Extreme giftedness? Trading on the general education of child prodigies in the nineteenth century

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SUMMARY: 1.—Introduction: the general education of child prodigies. 2.—Prodigies in the arts: virtuosos. 3.—Prodigies in the sciences: mental calculators. 4.—Why was a general education important? 5.—Conclusions.

ABSTRACT: The child prodigy phenomenon expanded during and after the mid-19th century, nurtured by a growing entertainment industry in Europe. Prodigies were particularly popular in two domains —classical music and mental calculation. Many spent their early childhoods on tour and living abroad. This paper analyzes the problem of the general education of the child prodigy, and the parents' and impresarios' role in financially exploiting the child's talent. I focus on virtuosos and arithmetic wonders who performed in France in the 19th century. These children rarely received regular schooling and many only learned to read and write once their years of glory as a prodigy passed, or when their lack of education became problematic. The consequences of neglecting the prodigy's elementary studies were greater than parents and impresarios had anticipated. Illiteracy and a meager knowledge of the wider culture affected talent development. In the end, a lack of general education contributed to the deterioration of the child's giftedness, accelerating the transition from prodigy to ordinary.

KEYWORDS: virtuosos, calculating prodigies, elementary education, talent, childrearing.

1. Introduction: the general education of child prodigies (*)

Child prodigies have been historically renowned for displaying a precocious and extraordinary talent in a specific task or domain. The modern fascination for child prodigies was focused on what makes them unique, while general

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aspects of their upbringing, including their general education, remained overlooked. General education is understood to include basic studies in reading and writing, as well as elementary knowledge in arithmetic, geography, and history, the knowledge of which allow the cultivation of cultural literacy. The nineteenth century saw a cultural shift in the value of elementary education, and it became mandatory by law in a number of European countries[1]. Although initially, instruction often took place within the family, governments required parents to bring their children to school to ensure compliance with the law, especially in rural areas and in the context of working-class families, where child labor was sometimes necessary for survival and elementary studies were more frequently overlooked[2]. Nevertheless, this period was successful in raising awareness about the value of literacy and elementary education among different strata of the European population. In France, literacy was believed to reduce economic pressure and youth crime and to increase occupational opportunities[3].

Child prodigies, however, rarely benefited from the new value given to general education. In an era remembered for the progress made against illiteracy, many prodigies admired by European audiences were uneducated children who only learned to read and write at the age of twelve or later —that is, once their years of stardom began to fade or when their lack of schooling began to have a negative effect. As I will show, parents and impresarios neglected the elementary studies of prodigies, despite having the means to provide them with this education. Sometimes their choice was unintentional, as parents were convinced that, with their children's exceptional talent, postponing their instruction would not harm them.

My focus is on child prodigies in science (mental calculation) and the arts (classical music) who performed in France in the nineteenth century. At that time, cities like Paris attracted prodigies from all over the world. Virtuosos and calculating boys were the most common type of prodigy during this period. The children displayed their talent at cafés, private soirées, and the newly built boulevard theaters, as well as at learned societies keen to understand

1. The Montano law (Spain, 1857), the Casati law (Italy, 1859), the Jules Ferry's laws (France, 1881-1882).
2. Guereña, Jean-Louis; Tiana, Alejandro, eds. Clases populares, cultura, educación, siglos XIX-XX. Madrid: Casa Velázquez, UNED; 1989, p. 17.
3. Gillis, A. R. Institutional dynamics and dangerous classes: reading, writing, and arrest in nineteenth-century France. Social Forces. 2004, 82 (4): 1303-1331.

the prodigies' talent, such as the Académie des sciences. While virtuosos attracted an upper class audience from the start, the majority of calculating prodigies came from the countryside and began their careers by performing in small villages. Only once their careers took off were they called to perform at embassies, exclusive soirées, and royal colleges[4]. The child prodigies I will be examining here mainly encountered a literate, cultivated audience.

Historical research on child prodigies is scarce and has favored a domain-centered approach. Musicology focused on virtuosos[5], cultural studies analyzed child actors and entertainers[6], and the history of psychology examined mental calculators and intellectually gifted children[7]. This research has tended to concentrate on case studies, sometimes using a biographical approach. We have obtained a rich yet fragmented view of what constitutes essentially the same phenomenon: the child prodigy. Exceptions to a historically fragmented view include, among others, Ann Jefferson's account of the prodigy phenomenon. Despite her focus on case studies like the poet Minou Drouet and the calculating boy Jacques Inaudi, Jefferson is able to show the evolution of the child prodigy in relation to the category of genius in modern France[8]. The child prodigy phenomenon, although initially linked to the virtuosos of the eighteenth century, expanded during the second half of the nineteenth century, nurtured by a growing entertainment industry in major cities and the emergence of child psychology, and coinciding with the establishment of compulsory education in a wide range of European countries.

4. See e.g., Jacoby, Émile. Biographie de Henri Mondeux, le jeune pâtre calculateur de la Touraine. 6ème édition. Paris: Charpentier; 1846, p. 95.
5. See e.g., Amthor, Yvonne. 'Wunderkinder' – Musical prodigies in European concert life between 1791 and 1860 [doctoral thesis]. University of Leeds; 2012. Kopiez, Reinhard. The musical child prodigy (wunderkind) in music history: a historiometric analysis. In: Deliège, Irène; Davidson, Jane, eds. Music and the mind. Oxford: Oxford University Press; 2011, p. 225-236.
6. Gubar, Marah. The drama of precocity: child performers on the Victorian stage. In: Denisoff, Dennis, ed. The nineteenth-century child and consumer culture. Aldershot: Ashgate; 2008, p. 63-78. Davis, Jim. Freaks, prodigies and marvellous mimicry: child actors of Shakespeare on the nineteenth-century stage. Shakespeare. 2006; 2 (2): 179-193.
7. Burman, Jeremy Trevelyan; Guida, Alessandro; Nicolas, Serge. Hearing the inaudible experimental subject. Echoes of Inaudi, Binet's calculating prodigy. History of Psychology; 2015, 18 (1): 47-68; Porter, Jim Wynter. A «precious minority»: constructing the «gifted» and «academically talented» student in the era of Brown v. Board of Education and the National Defense Education Act. Isis. 2017; 108 (3): 581-605.
8. Jefferson, Ann. Genius in France. An idea and its uses. Princeton and Oxford: Princeton University Press; 2015, Part 5.

In Western Europe, literacy rates were estimated at 50% in the 1850s, and in the 1870s, around 70% of the population is said to have enrolled in education at some point. In this decade, the French Minister of Education estimated that 23% of men and 33% of women were still illiterate[9]. In 1876, it was estimated that 73.6% of French children between six and thirteen years old attended school[10]. Compulsory and free primary education became available in France with the laws of 1881 and 1882, more or less in line with other countries like England, but much later than Prussia, which was the first to implement it in the late eighteenth century[11]. Compulsory education, however, did not mean mandatory schooling, as despite the efforts in improving the school system, elementary schools (including public and private, religious and secular) were still not available in every town or region, and alternative educational practices, such as home schooling and tutors, were still necessary[12].

The question of the general education of child prodigies has not received much scholarly attention. One of the reasons for this is that the research has focused on the modern perception of the child prodigy as a wonder —a notion that sometimes carried a supernatural connotation[13]. In the nineteenth century, wondrous and innate gifts were certainly more effective in advertising a prodigy than discourses about parental pressure and «manufactured genius»[14]. On the one hand, the idea of innate talent reflected the Romantic ideal of the genius as a never-growing child. Rousseau's understanding of the child as a creature that society has not yet tamed or tainted influenced such ideals; from the Romantic perspective, precocity was proof of natural-born genius and a sign of the artist's destiny[15]. On the other hand, nineteenth-century notions of innate talent were built upon theories of heredity —Francis Galton's eugenics, in particular. According to Galton, geniuses were born, not made. While Cesare Lombroso's theory of degeneration saw genius and precocity as a pathological manifestation, to Galton, precocious children were

9. Heffernan, Michael J. Literacy and the life-cycle in nineteenth-century provincial France: some evidence from the *département* of Ille-et-Vilaine. History of Education. 1992; 21 (2): 149-159.
10. Gillis, n. 3, p. 1311.
11. Grevet, René. L'Avènement de l'école contemporaine en France, 1789-1835. Paris: Presses Universitaires du Septentrion; 2001, p. 258.
12. Quéniart, Jean. Les Français et l'écrit (XIII^{e}-XIX^{e} siècle). Paris: Hachette, 1998.
13. Spiritism and theosophy insisted that child prodigies proved reincarnation. Denis, Léon. Le problème de l'être et de la destinée. Paris: Librairie des sciences psychiques; 1908.
14. Howe, Michael J. A. Genius explained. Cambridge: Cambridge University Press; 1999.
15. Jefferson, n. 8; Menger, Pierre-Michel. La précocité créatrice et les conditions sociales de l'exception. In: Le travail créateur. S'accomplir dans l'incertain. Paris: Gallimard, Seuil; 2009, p. 429-445.

well-balanced and important for the progress of humanity. In reviewing the biographies of men like Mozart and Pascal, Galton insisted that their early achievements indicated their bright futures[16].

Emphasis on natural-born genius supported the notion that talent did not need to be developed along with other skills, and in this vein, some parents believed that illiteracy and lack of general education were harmless to a child prodigy[17]. Concerning the two categories of prodigies I examine in this paper (virtuosos and mental calculators), several points have been made. Scholarship in musicology has examined the musical training of virtuosos, observing that their elementary studies were not a priority[18]. As I aim to show, several of the most famous virtuosos performing in Paris had an exquisite musical education, acquired with the best maestros in national conservatories in Europe. As a result, their primary education, including reading and writing, was postponed until the age of twelve or later. With regards to calculating prodigies, the psychological literature of the period highlighted that the majority of them came from a humble background and, as a consequence, had no formal education[19]. As I will argue, the parents and impresarios in charge of arithmetical prodigies allegedly looked to fund the prodigy's schooling with their performances; yet, at the same time, they refused offers from patrons and the French Ministry of Education to continue with the commercial exploitation of the child.

The myth of the «pushy parent» has long been associated with the phenomenon of child prodigies. In the popular imaginary, prodigies in music, or in other fields, would not have achieved such level of excellence at an early age without the pressure from their parents, guardians and trainers[20]. Clementine Beauvais has explored the pushy parent label as a derogatory term since the 1980s. A narrative of «true» and «pseudo» giftedness has been built around this category; that is, between those children that are truly gifted and those who are pushed to over-achieve by their parents[21]. Even though the

16. Galton, Francis. Hereditary genius. An inquiry into its laws and consequences. London: MacMillan; 1869. Lombroso, Cesare. The man of genius. London: Walter Scott; 1891, p. 15-16.
17. See the section titled «Why was a general education important?» below.
18. Fort the nineteenth century see: Amthor, n. 5. For the seventeenth and eighteenth centuries see: Giron-Panel, Caroline. Enfants prodiges, génies en devenir: former les enfants à la musique dans les ospedali de Venise (XII^{e}-XVIII^{e} siècle). Mélanges de l'École française de Rome - Italie et Méditerranée modernes et contemporaines. 2011; 123 (2): 347-357.
19. Scripture, Edward. Arithmetical prodigies. American Journal of Psychology. 1891; 4 (1): 1-59.
20. Terrassier, Jean-Charles. Les enfants surdoués ou la précocité embarrassante. Paris: ESF; 2017, p. 93.
21. Beauvais, Clementine. An exploration of the «pushy parent» label in educational discourse. Discourse: Studies in the Cultural Politics of Education. 2017; 38 (2): 159-171.

pushy parent label is relatively recent, the notion can be traced back in time. The father of the nineteenth-century thinker John Stuart Mill (1806-1873) is among the best-known cases. James Mill deliberately separated his son from children of his age and began to teach him Greek and arithmetic when he was only three. His purpose was to transform his son into a genius[22]. The parents and guardians of the virtuosos and arithmetic prodigies I will analyze also pushed the children to achieve extreme forms of giftedness within a field. In doing so, other aspects of their development were disregarded. In what follows, I analyze the general education of these two types of child prodigies performing in France and explore the consequences of a lack of elementary studies on their talent and development. I conclude that in most cases, a poor general education contributed to the deterioration of the prodigy's talent.

2. Prodigies in the arts: virtuosos

In an interview, the German pianist and former child prodigy Emil Sauer (1862-1942), who had been a pupil of Liszt, made the following statement about the education of child virtuosos:

> «I can imagine nothing more stultifying or more likely to result in artistic disaster than the course that some parents take in neglecting the child's school work with an idea that if he is to become a professional musician he need only to devote himself to music. This one-sided cultivation should be reserved for idiots who can do nothing else»[23].

In this statement, Sauer points to the potential feebleness of musical prodigies: their lack of general education. He also identifies those chiefly responsible for this: the parents.

In the history of virtuosos, parents are often referred to as the first teachers of the prodigy, but only in music. In Mozart's case, it was his father who taught him to play; yet, it was also very common for a cultivated mother to give the first music lessons to her child at home. Among the many examples is the German pianist and former prodigy Alfred Reisenauer (1863-1907), who

22. Mill, John Stuart. Autobiography. London: Longmans, Green, Reader and Dyer; 1874.
23. Sauer cited in: Cooke, James Francis. Great pianists on piano playing. Philadelphia: Theo. Presser Co.; 1913, p. 238-239.

recalled learning to play the piano with his mother. In an interview he said: «I can never thank my mother enough for the splendid start she gave me in my early musical life. She was a wonderful woman and a veritable genius as a teacher»[24]. Besides giving the future virtuosos their first music lessons, the parents were the ones who organized their child's career. They presented him or her to renowned musicians and music professors, as well as to prospective patrons who could sponsor their child's musical education. To parents, studying with the best maestros appeared to be the ideal way for their children to enhance their gift, and in order to promote their child as a prodigy, parents circulated stories about the alleged natural-born genius and innate talent of their offspring. In the press and in early biographical accounts, the discovery of a child's musical giftedness was often described as having been a surprise to the family[25]. Within the process of forging the musical prodigy, however, their general education was overlooked.

It is very difficult to know which schools, aside from music schools, virtuosos attended. In the best-case scenario, regular schooling was a parallel activity to their musical studies and concert tours but was not prioritized. However, in general, regular schooling was simply absent from the virtuoso's life or was postponed until his or her career began to slow down —or when the lack of education began to cause them problems in continuing with their musical career. In some cases, the family's financial struggles motivated this delay. Unlike other children who contributed to the household income, especially in the working classes, some prodigies were expected to provide for the whole family and did not have the option to stop performing. The virtuosos present in Paris in the nineteenth century provide an illuminating set of examples. I will only refer to a few relevant cases that reflect these dynamics. It is important to notice that these were several of the internationally famous virtuosos of the time, although some were forgotten in their adulthood.

The German pianist Clara Schumann (1819-1896), née Wieck, one of the first female musical prodigies reported, received poor regular schooling but a superb musical education. She was the daughter of Friedrich Wieck, a piano professor and former child prodigy who introduced her to music. In 1832, when Schumann was thirteen, they both arrived in Paris for a two-month tour. There, she gave a public concert, performed in private soirées, and met

24. Reisenauer cited in Cooke, n. 23, p. 222.
25. See, for example, Zamora, Justo M. Pepito Rodríguez Arriola (Apuntes para la biografía de este prodigioso músico). Madrid: Imp. del asilo de huérfanos del S. C. de Jesús; 1900.

Chopin and Paganini among other musicians and composers[26]. At that time, despite her exquisite musical training, her general education was almost non-existent. In 1825, at the age of six, she had attended a small primary school for six months. She later spent about a year in a larger institution, but her father reduced the teaching hours considerably to give her piano lessons in the morning and the afternoon. Once her career took off and she began to go on tour, her father hired a private tutor. Nevertheless, the private education she received was oriented towards improving her musical career; she learned English and French in order to optimize her networking opportunities during tours and to arrange new concerts. In her adulthood, Schumann told Brahms that she was embarrassed by her lack of general education, which made her feel uneasy in intellectual circles[27].

Fig. 1. Camille Urso, eleven years old.
Source: Brandt, Caroline. Urso Polka. Boston: E. H. Wade; 1853. Courtesy of the Camilla Urso Collection, held by the Irvin Department of Rare Books and Special Collections, University of South Carolina Libraries, Columbia, S.C. (public domain image).

26. Mlle Clara Wieck. Le Constitutionel. 5 Apr 1832; Reich, Nancy B. Clara Schumann: the artist and the woman. Ithaca and London: Cornell University Press; 2001, p. 29-32.
27. Reich, n. 26, p. 21, p. 177.

The French violinist Camille Urso (1840-1902), the first female violin student of the Paris conservatory[28], had a similar experience (Fig. 1). Her grandfather had been a distinguished Italian musician and her father, a flautist and music teacher from Nantes, had planned a bright future for her. She took violin lessons in Nantes until she was seven, the legal age of entry to the Paris conservatory. As a result of her musical studies, and owing partly to her humble background, she missed primary school completely. During her time in Paris, she became a child star and was invited to perform in the Palais de l'Élysée before Prince Napoléon. She graduated with the first prize from the conservatory and did a tour in Switzerland and Germany before landing in New York in the early 1850s[29]. The European tour lasted six months and Urso was able to make enough money to support her whole family for the next two years[30]. According to one of her first biographers, Charles Barnard, when she arrived in the United States she was «woefully ignorant for a ten-year-old girl»[31]. Barnard, however, belittled her lack of education. In his words: «[it] did not make any particular difference. Things were going on quite to her satisfaction and she was perfectly happy even if she could not read or write»[32]. The family, who followed her to the United States, hired a private tutor who taught her English during the intervals of her tours, even though she still did not know how to read or write in her mother tongue[33]. As in Clara Schumann's case, these lessons aimed to further her career in her new country, rather than to provide her with a general education.

Urso and Schumann's cases were no exception. Another child prodigy who studied in Paris, the American pianist Ernest Schelling (1876-1939), saw his general education neglected until the age of twelve. The son of a Swiss physician and musician, he performed his first concert in the United States when he was only four[34] and was admitted to the Paris conservatory at seven to study with the great masters. At that time, it was believed that no musical education was complete without coming to Europe, so musical

28. At that time, the violin was considered to be a man's instrument. Kagan, Susan. Camilla Urso: a nineteenth-century violinist's view. Signs. 1977; 2 (3): 727-734.
29. Turgeon, J. O. Biographie de Camille Urso. Montreal: Plinguet & Laplante; 1865.
30. Schiller, Jennifer. Camilla Urso: pioneer violinist (1840-1902). University of Kentucky; 2006, p. 12.
31. Barnard, Charles. Camilla: a tale of a violin, being the artist life of Camilla Urso. Boston: Loring; 1874, p. 87.
32. Barnard, n. 31, p. 8.
33. Barnard, n. 31, p. 86-87.
34. Ernest Henry Schelling. Evening star. 13 Mar 1880, p. 2.

prodigies from around the world pursued their training in the old continent. While in Paris, Schelling made several tours that took him from France to England, Austria, Russia and other countries. Although the French press was enthusiastic overall about the eight-year old prodigy, some critical voices were raised. In 1884, *Le Petit Parisien*, one of the best-selling newspapers, wrote that in face of Schelling's success a «law» should be applied against those «barbarian parents» who «exploit a toddler's precocious abilities at the risk of shattering their fragile brain!»[35]. At the time these critiques were raised, the Jules Ferry laws (1881-1882) had established compulsory elementary education in France, either at school (including free and secular options), with a tutor or the family. These critiques, however, evidently had no impact on how Schelling's parents managed their son's career and education. It was not until he was twelve that his family settled in Switzerland for around three years, where «his general education received the attention which had been much neglected»[36].

A final example worth mentioning is the Spanish pianist Pepito Arriola (1896-1954). Having received his first piano lessons as a baby from an aunt obsessed with crafting a prodigy[37], Arriola performed for the first time in Madrid in December 1899, aged three. The French press proclaimed the discovery of a new Mozart and in less than a year Arriola travelled to Paris[38]. There, he played at several private soirées and at the International Congress of Psychology, where physiologist and advocate of psychical research Charles Richet gave a talk about Arriola's extraordinary musical precocity. To underline his innate talent, Richet insisted that the boy's mother had discovered his talent by chance and that it had developed without his having received any lessons[39]. As a result of Arriola's international success, the Spanish royal family decided to sponsor his musical education in Leipzig. His years in Germany were filled with tours around Europe and America, where he performed in the most

35. Les petits prodiges. Le petit Parisien. 28 Apr 1884, p. 2.
36. Cooke, n. 23, p. 267.
37. Sinclair, Alison. La forja del prodigio: Pepito Arriola. In: Bacon, Kathy; Thorton, Niamh, eds. The noughties in the hispanic and lusophone world. Newcastle: Cambridge Scholars Publishing; 2012, p. 143-161. Pepito Arriola's aunt was Aurora Rodríguez, mother of Hildegart Rodríguez, a famous child prodigy and activist killed by her mother.
38. Les journaux espagnols. Gil Blas. 13 Jan 1900, p. 13.
39. Richet, Charles. Note sur un cas remarquable de précocité musicale. In: Janet, Pierre, ed. IVe Congrès International de Psychologie. Compte rendu des séances et texte des mémoires. Paris: Félix Alcan; 1901, p. 93-99.

important concert halls. Although he did not attend school, he had a private tutor who taught him «some Latin, French, and regular school studies»[40]. According to the musician and journalist James Cooke, who interviewed Pepito Arriola at the age of twelve, the boy appeared to have «a little more general education» than other virtuosos he had known[41]. Camille Saint-Saëns was another former child prodigy in Paris who had received private lessons; from the age of seven, Saint-Saëns had training in Latin and the natural sciences[42]. Thus, when used appropriately, private tutors and home schooling could be a valuable alternative to regular schooling.

As these examples show, many of the famous child virtuosos performing in Paris and other cities in the nineteenth century were fairly illiterate boys and girls who had a poor general education. Their days were consumed with seven to nine hours of musical training and their parents organized their life according to concerts. Several of these children moved countries during their early childhood to study with the great masters or to enroll in different conservatories. During their time abroad, many had private tutors who taught them to speak a foreign language, even though many of them could not write or read in their mother tongue. The foreign language lessons aimed to ensure communication with their masters, patrons, and conductors, in order to improve their international career. It is thus not surprising that many virtuosos were polyglots. Luckily for these children, language acquisition is related to the perception of sound, which explains why musicians are often better at learning languages[43]. This could eventually help virtuosos pursue their schooling in a foreign country, as Schelling did in Switzerland; but again, if the child's career was successful or if the family was struggling financially, their parents often deliberately postponed their elementary education. As I argue in section 4, this eventually hindered the full development of the child prodigy's talent.

40. Cooke, n. 23, p. 47.
41. Cooke, n. 23, p. 40.
42. Studd, Stephen. Saint-Saëns: a critical biography. London: Cygnus Art; 1999, p. 11.
43. Brandt, Anthony; Gebrian, Molly; Slevc, L. Robert. Music and early language acquisition. Frontiers in Psychology. 2012; 3 (327): 1-17.

3. Prodigies in the sciences: mental calculators

Along with virtuosos, arithmetic prodigies or mental calculators were among the most popular child prodigies of the period. They were the first gifted children in which scientists, especially phrenologists, physicians and psychologists, took a deep interest. The history of arithmetic prodigies in France is not new. Scholars such as Serge Nicolas have extensively examined the story of one the most famous calculating boys of the time, Jacques Inaudi (1867-1950), showing how he was examined by the Société d'anthropologie in 1880 and the Académie des sciences in 1892[44]. Before him, other arithmetic wonders had caught the attention of French savants and the general public, including the American Zerah Colburn (1804-1839), the Sicilian Vito Mangiamele (1827[45]-1897) and the French Henri Mondeux (1826-1862). As with the virtuosos, my interest here is not to re-tell the story of these children focusing on their demonstrations in theatres, cafés and scientific societies, but to examine their general education during their years of glory. In what follows I analyze the above-mentioned cases, with the exception of Inaudi since his case has been well studied and his story resembles the others I examine[46].

One of the first internationally famous mental calculators of the time was Zerah Colburn. He is a good example of a so-called «calculating boy»[47]. The majority of calculating boys born in the nineteenth century appeared to be illiterate and from a humble background[48]. According Zerah Colburn's memoirs, at the age of six he had only attended school for six weeks in the state of Vermont (United States). As with many other prodigies, the discovery of his calculating gift was allegedly spontaneous. One day, Zerah overheard

44. Nicolas, Serge, ed. Jacques Inaudi (1867-1950). Un jeune calculateur prodige étudié par Broca, Charcot & Binet. Paris: L'Harmattan; 2017.
45. Some accounts date his birth to 1825. Marlin, D. Notice sur le jeune Vito Mangiamele. Revue Belge. 1840; 16, p. 189-200.
46. In the case of Inaudi, he only learned to read and write at the age of twenty, and his general educational was very poor. Binet, Alfred. Psychologie des grands calculateurs et joueurs d'échecs. Paris: Hachette; 1894, p. 31. See also: Burman et al., n. 7.
47. Girls were extremely rare among arithmetic prodigies. To my knowledge, the only well-known calculating girl of the time was Uranie Diamandi (b. 1887), the younger sister of Pericles Diamandi (b. 1868), an arithmetic prodigy studied by Binet when Diamandi was twenty-five. On Uranie Diamandi see: Ioteyko, I. Les calculateurs prodiges: (avec présentation de Uranie Diamandi). Bruxelles, Em. Rossel; 1910. On Pericles Dimandi see: Binet, n. 46, 110-130.
48. See e.g., Binet, n. 46, p. 180-190.

his father making calculations, and jumped in to give him the answer. From then on, father and child began a tour exhibiting Zerah's calculating talent around New England before heading to Europe to continue the business, first in London and then in Paris between 1814 and 1815, when the boy was ten years old.

While in Paris, he made several private demonstrations for wealthy people, as well as for mathematicians and other savants. The phrenologist Franz Joseph Gall examined him and noted that, «he has never been to school, he cannot read, nor write»[49]. According to Colburn, despite the constant trips and performances, his father's wish had always been to give him the best possible education, for which he allegedly never ceased to seek sponsors[50]. In Paris, they met the famous American writer Washington Irving, with important contacts in the city. Irving helped get Colburn admitted to the prestigious Collège Royal Henri IV (today, the Lycée Henri IV), which remains one of the most reputable schools in France. He went on to board there and was taught French grammar, Greek, Latin and mathematics, among other subjects. According to some of his classmates, Colburn did nothing in school but continue to calculate in his head. He either «could not» or «did not» want to learn anything else[51]. After eight months, his father withdrew him from Henri IV and took him again to London, allegedly following wealthier promises of patronage for his son's education[52]. His time in an English school lasted a little longer. He was placed in a class beneath his age and made good progress, but mostly because he had an extraordinary memory, a capacity which psychologists argued to be key for calculating prodigies[53]. When his father lost his last patron, he removed his son from school and suggested he dedicate himself full-time to the stage. In Zerah Colburn's words: «the idea of acquiring an Education was superseded», and it was left «in a very unfinished state»[54].

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49. Gall, Franz Joseph. Sur les fonctions du cerveau et sur celles de chacune de ses parties. Tome V. Paris, Ballière; 1825, p. 140.
50. The father received generous offers from several American gentlemen to take care of his child's education until he was able to attend college. Colburn, Zerah. A memoir of Zerah Colburn; written by himself. Springfield: G. and C. Merriam, p. 17.
51. Jacoby, n. 4, p. 10
52. Colburn, n. 50, p. 73-84.
53. Colburn, n. 50, p. 104. Nicolas, Serge; Gyselinck, Valérie. Introduction. Les grands calculateurs mentaux. In: Nicolas, Serge; Gyselinck, Valérie, eds. Les calculateurs prodiges. Leur histoire et leur psychologie. Paris: L'Harmattan; 2016, p. 5-16.
54. Colburn, n. 50, p. 121 and 120.

Fig. 2. Vito Mangiamele in 1839. G. 12181, Musée Carnavalet, Paris. (public domain image).

Cases like this one appear to repeat themselves in the history of calculating prodigies. The education of the child is allegedly presented as a priority to fulfill his talent; yet, such education is never really pursued. A few years after Colburn left Paris, the French press began to speak about a ten-year-old Sicilian boy named Vito Mangiamele (fig. 2), the son of a shepherd who, despite having no formal education, had an extraordinary calculating gift[55]. A man from Florence, Mr. Comparato, discovered the prodigy on a trip and asked the father permission to take him under his wing and give him an education. More than a professor, he acted as an impresario. Comparato exhibited

55. Chronique. Un jeune pâtre sicilien. Journal de l'Institut Historique. 1837; 6 (4): 232-234.

Mangiamele around Europe and, in 1837, presented the boy at the Académie des sciences in Paris. Learned societies had shown an interest in calculating prodigies since the eighteenth century, when the Royal Society examined the arithmetic wonder Jedediah Buxton (1707-1772). As with Mangiamele's case, their interest was in understanding the calculating methods of child prodigies and the abilities that supported them, but the children could not explain how they accomplished what they did[56]. Late nineteenth-century works by French physicians and psychologists, notably Alfred Binet, helped clarify the faculties behind the techniques of mental calculators, which were found to be, essentially, visual and aural memory[57].

Just before Mangiamele's demonstration at the Académie des sciences, the Minister of Education wrote to the Academy that, in case his faculties were judged extraordinary and they could be further developed, he «would use the means at [his] disposal to this end. France is the adoptive homeland of all talents»[58]. In a contemporary case, the Neapolitan government had decided to sponsor the education of a calculating boy named Vincenzo Zuccaro (b. 1822), the son of an itinerant fiddler[59]. Mangiamele's tutor, however, refused the offer because he allegedly planned to publish a work to fund his career and schooling[60]; but instead, they continued making a living with the boy's demonstrations around Europe[61]. Mangiamele returned to France in 1842 at the age of fifteen; he was abandoned by his impresario, who took all the profits from the tour with him. The director of an *école préparatoire*[62] in Versailles decided to take Mangiamele under his wing. He gave him an education and employed him to teach mathematics at his school. In 1851, when Mangiamele

56. Shuttleworth, Sally. The mind of the child. Child development in literature, science, and medicine, 1840-1900. Oxford: Oxford University Press; 2010, p. 142.
57. Nicolas, Serge; Guida, Alessandro; Levine, Zachary. Broca and Charcot's research on Jacques Inaudi: The psychological and anthropological study of a mental calculator. Journal of the History of the Neurosciences; 2013, 23 (2): 140-159; Nicolas, n. 44.
58. Correspondance. In: Compte rendus hebdomadaires des séances de l'Académie des Sciences. Tome IV. Paris: Bachelier; 1837, p. 1001-1002.
59. Vito Mangiamele – Vincent Zuccaro. L'Album. Journal des beaux-arts et de la littérature; 1837, 4 (2): 7-12. About Zuccaro see: Malvica, Fernando. Sopra il famoso fanciullo Vincenzo Zuccaro. Palermo: Lorenzo Dato; 1829.
60. Marlin, n. 45, p. 195.
61. For example, Mangiamele was in Barcelona in 1853, where he was examined by the Academy of Science. Cubí i Soler, Marià. Lecciones de frenolojía. Barcelona: Hispania; 1853, p. 306-308.
62. An *école préparatoire* is a preparatory school for post-secondary students who plan to apply for the Grandes Écoles, prestigious and elite institutions in the French higher education system.

asked the Ministry of Justice to recognize him as a permanent resident of France, the prefect supported his claim, recalling how his former tutor «odiously took advantage of [his] remarkable talent and young age», while the director of the school had ensured his instruction[63].

After Mangiamele, another shepherd boy took over the role of calculating prodigy in France and in Europe. His name was Henri Mondeux and he was also illiterate. His story is linked to Émile Jacoby, the director and founder of a boarding school in Tours. Jacoby had once attended an exhibition featuring Mangiamele. About a year later, in 1838, he found out that another arithmetic prodigy lived in his region and tracked him down. After noticing that Mondeux, aged between eleven and twelve, could neither read nor write, he asked the father permission to look after the boy's education. Jacoby became his guardian and impresario. In the words of Jacoby, when he took him to his boarding school the boy «knew nothing, absolutely nothing, even the shape of the numbers was unknown to him»[64]. Just like Zerah Colburn, Mondeux appeared to be either «incapable» of or «uninterested» in learning. Although Jacoby maintained that his wish was to prepare Mondeux for the École Polytechnique, after a few weeks he began organizing public exhibitions at his school which several members of the aristocracy from the region attended, and from whom Jacoby was able to obtain money to «fund» the boy's schooling[65] —a similar strategy to that used by Colburn's father.

Because Mondeux did not seem to progress at school owing to «his lack of discipline»[66], Jacoby began to take him on tour while allegedly becoming his private tutor. In 1840, he arranged a meeting with the Académie des sciences, from whom Jacoby expected «to obtain an assistance allowance that would allow him [Mondeux] to pursue his education in Paris»[67]. After receiving a positive advice from the Academy[68], the Ministry of Education offered Mondeux a stipend to attend a royal college, as Colburn did.

63. Mangiamele, Vito. Demande civile, Ministère de la justice. Dossier n. 6032 X 5, BB/11/614; 1851. Located in: Archives Nationales, Pierrefitte-sur-Seine.
64. Jacoby, n. 4, p. 124-125.
65. Jacoby, n. 4, p. 53-56.
66. Barbier, Hippolyte. Vie de Henri Mondeux, jeune pâtre mathématicien. Paris: Appert; 1841, p. 10-11. Jacoby, n. 4, p. 64.
67. Jacoby, n. 4, p. 70.
68. Cauchy, Augustin. Rapport fait à l'Académies des sciences, par M. Augustin Cauchy, sur les procédés de calcul imaginés et mis en pratique par un jeune pâtre de la Touraine. In: Barbier, n. 66, p. 61-71.

Jacoby refused the offer considering it was not suited to Mondeux's «special needs», and that he alone could provide him with a better education. As in Mangiamele's case, introducing him to the Académie des sciences acted as a promotional campaign. In both cases, it worked. Mondeux's career reached its peak internationally and he began to give demonstrations in various exclusive venues (embassies, salons, banquets, universities), and for renowned personalities (Victor Hugo, Chateaubriand, George Sand) in France, Belgium, England, Germany and Switzerland[69]. Jacoby certainly made a profit from these demonstrations.

The financial crisis of 1847 and the 1848 revolutions put a temporary stop to their tours. Eight years after refusing the offer of the Minster of Education, Jacoby wrote two desperate letters to him, reminding him of this calculating prodigy who had once been received by the Académie des sciences. He told him about all the sacrifices he had made to educate «his pupil» in order to turn him into a «useful citizen for science and for his country». Unfortunately, Mondeux's «rebellious» nature made the task impossible. Jacoby had finally understood that the boy (now twenty-two) would remain a «curious, but sterile phenomenon»[70]. He told the Minister that as a result of the crisis they were not even able to perform to make a living. In consequence, he asked for an allowance for him and Mondeux from the budget being used to help the artists during the crisis. The allowance, it appears, never arrived. After the crisis, Mondeux continued to tour until his sudden death in 1861 from an epileptic attack[71].

To sum up, unlike in the case of virtuosos, those who were in charge of calculating prodigies, whether a parent, tutor or impresario advocated the importance of giving the prodigy a general education to develop his potential and ensure his future contribution to science. They sought to have them admitted to the best schools and universities. To this aim, they looked for patrons and ministerial allowances. The strategies used to obtain funding, such as presenting the boy to the Académie des sciences, served as promotional campaigns. Yet, even when funding became available, this never seemed

69. See a transcription of Mondeux's album, where he kept dedications from personalities such as George Sand in: Barbier, n. 66, p. 73-101. Jacoby, n. 4, p. 95-107.
70. Jacoby, Émile. Two letters to the French Minister of Education asking for an allowance for him and Henri Mondeux. 20 July 1848 and 18 September 1848; M. Henri Mondeux. Demande d'indemnité, 1848. F/17/3191. Located in: Archives Nationales, Pierrefitte-sur-Seine.
71. Chauvin-Tachot, Clô. Henri Mondeux: l'enfant mathématique: le calculateur de Touraine. Chemillé-sur-Indrois: Éditions Hugues de Chivré; 2016, p. 146-147.

enough for the guardian or parent, especially when he was not a beneficiary or if more money could be obtained from exhibiting the child. In the end, despite all the alleged efforts to provide these prodigies with an education, their instruction remained unfinished.

4. Why was a general education important?

Child prodigies have been historically perceived as children with an extraordinary yet focalized talent. Their giftedness is extreme, but only regarding a particular field and even, a particular task within a field. For example, many arithmetic prodigies were not good in mathematics outside calculation, and virtuosos sometimes showed poor skills for composition and improvisation[72]. Their giftedness was thus not without any feebleness. In this section, I will argue that improving the general education of the child prodigy allowed their talent to be cultivated in and beyond their field of expertise. On the contrary, neglecting it proved to have unwanted consequences for their talent and general development that were difficult to overcome. This argument is based on the opinions of several of the child prodigies in music and arithmetic I have examined, as well as those of the savants who took an interest in them. In the following, I shall present their opinions as to why a general education was important and expose some of the consequences of neglecting it.

An obvious consequence, namely the illiteracy and ignorance that many virtuosos and calculating prodigies had to cope with until their adolescence or later, has been discussed in previous sections. Psychologists who studied child prodigies, such as Franziska Baumgarten, noted that uneducated prodigies had the capacities, but lacked the knowledge. She also noted that despite excelling in complex domains such as music or arithmetic, many prodigies were unable to perform simple tasks commonly performed by children, such as drawing or identifying different animals, because they had never drawn or seen illustrations in books[73]. As mentioned in the introduction, this occurred during an era in which elementary education had become compulsory in many European countries, and where a cultural shift underlined the advantages of

72. Ioteyko, n. 47, p. 2. Révész, Géza. The psychology of a musical prodigy. Kegan Paul & Co.; 1925, p. 112-113.
73. Baumgarten, Franziska. Wunderkinder, psychologische Untersuchungen. Leipzig: Johann Ambrosius Barth; 1930, p. 38-39.

literacy for citizenship, especially for the lower classes. What distinguished the child prodigies examined here from other illiterate children of their time was that their parents and guardians would have had the opportunity to attend to their education much earlier. Virtuosos amassed a small fortune with their concerts, which the family administrated[74], and calculating prodigies were offered ministerial stipends and funding from patrons to fulfill their general education inside or outside the school system. In this vein, if they remained illiterate or ignorant it was because of the choices made by their parents and guardians, not because their social and economic condition hindered their chances of obtaining a primary education. In cases where the parents had a good education (for example that of the virtuoso Schelling, whose father was a physician), the family's choice seemed paradoxical.

Fig. 3. Alwine Ohm in: Ohm, J. H. M. Die 13jährige Pianistin Alwine Ohm aus Hannover und deren 4jährige Kunstreise durch Deutschland. Dresden: Blochmann & Sohn; 1853. Courtesy of Bayerische Staatsbibliothek München, urn:nbn:de:bvb:12-bsb10600233-0.

74. Dopico Vale, Julia, Mera Castro, José Luis. Las cuestiones de familia y los dineros de los niños músicos. Ferrol Análisis; 2003, 18: 69-75.

The parents of child prodigies sometimes appeared to be unaware of the consequences of neglecting their child's general instruction. The father of the German pianist Alwine Ohm (b. 1847) began a tour in Europe with his daughter when she was nine, which lasted until she was fourteen (fig. 3). Although she had some education, for five years Ohm did not receive any regular school studies and her father focused on her piano training. In the end, they had to stop their tour because her lack of instruction had become too pronounced and was affecting her playing. In the words of Ohm's father: «the lack of general education became increasingly visible in Alwine. It is not widely known that one-sided education will only get you so far, and then grinds to a halt»[75]. This quote shows the lack of awareness of Ohm's father with regard to the harm he had been causing his daughter. Clearly, parents of prodigies were overestimating their children's skills and playing down their ignorance outside their single talent, with the presumption that it would be easy for a child prodigy to overcome an education gap.

Although it was not a widely-shared opinion, several former virtuosos advised against a one-dimensional (here, musical) education. When in 1839 a father asked Mendelssohn to take his child as pupil, Mendelssohn warned him to take care of his son's schooling first before dedicating all his time to music. In Mendelssohn words: «the prosecution of the usual elements of study, the acquirement of languages, and the various branches of scholarship and science, are of more value to the boy than a one-sided, even though more perfect cultivation of his genius»[76]. As cited in section 2, the former prodigy Emil Sauer also advised parents against a one-sided education which, in his opinion, should be reserved for «idiots». For Sauer, as for Mendelssohn and other former child prodigies, a virtuoso should have the broadest possible cultural education to improve his or her talent and be able move the audience with their playing.

Favoring a one-sided education certainly helped improve the prodigy's musical technique. This was important for the child's early career, because prodigies of all kinds became renowned for performing at an adult level in skill-demanding domains. However, musical performance is not only about technique, but also about sensibility. While virtuosos impressed the audience with technical skills beyond their years, most professional musicians achieved

75. Cited in Amthor, n. 5, p. 240.
76. Mendelssohn Bartholdy, Paul; Mendelsshon Bartholdy, Carl, eds. Letters of Felix Mendelssohn Bartholdy. Philadelphia: Frederick Leypoldt; 1865, p. 169.

the same level of technique as they grew older. Sensibility, or the ability to move the audience, became an increasingly important aspect of their talent. Such sensibility, Sauer warned, could only come from cultivating oneself outside music[77].

Pepito Arriola, the child prodigy who appeared to have a better general education than other virtuosos of his time, expressed a similar opinion. In an interview when he was twelve, he said that apart from music, he had a wide range of interests. Nurturing a general culture was of much importance because:

> «We play as we think. The mind must be continually improved or the fingers will grow dull. [...] Music is, after all, only another kind of poetry, and if we get poetical ideas from books we become more poetical, and our music becomes more beautiful. The student who thinks only of hammering down keys at the piano cannot play in a manner in which people will take pleasure»[78].

A broad cultural education was therefore necessary to improve one's talent, but of course this could only be achieved if a general education had been previously acquired.

Similar considerations were made for calculating prodigies. Those psychologists who studied this type of children, including Edward Scripture, Alfred Binet and Frank Mitchell, argued that arithmetic prodigies rarely showed interests outside calculation. Just like virtuosos, they cultivated a kind of one-sided education and sought to exploit their image as wonders. From this perspective, ignorance actually worked in their favor, as it helped promote their out-of-the-ordinariness. Scripture noted that the guardians and biographers of calculating prodigies often presented them as «modern miracle[s]», insisting that the discovery of their gift was completely unexpected in an uneducated child. Such stories reflected popular beliefs about child prodigies and, as Scripture observed, one should be extremely cautious when reading or hearing about them[79].

Psychological investigation showed that arithmetic wonders had some natural predispositions, such as extraordinary memory, but that continuous training was necessary to maintain their gift. Binet noticed that stopping this

77. Sauer cited in Cooke, n. 23, p. 239.
78. Arriola cited in Cooke, n. 23, p. 46 and 49.
79. Scripture, n. 19, p. 11.

training to resume or to begin regular studies proved to have pernicious effects: «Colburn tried to get an education for three months and stopped his public performances; when he began to calculate again, it appeared that he was less able. The same misadventure happened to Mr. Inaudi»[80]. We may speculate that parents and impresarios became aware that dedicating time to other tasks outside calculation had negative effects on the prodigy's ability. This could explain why Colburn's father withdrew him from several schools, or why impresarios refused scholarships from the French Ministry of Education and private benefactors. From this perspective, ignorance, and the inhibition of the cultivation of other skills, was believed to preserve the child prodigy's talent. According to Mitchell's study of mathematical prodigies: «This explains why so many ignorant men have excelled as calculators; ignorance, by preventing the intrusion of other interests, leaves the calculator free to develop his one gift, and keeps him from realizing how trivial it is, and how groundless is the public amazement which, perhaps, contributes to his support»[81].

In this vein, it may seem that general education and a broad culture hindered the development of talent in calculating prodigies. However, talent here only concerns calculation, which, as Mitchell argued, was «trivial». In order to go beyond this calculating talent —for example, to become a great mathematician— a good general education and a wide range of interests were of utmost importance. The cited psychologists mentioned that Gauss, Ampère, or Bidder stood among the few mathematical geniuses and distinguished engineers who had been calculating prodigies in their childhood. What differentiated them from Colburn or Mondeux was that they had been able to cultivate themselves widely. Gauss and Bidder received a university education thanks to patronage, which spared them the commercial exploitation of their calculating talent —despite Bidder's father's attempts to continue making a living through his child—, while Ampère was self-educated using his father's rich library[82]. According to Mitchell, these cases proved that «if the interest in calculation is retained despite the widening of the sphere of interests resulting from education, the calculating power may prove to be of considerable practical value»[83]. Otherwise, the calculator remained «a curious, but sterile

80. Binet, n. 46, p. 196-197.
81. Mitchell, Frank D. Mathematical prodigies. The American Journal of Psychology; 1907, 18 (1): 61-143, p. 102.
82. Scripture, n. 19, p. 6-9 and 23-28.
83. Mitchell, n. 81, p. 102.

phenomenon»[84], to recall the words of Émile Jacoby, the tutor in charge of Henri Mondeux who was allegedly unable to give him an education.

5. Conclusions

The nineteenth century is perceived as a turning point in the history of education. Compulsory elementary studies at a certified institution (or within the family) became the norm in Western Europe, which saw its illiteracy rates decline considerably among different strata of the population. Child prodigies, however, did not always benefit from this progress. During the years in which compulsory education was supposed to take place (between six and thirteen years old), many child prodigies in music and arithmetic spent their life on tour and cultivating a one-sided education to develop their focalized giftedness. Acting as their children's managers and main beneficiaries, parents and guardians prioritized their careers over their general education.

Virtuosos attended prestigious conservatories and became the pupils of important maestros. They also received foreign language lessons to improve their career abroad. Arithmetic prodigies cultivated their calculating gift through training with the parents and tutors who arranged their tours. Unlike for other illiterate children of the time, the families and impresarios of these child prodigies had the means to give them an education. The exhibition of the prodigy's talent was a significant source of income —income that, at some point in the child's career, could have been used to eradicate the all too frequent complete illiteracy and ignorance of the young prodigy. As such, the choice of neglecting their child's general education was a deliberate one, although parents were not always aware of its drawbacks.

Theories and beliefs with regard to innate talent and precocity being signs of genius fostered the idea that talent could be developed independently from other skills. Some parents and guardians perceived the cultivation of other interests as an intrusion that may harm their child's gift. In this vein, they thought that a one-dimensional education would be the most effective method for talent development. From this point of view, ignorance was not harmful as long as it allowed the prodigy to focus on their single talent. In

84. Jacoby, Émile. Letter to the French Minister of Education asking for an allowance for him and Henri Mondeux, 20 July 1848; M. Henri Mondeux. Demande d'indemnité, 1848. F/17/3191. Located in: Archives Nationales, Pierrefitte-sur-Seine.

addition, ignorance helped promote the idea of the child's natural-born genius. In the case of arithmetic prodigies in particular, impresarios emphasized the image of illiterate wonder boys who were unable to acquire an education outside calculation. This supported the idea that prodigies were unsuited to do anything else, and that a one-dimensional cultivation of their talent was the most beneficial choice for their future.

If talent is what constituted the child prodigies' giftedness, their weakness was a poor general education. In the long run, lack of education prevented them from nurturing interests outside their domain of expertise, which eventually (contrary to some parents' expectations) hindered the cultivation of their genius. The idea that a lack of general education could harm child prodigies did not become evident until their ignorance became problematic. Although former child prodigies and psychology experts alike warned about the dangers of a one-sided education, this was not a widely-held opinion before the end of the nineteenth century. The cases examined here demonstrate that efforts to reverse the situation and provide child prodigies with an elementary education usually came too late. In the end, a lack of education combined with narrow, focused training contributed to a rapid deterioration of the child's gift, accelerating the transition from prodigy to ordinary. This proved to be the fate of the majority of calculating boys of the time and, to a lesser extent, of the virtuosos. Some musical prodigies who performed or studied in France, such as Clara Schumann and Ernest Schelling, were able to continue with their career during their adulthood, but others were forgotten.

Nowadays, schooling is still a parallel and sometimes overlooked activity in the child prodigy's career. In the case of virtuosos, some major music schools, such as Juilliard in New York, have agreements with public and private institutes to facilitate the general education of these children, who need to devote long hours to musical practice and cannot attend all the courses. Another option that conservatories foster is approved home schooling[85]. Concerning calculating prodigies, contemporary psychology has continued to take an interest in these children. Distinguishing as early research did between calculators and mathematicians, recent work argues that gifted children in

85. Gagné, Fraçoys; McPherson, Gary E. Analyzing musical prodigiousness using Gagné's integrative model of talent development. In: McPherson, Gary E., ed. Musical prodigies. Interpretations from psychology, education, musicology & ethnomusicology. Oxford: Oxford University Press; 2016, p. 3-114, p. 48.

mathematics should benefit from enriched education programs[86]. The examined cases of nineteenth-century virtuosos and arithmetic wonders show that the disadvantages of neglecting regular school studies are greater than its advantages, and that talent benefits from the harmonious development of a wide range of skills and subjects. ▮

86. Lépine, Raphaëlle; Camos, Valérie. Approche cognitive: l'étude de calculateurs prodiges et d'enfants à haut potentiel en mathématiques. In: Lubart, Todd, ed. Enfants exceptionnels: précocité intellectuelle, haut potentiel et talent. Rosny-sous-Bois: Bréal; 2005, p. 90-116.