

Zerah Colburn, the 'mental calculator'

by
Anne van Weerden,
18 August 2022

In September 1813, the later 'Sir' William Rowan Hamilton (1805-1865) had "engaged in trials of arithmetical skill" with Zerah Colburn (1804-1839), an American 'calculating boy' who was able to make enormously long calculations in his head, answering many different arithmetical questions in very short times. His amazing skills had been exhibited since 1810, when he was six years old. Hamilton's biographer Robert Graves wrote about the contest between Hamilton and Colburn, who then just had turned eight and nine respectively, in his *Portrait* of Hamilton, "Zerah Colburn, the American boy, was exhibited in Dublin, as an arithmetical prodigy, and [...] opportunities occurred for trials of skill between him and Hamilton, in which, rather in play than otherwise, they exchanged questions and fought arithmetical duels; but we have heard Sir William declare,¹ that in these encounters his competitor was usually the more expert of the two combatants." From the description it does not seem that these 'encounters' had been held in public.

In 1820 Colburn and his father visited Ireland for a second time, and in April Hamilton and Colburn met each other in the house of Cousin Arthur Hamilton in Dublin. Colburn then shared his methods with Hamilton, and returned the following morning to have breakfast with them. Telling his sister Eliza about the meeting in a letter, Hamilton described Colburn as "the wonderful American boy who used to calculate with such astonishing rapidity when here some years ago." The last time they met, again in Cousin Arthur's house, was early in June. Hamilton wrote to Eliza, "Zerah Colburn dined with us lately, and acted a little in the evening, - "Pierre" and "Zanga". I conversed with him on his Tables."

In my *celebration article*, written because this year it is exactly two hundred years ago that Hamilton turned into a mathematician, I mentioned their two meetings in a footnote, stating that they had met in 1817 and 1819 instead of 1813 and 1820. After the publication of the article I started to doubt the years I had given for the contest, and rereading Graves' remarks about it I saw that I had made a mistake; Hamilton and Colburn did not meet for a second time in April 1819 but in April 1820. Graves wrote about their second meeting on a page with in its heading '[1819. aetat. 14.]', and the biography generally being divided in chapters which each describe a different year, I had erroneously assumed it was a chapter about 1819. On these pages Graves also remarked that the contest had taken place "two years" before Hamilton and Colburn met for the second time, and therefore I had concluded that the contest had taken place in 1817 instead of 1818, the year Graves thought it had.

¹ Graves met Hamilton when the latter befriended his elder brother John T. Graves in 1823 or 1824 while at college, in 1841 Graves researched and wrote the 'Portrait'.

In Graves's biography, Hamilton's early years were described using letters written by family members; the first letter written by Hamilton himself was given in the chapter called 'His Childhood'. The next chapter, called 'His School-time' describes 1816-1819 and contains letters by Hamilton and by his father, but not anything relating to Colburn. Wondering why the 1818 contest was not mentioned I decided to search online for Zerah Colburn, and readily found Norman Redington's weblog, *Zerah Colburn's Saga*. It appeared that in 1833 Colburn had published an autobiography, *A Memoir of Zerah Colburn*, and that it is available online. In his *Memoir* Colburn does not mention Hamilton, and I became curious whether the time of the contest could nevertheless be derived from it.

The *Memoir* is quite difficult to search through because Colburn only now and then gives dates. The first thing I therefore noticed was that the **earliest likeness** of Colburn was made late in 1810 or early in 1811, when he was only six, by **Rembrandt Peale** in Philadelphia and "placed in the gallery of the Museum."² The most **well-known likeness** of Colburn was made **early in 1813** when he was eight years old; the drawing was made by **Thomas Hull**, and it was engraved by **Henry Meyer**. Somehow this likeness seems kinder than the **copy** published by **R.S. Kirby** and shown on Colburn's **Wikipedia page**; I could not find its engraver. Remarkably, the copy Colburn gave in his *Memoir* as a **frontispiece** is yet another one, and it is unfortunate that Colburn did not give any information about it. The main difference is that in this copy there is **no trace** of Colburn's sixth finger which is clearly shown in the original likeness, and somewhat less conspicuous in the copy published by Kirby; Colburn had **inherited** his twelve fingers and twelve toes from his father.

Through Colburn's polydactyly it is certain that the contest was held in 1813; Hamilton **wrote** to his sister Eliza about meeting Colburn again in 1820, "He is greatly grown and much improved in manner. He has lost every trace of his sixth finger." Indeed, having visited **Ireland and Scotland** in 1813 and early 1814, Colburn returned to London in March 1814, and soon thereafter his extra fingers were **taken off** by **Anthony Carlisle**.³ The contest therefore took place before the operation, hence during Colburn's **1813 visit to Dublin**. Even though Colburn "was generally the **victor**," the often drawn conclusion that Hamilton thereupon decided to give less time to his studies of the classics and more to mathematics is not true; in 1813, having been only eight years of age, that was not for him to decide.⁴

² It was, unfortunately, not found online, and I do not know if it still exists.

³ Carlisle also wanted to remove Colburn's extra toes, but father and son refused. Carlisle apparently wanted to remove the toes "on account of their probable inconvenience to him when learning to dance," to which in 1833 Colburn dryly **commented**, "as yet there has been no trouble on that account." It is not known why the Colburns refused this operation; a likely reason might be that even though in the likeness the extra finger looks rather small, Carlisle wrote in an 1813 '**Account**' of the polydactyly of the Colburn family that, like his father, Colburn had the extra metacarpal and metatarsal bones, and these extra bones also had to be removed. At that time there were no anaesthetics yet, nor antibiotics, and it is therefore possible that for the hands they had been willing to take the risk of such an operation, but that they judged it too dangerous in case of the toes; in public no one could see them.

⁴ Graves' suggestion that the contest was held in 1818 was, in some form, repeated by all six authors discussed in our **gossip article** (and of course by me). The second author, E.T. Bell, introduced the notion that Colburn was the reason Hamilton turned from languages and the classics to mathematics. That was repeated by the later authors, except Hankins. Coincidentally, Colburn's *Memoir* was placed online in 2007, the year that Ian Stewart, the last of the six authors, published his book.

Yet in 1822, then seventeen years of age and about to write his first original mathematics papers, Hamilton openly acknowledged Colburn's influence on him in a letter to Cousin Arthur. "I was amused this morning, looking back on the eagerness with which I began different branches of the Mathematics, and how I always thought my present pursuit the most interesting. I believe it was seeing Zerah Colburn that first gave me an interest in those things. For a long time afterwards I liked to perform long operations in Arithmetic in my mind; extracting the square and cube root, and everything that related to the properties of numbers." This enjoyment stayed with him; even in his **last years** Hamilton saw doing enormously long calculations, often without pen and paper, as relaxation, and Graves remarks that it "was in a sense **play** to him." But the ultimate incentive for becoming a mathematician was the book he received from Uncle James in August 1821, Bartholomew Lloyd's *Analytic Geometry*. In September 1822 Hamilton called it an "ill-omened gift!" because it had "in so great a degree withdrawn my attention, I may say my affection, from the Classics."

The Colburn family and polydactyly

Not only Colburn, but also other family members were polydactyls; on 23 December 1813 the aforementioned **Account** by **Carlisle**, the surgeon who thereafter removed Colburn's fingers, was read to the Royal Society in London, describing the "supernumerary Fingers and Toes" of the Colburn family. In the 'Account' the "hereditary descent of this peculiarity" was given in a **family tree**, showing that Colburn, his father and two of his brothers "had the peculiarity complete," as Carlisle called it in the **text**, the eldest brother had it partially, the other family members were "exempt" from it.

From the overview of Abia Colburn's family, given in the *Genealogy of the descendants of Edward Colburn/Coburn family*, it appears that two of Zerah's brothers were twins, and that of these two brothers Jonathan died in 1811, as is corroborated by this **photo** of his tombstone, while David died in 1852. Yet in the 'Account', written late in 1813, Carlisle **stated** that the twin brother David died young, and that he did not have polydactyly; it appears not to be possible to conclude from other parts of the text who of the twins had it. In the **family tree** it can also be seen that Carlisle did not know the name of Colburn's mother, indicating that he probably did not know more about this family than what he had seen and heard from father and son Colburn.

Standing out in the *Genealogy* are the twins in the Colburn family. Colburn had twin brothers, his eldest brother **Green Colburn** had twin sons, and Colburn himself had twin daughters. Of Zerah's brothers it is obvious that they were fraternal twins; one of the twins had polydactyly, the other twin 'was naturally formed.' Conceiving fraternal twins tends to run in families, but because this trait is carried by the mother's genes, it does not explain why both Zerah and his brother had twins.

Colburn's early life

Zerah Colburn was born in **Cabot, Vermont**, as the **sixth child** of Abia Colburn (1769-1824)⁵ and Betsey Colburn née Hill (1769-1860). They had **six sons and three daughters**; two children died young. Abia Colburn **discovered** his son's remarkable talent for calculation in August 1810, when Zerah Colburn still was five years old; he then had attended the district school for six weeks. Very soon thereafter father and son left home to exhibit Zerah's calculating powers to the public in the hope to secure a good future for the family; from 1810 in America, from 1812 in Europe.

Even though it must be noted that there also were good times it cannot be said that it was all in Colburn's best interest; in his 1833 *Memoir* every now and then he contemplates how things could have been different. For instance, in April 1811 his mother and siblings were "transiently residing" in Norwich and with his father he visited them; it was the last time Abia Colburn saw his other children, and Colburn **wonders** if things would have been better if his father had decided to return home and use the money they had already earned with the exhibitions. Or, what if **in 1812**, when visiting her husband in Boston and accompanying them for a while, his mother could have convinced his father to come home, as she later regretted she did not; she never saw her husband again.

Together with his father, Zerah Colburn left America on **3 April 1812**, and he returned on **24 June 1824**, having been "**absent** from it twelve years and three months. Of this time, eighteen months were spent in Paris, nine years in London, and the remainder in travelling in England, Ireland, and Scotland." Colburn "continually [came] in contact with an **endless variety** of characters and scenes," and he was praised and admired, yet at times he was unhappy; for instance, about his **1820 visit to Dublin** he wrote that he had been comparatively unhappy since May 1819, and that "frequently walking down to the wharf, or the beach," upon seeing vessels bound for an American port he became sad and longed to go home. From September 1820 until January 1822 he even was so **unhappy** that he did not want to write about that period.

Their seeming prosperity had only lasted for "**two or three years**," yet Abia Colburn had not been able to give up his dream of success. It certainly was not always his fault that new plans **fell to the ground**, and describing 1814 Colburn expresses frustration about the **empty promises** which were made to his father, something he mentions **more often**. But he also writes that his father listened "**too much** to the advice of others whom he considered to have more knowledge and experience than himself;" there had been moments and circumstances in which he could have made different choices. Colburn **comments**, "Is it asked why then [Abia Colburn] tarried so long in a foreign land be our plain answer this: he was perfectly confident that the hour drew near when he should return in a manner that

⁵ Betsey Colburn having been born on **12 March 1769**, as is stated on 'Find a Grave', is in accord with Colburn's remark that in 1833, when he wrote his *Memoir*, his mother was in her **65th year**. But Abia Colburn was not born on 6 November 1763 as is stated on the same page of 'Find a Grave'. He died on 14 February 1824, and according to Colburn he was 54 years, 3 months, and 8 days; he therefore was born on 6 November 1769. This calculation was of the kind of **questions** often asked during exhibitions, and although perhaps as a child Colburn did not know the exact age of his father, he wrote this in 1833 when he was a father himself already, and his mother still alive; it would be very strange if he would have been incorrect.

would be honorable to himself, and make every amends to his deserted family for years of separation. The [course of events] painfully showed that he was mistaken in his anticipations, but however misguided he might have been, there never was a period at which he could have felt justified in his own mind to abandon his undertaking, and without educating his son come back to his farm." Perhaps that is the most amazing aspect of the *Memoir*; the respectfulness Colburn retained for his father despite his ostensible naivete, with every new plan believing he soon would have enough money to educate his son, and finally return home knowing he would be able to take good care of his family.

Colburn and mathematics

In his *Memoir* Colburn relates how his amazing calculating skills came to him **long before** he had learned how to describe what he was doing. But he did not become a mathematician, and comparing him to Hamilton, it has often been suggested that he could not have become one even if he had been given the opportunity. Yet Hamilton and Colburn can hardly be compared. First, there are not many mathematicians of Hamilton's stature, and interesting is not if Colburn could have been one of these exceptions, but if in general he could have become a mathematician if he had wanted to. Second, their youths were completely different. Hamilton grew up in a warm bath of education and learning, with all the encouragement, guidance and care any one could wish for, while Colburn in his youth only received formal education for short and interrupted periods of time, and was most of the time accompanied by his father who certainly was **educated**, but, unfortunately for both of them, not as highly as people around Hamilton.

From his *Memoir* it can be seen that Colburn was formally educated for a total of four and a half years. In the Summer of 1810, still five years old, he had been at the Cabot district school for **six weeks**. Then there was some **informal education**; alluding to himself in the third person Colburn wrote, "since he started from Cabot, he had learned to read, and in London, to write; but this was all." After July 1814 having **learned French** from a French teacher in just three or four months, with ten years and nine months Colburn entered the **Lycée Napoléon** in Paris, at that time called the 'Royal College of Henry the Fourth,' on **30 May 1815**; he remained there until **February 1816**. Just having turned twelve, he entered **Westminster School** in London on **19 September 1816**, and he remained there until **Witsuntide 1819** (late in May). About the **Lycée** Colburn wrote that he "attended to the study of L'Homond's French Grammar, writing and Latin," and about the **School** that "the ancient languages were the only study pursued." Apparently, at neither institution Colburn was taught mathematics.

But **in 1814**, the year before he entered the Lycée and still in London, he was for some time privately educated, and Colburn then briefly contemplates what studying mathematics could have meant for him. "His education, except in reading and writing, had hitherto been neglected, on account of his being exhibited, but it was now recommended that he should commence a course of mathematical studies. In pursuance of this advice, a private instructor was engaged, and **Hutton's Algebra** commenced. [...] As might be expected from the nature of his early gift, he ever had a taste for figures. To answer questions by the mere operation of mind, though perfectly easy, was not anything in which he ever took

satisfaction; for, unless when questioned, his attention was not engrossed by it at all. The study of Arithmetic was not particularly easy to him, but it afforded a very pleasing employment, and even now [1833], were he in a situation to feel justified in such a course, he should be gratified to spend his time in pursuits of this nature. The faculty which he possessed, as it increased and strengthened by practice, so by giving up exhibition, began speedily to depreciate. This was not as some have supposed, on account of being engaged in study; it is more probable to him that the study of any branch that included the use and practice of figures would have served to keep up the facility and readiness of his mind. The study of Algebra, while he attended to it, was very pleasant, but when just entering upon the more abstruse rules of the first part, he was taken away from his books and carried to France." That happened in July 1814, when Colburn was almost ten years old.

Colburn thus claims that the cause of his 'faculty' having begun to 'depreciate' was not being exhibited any more, because he did not pay attention to his gift when he was not directly asked to calculate. He experienced the depreciation when exhibited in France; the Colburns had left London for Paris in July 1814, and on 4 August 1814 Colburn was exhibited in Paris. He wrote, "Three months had now elapsed that he had not been exhibited, but had given his attention to study; even in this short space, it was observable that he had lost in the quickness of his computations. When examined at this time, he was much longer in attaining to the answer of questions than ever before."⁶

About the **Summer of 1817** Colburn wrote, "Being much at leisure, and having no children, [Rev. **Henry St. John Bullen**, chaplain to the Earl of Bristol] undertook the private instruction of four boys in Latin and other branches. While residing with him, Zerah pursued his classical studies, and also surveyed the first six books of **Simson's Euclid**.⁷ Many have inquired if the study of Geometry was easy to him? He never found, that he recollects, any difficulty in understanding the demonstrations laid down by Euclid. Their fitness and adaptation to the various problems or theorems were very evident to his mind, but the study was always dry and devoid of interest. The reason probably was, that while studying he did not realize, even in anticipation, the benefits of such a science; had he been engaged in some pursuit that would have required the continual introduction and

⁶ Colburn continued writing that "on retiring," the members of the French Institute where he was exhibited, "favored him with a copy of their Journal of that day in reference to him, bearing date August 4, 1814, and signed by their secretary, Delanobre. The celebrated mathematician, La Place, was present at that time." Searching for the French Institute and their journal, it was found that the Secretary must have been **Jean-Baptiste Joseph Delambre** (1749-1822), and the Institute the 'Institut pour les Sciences Mathématiques'; in the signature of the Secretary, Colburn apparently misread the 'm' for 'no'. Delambre was **Secrétaire perpétuel** for the Institute from 1801 until 1822; Pierre-Simon de Laplace (1749-1827) indeed also was a **member** of the **Académie des Sciences** (the then rapidly changing organisation of the Institute makes the naming quite confusing). The minutes of the meetings were printed in the '**Procès-verbaux** des séances de l'Académie des Sciences', signed by Delambre. The records sometimes took only one page, which might explain why Colburn could receive it on the same day. The exhibition may have been held in an extra meeting; the regular meetings were on Monday, 4 August 1814 was on a Thursday. Unfortunately, the 1814 volume of the 'Procès-verbaux' is not available online.

⁷ Summarising, Colburn's formal education consisted of six weeks district school in 1810; four or five months arithmetic and some basic algebra by a private tutor in 1814; three or four months of French from a French teacher after July 1814; eleven months at the Lycée Napoléon in Paris in 1814-1815; two years and eight months at Westminster School in London in 1816-1819, including two months private instruction in the Summer of 1817. This adds up to four years and four months.

application of Geometrical principles, the subject would have assumed an interesting appearance, his mind would have been engaged in it, and he would have remembered the principles and arguments laid down."

Obviously, Colburn did not have any problem with geometry, but from his having found Euclid "dry and devoid of interest" it has been concluded that he was not interested in mathematics. Yet Colburn then only was twelve years of age, and from Hamilton's early education it can easily be seen that, in the context of their time, Colburn makes perfect sense in his analysis that the problem was that he then did not have any idea what the study could be profitable for; that was what had been so completely different for Hamilton. In 1815, ten years old, Hamilton went through "half the first book [of Euclid] with uncle," and at some time before 1822 he "used to go to breakfast with [Cousin Arthur], and we read two or three propositions together every morning." Not only did Hamilton read Euclid together with people he loved and trusted, due to the social classes he moved in, from his youngest years Hamilton had been impregnated with a **deep respect** for the classics. The constant closeness of family members not only to live with, but at the same time to work with and learn from, which Hamilton enjoyed, was something Colburn did not have.

Due to not having been exhibited any more Colburn apparently lost much of the speed of his calculations, but he did **not lose his ability** for calculating. That the exhibitions stopped is not in any way surprising; people paid to be amazed by such a young child calculating that fast, yet there were many adult mental calculators. It is very difficult to ascertain from the *Memoir* when the exhibitions stopped exactly; Colburn wrote about his contemporary, the calculating boy **George Parker Bidder** (1806-1878), that he "did not begin to excite attention until after Zerah had retired from public exhibition in London, sometime **in the year 1815**," a sentence which can be explained in various ways. In another chapter of the *Memoir* Colburn seems to say that it stopped at some time before he went to Westminster School, therefore before **September 1816**.

Concluding, it seems to be possible to infer from the *Memoir* that if circumstances **had allowed it**, Colburn could have become a mathematician; he found studying arithmetic and algebra 'very pleasing', and did not have any problem with geometry. The 1913 *Genealogy* contains a **succinct overview** of Colburn's life, from which it appears that after having published his *Memoir*, in 1835 he became professor of languages at **Norwich University**, which then was recently established. The son of his brother **Zebina**, Colburn's namesake **Zerah Colburn** (1832-1870), became an **engineer**, a **locomotive designer**. Colburn's lack of mathematics education and unfavourable circumstances, perhaps combined with a lack of higher education of his father, seems to have been the main reason that he did not become a mathematician.

Colburn's later life

Abia Colburn died in 1824, and Colburn finally could go home. It is sad to **read** that when he saw his mother and siblings again at first they did not even recognise each other, and how difficult the years for his family had been without direct support of their husband and

father. But in his later years Colburn became happy after all; having had a school in Cabot for two months, having been an assistant in an Academy in Fairfield, New York, for three months, and having taught French and resumed his classical studies in Burlington, Vermont, for another three months, shortly after July 1825 he **decided** to become a preacher. After much doubt and deliberation he joined the **Methodist church**, and when in 1832 or 1833 he finally started to write his *Memoir* he had already been a preacher for seven years. He then also had a family; in January 1829 he had married **Mary Cory Hoyt** and in 1833 they already had **three daughters**. After the publication of the *Memoir* two more daughters and a son were born, and as mentioned above, in 1835 Colburn became professor of languages at Norwich University.

In those times many parents lost young children and many adults did not reach high ages, and that also held for Zerah and Mary Colburn; they lost their nearly one year old daughter **Mary** in December 1837, and their six year old daughter **Laura** in October 1838. Two months later their son William Horace was born, but already three months after his birth Colburn died, in March 1839, only thirty-four years old. Mary lived until **March 1856**, four years after her eldest daughter Maria **married** Ezekiel Hatch, and it is to be hoped that she saw her eldest two grandchildren before she died with fifty-one. **Jane** would become the eldest of the family, born in 1834 she died in 1919, eighty-four years old. Of two of the Colburn daughters photos are online, of the eldest daughter **Maria** (whose death record and gravestone, given on the same page, show 1905 for her death year instead of 1903), and of **Eliza**, twin sister of Laura.