

DEPARTMENT: ANECDOTES

Was There a French Engine Before Babbage's Difference Engine?

Marc LaViolette , Royal Military College of Canada, Station Forces Kingston, ON, K7K 7B4, Canada

Most writings discussing Charles Babbage's attempts at creating mechanical calculating machines use the heroic theory of invention and scientific development as a hypothesis for describing his accomplishments. Many of the mechanisms he imagined, do appear to be the first implementations of ideas used by modern computing machines such as pipelining, parallel computing, anticipating carry, mill (cpu), and store (RAM) (see Bromley [1] and Swade [2]).

However, there is an argument to be made for the competing hypothesis of simultaneous invention. Lindgren [3] describes three different attempts at constructing a difference engine: those of Johann Müller, Charles Babbage, and Georg and Edvard Scheutz. Since 1900s, once adding machines had become common, John Thompson connected four Triumphators to create a difference engine to calculate his logarithmic tables in *Logarithmetica Britannica* [4].

A RASCALLY FRENCHMAN

Lindgren [3] attempted to establish what Babbage knew about mechanical calculation before undertaking his design and in doing so brought to light an enigma. Lindgren cites a letter from John Herschel to Babbage [5] relating some troublesome news:

Dear Babbage – Bad news – I am sorry to have to tell you that some rascally frenchman has been presenting to the Institute “A machine for performing readily all the most difficult operations of Arithmetic and forming all sorts of tables” – D–n his Soul! The Inst. have I am told approved it. – It does not however follow that it is the same as yours & every body will at least swear to your independent invention of it.

– Kater is just come & I have no time but to add believe me.

Yours sincerely,
J.F.W. Herschel

The dating of this correspondence is unclear. There is no date in Herschel's handwriting but some one else has inscribed “Dec ? 1820 ?” [sic] at the top of the page. Unbeknownst to Lindgren, there is a transcription of this letter, [6] which appears to be in the same handwriting as the annotation on the original. At the top of the copy, next to the date, a third person has inscribed “No. probably April 1822.” This date was gleaned from a letter from Babbage to Herschel [7] dated April 1822 where he graciously accepts the news.

Dear Herschel,

I was much more glad to find from your letter that your interest in the success of the machine has rekindled than I was sorry at the news you sent me. It is scarce probable that another person should have contrived the same means for the same purpose nor is it probable that any one should have copied from mine, however when they both appear if such a thing has taken place, I think it will not be very difficult to find it out. If any one has found out other principles of applying machinery to arithmetic uses has produced such results as my engine will procure he deserves to be amply rewarded and I wish him success and what is much more to the purpose if he has contrived such and if they put the type together and if he is a frenchman [Babbage's underlining] I am quite sure he will be well rewarded. Supposing the worst for me this is a case of two independent inventors and each must be content with that portion of fame due to the engines he produces. It will be quite otherwise with any future contrivance however ingenious; the egg has once stood upright and any future

imitators may if they choose set it erect by breaking a different end...

very sincerely Yours,
C.B.

Did a “rascally frenchman” construct a difference engine before Babbage? Lindgren could not answer this, stating that: “...despite various attempts, I have not been able to find out who this Frenchman was, nor anything about a French difference engine” [3, p. 69]. He adds that he has “examined all *Comptes Rendus* from 1800 to 1860” [3, footnote 243, p. 311], which was the extent of his search.

To identify this Frenchman, Lindgren relied on the sparse evidence available from Herschel’s correspondence. The machine was presented to “the Institute,” or l’Institut de France in Paris, which sponsors *Comptes Rendus*; and the quotation appears to be from a document promoting the machine. From Babbage’s letter, we know that the presentation of the machine must have happened before April 1822. Lindgren is correct that there is no reference to a difference engine at the Académie des sciences from 1800 and 1860. What if Herschel is not talking about a difference engine, however, but a calculating machine instead? His reference to the Frenchman’s machine states only that it can do “difficult operations of Arithmetic and forming all sorts of tables.

THE INSTITUTE AND LA SOCIÉTÉ

At the time, the only British organization of scientific learning with a name similar to “Institute” is the Royal Institution of Great Britain (RI). Established in 1799, it was chartered [8] as a

Public Institution for diffusing the knowledge, and facilitating the general introduction of useful mechanical inventions and improvements; and for teaching by courses of philosophical lectures and experiments, the application of science to the common purposes of life.

It would be the proper venue for the display of such a calculating device if one existed. At this time, the Royal Institution did not have a formal publication in which lecturers could publish their shared knowledge. However, Professor W. T. Brande, a member of the Institution, edited the *Quarterly Journal of Science, Literature and the Arts* (QJSLA), which published many members’ research works. The following paragraph appeared in the April 1822 issue [9, p. 220].

4. Arithmometer—A French artist, M. Thomas, of Colmar, honorary director of the Phoenix

Company, has obtained a brevet of invention (patent,) for a machine of calculation, to be called the Arithmometer. It has been presented to the Society for the encouragement of National Industry, and by it a person unacquainted with figures may be made to perform, with wonderful promptitude, all the rules of arithmetic. The most complicated calculations are done as readily and exactly as the most simple; sums in multiplication and division of seven or eight figures require no more time than those of two or three.

This text was reprinted from the *Monthly Magazine* [10] and *The Leeds Correspondent* [11]. The named society, translated to English, is a French organization with a role similar to that of the Royal Institution. *La Société d’encouragement pour l’industrie nationale* (SEIN) was founded in 1801 and its aim was to “favor the progress of the national economy by encouraging technical innovation and promoting the useful arts” [12].

Having examined the *Bulletin de la Société d’encouragement pour l’industrie nationale* (BSEIN) for 1815 to 1825, this author found no mention of a difference engine but there is an article in February 1822 about Thomas de Colmar’s arithmometer by mathematician and astronomer Louis Benjamin Francoeur [13]. It describes a calculating machine capable of addition, subtraction, multiplication and division, and how to use it. Francoeur praises the machine but gives no details of its inner workings. The arithmometer must have given rise to considerable interest because in the November issue of the same year Hoyau [14] gives a complete description of it, including ten engravings.

LE CHEVALIER THOMAS, DE COLMAR

Charles-Xavier Thomas, de Colmar was a French administrator who joined the French Army’s campaign under Napoleon in Portugal and Spain from 1809 to 1813. He rose to become the *Inspecteur des vivres*, or inspector of provisions, for the entire French army in the Peninsular Campaign. During this time the daily routine of calculations to balance the books inspired his desire for a calculating machine. After Napoleon’s defeat, Thomas studied the insurance business in London before returning to France to found several fire insurance companies. In 1819, the French government made him a Chevalier de la Légion d’Honneur and he adopted the epithet “de Colmar” after his birthplace [15].

A profitable insurance company requires the production of accurate actuary tables so that insurance premiums can be established without undue risk to the

company. These tables of mathematical functions would have been calculated using the difference method described by Briggs in 1624 [16]. This again motivated de Colmar to design a calculating machine. In 1820, he obtained a patent [17] and tried to commercialize his arithmometer. An improved machine was demonstrated to the SEIN in 1822. Little came of this first attempt to commercialize de Colmar's invention and the successful running of insurance companies became his main concern. Through acquisitions and mergers, he profited greatly from the insurance business [18]. His three insurance companies all still operate in France today.

By the mid-century, the arithmometer achieved widespread recognition. Only one built before 1846 has survived [19]. But de Colmar's machine won silver medals from the SEIN at the Exposition publique des produits de l'industrie française in 1849 [20] and at l'Exposition universelle of six years later [21]. With de Colmar's refinements and international recognition, the arithmometer was successfully commercialized. One contemporary report [22] states that 500 arithmometers were made between 1821 and 1865, 300 for 1865–1870, 400 from 1870–1875, and 300 more from 1875–1878.

ARTITHMOMETER

Descriptions of the different stepped drums and carry mechanisms used in Thomas arithmometers can be found at www.arithmometre.org. [23]. The arithmometer was never capable of using the method of differences on its own. To calculate a table, the operator had to implement the desired difference algorithm aided by the engine to quickly add, subtract, multiply, and divide. To answer the question in the title, yes there was a French engine but it certainly was not what Babbage aspired to achieve.

Jonhston [24] describes its use to create actuarial tables in England. The arithmometer was copied with improvements by other manufacturers such as Tate [25] or Layton [26] and greatly influenced the design of calculating machines. Thomas de Colmar's most important contribution was the moveable carriage, which minimized the number of manipulations in multiplication and division. All later mechanical pinwheel calculators, such as the Triumphator, the Odhner or, the Curta, implemented a moveable carriage.

CONCLUSION

A strong argument has been made that the machine discussed in the correspondence between Herschel and Babbage must be Thomas de Colmar's Arithmometer. It is at the right place at the right time. However, it is not what Babbage wanted his difference engine to

be; it is not an engine capable of producing tables without human intervention.

ACKNOWLEDGMENT

The author would like to thank Jane Harrison, Documentation Manager, Royal Institution of Great Britain, for her efforts in unsuccessfully trying to find a mention of Thomas de Colmar in their records.

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