

AccessionIndex: TCD-SCSS-V.20161219.001

Accession Date: 19-Dec-2016

Accession By: Dr.Brian Coghlan and Dr.Dan McCarthy

Object name: Table of the logarithms of the natural numbers from 1 to 108000, a proof copy to the 1st Edition

Vintage: c.1827

Synopsis: Babbage, C., Murray: London, contains a printed inscription from Babbage to Lt-Colonel Colby of the Royal Engineers.

### **Description:**

In 1827 in the midst of the design and construction of his Difference Engine No.1, prompted by his friend Lt.Col.Thomas Frederick Colby of the Irish Ordnance Survey (another founder of the Astronomical Society), who wanted a compact set of field tables, Babbage compiled a greatly improved table of logarithms, a major achievement in itself, by comparing many existing tables, and where different, recalculating the correct value.

As well as Babbage's printed inscription to Colby following the title page, see Figure 10, explicit and implicit references in the preface by Babbage to Colby attest to the importance of Colby's contribution to the compilation. For examples, p. vi, 'For the whole of the readings subsequent to the third, I am indebted to the kindness of Lieutenant-Colonel Colby, under whose direction they were executed'; p. vii, 'With the assistance of my friend Lieutenant-Colonel Colby, I examined a considerable collection of tables of different kinds'. According to Prof.J.G.Byrne, Colby did much of the proof reading, some of it in a tent on top of Slieve Donard [4].

Babbage was particular about the layout of the tables and the colour of the paper they were printed on. This proof copy and the 1<sup>st</sup> Edition of 1827 and 2<sup>nd</sup> Edition of 1831 were printed on yellow paper; the 3<sup>rd</sup> Edition of 1834 was printed on green paper for the Hungarian Academy of Science; the 4<sup>th</sup> Edition of 1844 was printed on plain paper. The John Gabriel Byrne Collection also includes a copy of the 4<sup>th</sup> Edition, see elsewhere in the Literature category of this catalog, and the Library of Trinity College Dublin has the 1<sup>st</sup> Edition, as well as the 3<sup>rd</sup> Edition.

There is a very faint inscription in lead pencil on the recto of the first fly-leaf of which enough words could be read in visible light to identify the hand as that of Charles Babbage. Approximate multi-spectral enhancement in the visible spectrum showed that it might be recoverable, see Figure 5, and in March, 2017, Tim Keefe in Digital Resources & Imaging Services in Trinity College Dublin scanned the fly-leaf in the infra-red, and processed this to obtain the splendid image reproduced in Figure 6, wherein the inscription may clearly be read as:

Line 1:	A Receipt given for this and the other one
Line 2:	to be returned when the volumes are
Line 3:	returned.
Line 4:	C. B.

The hand and signature in Figure 6 may be compared with Babbage's hand and signature in his letter to Lady Rosse reproduced in Figure 7.

The following details show that this volume was a proof copy sent by Babbage to Colby prior to the publication of the 1<sup>st</sup> Edition:

- a) In this volume the covers are entirely covered with vellum, whilst the 1<sup>st</sup> Edition and later editions all have triangular vellum corners and vellum spines, with the remainder covered with marbled paper.
- b) The end-papers of this volume are yellow, while those of the 1<sup>st</sup> Edition are white.
- c) The text of this volume is verbatim with that of the 1<sup>st</sup> Edition except that the footnote indexed by the '\*' in the fifth line on preface page vi of this volume is missing, whereas the footnote itself, '\* Now that of Mr. Clowes.', is present in the 1<sup>st</sup> Edition, indicating that this copy is incomplete. Thus it appears that this volume is a pre-production copy to the 1<sup>st</sup> Edition.
- d) The above-mentioned fly-leaf inscription then suggests that it is one of two volumes that Babbage had made available to the addressee, and given the extent of their collaboration in preparing the tables and Babbage's cryptic signature, 'C.B.', Colby surely is the most likely addressee, as the following details confirm.
- e) On p. xvi of the introduction the word 'same' has been struck through and 'preceding' written interlineally above it, see Figure 17, and this hand compares closely with Colby's hand in his letter of 14 July, 1835, see Figure 23.
- f) The volume has been stamped on four pages with the stamp of the Irish Ordnance Survey of which Colby was the Director.

It consequently appears that prior to the publication of the 1<sup>st</sup> Edition Babbage sent two proof copies to Colby, presumably so that he could proof-read them, and requested them to be returned. This copy, however, was not returned but apparently retained in the Irish Ordnance Survey.

It is worth noting that Colby's correction of 'same' to 'preceding' on p. xvi was not registered in the 1<sup>st</sup> Edition, but in the 3<sup>rd</sup> and 4<sup>th</sup> Editions the entire paragraph has been substantially re-drafted.

This item was donated by Dr. Brian Coghlan and Dr. Dan McCarthy after acquisition at auction on 7-Dec-2016 at Mealy's, Kilkenny Road, Castlecomer, Co. Kilkenny.

We wish to gratefully acknowledge the expertise and assistance of Tim Keefe, Head of Digital Resources & Imaging Services, Trinity College Dublin, who successfully recovered the fly-leaf inscription by taking an infra-red image of it. For details of how this was done please see [3] in the related folder in this catalog. Also the vigilance of Daphne Gill who thoughtfully brought the impending auction of the item to our attention, and the assistance of Dr. Ronald Cox who kindly provided the copy of Thomas Colby's letter reproduced in Figure 23.

*Sadly: The 1<sup>st</sup> edition was published in 1827, the same year as Babbage's father Benjamin, his wife Georgiana, his 2<sup>nd</sup> son Charles and his newborn 8<sup>th</sup> son Alexander, all died*

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

Accession Index	Object with Identification
<a href="#">TCD-SCSS-V.20161219.001</a>	Table of the logarithms of the natural numbers from 1 to 108000, proof copy to the 1st Edition, Babbage, C., Murray: London, contains a printed inscription from Babbage to Lt-Colonel Colby of the Royal Engineers, c.1827.
<a href="#">TCD-SCSS-V.20121208.640</a>	Table of the logarithms of the natural numbers from 1 to 108000, 4th Edition, Babbage, C., Murray: London, contains a printed inscription from Babbage to Lt-Colonel Colby of the Royal Engineers, c.1844.

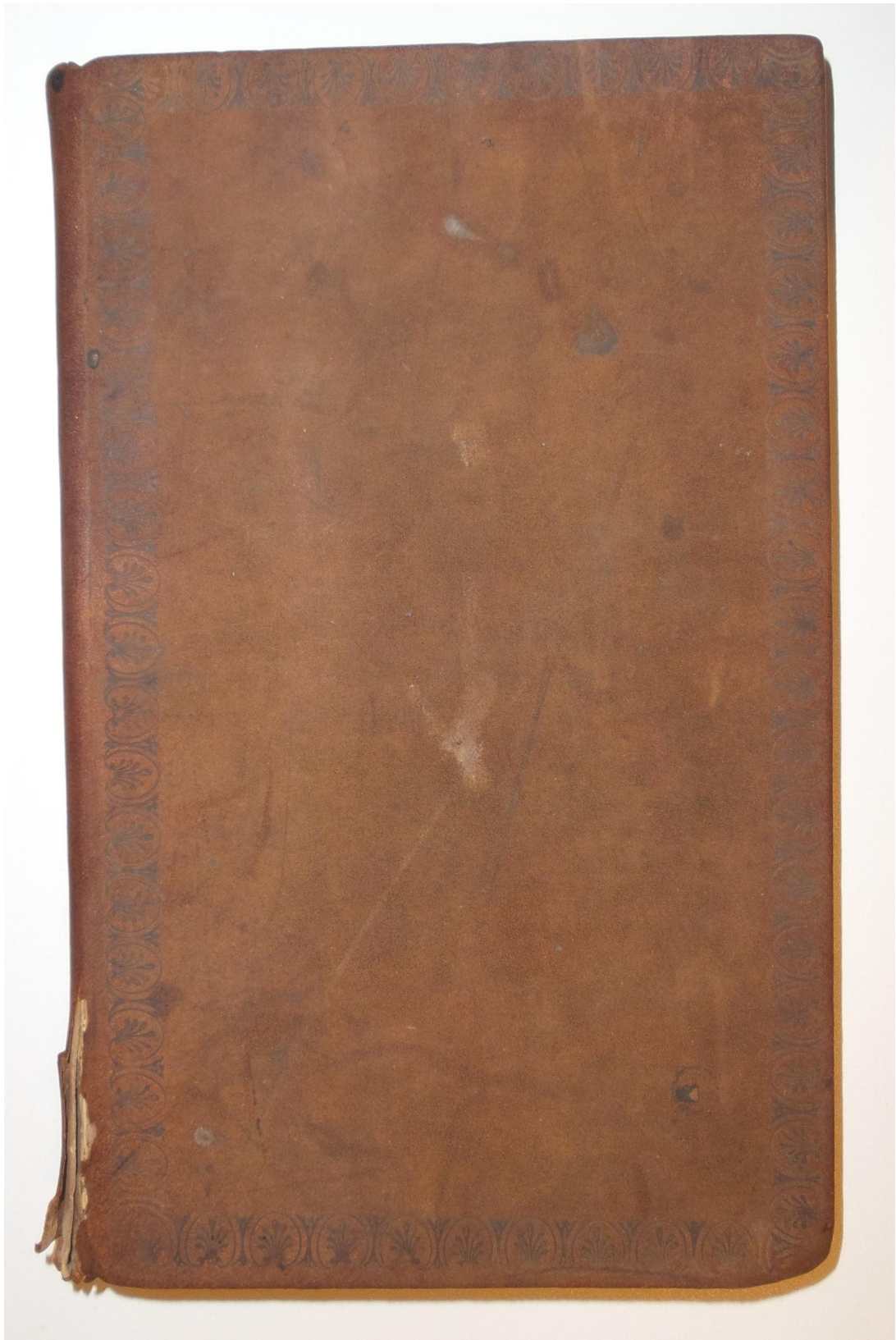
#### References:

1. Wikipedia, *Charles Babbage*, see:  
[https://en.wikipedia.org/wiki/Charles\\_Babbage](https://en.wikipedia.org/wiki/Charles_Babbage)  
Last browsed to on 7-Jan-2017.
2. Denis Roegel, *A reconstruction of Charles Babbage's table of logarithms (1827)*, 9-Oct-2012, see:  
<http://locomat.loria.fr/babbage1827/babbage1827doc.pdf>  
Last browsed to on 7-Jan-2017.
3. Timothy Keefe, *Revealing a hidden past*, Digital Resources & Imaging Services, Trinity College Dublin, 22-Mar-2017, see:  
<https://www.scss.tcd.ie/SCSSTreasuresCatalog/literature/TCD-SCSS-V.20161219.001/TimothyKeefe-Revealing-a-hidden-past-corrected-20170322-0920.pdf>  
Last browsed to on 22-Mar-2017.
4. John Gabriel Byrne Computer Science Collection, *About a dozen typed captions, all mounted on black cardboard, relating to Charles Babbage*, c.1986, see:  
<https://www.scss.tcd.ie/SCSSTreasuresCatalog/literature/TCD-SCSS-V.20121208.866/TCD-SCSS-V.20121208.866.pdf>  
Last browsed to on 3-Jun-2017.  
Also see: John Gabriel Byrne Computer Science Collection, *Charles Babbage's Engines*, see Fig.18 in:  
<https://www.scss.tcd.ie/SCSSTreasuresCatalog/miscellany/TCD-SCSS-X.20121208.001/TCD-SCSS-X.20121208.001.pdf>  
Last browsed to on 3-Jun-2017.
5. J.H. Andrews, *A Paper Landscape – The Ordnance Survey in Nineteenth-Century Ireland*, Oxford, 1975, 2nd edition 2002.
6. J.E. Portlock, *Memoir of the life of Major General Colby*, 1869.



*Figure 1: Charles Babbage's Tables of Logarithms, proof copy to the 1st Edition, front cover*





*Figure 2: Charles Babbage's Tables of Logarithms, proof copy to the 1st Edition, rear cover*

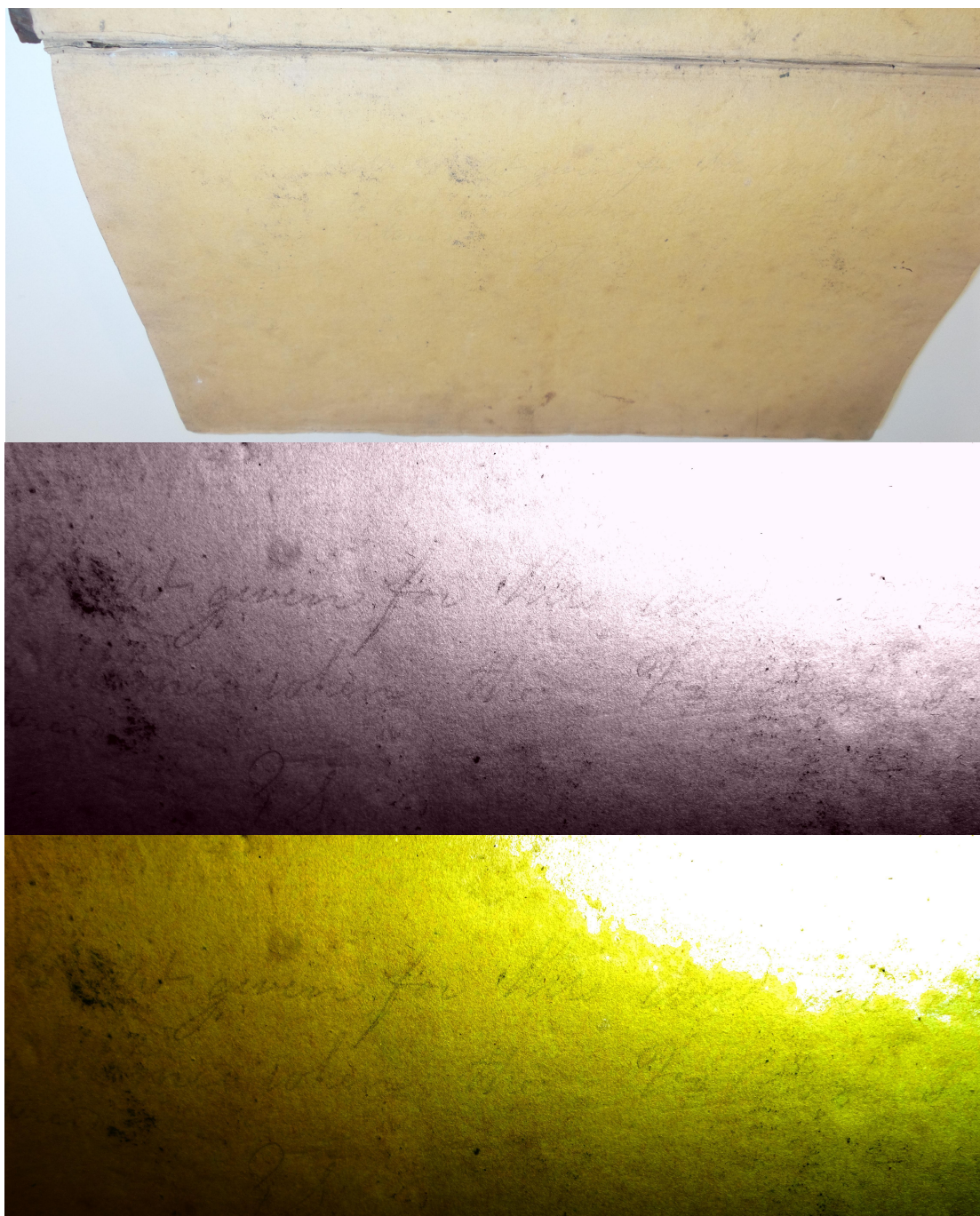


*Figure 3: Charles Babbage's Tables of Logarithms, proof copy to the 1st Edition, binding*

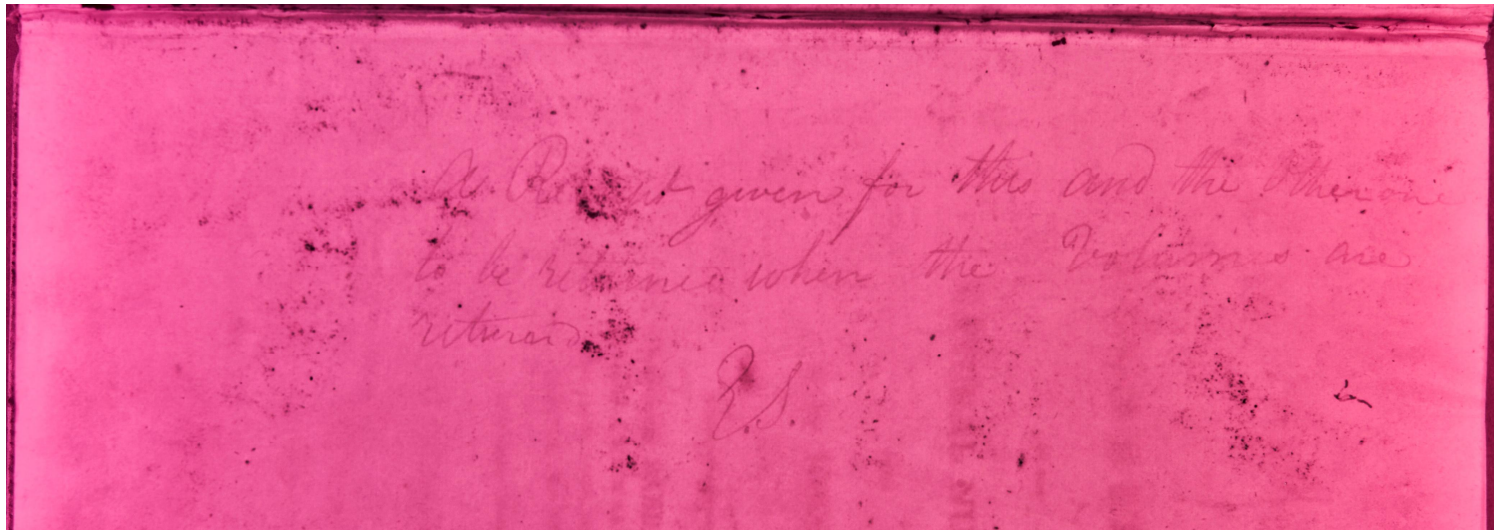


*Figure 4: Charles Babbage's Tables of Logarithms, proof copy to the 1st Edition, inside front cover and first fly-leaf*





*Figure 5: Charles Babbage's Tables of Logarithms, proof copy to the 1st Edition, first fly-leaf showing the faint inscription in lead pencil, with two approximate multi-spectral enhancements revealing:*  
"... given for the ....  
... when the ...  
... "



*Figure 6: Charles Babbage's Tables of Logarithms, proof copy to the 1st Edition, processed infra-red image of first fly-leaf.*

*Courtesy Tim Keefe, Head of Digital Resources & Imaging Services, Trinity College Dublin*

*"A Receipt given for this and the other one  
to be returned when the volumes are  
returned.*

*C. B."*



5/1/6

Dear Lady Rosse

I shall very great  
pleasure in accepting your  
kind invitation to dinner  
for Wednesday the 11 June

Yours very truly  
C Babbage.

Secret  
March 16 W.  
Monday 5 June 1862

Figure 7: Charles Babbage's letter to Lady Rosse on 5 June 1862.  
From Prof.J.G.Byrne's copy of Babbage's letter J\_1\_6



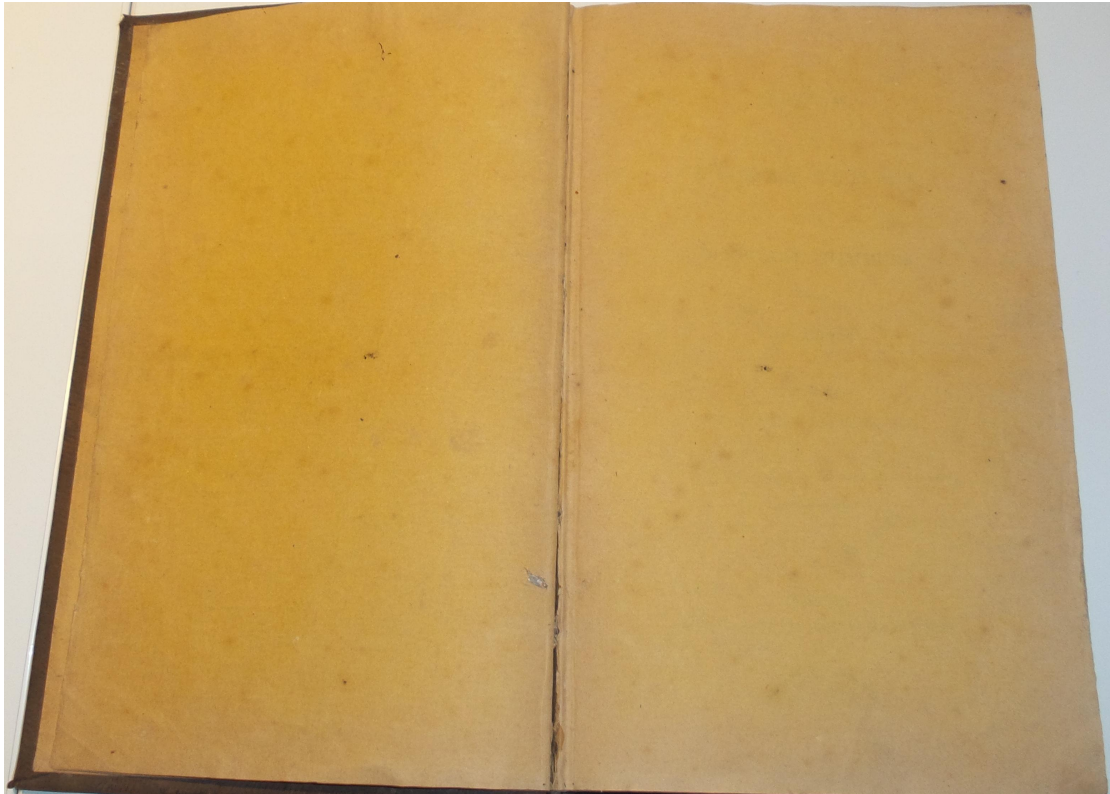


Figure 8: Charles Babbage's *Tables of Logarithms*, proof copy to the 1st Edition, verso of the first fly-leaf, and the recto of the second fly-leaf

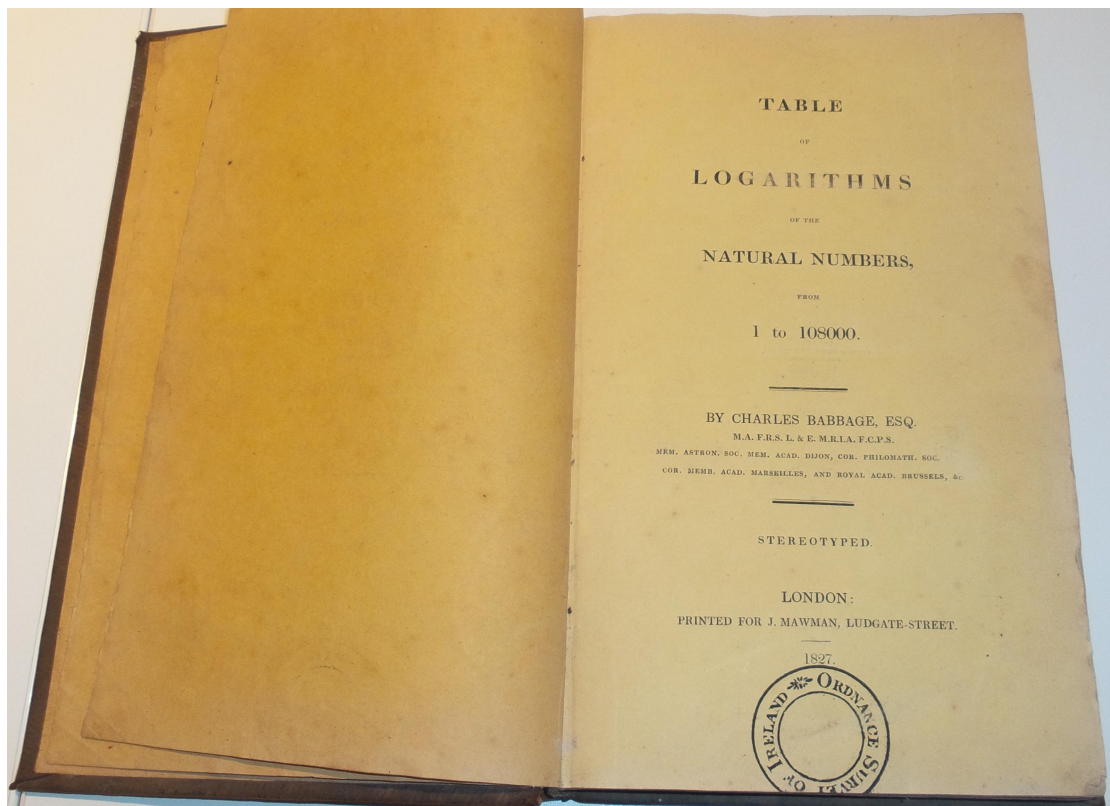


Figure 9: Charles Babbage's *Tables of Logarithms*, proof copy to the 1st Edition, Title Page  
At the end of the first line of Babbage's list of societies the word 'Paris' has been carefully erased.  
Note also the stamp of Irish Ordnance Survey

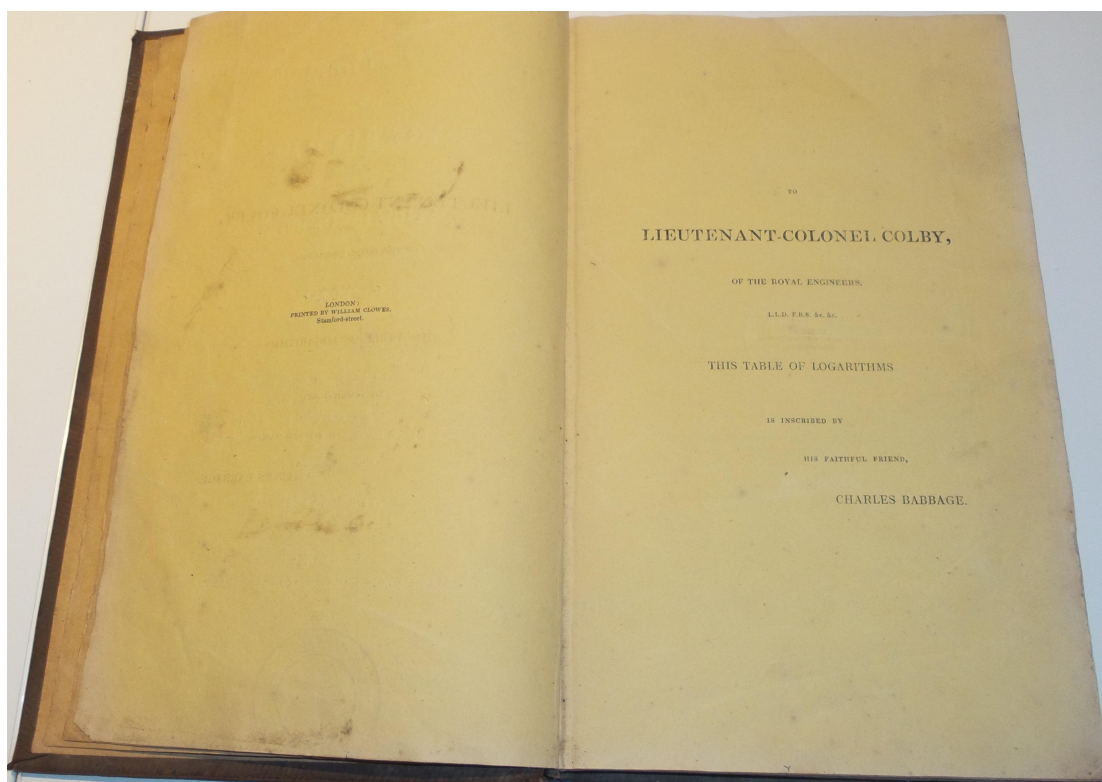


Figure 10: Charles Babbage's *Tables of Logarithms*, proof copy to the 1st Edition, printer's address on page [ii] and the printed inscription to Colby on page [iii]

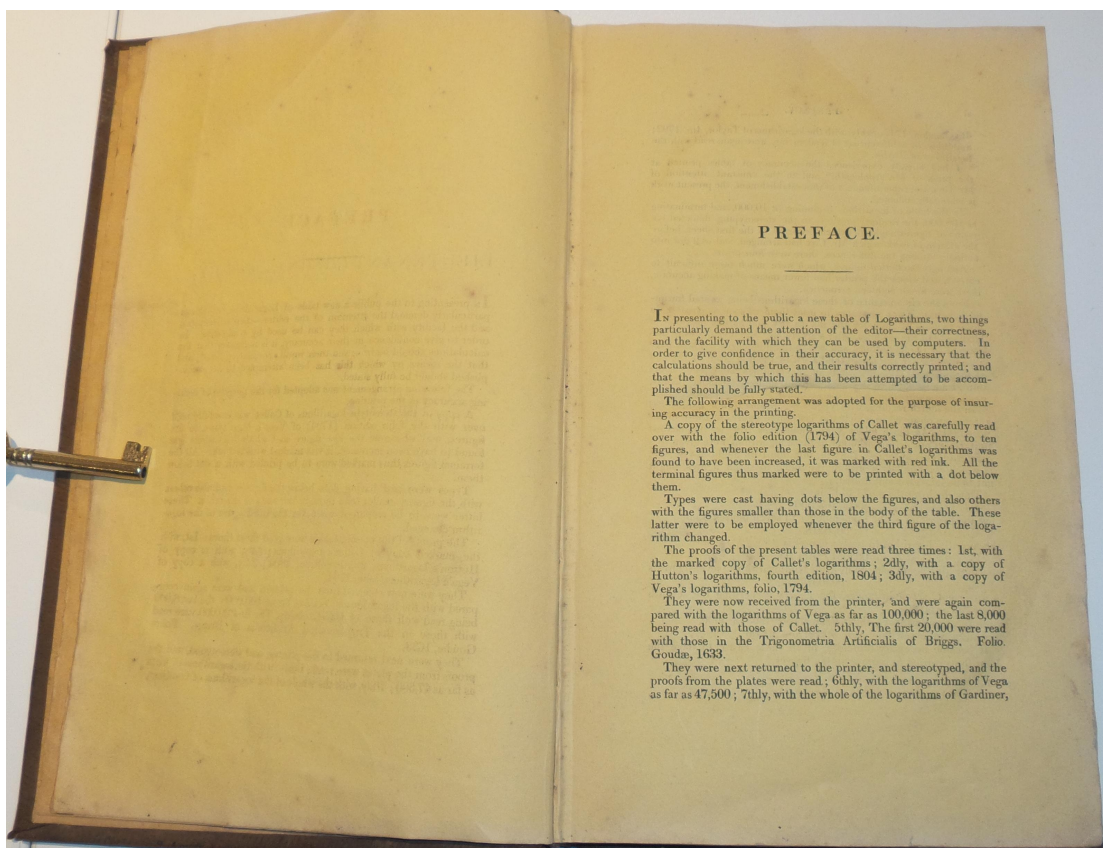


Figure 11: Charles Babbage's *Tables of Logarithms*, proof copy to the 1st Edition, verso of the printed inscription to Colby on page [iv], and first page of the Preface on page [v]



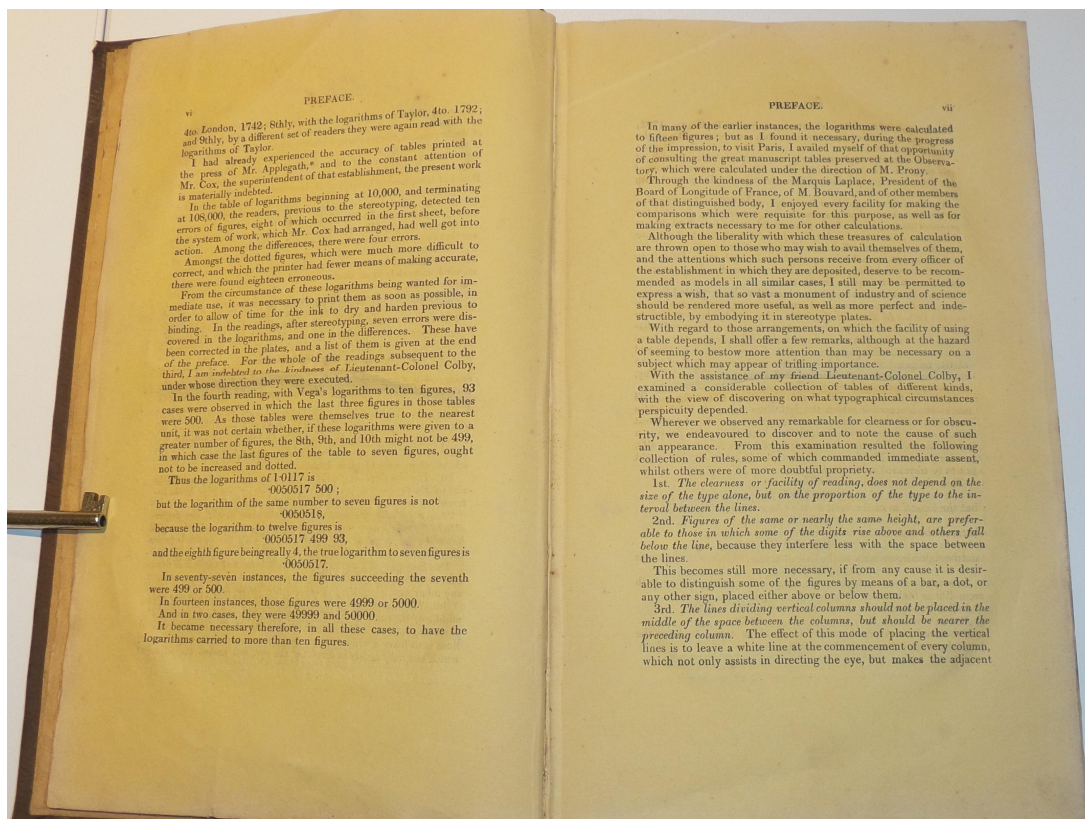


Figure 12: Charles Babbage's Tables of Logarithms, proof copy to the 1st Edition, Preface pages vi & vii.  
Note the '\*' on line 5 of page vi, with no corresponding footnote below

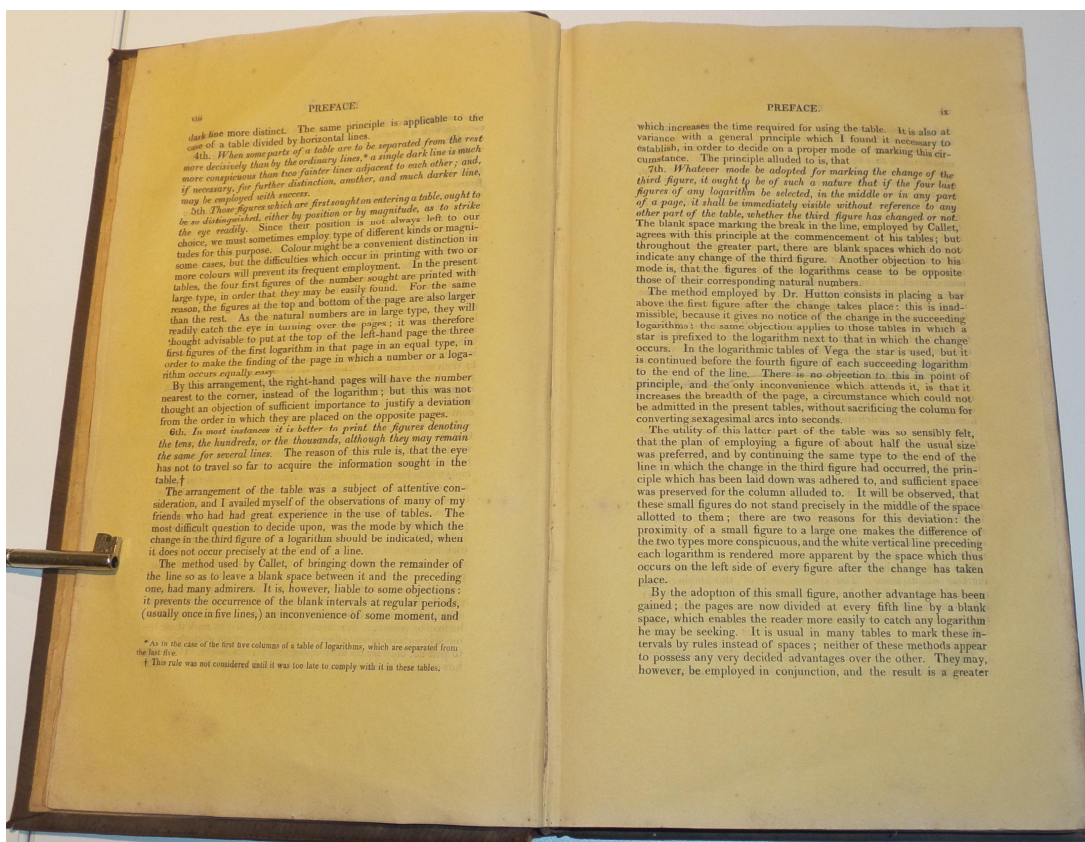


Figure 13: Charles Babbage's Tables of Logarithms, proof copy to the 1st Edition, Preface pages viii & ix



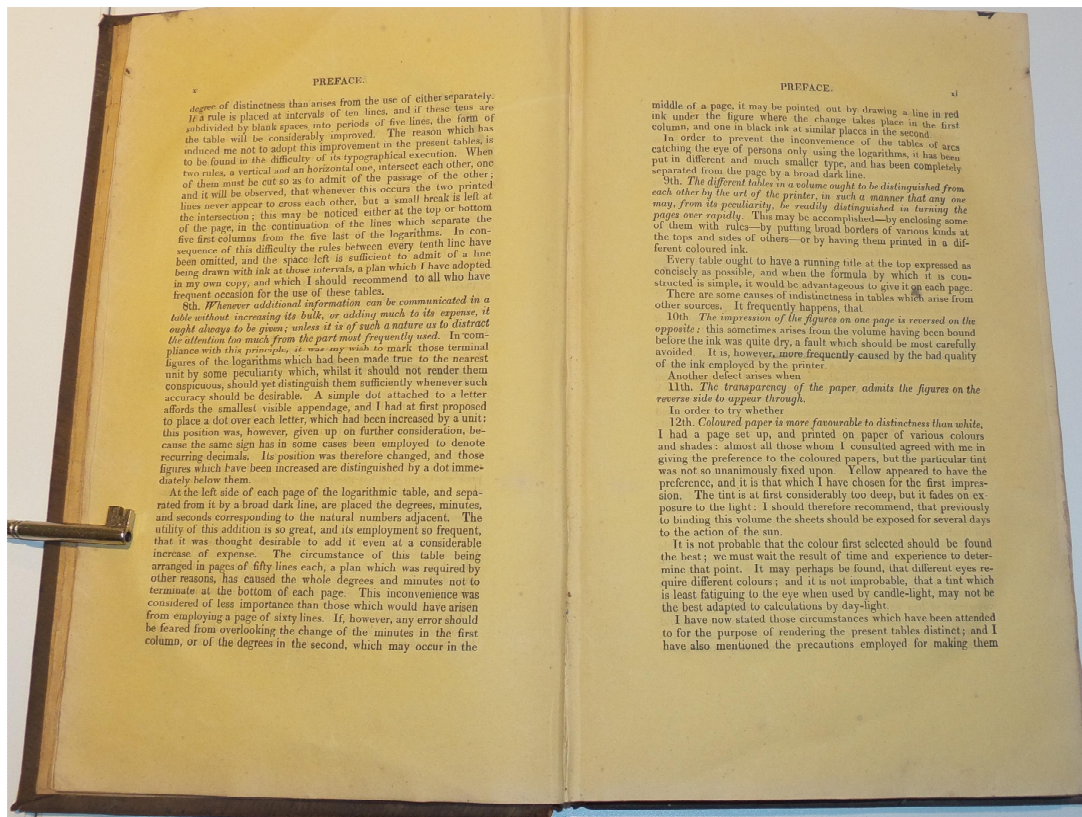


Figure 14: Charles Babbage's Tables of Logarithms, proof copy to the 1st Edition, Preface pages x & xi

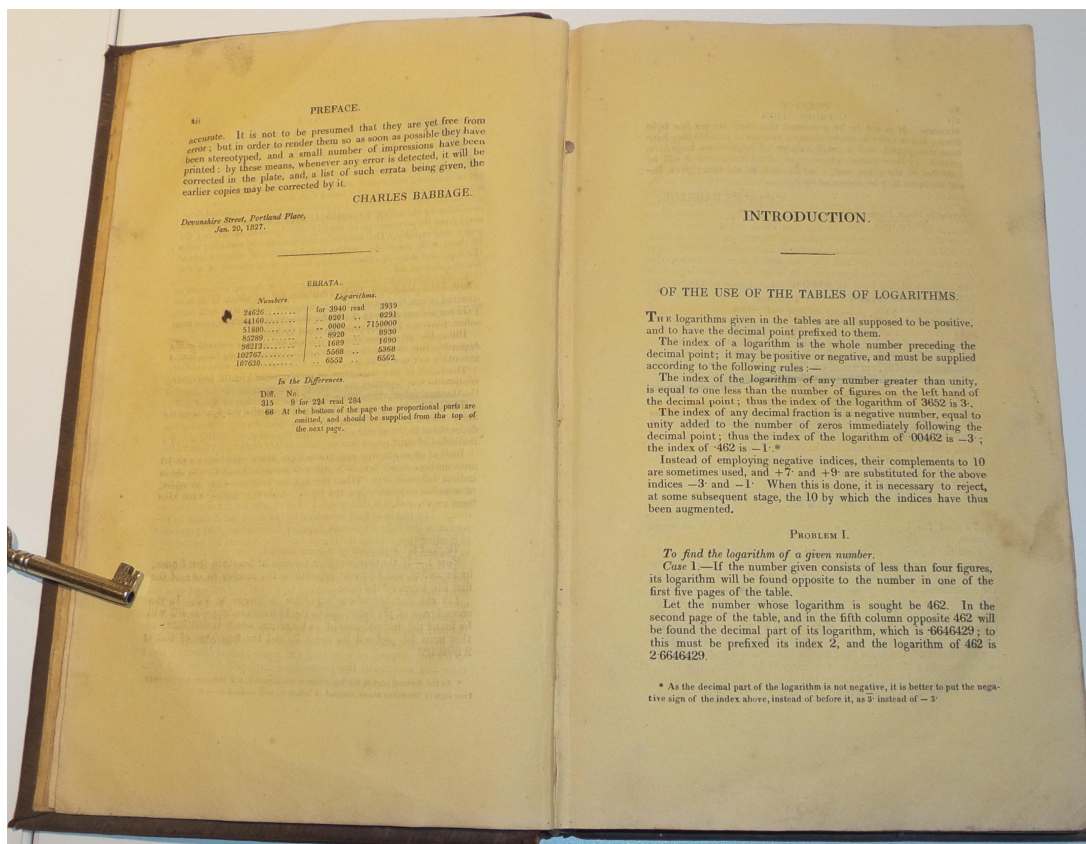


Figure 15: Charles Babbage's Tables of Logarithms, proof copy to the 1st Edition, Preface page xii and Introduction page [xiii]

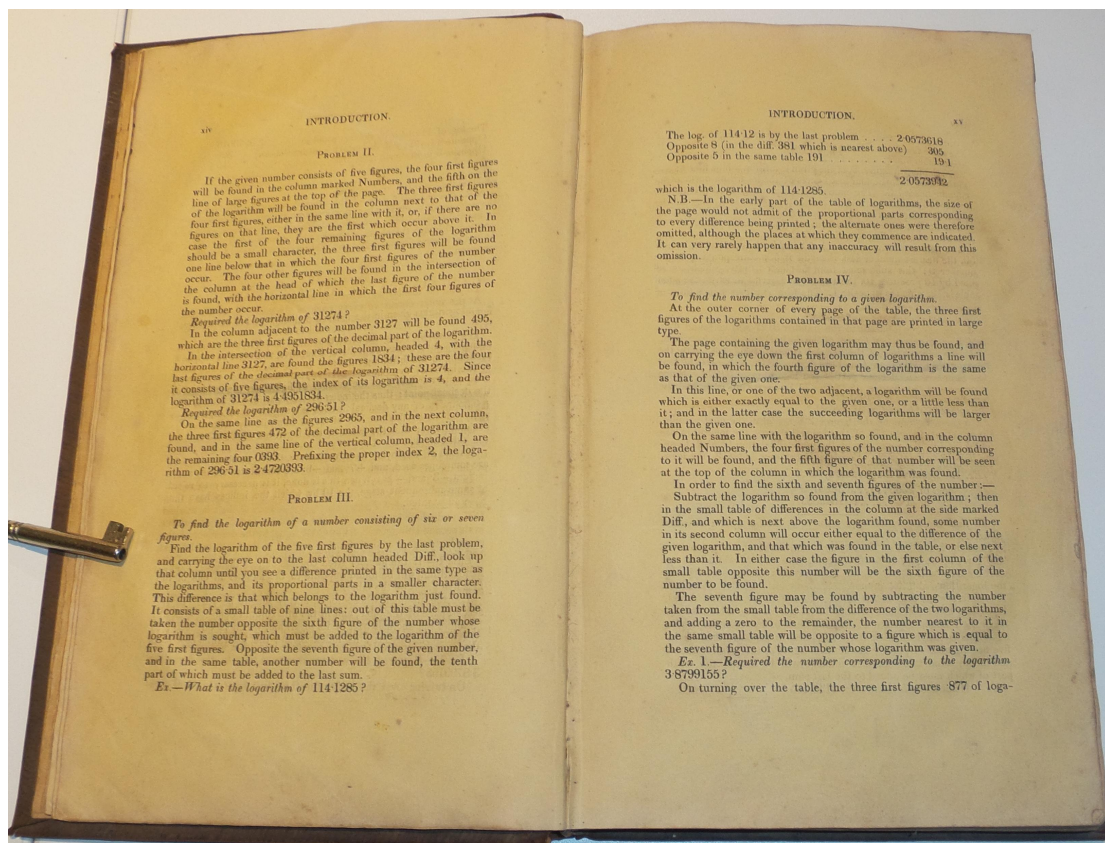


Figure 16: Charles Babbage's *Tables of Logarithms*, proof copy to the 1st Edition, Introduction pages xiv & xv



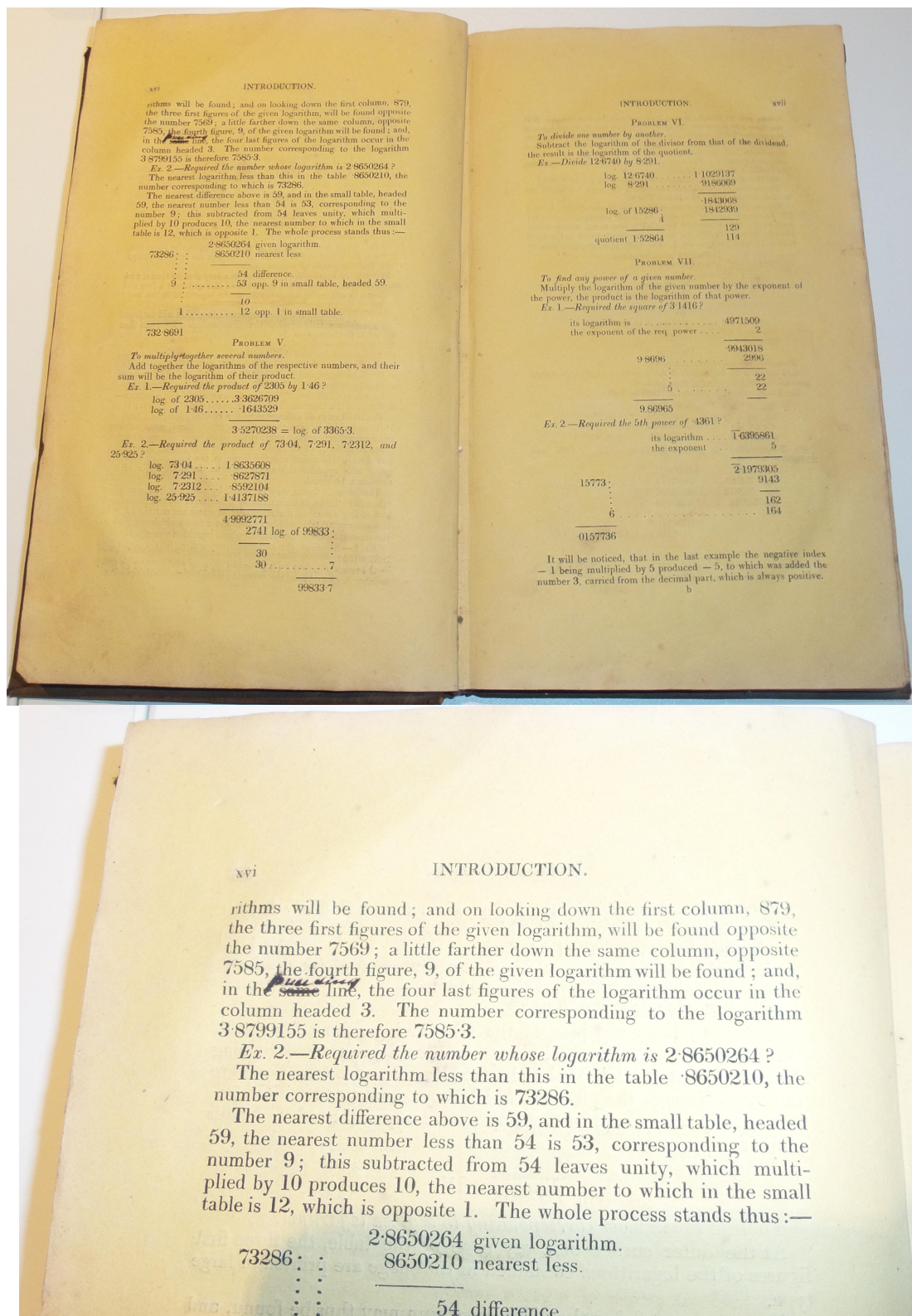


Figure 17: Charles Babbage's *Tables of Logarithms*, proof copy to the 1st Edition, Introduction pages xvi & xvii, showing Colby's deletion and annotation



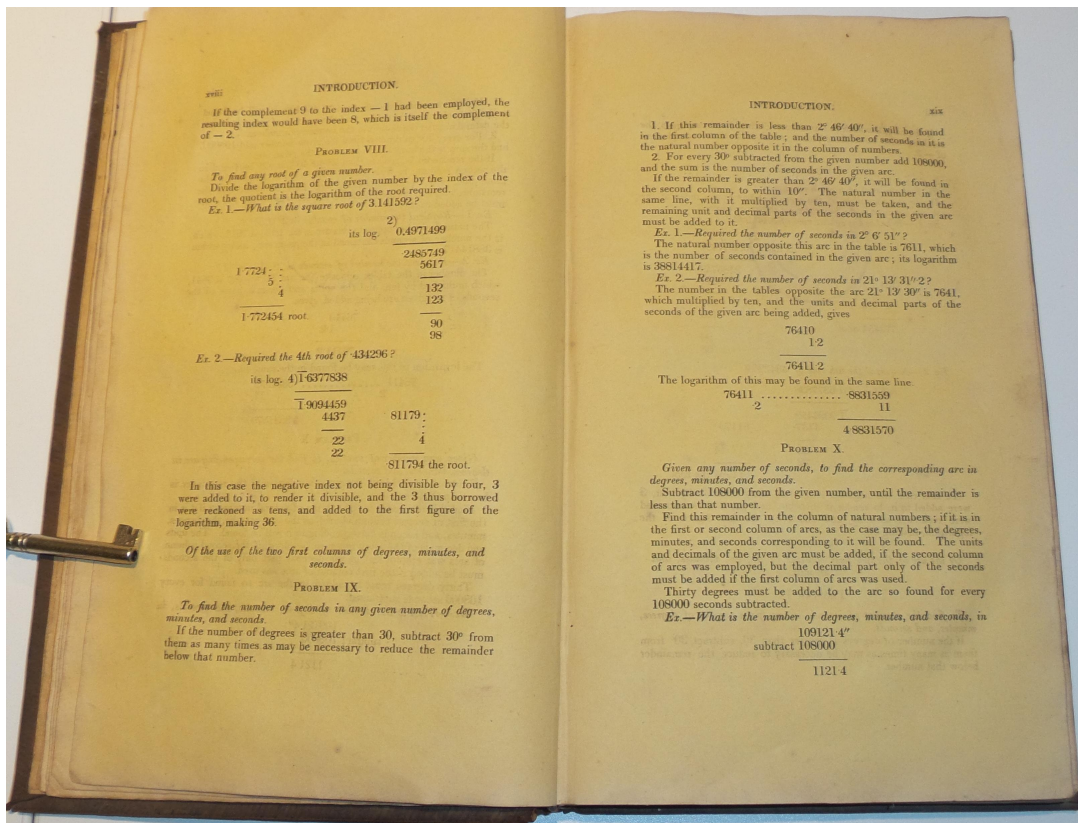


Figure 18: Charles Babbage's *Tables of Logarithms*, proof copy to the 1st Edition, Introduction pages xviii & xix

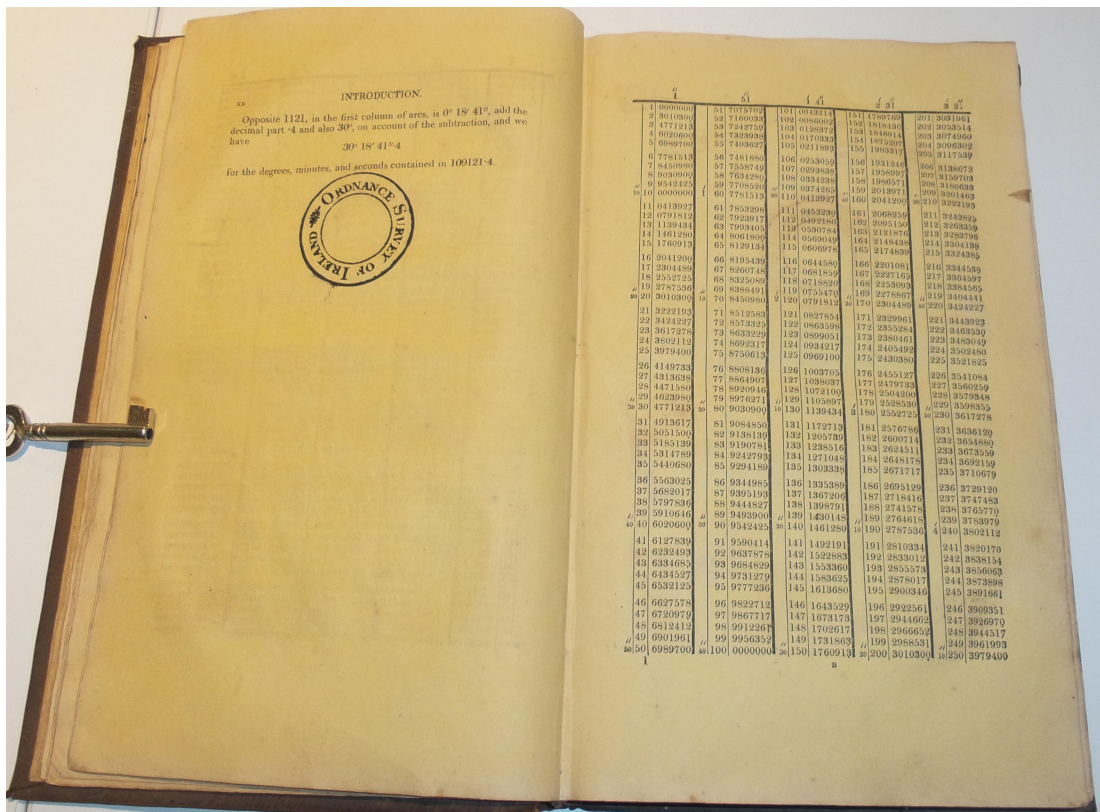


Figure 19: Charles Babbage's *Tables of Logarithms*, proof copy to the 1st Edition, Introduction page xx & Page 1. Note stamp of Irish Ordnance Survey



Figure 20: Charles Babbage's Tables of Logarithms, proof copy to the 1st Edition, pages 84 & 85. The image shows two open pages of a large, handwritten table of logarithms. The left page is labeled "Log. 630. N. 480" and the right page is labeled "Log. 634. N. 492". Both pages feature a grid of numbers with columns labeled "Num." and "Diff.". A green key is placed on the left page, and a circular stamp of the "IRISH ORDNANCE SURVEY" is visible on the right page.

Figure 20: Charles Babbage's Tables of Logarithms, proof copy to the 1st Edition, pages 84 & 85.  
Note stamp of Irish Ordnance Survey

Figure 21: Charles Babbage's Tables of Logarithms, proof copy to the 1st Edition, pages 182 & 183. The image shows two open pages of a large, handwritten table of logarithms. The left page is labeled "Log. 991. N. 980" and the right page is labeled "Log. 993. N. 982". Both pages feature a grid of numbers with columns labeled "Num." and "Diff.". A circular stamp of the "IRISH ORDNANCE SURVEY" is visible on the right page.

Figure 21: Charles Babbage's Tables of Logarithms, proof copy to the 1st Edition, pages 182 & 183.  
Note stamp of Irish Ordnance Survey

CONSTANTS.			
		Logarithm.	Comp. of Log.
Diam. = 1 circumference = $\pi$ =	3.1415927	-.4971499	9.5028501
Diam. = 1 area of circle = $\frac{\pi}{4}$ =	.7853982	9.8930899	10.49101
Diam. = 1 contents of sphere = $\frac{\pi}{6}$ =	.5235988	9.7189986	9.2510014
$\sqrt{\pi}$ =	1.7724539	-.2485750	9.7514250
Hyp. log. $e$ =	9.6666044	-.9942997	9.0057099
Length of arc 1' = $\sin 1'$ =	1.1447299	0.0057030	9.9412979
Length of arc 2' = $\sin 2'$ =	-.00004848	4.6635749	9.3144251
Length of arc 3' = $\sin 3'$ =	-.000009696	4.9866049	9.3144251
Length of arc 1' = $\sin 1'$ =	-.000290888	6.4637361	4.8873030
Length of arc 1' = $\sin 1'$ =	-.017453293	8.2418774	1.7581236
$\sin 1'$ =	-.017453246	8.2418553	1.7581236
360 degrees expressed in seconds =	1296000	6.1126030	9.8870040
Rad. reduced to seconds =	206264.8	5.3144251	4.6835749
Rad. reduced to minutes =	3437.74677	8.5362739	7.4637361
Rad. reduced to degrees =	57.295780	1.7581236	9.4418774
Number whose hyp. log. is unity = $e$ =	2.718281829	43.42945	9.5657035
Modulus of common logarithms =	43.4294489	9.6377543	39.22136
French toise = in metres	1.949040	0.2898200	9.7101800
French toise = in English yards	2.131308	0.3286916	9.6713084
French toise = in English feet	6.3945925	0.8081129	9.1841871
French metre = in English yards	1.0936331	0.0388716	9.9611294
French metre = in English feet	3.2808993	0.5159929	9.4840071
French foot = in English feet	1.0657654	0.0276616	9.9723384
French metre = in English inches	39.37079	1.5951741	8.4048299
French are = in English acres	0.2471143	8.3928979	1.6071021
French gramme = in imperial lbs. troy	0.0026808	7.4282928	2.5717072
French gramme = in imperial lbs. avoirdupois	0.00220606	7.3436173	2.6453827
French kilogramme = in English cwts.	0.0166669	8.2943993	1.7036607
French litre = in imperial gallons	220.09687	9.3426199	-.6378661
Cent. degree = in sex. degrees	9	9.9442465	9.9557555
Cent. minute = in sex. minutes	54	9.7323958	0.2676662
Cent. second = in sex. seconds	324	9.5105450	0.4894550
24 hours expressed in seconds =	86400	4.9365137	5.0634863
Di. ac. of stars = 3' 55" 000 in m. sol. seconds =	235.9093	2.3727451	7.6272549
Sid. day = 23 <sup>h</sup> 56' 4" 09 in mean sol. days =	-.99726967	9.9983126	0.0011874
Sol. mean day = 24 <sup>h</sup> 3' 56" 5554 in sid. days =	1.00273791	-.0011874	9.9988126
Sid. rev. of earth in mean sol. days =	365.25636	2.5625978	7.4374022
Trop. rev. of earth in mean sol. days =	365.24224	2.5625810	7.4374190
Bar. 30 in. F. Ther. 62... Cub. in. distilled Water } in grains =	252.458	2.4021891	7.5978109

Figure 22: Charles Babbage's Tables of Logarithms, proof copy to the 1st Edition, Table of Constants



Ordinance Map Office Tower

14<sup>th</sup> July 1835.

Sir,

In reference to the Honorable Board's letter of the 11<sup>th</sup> instant, <sup>7/35</sup> in which it is directed that Mr De la Beche shall commence the Geological Survey of Cornwall without any delay:

I have to request the Honorable Board will be pleased to direct an Imprest of one Hundred Pounds to be granted to Mr Henry Thomas De la Beche, to enable him to defray the contingent expenses attendant on this work. — And that he shall send in Quarterly accounts of the expenditure to the Office of the Surveyor General.

I have the honor to be V<sup>rs</sup> &c.

Signed) Thomas Colby

Lieut. Col. R. Engineer.

Figure 23: Thomas Colby's letter of 14 July, 1835