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Accession By: Dr.Brian Coghlan

Object name: Unveiling of a Science Plaque to Percy Edwin Ludgate

Vintage: 2022

Synopsis: Videos and photographs of the unveiling of the Ludgate Plaque.

### **Description:**

In one of the occasional very sunny intervals on a very windy, occasionally very wet day in Drumcondra (north Dublin city) in Ireland, a blue plaque in honour of Percy Edwin Ludgate was unveiled in October, 2022, one hundred years after his death, by the Provost of Trinity College Dublin, Prof Linda Doyle, as part of a national series of commemorative plaques honouring leaders in Science & Technology.



*Figure 1: Provost Prof Linda Doyle unveiled the plaque for Percy Edwin Ludgate, with left: Prof Gregory O'Hare, Head of the School of Computer Science and Statistics, and right: Prof Brian Randell, School of Computing, Newcastle University.*

Percy Ludgate published the World's second design for a computer. He designed it, often into the early hours, in his home at 30 Dargle Road, Drumcondra, where he died on the 16th October, 1922, and where the plaque has now been unveiled. There were only two mechanical designs before the electronic computer era: Charles Babbage's "Analytical Engine" (published in 1843 by Ada Lovelace, whose bust will soon be erected in TCD's *Long Room* in the Old Library), then Percy Ludgate's "Analytical Machine" (published in 1909 in the Scientific Proceedings of the Royal Dublin Society). All modern computers are in principle "analytical machines".

Speaking at the unveiling, Professor Brian Randell, School of Computing, Newcastle University, gave an excellent introduction to Ludgate's specific design:

It's my great pleasure, and as far as I am concerned, privilege, to be here. I thank you for the invitation; it's giving me great pleasure. I'm just very sorry to hear that Brian Coghlan can't be with us. He is the person who has done most of the work in the last few years in investigating Percy Ludgate, and in setting this occasion up. So I was horrified when I got an email from him yesterday late afternoon saying that he and his wife had just failed the Covid test.

For years, most accounts of the history of the digital computer typically began with the story of the famous English mathematician and inventor Charles Babbage's attempts, starting in the 1830s, to build what he termed an Analytical Engine. This was a mechanical precursor to the modern programmable electronic digital computer, the first of which were built in the late 1940s. (Describing the first electronic computers as modern is perhaps a bit of a stretch – they were room-sized, and far less capable and usable than any present-day mobile phone or laptop computer.) These early historical accounts all presumed that over a hundred years, and two World Wars, had passed before anyone anywhere successfully, knowingly or otherwise, followed in Babbage's footsteps.

But now we know otherwise. In particular, we have learned that in the early 1900s here in Dublin, indeed in this house, a lone Irish inventor, Percy Ludgate, produced a remarkably innovative design for a fully programmable mechanical computer. Ludgate's design differed significantly from, and was in several ways a conceptual advance on, Babbage's. In fact Ludgate's plan was one of the most significant advances on Babbage's ideas until the advent of the electronic digital computer some forty years later. Yet it seems certain that Ludgate's work largely pre-dated his learning of Babbage's efforts, and that his main ideas were completely original.

In the early 1970s I stumbled across Percy Ludgate, and acquired the one paper that he published about his Analytical Machine. This was in the Scientific Proceedings of the Royal Dublin Society in 1909. I immediately undertook an investigation into Ludgate's life and work. I learned that he had died in 1922, at the age of just 39. Through the heroic efforts of the Librarian of the Royal Dublin Society, who contacted all the Ludgates listed in the Dublin telephone directory, just one close relative of Percy Ludgate was found. This was his niece, Violet Ludgate. She was only 18 when he died in 1922, but was very helpful with her memories, and provided me with a photograph, of her Uncle Percy. These memories were augmented by those of the one colleague from his later years who she helped trace. Numerous Irish librarians and archivists, intrigued about this hitherto unknown Irish computer pioneer, were soon involved in the hunt. Unfortunately, little additional information was found. I published the results of my investigation in 1971 in the British Computer Society's Computer Journal. Thereafter, detailed accounts of the history of computing that others published did tend to cover Ludgate's work. But for nearly fifty years virtually nothing further was discovered about his life and work, beyond what had been described in my Computer Journal paper. This situation remained until Dr. Brian Coghlan contacted me a few years ago.

Dr Coghlan I should explain is Curator of Trinity College Dublin's "John Gabriel Byrne Computer Collection". This is a magnificent collection of historical computers, computing artefacts, books and documents, started by the late Professor Byrne. (Professor Byrne founded TCD's Department of Computer Science in 1969, and has been referred to as "The Father of Computing in Ireland".) Dr Coghlan first contacted me in January 2017, saying he was preparing a description of Ludgate's machine for the Collection's catalogue. He asked me whether I had had any correspondence with Professor Byrne.

I hadn't, but a succession of further questions from him about my original Ludgate investigation, very few of which I could answer, led to my joining in Dr. Coghlan's informal little research group, set up to find out more about Ludgate's life and work. Thanks largely to Dr. Coghlan's efforts and commitment to the task, and despite my initial pessimism as to whether any significant results could be obtained after all these years, much further information has in fact been uncovered and published by the group. ↯And various issues concerning Ludgate's design have been clarified.

Unfortunately, the faint hope the group had of discovering the large set of drawings that Ludgate said he had made remains unfulfilled. This is despite an extremely thorough and extensive set of searches. But to our great surprise one published contemporary drawing, in all probability by Ludgate himself, was discovered! Close study of this unexpected find, and a much more careful analysis of Ludgate's text than I had undertaken, have successfully clarified a number of uncertainties concerning his design.

In particular, much more is now known about Ludgate's design of a very ingenious number store and arithmetic unit for his machine. Babbage's Analytical Engine, and other ordinary calculating machines of its era, represented decimal digits using rotating gear wheels. But Ludgate had the idea of using a "shuttle" containing a set of sliding rods, each capable of taking up ten lateral positions, to represent a multi-digit decimal number. The shuttles, each holding 21 slides (one for the sign, and one per digit of a twenty-digit number), were arranged around a rotatable cylinder. This scheme might well at the time have had advantages over Babbage's, such as its provision of means for offline data (shuttles in dismounted cylinders), as well as an online number store. Even more novel was Ludgate's design for an arithmetic unit. This was for performing the direct multiplication of pairs of multi-digit decimal numbers. It was to use his special form of logarithms. These were delightfully termed "Irish Logarithms", by one of his contemporaries. (At this time calculating machines almost invariably incorporated just an adding mechanism so that multiplication had to be done by repeated additions.)

Even more impressive was the system of program control that Ludgate envisaged. This was a distinct step forward compared to Babbage's scheme. Ludgate's machine was to be controlled by a perforated paper tape, in which each row of perforations defined a complete instruction. Each instruction specified where to find two numbers, the type of arithmetic operation to be performed on them, and where the result was to be stored. Babbage on the other hand intended to use two distinct sets of laced-together punched cards, one set for specifying where to find numbers and store results (his so-called 'variable cards'), the other set for specifying the planned sequence of operations ('operation cards'). Babbage designed a complex means of using the specification, on a variable card, of a particular variable, to access the column of disks representing that variable; in Ludgate's machine such access just required an appropriate rotation of the shuttle cylinder.

Ludgate clearly understood the fundamental importance of being able to change the sequence of calculations based on previous results (now known as "conditional branching"). Presumably, and again more simply than with Babbage's two distinct sets of cards, he intended that the mechanism that read the formula paper would be directed when necessary to skip a specified number of rows forwards or backwards. A further feature of his planned sequencing mechanism was the provision of built-in subroutines. For example, the instruction for division caused control to be passed to a pre-defined sequence of instructions "hard-wired" as rows of perforations on a 'dividing cylinder'. In summary, the sequencing mechanism that Ludgate describes is significantly simpler and more convenient, indeed more like that of a modern computer, than that designed by Babbage for his Analytical Engine. (Incidentally, we have just been alerted by Ralf Buelow to his finding that Ludgate's paper



was involved in a 1967 decision by the German Federal Patent Office to deny a patent to Konrad Zuse on the computer.)

In the last few years our investigation has also discovered a great deal of additional information concerning Ludgate's family and ancestors. Unfortunately, this hunt did not turn up any documents or any further photographs. Instead, we discovered that his niece Violet had in fact had a child in 1935 who was privately adopted and renamed and was brought up overseas, married, and had six children. These grandchildren of Violet, one of whom joined our investigation, are direct descendants of other occupants of the hitherto unmarked grave in which Percy Ludgate was buried in 1922. As such they were allowed (in 2019) to erect a grave marker. This lists him as an "Analytical Machine Pioneer" – an unexpected but very welcome development.

This erection today of a plaque at his home, marking where he designed the world's second computer, is a further very pleasing development. Perhaps somewhere more information about his life and his machine still exists, awaiting discovery. Meanwhile, our results have been documented in two published papers and an edited book. Indeed, there is now more than sufficient information available for the Irish STEM communities represented here to be justly proud of Percy Ludgate's life and in particular of his astonishing work.

#### References:

Brian Coghlan et al. Investigating the Work and Life of Percy Ludgate, *Annals of the History of Computing*, IEEE. (2021) **43**(1) pp.19-37.

Brian Coghlan et al. Percy Ludgate (1883-1922), Ireland's First Computer Designer, *Proceedings of the Royal Irish Academy: Archaeology, Culture, History, Literature*. (2021) **121C**, pp.303-332.

Brian Coghlan and Brian Randell (eds.) *Percy Ludgate (1883-1922): Ireland's First Computer Designer*. The John Gabriel Byrne Computer Science Collection, ISBN 9781911566298, (2022) 246 pp.



Figure 2: Professor Brian Randell in full flow





*Figure 3: The exposition on Dargle Road by Prof Brian Randell on the work and life of Percy Ludgate.*

The Provost then unveiled the plaque:



*Figure 4: The moment of unveiling of the plaque by the Provost Prof Linda Doyle.*

Responding after unveiling the plaque, the Provost said that:

It's exciting to be here, and Professor Randell that was a fantastic description, and I think you're absolutely right, when we think of the brilliance that happened in that house [30 Dargle Road, behind the Provost], it really makes you realize how extraordinary Percy Ludgate was to follow his own genuine interest and passion to publish such amazing ideas. Obviously the most important factor was that we was born in Cork ... That aside, I find it amazing.

I'm always fascinated by people who can see the future, and it's exceptionally fascinating when people can see the future and come up with a design for the future before anything exists to implement those. So I think it is pretty amazing what he has done. And thanks to Professor Randell, and particularly the School of Computer Science and Statistics in Trinity as well, it hasn't been left to him.

You mentioned John Byrne earlier. There are some of you who knew John Byrne, who was head of the School of Computer Science and Statistics for many years, and was completely influential to many people, and he actually gathered amazing things. The fact is that he has an archive and that he cared for the past. And one thing that can happen if you're involved in the tech sector, always looking to the future, you can very often forget to look behind you and, I suppose, see the giants you stand on. So I think one of the very special things about the department, Greg, that you're the head of, is that they actually fully understand the value of the past as well as the great things that will happen in the future. I'm absolutely delighted to have pulled down that curtain, and very appreciative of the fact that the curtain was put there.

I do want to thank the National Committee for Plaques of Science and Technology, whose approval is required, and it is really fantastic that you care so much about remembering our history. Thankyou to the Organizing Committee, who you can see here. It's a simple plaque, but behind it is passion, commitment to history, and many years of digging and research on Percy Ludgate. Joan Hovenden and Michael Mongan, you are incredible that you are hosting this plaque on your beautiful home. To Greg and the School of Computer Science and Statistics, thankyou, and Professor Brian Randell for coming over to here. And thanks to Caroline, who leads a lot of outreach for the School, and it is very important that we reach out to the community and people understand the value of what is actually great research, amazing research, done not because Percy was part of an institution, but because it was in his mind and heart that he wanted to do something amazing. So it was my great pleasure to unveil the plaque, and thanks to everyone.

The unveiling was jointly hosted by the School of Computer Science and Statistics and the owners of 30 Dargle Road, sponsored by the School, see Figure 5 below. Given its significance for Irish STEM communities the event was attended at very high level by representatives of all the relevant learned institutions and communities, including the Royal Irish Academy, Royal Dublin Society, Engineers Ireland, Irish Academy of Engineering, Irish Computer Society, and Irish Mathematical Society, see the very nice group photo in Figure 6 below. The unveiling was followed by an excellent reception two minutes away in The Lovely Food Company, Drumcondra.





*Figure 5. After the unveiling of the plaque:*

*Michael Mongan and Joan Hovenden (joint hosts and owners of 30 Dargle Road), Trish Gonzalez (Ludgate's great-niece, Florida), Prof Gregory O'Hare (sponsor and joint host), Provost Prof Linda Doyle, Prof Brian Randell (School of Computing, Newcastle University)*

Our sincere thanks to the Provost and the School of Computer Science and Statistics, the owners of 30 Dargle Road, the National Science Plaque Committee, and the Organizing Committee for making this event possible, and to Prof Brian Randell, Trish Gonzalez (Ludgate's great-niece), Vital Cordova, Eric Hutton and Dr Steven Collins for travelling from afar to attend the event, and to Terry Cartin, ceramicist, for designing and making the plaque. Also to Prof Anil Kokaram and Dr Jimmy Eadie of Electronic and Electrical Engineering for their assistance with reduction of the buffeting wind noise in the video of this very atmospheric event.

*Trivia: Ludgate was born in 1883, the plaque art mistakenly says 1882; it is considered that any remedial work would degrade the integrity of the plaque or wall or both.*

For further information, including videos of this event, see:

<https://www.scss.tcd.ie/SCSSTreasuresCatalog/ludgate/>

More specifically, a video of this event is available at:

<https://www.scss.tcd.ie/SCSSTreasuresCatalog/ludgate/lnk125.html>

And an alternative video of the event is available at:

<https://www.scss.tcd.ie/SCSSTreasuresCatalog/ludgate/lnk126.html>





*Figure 6: Group photo of attendees, from left to right:*

Rear: Dr Jonathan Dukes (*Organizing Cmte*), Clem Ryan, Mohamed Suliman (*2021 Ludgate Prizewinner*), Mark Gantly (*Irish Academy of Engineering*), Prof Gregory O'Hare (*sponsor and joint host*), Dr Steven Collins (*1st Ludgate Prizewinner*), neighbour, John Sterne (*techarchives.irish*), neighbour, neighbour, Gabriel Flanagan

Mid: Vital Cordova (*partner of Trish Gonzalez*), Erik Hutton (*co-discoverer of only known diagram of Ludgate's machine*), Declan Hovenden, Dr Maurice O'Reilly and Dr Brian Smyth (*Treasurer and Chair, National Cmte*), Prof Owen Lewis (*President, Royal Dublin Society*), Evelyn Cusack (*Head of Forecasting, Met Éireann*), Declan Brady (*President, Irish Computer Society*), Damien Owens (*Director General, Engineers Ireland*), Dr Leo Creedon (*incoming President, Irish Mathematical Society*)

Front: Trish Gonzalez (*Ludgate's great-niece, Florida*), Dr Karlin Lillington (*Irish Times*), Grainne O'Keeffe (*CEO, Ludgate Hub, Skibbereen*), Michael Mongan and Joan Hovenden (*joint hosts and owners of 30 Dargle Road*), Dr Mary Canning (*President, Royal Irish Academy*), Prof Brian Randell (*School of Computing, Newcastle University*)

Dr Brian Coghlan (*Chair, Organizing Cmte*) was absent with Covid, and Dr Caroline Brophy (*Organizing Cmte*) took this photograph.



The homepage for this catalog is at: <https://www.scss.tcd.ie/SCSSTreasuresCatalog/>  
 Click '*Accession Index*' (1st column listed) for related folder, or '*About*' for further guidance.  
 Some of the items below may be more properly part of other categories of this catalog,  
 but are listed here for convenience.

Accession Index	Object with Identification
<a href="#">TCD-SCSS-V.20221015.001.001</a>	Unveiling of a Science Plaque to Percy Edwin Ludgate. Videos and photographs of the unveiling of the Ludgate Plaque. 2022.
<a href="#">TCD-SCSS-V.20221015.001.002</a>	Video of unveiling of a Science Plaque to Percy Edwin Ludgate, mpeg4, 1920 x 1080 @ 30fps. 2022.
<a href="#">TCD-SCSS-V.20221015.001.003</a>	Alternative video of unveiling of a Science Plaque to Percy Edwin Ludgate, mpeg4, 1920 x 1080 @ 30fps. 2022.
<a href="#">TCD-SCSS-X.20121208.002</a>	Percy E. Ludgate Prize in Computer Science. Prize in memory of Percy Ludgate's novel 1909 design for an Analytical Engine, the next after Babbage's. c.1909.
<a href="#">TCD-SCSS-V.20170124.001</a>	Nature volume that includes article on Percy Ludgate's analytical engine. Nature, Vol.81, including: C.V.Boys, 'A new analytical engine', pp.14-15, Jul-1909.
<a href="#">TCD-SCSS-V.20121208.873</a>	On a Proposed Analytical Machine Percy E.Ludgate, offprint of article in Scientific Proceedings of the Royal Dublin Society. Apr-1909.
<a href="#">TCD-SCSS-V.20170221.001</a>	Napier Tercentenary Celebration Handbook that includes article by Percy Ludgate. Handbook of the Napier tercentenary celebration or modern instruments and methods of calculation, Ed: E.M.Horsburgh, including: Percy E.Ludgate, 'Automatic Calculating Machines'. 1914.
<a href="#">TCD-SCSS-V.20170217.001</a>	Reprint of 1909 RDS Proceedings that includes article on Percy Ludgate's analytical engine. Scientific Proceedings of the Royal Dublin Society, 12 (9), including: Percy E.Ludgate, 'On a Proposed Analytical Machine', pp.77-91, 28-Apr-1909, reprinted 2016.
<a href="#">TCD-SCSS-V.20190903.002</a>	'An exploration of the life of Percy Ludgate'. Video and audio recordings of a presentation at the West Cork History Festival. 2019.
<a href="#">TCD-SCSS-V.20190903.001</a>	Podcast on Percy Ludgate. Audio recording of an interview at the West Cork History Festival. 2019.
<a href="#">TCD-SCSS-V.20200520.001</a>	Archives of The English Mechanic and World of Science. The full archive set in which was first discovered a diagram of Percy Ludgate's Analytical Machine. 2020.
<a href="#">TCD-SCSS-V.20210520.001</a>	20-May-2021 edition of the Irish Times. A printed issue that contains an article on Percy Ludgate by Dr.Chris Horn. 2021.
<a href="#">TCD-SCSS-V.20210507.001</a>	Investigating the Work and Life of Percy Ludgate. Technical paper by Coghlan, Randell, Hockie, Gonzalez, McQuillan, O'Regan, in the IEEE Annals of the History of Computing, plus a printed copy of the issue that contains the paper, both courtesy of Institute of Electrical and Electronics Engineers (IEEE). 2021.

<a href="#">TCD-SCSS-V.20210916.001</a>	Investigating the Work and Life of Percy Ludgate (1883-1922). Brian Randell, video of and slides for Zoom presentation about Percy Ludgate to The Computer Conservation Society (CCS), U.K. 2021.
<a href="#">TCD-SCSS-V.20210428.001</a>	Percy Ludgate (1883 -1922) - Charles Babbage's First Successor. Brian Randell, video of and slides for Zoom presentation about Percy Ludgate to The National Museum of Computing (TNMOC), Bletchley Park, U.K. 2021.
<a href="#">TCD-SCSS-V.20210921.001</a>	Percy Ludgate (1883-1922), Ireland's first computer designer. Historical paper by Coghlan, Randell, Hockie, Gonzalez, McQuillan, O'Regan, in the Proceedings of the Royal Irish Academy: Archaeology, Culture, History, Literature, plus a printed copy of the issue that contains the paper, both courtesy of RIA. 2021.
<a href="#">TCD-SCSS-V.20221015.002</a>	Percy Ludgate (1883-1922): Ireland's First Computer Designer. Brian Coghlan and Brian Randell (eds.), The John Gabriel Byrne Computer Science Collection, ISBN 9781911566298, 246 pp. 2022.

#### References:

1. Wikipedia, *Percy Ludgate*, see:  
[https://en.wikipedia.org/wiki/Percy\\_Ludgate](https://en.wikipedia.org/wiki/Percy_Ludgate)  
Last browsed to on 24-Oct-2022.