and School of Arts’ was built in 1852 with Watt’s statue proudly standing outside the front door.
Initially most students of the Institute were from poorer backgrounds, but there were some wealthy scholars such as James Nasmyth, son of landscape and portrait painter artist Alexander Nasmyth. James Nasmyth was one of the first students of the Institution and later invented the steam hammer. As the School of Arts developed it became clear there was one glaring omission - all the students were male. Pioneering local campaigner Mary Burton led a successful campaign to admit women in 1869. The Watt Institution was some twenty years ahead of other Scottish universities, where women were only allowed to graduate following an Act of Parliament in 1889. This heritage for widening access and equality of opportunity remains a strong value for the University. Burton became the first woman on the School's Board of Directors and a Life Governor of (the latterly named) Heriot-Watt College.

Further financial difficulties were encountered by the Institution following widespread city redevelopment, including the demolition of Adam Square and an enforced move to premises in Chambers Street (Figure 7). In 1873 the Directors of the Institution agreed a merger with the George Heriot’s Trust endowment. George Heriot had been a jeweller and goldsmith in the late 16th and early 17th centuries, and had become wealthy due to patronage from the Royal family. Upon his death his estate was largely left to philanthropic causes forming the endowment trust. The main consequences of the financial agreement with the George Heriot’s Trust was a repositioning of the Institution to become a technical college, and a renaming to become the Heriot-Watt College in 1885.

The college’s links with industry had inspired and fuelled the growth of new specialist departments: Pharmacy, Brewing, Physics and Civil Engineering, each with its own professor. The College’s power to appoint professors was a relatively rare accolade in non-university institutions, with only two other colleges in the UK having this ability at that time. Lack of space at Chambers Street led Heriot-Watt to expand yet again, into the Grassmarket beneath Edinburgh Castle. The Department of Mining used this extended space to open a mine rescue station, which enabled the teaching of vital lifesaving skills to engineers from collieries across southeast Scotland. The College had also forged academic partnerships with Edinburgh University.
This included teaching mining, electrical and chemical engineering, and delivering Building Science courses to the architect students at the Edinburgh College of Art.

Over time the College moved its focus to degree level and postgraduate studies. The Printing Department moved to Napier College in 1964, signalling the end of an era, and the evolution from College to University was almost complete. In 1963 the now famous UK government committee chaired by Lord Robbins made momentous proposals for the expansion of higher education. In 1964 the government announced that Heriot-Watt was to be one of the first of "a new breed of technological University". The University gained its Royal Charter in 1966. With this new university status, the College Principal Hugh Nisbet became Heriot-Watt University’s first Principal and Vice-Chancellor. In line with both the significant status change, but also in the historical spirit of the institution’s pioneering approach, a new degree course in Computing Science was launched - the first in Scotland and to have a profound impact in the economy and global digital industry. Like so many things, the University was pioneering in education in the frontier programmes it offered.

Further expansion continued, including the opening of the Mountbatten building in the Grassmarket 1968 for electrical engineering, management, languages and a ground breaking new television centre. But there was precious little room in the crowded Edinburgh city centre to build new research and teaching laboratories. A new campus community was needed to combine academic buildings with sports and social facilities and student accommodation. The new University needed a new home and one was provided in the west of Edinburgh in the wonderful grounds of over 280 acres of land comprising the former Riccarton Estate.

The Continued Ethos of the Institute of Mechanics

The new campus accelerated new opportunities for research, again based on the ‘pure’ science of Mathematics, Physics and Geology that gave rise to world leading capabilities in Laser (and now Quantum Science), Petroleum Engineering, Civil Engineering, Actuarial Science and Artificial Intelligence. In the usual spirit of Institute of Mechanics the University retained an uncanny knack of deep scholarly excellence in research coupled with a passion
for application to professions and society. In 1990 it pioneered the UK’s first ever on-line MBA through the establishment of the Edinburgh Business School, which today is still the largest on-line business school in UK.

The University had a strong sense of international reach and was amongst the earliest in the UK to develop a substantial campus in Dubai, and later in Malaysia. Currently the footprint of the University involves around 30,000 students with one third studying in Scotland (at three campuses in Edinburgh, Galashiels and Orkney), one third on-line and one third at either Dubai or Malaysia. These have evolved not as a series of branch campuses but as an integral part of a global university in which, for many programmes of study, students can choose to study at multiple locations and take identical examinations and receive a single degree certificate. This extraordinary and unique model is distinctive to Heriot-Watt and exemplifies its roots.

Heriot-Watt has also retained a strong sense of public mission and partnering, again in keeping with the educational outreach to business and community so much associated with the Mechanics movement. For example, it has developed a national performance centre for sport (‘Oriam’, meaning “gold I am”) and a collaborative research centre for geosciences with the British Geological Survey (the “Lyell Centre”, named after Sir Charles Lyell, a famous geologist who was married to an eminent conchologist and geologist Mary Horner Lyell, the eldest of the six daughters of Leonard Horner). A further example of the University’s intent on outreach and connectivity was the purchase and care of a famous building, Panmure House, the home of the economist and moral philosopher Adam Smith, just off the Royal Mile in the Edinburgh Old Town (Figure 8). Now (2018) refurbished to its almost original state as a place of debate and economics research for the Business School.

Figure 8: Panmure House, just off the Royal Mile in Edinburgh, the former home of economist and moral philosopher Adam Smith and now part of Heriot-Watt University’s “Edinburgh Business School”.


Just as the Edinburgh Institute of Arts initiated a night school for employed workers, the University continues to focus on what is often referred to as ‘work based learning’. In recent years it has facilitated a cadre of graduate apprentice degrees, in which students study whilst employed in a company. The class has a wide range of ages working with 70 companies from across Scotland. The spirit of the Mechanics Institute is still very much alive.

Looking ahead the University has plans to ensure equality of opportunity for access to excellence in discovery and learning. The adoption of a ‘positive education’ model and mind-set will ensure development of a flourishing community of staff and students yielding resilient graduates suited for the global and digital world. 2021 will mark the bicentennial Anniversary of the University and, of course, the Institute of Mechanics movement.

Who could have guessed that a conversation in a clock shop that triggered the creation of the world’s first Mechanics Institute would have this impact in the world!

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References