

**Offprints of Ada Lovelace's translation of Luigi Menabrea's account of Charles
Babbage's Analytical Engine, incorporating an offprint by Babbage**

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Introduction

On 5 October 1959 John G. Byrne, then a civil engineering post-graduate student in Imperial College, purchased for £2-10-0 from Edward G. Allen and Son, Booksellers & Library Agents, 14 Grape Street, Shaftsbury Avenue, London, a slender volume described as “1648 Menabrea, Sketch of the Analytical Engine.” Over the following half-century, while founding and heading the Department of Computer Science in Trinity College, Professor Byrne continued to very actively collect documents and instruments relating to computation. In circa 1985 John Byrne requested that this remarkable collection be kept in the Department of Computer Science, and from 2012 my colleague, Dr Brian Coghlan, and I have been engaged in cataloguing the collection. On 1 July 2015 John Byrne showed me the volume that he had purchased in 1959 and asked that it be included in his collection in the Department, and, because he was aware that it was valuable, that it should be kept securely there.¹ Sadly, Professor John Byrne died on 16 April, 2016, aged 82. The purpose of the following is to provide a description of his volume, and to identify its background and significance.

Description

The volume comprises thirty-nine leaves measuring 226×142 mm. and a foldout leaf of 226×346 mm. with a cover of light beige card. On the covers of the volume are two annotations, probably inscribed by book dealers: on the upper left-hand corner of the front cover the number “4126” is written in biro, and encircled; on the bottom right-hand corner of the inside back cover is written in pencil, “L 802 dn/5.” On the front cover is printed the following:

“SKETCH OF THE ANALYTICAL ENGINE INVENTED BY CHARLES BABBAGE, Esq. By L.F. MENABREA, *of Turin*, OFFICER OF THE MILITARY ENGINEERS, WITH NOTES BY THE TRANSLATOR. – [Extracted from the ‘SCIENTIFIC MEMOIRS’ vol. iii.] – LONDON: PRINTED BY RICHARD AND JOHN E. TAYLOR, RED LION COURT, FLEET STREET. 1843.”

This is printed in various font sizes, in fourteen centred lines, down the front cover, and is then repeated as a title page on the recto of p. 666. This title indicates, therefore, that the volume contains the famous translation by Ada Lovelace (1815–1852) of the account by Luigi Menabrea (1809–1896) of the Analytical Engine invented by Charles Babbage (1791–1871), published in the *Scientific Memoirs* in 1843.

However, examination of the contents revealed that the volume actually contains two separate articles, the first an offprint of Ada’s article in *Scientific Memoirs* (1843), pp. 666–731, which I shall reference with the first word of its title, “Sketch.” This is followed by a four-page article whose first page is entitled, “ADDITION TO THE MEMOIR OF L. MENABREA ON THE ANALYTICAL ENGINE. SCIENTIFIC MEMOIRS, VOL. III, PART XII. P. 666.,” while the following three pages are each headed “Mr. Babbage’s *Calculating Engines*.” I shall reference this article with the first word of its title, “Addition,” and both the title and these page headings make it immediately clear that the two articles are related in some way.

Examination of the “Sketch” shows that it has a composite structure, with first a heading, then a preface, then Ada’s translation of Menabrea, then her notes conclude the article. It thus comprises four distinct sections, a heading, preface, translation, and notes, and I give below a brief account of each.

Heading – At the top of p. 666, it reads, “ARTICLE XXIX – *Sketch of the Analytical Engine invented by Charles Babbage, Esq. By L.F. MENABREA of Turin, Officer of the Military Engineers.* [From the *Bibliothèque Universelle de Genève*, No. 82. October 1842.]” The first element, “ARTICLE XXIX” is part of the journal apparatus used by Richard Taylor, the editor of the *Scientific Memoirs* at that time. The article title follows this and the concluding passage in square brackets briefly states some bibliographic details of Menabrea’s publication.²

Preface – This extends over pp. 666–669 and is entirely placed within square brackets “[...]” The opening paragraph explains that its purpose is to present to the reader, “a list of the printed papers connected with the subject [of the Analytical Engine], and also of those relating to the Difference Engine.” A list of ten printed items relating to Babbage’s Difference Engine is concluded by an account of its then current situation in 1843 in King’s College, London.³ Then the account of the Analytic Engine commences with a translation of a letter from Babbage to M. Quetelet read to the Royal Academy of Sciences in Brussels in May, 1835, followed by a brief reference to the second edition of Babbage’s *Ninth*

Bridgewater Treatise, stated to have been published in 1834, followed by a list of thirteen printed drawings relating to the Analytical Engine.⁴ The concluding paragraph gives a brief account of Babbage's distribution of these drawings, but no summary of the then current state of the Analytical Engine is provided, so that the preface is incomplete in this regard. The final word of this preface is "EDITOR," implying it all to be the work of the editor, however, it is obvious that much of the information given, especially that relating to the drawings of the Analytical Engine, could only have come from Charles Babbage. Moreover, there are references in the Lovelace-Babbage correspondence to a "Preface" that indicate that this had been composed by Babbage in consultation with Ada and her husband, Lord Lovelace. For instance, in an undated letter Ada wrote, "I hope you will attend carefully to my criticisms about the Preface. I think them of consequence. If Lord L. suggests any further ones, you shall hear." On 26 July Babbage himself noted, "Second revise of Preface B." where his "B." refers to himself, and on 27 July Ada wrote to him, "I approve your alteration in the preface, excepting that I think the word "so" comes in both awkwardly and superfluously."⁵ From these, and other considerations to be discussed below, it appears that the preface as printed is an edited version of the preface drafted by Babbage in consultation with Ada and her husband.⁶

Translation – The translation was undertaken by Ada at the suggestion of and with the support of Charles Wheatstone (1802–1875), a scientist and successful inventor.⁷ However, from Wheatstone's statement in his letter to Ada following the publication of the "Sketch," that, "I made no stipulations whatever with Mr. Taylor when he sent Menabrea's paper for translation," it is apparent that Richard Taylor had played a significant role by initially supplying Ada with the source for her translation.⁸ This detail was to play a brief but important role in subsequent events. Ada's translation of Luigi Menabrea's article extends over pp. 669–690, with occasional footnotes added by her and identified as "NOTE BY TRANSLATOR."

Notes – At Babbage's suggestion Ada added extensive notes to her translation, and these were compiled in close collaboration with him.⁹ These notes, labelled A–G, extend over pp. 691–731, and notes A–F are signed "A.A.L.," while note G is signed "A.L.L." Pasted in opposite p. 730 is a larger, un-paginated, foldout page which provides tabulated details for note G of the computation of Bernoulli numbers. The verso of the final page, p. 731, is blank, and all the pages extending over pp. 666–731 are stitched together with white thread. Ada's notes have also been intermittently annotated in pencil, as will be discussed in due course.

Comparison of the text of this article in John Byrne's volume with the original publication in the *Scientific Memoirs* vol. iii (1843), pp. 666–731, shows them to be identical in font, word, line and paragraph spacing and breaks, and with verbatim text; the only differences are the title page on the recto of p. 666, and the blank verso of p. 731. Both the title page details, and the identical type-setting, show that this is a contemporaneous offprint from the *Scientific Memoirs*. Regarding the title of the article, it seems very likely that, as in the content of the preface, this was supplied by Babbage himself. It is not a faithful translation of Menabrea's title, "Notions sur la machine analytique de M. Charles Babbage," which would translate as "Ideas on the Analytical Engine of Mr. Charles Babbage," nor is it an accurate description of Menabrea's article. Indeed, in his introduction Menabrea explicitly states, "the reader must not expect to find a description of Mr. Babbage's engine ... I shall endeavour merely to give an insight into the end proposed, and to develop the principles on which its attainment depends."¹⁰ Rather, the use of the word "Sketch" corresponds with Babbage's usage to reference his account of Difference Engine No. 1, given in chapter V of his *Passages from the Life of a Philosopher*.¹¹

Turning next to consider the second article, the "Addition," a more complex situation emerges. The four pages are printed on a single bifolium which is not stitched with the preceding article, but neatly glued along its inner margin to the verso of p. 731. The first page is un-paginated but titled, "ADDITION TO THE MEMOIR OF L. MENABREA ON THE ANALYTICAL ENGINE. SCIENTIFIC MEMOIRS, VOL. III, PART XII. P. 666.," while the following three pages are paginated as 2, 3, 4, and each is headed "Mr. Babbage's *Calculating Engines*." Thus, while describing itself explicitly as an "Addition" to the publication of the preceding article, the title makes no endeavour to identify its own origin or purpose. The four pages provide an extensive, self-justifying account of Babbage's vicissitudes with attempting to finance the development of the Analytical Engine over the years 1833–1842, singling the British Government as particularly blameworthy. The concluding section of the article commences, "The present state of the Analytical Engine is as follows –," and this provides the summary that is missing from the preface to the "Sketch." The details that are provided about these events are such that only Babbage could plausibly have been their author.

Identification of the publication of this article did not prove entirely straightforward, as this title does not appear in Babbage's own list of his printed papers given at the end of his *Passages from the Life of a Philosopher* published in 1864.¹² The title is, however, listed in

Alfred Van Sinderen’s comprehensive survey of Babbage’s printed papers, where he cites the identical title published in the *Philosophical Magazine* 23 (September, 1843), pp. 235–9. While no author is given for this article, Van Sinderen states that when the article was reprinted shortly afterwards in *Astronomische Nachrichten*, it was attributed to Babbage “by authority of Sir David Brewster, one of the editors of the *Phil. Mag.*”¹³

Comparison of the “Addition” in John Byrne’s volume with the *Philosophical Magazine* version shows that they differ in a number of details, and it will be helpful to set forth the distinguishing features of each version. In the *Philosophical Magazine* the article is distributed across the five pages, pp. 235–9, and is preceded on pp. 234–5 by a list of the titles of articles published in the *Scientific Memoirs* iii (1843) part xii, concluding with “Sketch of the Analytical Engine ... Notes by the Translator.” After this appears the following curious paragraph, printed in italic:

The rules prescribed for the publication of the Foreign Scientific Memoirs prevented the Editor from inserting in that work the following authorized statement of the facts connected with the history of Mr. Babbage’s Calculating Engines. As those facts may be interesting to our readers, we take this opportunity of communicating them.

While no author is identified for the article the assertion here that the “following” is an “authorized statement” can only refer to Babbage, and it is evidently a statement from the journal editor, as the reference to “our readers” indicates. On p. 236 three typographical errors occur in the first line of the third paragraph, where a space was omitted after all three commas. On p. 237 two footnotes are given, using a “*” and “†” as reference marks, and reading:

[* Of M. Menabrea’s treatise, which appeared in the Bibliothèque Universelle de Genève for October last, a translation is given in the 12th Part of the Scientific Memoirs jutt [sic] published, with copious and valuable explanatory Notes by the Translator. – ED.]

† That of Mr. Hawes, Member for Lambeth.

Turning to the version in John Byrne’s volume, while the title and text are identical with that of the *Philosophical Magazine* with regard to their fonts, their word, line, and paragraph spacing and breaks, the following differences exist:

- i. There is no introductory paragraph referring to “rules prescribed” for publication.
- ii. The footnote referring to “M. Menabrea’s treatise” and signed “ED.” was deleted, and the reference mark “*” was moved to reference that of “Mr. Hawes” instead.

iii. Three spaces were inserted after the commas.

iv. The article occupies just four pages, the latter three of which are paginated 2–4.

The identity of the typesetting of this version with the published version shows that, while it is indeed a contemporaneous offprint made from the article published in the *Philosophical Magazine*, a number of significant modifications were introduced. The most substantial of these was the re-formatting of the article on to four pages which meant that it could then be printed on to a single bifolium.

Compilation of the “Sketch” and “Addition” and their offprints

Babbage’s separate publication of the “Addition” was the result of a conflict that developed between himself and the editor of the *Scientific Memoirs* in early August, 1843, concerning material that Babbage presented for inclusion in the publication. In view of what was subsequently published as the “Addition” it appears certain that this was the concluding section of Babbage’s preface which included references to his confrontation with the British Government. This section the editor did not wish to publish, understandably enough, when the account indicated that Babbage was in conflict with no less than the Prime Minister, Sir Robert Peel, and by insisting that it be anonymous Babbage required the editor to take responsibility for it. As a result, in the course of last minute negotiations involving Babbage, Ada, their mutual friend Charles Lyell, and Wheatstone, Babbage proposed to Ada that her article be withdrawn and published elsewhere.¹⁴ This proposal she vehemently rejected, writing to him on 6 August:¹⁵

On the *one point of not withdrawing* the translation & Notes from the Memoir, or consenting to its separate publication, I was entirely and finally decided; as I think neither for *your advantage* nor my own, to do so; added to my opinion that it would under the circumstances be dishonorable and unjustifiable ... Be assured that I am your best friend; but that I never *can* or *will* support you in acting on principles which I conceive to be not only wrong in themselves, but *suicidal*.

On the same day she wrote to her mother:¹⁶

I declared at once to Babbage, that no power should induce me to lend myself to any of his quarrels, or to become in any way his *organ*; & that I should myself communicate in a direct manner with the editors on the subject, as I did not choose to commit a dishonourable breach of engagement, even to promote *his* advantage ... He was *furiosus*; I am imperturbable & unmoved.

It should be noted here that, in both instances, Ada expressed the view that for her to withdraw would be dishonourable, and it may be recalled that it was Richard Taylor who had enabled Ada to undertake the translation project by supplying Menabrea's article to her. This view accords with the reply to her written by Babbage on 8 August, arranging that she despatch the proofs directly to the printer of the *Scientific Memoir*, and concluding:¹⁷

I have nothing to add at present except that you do me injustice in supposing I wished you to break any engagement with the Editor. I wished you to ask him to allow you to withdraw from it. Had the Editor been in England I believe he would at my request have inserted my defense or forborn to have printed the paper – As it stands I have done all I can at present to defend myself and having failed in the most important part shall make the best I can of the rest.

Here Babbage confirms that Ada's difficulty was that she did not feel free "to break any engagement with the Editor." It also appears that Richard Taylor was not then in England, implying that it was an acting editor who had refused publication of part of Babbage's preface, and that Babbage believed that Taylor himself would have either published his "defense," or voluntarily agreed not to publish the paper. With his concluding sentence Babbage clearly signalled his intention to continue his campaign to publicize his grievances.

In the event it appears that a compromise was adopted whereby the editor eliminated from Babbage's preface all reference to his conflict with the British Government. Consequently Babbage's account of his financial vicissitudes with the Analytic Engine was removed and the editor took responsibility for the remainder of the preface with his "[... EDITOR]." It seems likely that it is to an anticipation of this compromise that Babbage alludes in his letter to Ada of 5 August, writing, "Today I saw Wheatstone and proposed to him a plan which will fulfill *all* your conditions and some of mine – He approves of it and thinks it will be adopted."¹⁸ As it transpired, Babbage's letter to Ada of 8 August cited above shows that by then the publication crisis had been resolved, and thereafter an amicable relationship between them prevailed.

For his part Babbage pursued his commitment to "make the best I can of the rest," so in the following month his "defense" was published as the "Addition" in the *Philosophical Magazine* where Sir David Brewster was the principal editor. Presumably either Brewster, or a co-editor, was responsible for the curious introductory paragraph with its *ad hoc* explanation that the "rules prescribed" for the *Scientific Memoirs* prevented its publication there. Babbage's choice of the title, "Addition to ... Scientific Memoirs, vol. III, part xii. p. 666," for this publication shows clearly that he intended it to be considered part of that

publication. In a letter to Ada on 12 September Babbage makes what appears to be a brief reference to a proof of his “Addition” when he writes of a forthcoming visit, “I hope to be able bring with me a final proof of the Statement in which the dates of every fact are clearly set out.”¹⁹ This remark also indicates a congenial openness between Babbage and Ada regarding the content of his “Addition,” even before its publication. That this continued after its publication is suggested by an undated letter to Ada from William, her husband, in which he reports a conversation “respecting Babbage” with someone identified only as “Eb-n,” and states that, “I told him there was in the copy a full account of the state of the matter as far as the govt & public had been concerned in a pecuniary point of view.”²⁰ This reference to a copy giving an account of Babbage, the Government, and money can only refer to Babbage’s “Addition,” and William’s approving reference to “the copy” surely requires that both he and Ada regarded it favourably.

For the remainder of his life Babbage continued to regard his “Addition” as an important apologia for his work on calculating engines, for in the “List of Mr. Babbage’s Printed Papers” that he appended to his *Passages from the Life of a Philosopher* published in 1864, the final item was:²¹

80. [In the press]. History of the Analytical Engine. 4to. It will contain Chapters V., VI., VII., and VIII., of the present Volume. Reprint of The Translation of General Menabrea’s Sketch of the Analytical Engine invented by Charles Babbage. From the *Bibliothèque Universelle de Genève*, No. 82. Oct. 1842. Translated by the late Countess of Lovelace, with extensive Notes by the Translator.

Since his “Chapters V., VI., VII., and VIII., of the present Volume” all relate to his Difference Engine it is clear that, Babbage had assembled a comprehensive account of his calculating engines that also included Ada’s “Sketch.” Although he made no explicit reference here to his own “Addition,” given that he had originally conceived it as part of the preface to Ada’s “Sketch” it would seem certain that he included them both together in the draft of this work, already then in the press. In the event this “History” had not been published by the time of Babbage’s death in 1871, but in 1889 his son, Henry Prevost Babbage, published a compilation of his father’s papers entitled *Babbage’s Calculating Engines – Being a Collection of Papers Relating to Them; Their History, and Construction*. In this publication the “Addition” was promoted to precede the “Sketch,” and so became the very first article in the book, where it was re-titled as, “*Statement of the circumstances attending the Invention and Construction of Mr. Babbage’s Calculating Engines*. [From the

Philosophical Magazine, Sept. 1843, p. 235.]” That this re-titling and promotion of the “Addition” was indeed the work of Charles Babbage is confirmed by Henry’s preface describing his father’s compilation of the papers and concluding, “Thus the first 294 pages of this book were printed in his lifetime,” and its prominence and title here underline the importance with which Charles Babbage viewed it.²²

Regarding the production of offprints of these two articles a number of contemporary references provide indications of the process. On 15 August Ada wrote to her Mother that she had been “summoned by the printers who needed further supervision ... to revise the printing of *mathematical* formulae,” adding, “You will receive a few copies (amongst a hundred that are printed separately for me).”²³ Ten days later, on 25 August, Charles Wheatstone wrote to Ada:²⁴

I called yesterday at the printers and was informed that a separate copy of your paper had been forwarded by post to Ockham, and the new number of the Scientific Memoirs sent to St. James’ Square.

I made no stipulations whatever with Mr. Taylor when he sent Menabrea’s paper for translation, and the only arrangement made since has been that you should be allowed to have for the mere expense of paper and print 100 copies and Mr. Babbage 50. He is desirous of knowing what to do with the remaining 99 copies.

Ockham Park was the family seat of Lord Lovelace, Ada’s husband, an hour south of London, and James’ Square her London residence, and Wheatstone’s description, “a separate copy,” suggests that one offprint had been posted to Ockham Park and the current issue of the *Scientific Memoirs* sent to St. James’ Square. Both accounts imply that offprints of the “Sketch” were printed at the same time that the September issue of the *Scientific Memoirs* was published, and were available to Ada and Babbage.

While I have not found any contemporaneous statement referring to an offprint of Babbage’s “Addition,” the version published in two parts in successive issues of the *Astronomische Nachrichten* commencing in October 1843 corresponds with the offprint version in having only one footnote, that referring to “Mr. Hawes.” From this it would appear that this offprint was likewise printed contemporaneously with the publication of the “Addition,” and a copy then used to type-set the reprint in *Astronomische Nachrichten*. From the foregoing it is apparent that by 25 August, 1843 a substantial number of offprints of the “Sketch” were printed and available to both Ada and Babbage, and that offprints of the “Addition” had been printed at least by October, 1843. Taken together these two offprints represent the publication that had been originally envisaged by Ada and Babbage.

Further copies of these offprints

The distinctive characteristics of John Byrne’s two offprints prompted a search for other copies of them, and five further copies have so far been located in libraries in Britain, and notices of another two that were auctioned by Christies in New York. The relevant details of these copies are tabulated in Figure 1.

Institution	Shelf-mark	“Sketch”	“Addition”	Relationship	Provenance
Trinity College, Dublin, John G. Byrne Collection	TCD-SCSS-V.20121208.870	yes	yes	attached	Unknown – but with anonymous annotations
University of London, Senate House Library	[DeM] M (B.P.7) SSR	yes	yes	attached	Augustus De Morgan’s library
King’s College, London, Maughan Library	PAMPH. BOX QA75 MEN (2)	yes	yes	detached	Charles Wheatstone’s library
British Library, St Pancras Reading Rooms	C.T.192.(5.)	yes	yes	attached	Edwin Chadwick’s library
National Trust, Calke Abbey, Derby	olim P.61.	yes	no	–	John Gardner Wilkinson’s library
National Trust, Calke Abbey, Derby	olim A.H.10.	yes	no	–	John Gardner Wilkinson’s library
Christies, New York, (2005)	–	yes	yes	attached	Annotated by William King
Christies, New York, (2008)	–	yes	yes	detached	Unknown

Figure 1. A tabulation of the known offprints of the “Sketch” and “Addition,” identifying their location, relationship (whether attached together, or not), and provenance, where known.

Given the close relationship between the content of these two offprints and their dates of publication one would expect them to have circulated together. From Figure 1 we see that of these eight known offprints of the “Sketch,” six are found in association with the “Addition.” Only the two copies of the “Sketch” from the library of John Gardner Wilkinson (1797–1875), a scholar and close family friend of the Lovelace family, are found alone. Of the six copies accompanied by the “Addition” three are likewise associated with personal friends of Ada, or her family: Augustus De Morgan (1806–1871) was her tutor in mathematics; Charles Wheatstone suggested to her that she translate Menabrea’s article and assisted her;²⁵ the title page of the copy auctioned by Christies in 2005 had been inscribed by William King, Ada’s husband, Lord Lovelace, to “C.R. Weld Esq. with Ld. Lovelace’s compts..” William King also inscribed “Lady Lovelace” under the printed words “WITH NOTES BY THE TRANSLATOR” on the title-page.²⁶ The recipient was Charles R. Weld (1813–1869), author in 1848 of *A History of the Royal Society* which is said to contain “the first authorized printed announcement of Ada’s authorship” of the translation of Menabrea.²⁷ Here William King’s action in endorsing this copy of the “Sketch” and “Addition” attached together conforms to his favourable reference to the “Addition” in his letter to Ada cited above. In a similar way, Augustus De Morgan inscribed his copy of the “Sketch,” as, “(The Countess of Lovelace) – AND ADDITION BY MR. BABBAGE.” under the words “WITH NOTES BY THE TRANSLATOR.” Then on the first page of the “Addition” De Morgan inscribed in the upper margin, “Intended to accompany Lady Lovelace’s translation of the Memoir, but refused by the editor of the ‘Sci. Mem’ and inserted in the Phil. Mag for Sept. 1843.” De Morgan’s inscription here shows explicitly that it was the editor’s refusal to include the content of the “Addition” that had caused Babbage to publish it in the *Philosophical Magazine*. While Sir Edwin Chadwick (1880–1890), from whose library one of the attached copies came, is not known to have associated with the Lovelace family, he was a contemporary of Babbage’s, and was, like him, prominently involved in schemes for the improvement of social infrastructure, notably the upgrade of London’s system of sewers.

A striking feature of the copies contemporaneous with Ada and Babbage is that in four instances the “Sketch” and “Addition” are physically attached together. While these could all have been done separately, their contemporaneity and the professional manner in which John Byrne’s copies were attached suggests rather that they were done at the same time. Since Richard and John Taylor at Red Lion Court, Fleet Street, printed both the *Scientific Memoirs* and the *Philosophical Magazine*, and Babbage wished his “Addition” to be considered part of

Ada's "Sketch", this suggests that he may have requested that copies of his offprint be physically inserted by the printers into offprints of the "Sketch". For the present, until there is an opportunity to examine the details of the bindings of all the attached copies, this must remain a tentative hypothesis.

Annotations

As mentioned above a unique feature of John Byrne's volume is a series of annotations to Ada's notes written in pencil, mostly in the margin. These, and Ada's statements at which these annotations appear to have been directed, are listed in Figure 2. From the facts that the target is often one of Ada's algebraic statements, and that one annotation is in Latin and another is a paraphrase of a German literary work, it is evident that the anonymous author was a well-educated person with an interest in mathematics. The further observations that their tone is repeatedly derisory, and that at p. 696, "a pretty & ladylike turn," has a sexist character, suggest that the author was both male and chauvinistic. There is nothing to date them reliably, though this sneering allusion to Ada's gender may suggest that they were written before her death in 1852. If so, a possible scenario suggested by his critical comments on "analysis" is that the author had belonged to Babbage's Cambridge mathematical circle.²⁸

The dismissive scepticism repeatedly expressed towards Ada in these annotations anticipates the doubts expressed by some twentieth century commentators regarding Ada's abilities. For example, in 1970 Bruce Collier wrote:²⁹

It would only be a slight exaggeration to say that Babbage wrote the 'Notes' to Menabrea's paper, but for reasons of his own encouraged the illusion in the minds of Ada and the public that they were authored by her. It is no exaggeration to say that she was a manic depressive with the most amazing delusions about her own talents, and a rather shallow understanding of both Charles Babbage and the Analytical Engine ... To me, this familiar material [Ada's correspondence with Babbage] seems to make obvious once again that Ada was as mad as a hatter, and contributed little more to the 'Notes' than trouble ...

On the other hand, in 2003 Doron Swade offered a very different and much more perceptive assessment of Ada's contribution.³⁰

Ada saw something that Babbage in some sense failed to see. In Babbage's world his engines were bound by number. He saw that the machines could do algebra in the narrow sense that they could manipulate plus and minus signs ... What Lovelace saw – what Ada Byron saw – was that number could represent entities other than quantity. So once you had a machine for manipulating numbers, if those numbers represented other things, letters, musical notes, then the machine could manipulate symbols of which number was one instance, according to rules.

It is this fundamental transition from a machine which is a number cruncher to a machine for manipulating symbols according to rules that is the fundamental transition from calculation to computation ... that transition was made explicitly by Ada in that 1843 paper.

It is hoped that by making these annotations available in the public domain that their author may be identified.

pg.	Annotation
691	“ <i>not true</i> ” beside “ $F(x, y, z, \log x, \sin y, x^p, \&c)$.”
691	“ <i>not intelligible</i> ” beside “ $u_z = a + b x + c x^2 + \dots m x^{n-1}$.”
692	<p>“<i>Leicht im Gehirne wohnen die Gedanken, doch hart im Raume stoßen sich [a + b x + c x² + p xⁿ] die Sachen.</i>”</p> <p>Cf. <i>Wallenstein’s death</i> II 2: “Eng ist die Welt, und das Gehirn ist weit, leicht beieinander wohnen die Gedanken, doch hart im Raume stoßen sich die Sachen.”³¹</p> <p>The annotation itself may be translated as, “Ideas dwell easily in the mind, but in reality such things come hard.”</p>
692	“ <i>All mere verbiage</i> ” with a “[” indicating the bottom third of the page.
693	A vertical line running through two “X”s down most of the right-hand margin, probably intended to extend the scope of the previous annotation.
694	“ <i>All verbiage</i> ” followed by a line down most of the left-hand margin, apparently intended to continue the scope of the previous two annotations.
694	“ <i>Ignotum pro magnifico</i> ” with a vertical line beside the sentence, “We cannot forbear suggesting one practical result ... combinations into which <i>imaginary quantities</i> enter.”
694	<p>“<i>Set up my whirligig & twirl it <u>Then</u> “if a science can be found” whose fundamental relations are susceptible of adaptation to the twirls of the whirligig – the whirligig will express and compare” propordicons in that science,</i>” across the bottom margin.</p> <p>Probably intended as a derisive comment upon the preceding two and one third pages; the three double quotes suggest that it includes citations but I have not been able to identify any source for these. Google found no match for “propordicon.”</p>
696	“ <i>wild talk</i> ” and a vertical line beside “this [mathematical] science constitutes the language through which alone we can adequately express the great facts of the natural world.”
696	“ <i>a pretty & ladylike turn</i> ” and two oblique strokes beside “We may say most aptly that the Analytical Engine <i>weaves algebraic patterns</i>”
697	“ <i>All misty & vague,</i> ” below an “X” beside a passage which includes the statement, “A new, a vast, and a powerful language is developed for the future use of analysis.”
697	“ <i>Prove first that the Analytical Engine <u>can</u> analyse,</i> ” alongside a passage that includes, “the Analytical Engine is equally capable of analysis or synthesis.”

pg.	Annotation
697	<i>“This is <u>not</u> analysis”</i> and a “]” beside the statement, “an engine which, like the Analytical Engine requires merely that we should know the <i>succession and distribution of the operations.</i> ”
713	<i>“X NB This is plain speaking at last”</i> and a “]” beside a sentence accepting that, as proposed, the Analytical Engine will deliver only numerical results.
714	<i>“i e “We” execute the process and give the engine the credit”</i> inscribed beside an algebraic substitution done by Ada.
718	<i>“It surely could not do this,”</i> with long lines drawn to different places in Ada’s text.
718	<i>“In case of $\varphi^n(x)$ <u>how</u> are you to develop $\varphi^1(x)$ in powers of n,”</i> with a line drawn to Ada’s statement that “the next step would obviously be to develop (5.) itself.” The expression “(5.)” on p. 717 lists the parameters of $\varphi(x)$.

Figure 2. In this table each annotation is transcribed in italic, while the part of Lovelace’s notes that the annotation appears to address is transcribed in plain font.

Conclusions

What has emerged from this examination of John Byrne’s volume is that it is an instance of offprints of Ada’s “Sketch” and Babbage’s “Addition”, attached together. Of these two articles Babbage’s “Addition” has a complex printing history, and it is clear that it represented to him a most important statement, which he designated as his “defense.” He first compiled it as the concluding part of his account of the Difference and Analytical Engines that was intended as an anonymous preface to Ada’s translation and notes. When the journal editor refused to include his version of his conflict with the British Government, he swiftly organized its separate publication in the *Philosophical Magazine*. At the same time he arranged for the printing of a four-page offprint of it which could conveniently be inserted into offprints of Ada’s “Sketch.” Within a month this offprint version was in the course of reproduction in the *Astronomische Nachricht* under the title “*Babbage’s Analytical Engine.*” In his later years, when he compiled a comprehensive account of his calculating engines, he placed his “Addition” first and gave it the all-encompassing title, “Statement of the circumstances attending the Invention and Construction of Mr. Babbage’s Calculating Engines.” All of these actions underline the importance with which Babbage viewed it. It also appears from the existence at the present time of six known copies of the offprint of Ada’s “Sketch” together with the “Addition” that these two offprints circulated together amongst

Lovelace and Babbage contemporaries from the time of their publication. In some instances these offprints are physically attached together, and it is tentatively suggested that this may have been done by the printers of the *Scientific Memoirs* and *Philosophical Magazine* at the instigation of Babbage.

While the offprints of the “Sketch” and the “Addition” provide for us no additional textual information, examination of how Babbage interacted with these offprints does provide insight into his attitudes and priorities as he came to terms with the failure to realise his extraordinary vision for automated calculation. At the same time, annotations on these offprints give us some idea of the view taken by their peers of Ada’s accomplished account, and Babbage’s remarkable inventions.

Acknowledgements

I wish to gratefully acknowledge the following contributions to this paper: Mary Higgins, Research Librarian, Berkeley Library, Trinity College, who located the copies of the offprints in British libraries; Charles Harrowell, Special Collections administrator, Senate House Library, University of London, who examined their copy and confirmed that it comprised both offprints attached together; Brandon High, Special Collections officer, Maughan Library, King’s College, London, who examined their copy and advised that it comprised both offprints detached; Paul Terry, Rare Books and Music librarian, British Library, who examined their copy and advised that it comprised both offprints attached together; Nicola Thwaite, Assistant Libraries Curator, United Kingdom National Trust, who helpfully communicated essential details of the two copies in Calke Abbey; Micah Hoggatt, Reference Librarian, Houghton Library, Harvard University, who examined copies of the “Sketch” in the Houghton and Widener libraries and established that they are not offprints.

Postscript – 26 March 2018

This article was submitted to the *IEEE Annals of the History of Computing* on 14 September 2016. On 31 October 2016 an email from the Chief Editor, Dr Nathan Ensmenger, included two reviews, the first recommending publication and the second recommending rejection. Dr Ensmenger concurred with the second review so that the article was not published.

Here follows Dr Ensmenger's email of 31 October 2016, including the two reviews, so that scholars may judge the situation for themselves.

31 October 2016 – *Ensmenger to Mc Carthy*

31-Oct-2016

Dear Dr. Daniel Mc Carthy:

Thank you for submitting manuscript, "Offprints of Ada Lovelace's translation of Luigi Menabrea's account of Charles Babbage's Analytical Engine, incorporating an offprint by Babbage," Annals-2016-09-0009.

I regret to inform you that the reviewers could not recommend the manuscript for publication in *IEEE Annals of the History of Computing*. The completed reviews follow below.

I appreciate the time and effort you invested in this submission. Although we are unable to publish this manuscript, we hope you will submit future papers.

Sincerely,

Dr. Nathan Ensmenger
Editor in Chief, *IEEE Annals of the History of Computing*
nensmeng@indiana.edu

Editor

Comments to the Author:

Our referees disagreed about their recommendations, but in my review of the article I agree with the assessment that although this article has some interesting ideas, it does not add much to the Babbage literature, and its engagement with that literature is limited. I also agree that the analysis of sexism is ahistorical.

Reviews:

Please note that some reviewers may have included additional comments in a separate file. If a review contains the note "see the attached file" under Section III A - Public Comments, you will need to log on to ScholarOne Manuscripts to view the file. After logging in, select the Author Center, click on the "Manuscripts with Decisions" queue and then click on the "view decision letter" link for this manuscript. You must scroll down to the very bottom of the letter to see the file(s), if any. This will open the file

that the reviewer(s) or the Associate Editor included for you along with their review.

Reviewer: 1

Recommendation: Accept If Certain Minor Revisions Are Made

Comments:

There is one place where I detected an error: on page 11 (of 17) line 41 gives the dates of Edwin Chadwick as "(1880-1890)" and the correct dates are (1800 - 1890).

While note an error, I think it would be nice to elaborate (even in an endnote if not in the main body of the paper) on page 3 (of 17) line 51 where they note "A.A.L." and "A.L.L." as to what these initials stand for - some readers will not appreciate the difference.

Additional Questions:

1. How relevant is this manuscript to the readers of this periodical? Does it increase the reader's understanding of the development of computation, the computer industry, the application of computers, or some other aspect of history? Please explain your rating in the Detailed Comments section.: Relevant

1. Please summarize what you view as the key point(s) of the manuscript and the importance of the content to the readers of this periodical. If you don't have any comments, please type No Comments.: This is an article in the form that is usually used for literary research and, thus, may be unfamiliar with many of the readers of Annals. It is, none-the-less, relevant and an interesting contribution to the scholarship of Babbage's computing devices. It details the publishing history (an very little understood one) of Babbage's and Lovelace's publication of his thoughts on the Analytical Engine and how they both saw the project from a different perspective.

2. Is the manuscript technically sound? Please explain your answer in the Detailed Comments section.: Yes

3. What do you see as this manuscript's contribution to the literature in this field? If you don't have any comments please type No Comments.: This helps to clear up some of the problems surrounding the beginnings of Babbage's work on the Analytical Engine and the famous publication of Ada, Lady Lovelace, dealing with her "translation" and annotation of the notes of Menabrea - perhaps one of the the most famous of the very early computing documents.

4. What do you see as the strongest aspect of this manuscript? If you don't have any comments, please type No Comments.: The authors have done a very good job of the analysis of a particular collection of papers.

5. What do you see as the weakest aspect of this manuscript? If you don't have any comments, please type No Comments.: no obvious weakness

Are the title, abstract, and keywords appropriate? Please elaborate in the Detailed Comments section.: Yes

2. Is documentation for facts and opinions appropriate and sufficient? Please elaborate in the Detailed Comments section.: Yes

3. Does the manuscript contain sufficient and appropriate references to the existing secondary literature? Is there some book or article in the secondary literature that should be included in the article? Please elaborate in the Detailed Comments section.: References are sufficient and appropriate

4. Does the introduction state the objectives of the manuscript in terms that encourage the reader to read on? Please explain your answer in the Detailed Comments section.: Yes

5. How would you rate the organization of the manuscript? Please elaborate in the Detailed Comments section.: Excellent

6. Does the manuscript provide a balanced presentation regarding the environment in which the reported activity as initiated, the activity itself, and the resulting impact on the world? Please elaborate in the Detailed Comments section.: Yes

7. Is the length of the manuscript appropriate for the topic? Please elaborate in the Detailed Comments section.: Yes

8. Please rate and comment on the readability of this manuscript in the Detailed Comments section.: Easy to read

Please rate the manuscript. Explain your choice in the Detailed Comments section.: Excellent

Reviewer: 2

Recommendation: Reject

Comments:

There are two facets to this paper. First, a bibliographical discussion of a contemporary reprint or offprint of Lovelace's "Sketch" of 1843. Second, a brief historical analysis of three commentaries on the Sketch.

The biographical discussion is competently done, although it is disproportionately long since it adds little or nothing to Babbage scholarship.

The historical analysis of the three commentaries is naïve. First, we are told that the tone of contemporary anonymous annotations "suggest" the writer is "male and chauvinistic", and his or her comments are "sneering allusions". It is plain revisionism to judge a 1840s commentary by today's attitudes to gender and misogyny. Second, the 1970s scholar Bruce Collier is accused of "dismissive scepticism", not on the grounds of misogyny, or indeed any reasoned argument, but simply because the authors happen to disagree with him. It is worth noting that Collier was an early and path-breaking scholar in Babbage studies who deserves a proper argument; his views on Lovelace's mental state are not without foundation. Thirdly, Doron Swade, a noted Babbage scholar (but not a Lovelace scholar) gets a condescending pat-on-the-back because the authors happen to agree with him. This is historical scholarship at its most fatuous and has no place in an academic journal.

Additional Questions:

1. How relevant is this manuscript to the readers of this periodical? Does it increase the reader's understanding of the development of computation, the computer industry, the application of computers, or some other aspect

of history? Please explain your rating in the Detailed Comments section.: Irrelevant

1. Please summarize what you view as the key point(s) of the manuscript and the importance of the content to the readers of this periodical. If you don't have any comments, please type No Comments.: See public comments

2. Is the manuscript technically sound? Please explain your answer in the Detailed Comments section.: Partially

3. What do you see as this manuscript's contribution to the literature in this field? If you don't have any comments please type No Comments.: See public comments

4. What do you see as the strongest aspect of this manuscript? If you don't have any comments, please type No Comments.: See public comments

5. What do you see as the weakest aspect of this manuscript? If you don't have any comments, please type No Comments.: See public comments

Are the title, abstract, and keywords appropriate? Please elaborate in the Detailed Comments section.: Yes

2. Is documentation for facts and opinions appropriate and sufficient? Please elaborate in the Detailed Comments section.: No

3. Does the manuscript contain sufficient and appropriate references to the existing secondary literature? Is there some book or article in the secondary literature that should be included in the article? Please elaborate in the Detailed Comments section.: Important references are missing; more references are needed

4. Does the introduction state the objectives of the manuscript in terms that encourage the reader to read on? Please explain your answer in the Detailed Comments section.: Could be improved

5. How would you rate the organization of the manuscript? Please elaborate in the Detailed Comments section.: Fair

6. Does the manuscript provide a balanced presentation regarding the environment in which the reported activity was initiated, the activity itself, and the resulting impact on the world? Please elaborate in the Detailed Comments section.: No

7. Is the length of the manuscript appropriate for the topic? Please elaborate in the Detailed Comments section.: No

8. Please rate and comment on the readability of this manuscript in the Detailed Comments section.: Readable - but requires some effort to understand

Please rate the manuscript. Explain your choice in the Detailed Comments section.: Poor

References and notes

¹ The catalogue of the ‘John Gabriel Byrne Computer Science Collection’ is at www.scss.tcd.ie/SCSSTreasuresCatalog/ and a full scan of the volume is available at www.scss.tcd.ie/SCSSTreasuresCatalog/literature/TCD-SCSS-V.20121208.870/TCD-SCSS-V.20121208.870.pdf

² L.F. Menabrea, “Notions sur la machine analytique de M. Charles Babbage,” *Bibliothèque Universelle de Genève*, vol. 41, 1842, pp. 352–376.

³ J. Fuegi and J. Francis, “Lovelace & Babbage and the Creation of the 1843 ‘Notes’,” *IEEE Annals of the History of Computing*, vol. 23, no. 4, 2003, pp. 16–26. (Reprinted *Ada User Journal*, vol. 36, no. 2, 2015, pp. 89–98), p. 18, “On January 5, 1843, Babbage was informed that the government had sent the prototype of the Difference Engine to the King’s College Museum.”

⁴ In fact, the first and second editions of Babbage’s *Ninth Bridgewater Treatise* were published in 1837 and 1838 respectively; see A. Van Sinderen, “The Printed Papers of Charles Babbage,” *IEEE Annals of the History of Computing*, vol. 2, no. 2, 1980, pp. 169–185 at p.181.

⁵ V.R. Huskey and H.D. Huskey, “Lady Lovelace and Charles Babbage,” *IEEE Annals of the History of Computing*, vol. 2, no. 4, 1980, pp. 315, 317.

⁶ Huskey and Huskey, “Lovelace and Babbage,” p. 316 attributed this section to the *Scientific Memoirs* editor, writing, “Incidentally, the published translation had no section labeled “Preface.” There was a lengthy introduction by the editor covering what had been published on the Analytical Engine previously, as well as a bibliography for the Difference Engine.”

⁷ D. Swade, *The Difference Engine: Charles Babbage and the Quest to Build the First Computer*, Viking, 2001 (published in the U.K. as *The Cogwheel Brain: Charles Babbage and the Quest to Build the First Computer*, Little, Brown & Co., 2000), p. 160; Fuegi and Francis, “Lovelace & Babbage Notes,” p. 18.

⁸ Huskey and Huskey, “Lovelace and Babbage,” p. 324.

⁹ Huskey and Huskey, “Lovelace and Babbage,” pp. 311–320; cf. Swade, *Difference Engine*, p. 161.

¹⁰ [A. Lovelace], “Sketch of the Analytical Engine invented by Charles Babbage, Esq. By L.F. Menabrea, of Turin, Officer of the Military Engineers, with notes by the Translator,” *Scientific Memoirs*, iii 1843, pp. 666–731 at p. 671; cf. Menabrea, “Notions,” p. 353, “On ne doit point s’attendre à trouver ici une description de la machine de Mr. Babbage ... mais je tâcherai d’en faire saisir le but et d’exposer le principes sur lesquels est fondée son exécution.”

¹¹ C. Babbage, *Passages from the Life of a Philosopher*, Longman, 1864, pp. 46–47, “I have proposed and drawn various machines for the purpose of calculating a series of numbers forming Tables by means of a certain system called “The Method of Differences,” which it is the object of this sketch to explain.”

¹² Babbage, *Passages*, pp. 493–496, “List of Mr. Babbage’s Printed Papers.”

¹³ Van Sinderen, “Printed Papers,” p.182; the “Addition” was reprinted with the title “*Babbage’s Analytical Engine*” in two consecutive issues of *Astronomische Nachrichten* vols 490–1, 1843, pp. 157–164. Vol. 490 is dated 26 October, 1843, and vol. 491 is dated 7 December, 1843.

¹⁴ Fuegi and Francis, “Lovelace & Babbage Notes,” pp. 22–23; Swade, *Difference Engine*, pp. 162–163.

¹⁵ Fuegi and Francis, “Lovelace & Babbage Notes,” p. 22. The letter is given in full in B.A. Toole, ed., *Ada – The Enchantress of Numbers: A Selection from the Letters of Lord Byron’s Daughter and Her Description of the First Computer*, Strawberry Press, 1992, pp. 219–222.

¹⁶ Swade, *Difference Engine*, p. 163, cf. Fuegi and Francis, “Lovelace & Babbage Notes,” p. 23.

¹⁷ Fuegi and Francis, “Lovelace & Babbage Notes,” p. 23.

¹⁸ Huskey and Huskey, “Lovelace and Babbage,” p. 320.

¹⁹ Huskey and Huskey, “Lovelace and Babbage,” p. 325.

²⁰ Huskey and Huskey, “Lovelace and Babbage,” p. 324.

²¹ Babbage, *Passages*, p. 496.

²² H. Babbage, *Babbage's Calculating Engines*, Preface.

²³ Fuegi and Francis, "Lovelace & Babbage Notes," p. 23.

²⁴ Huskey and Huskey, "Lovelace and Babbage," p. 324; cf. D.L. Moore, *Ada Countess of Lovelace – Byron's Legitimate Daughter*, John Murray, 1977, p. 162, where, referring to offprints of the "Sketch," she makes the unqualified statement that "only two hundred and fifty copies were printed."

²⁵ Moore, *Ada Countess of Lovelace*, pp. 46, 99, 213 (Augustus De Morgan); pp. 163, 220, 223–225, 259 (Charles Wheatstone); pp. 313, 321, 386 (Gardner Wilkinson).

²⁶ Christies auction catalogue 23 Feb. 2005, "Offprint from Scientific Memoirs III (1843)," www.christies.com/lotfinder/lot/menabrea-luigi-federico-sketch-of-the-analytical-4443501-details.aspx, s.v. "Menabrea," and see also their reproduction of the title page.

²⁷ Christies, 23 Feb. 2005, s.v. "Weld."

²⁸ Babbage, *Passages*, pp. 25–29, Babbage's mathematical circle at Cambridge and his role in founding the "The Analytical Society."

²⁹ Cited by Swade, *Difference Engine*, p. 168; cf. D.K. Stein, "Lady Lovelace's Notes: Technical Text and Cultural Context," *Victorian Studies* vol. 28, no. 1, 1984, pp. 33–67 at p. 34 "I would like to ... argue that Ada Lovelace's addition – her "Notes" – were more a reflection of the mathematical uncertainty of the author."

³⁰ Cited from an interview with Doron Swade in Fuegi and Francis, "Lovelace & Babbage Notes," p. 24.

³¹ I am grateful to Dr Immo Warntjes of Queen's University, Belfast, who identified Friedrich Schiller, *Wallenstein's Death II 2*, as the source of this annotation, pers. correspondence, 5 July, 2015.