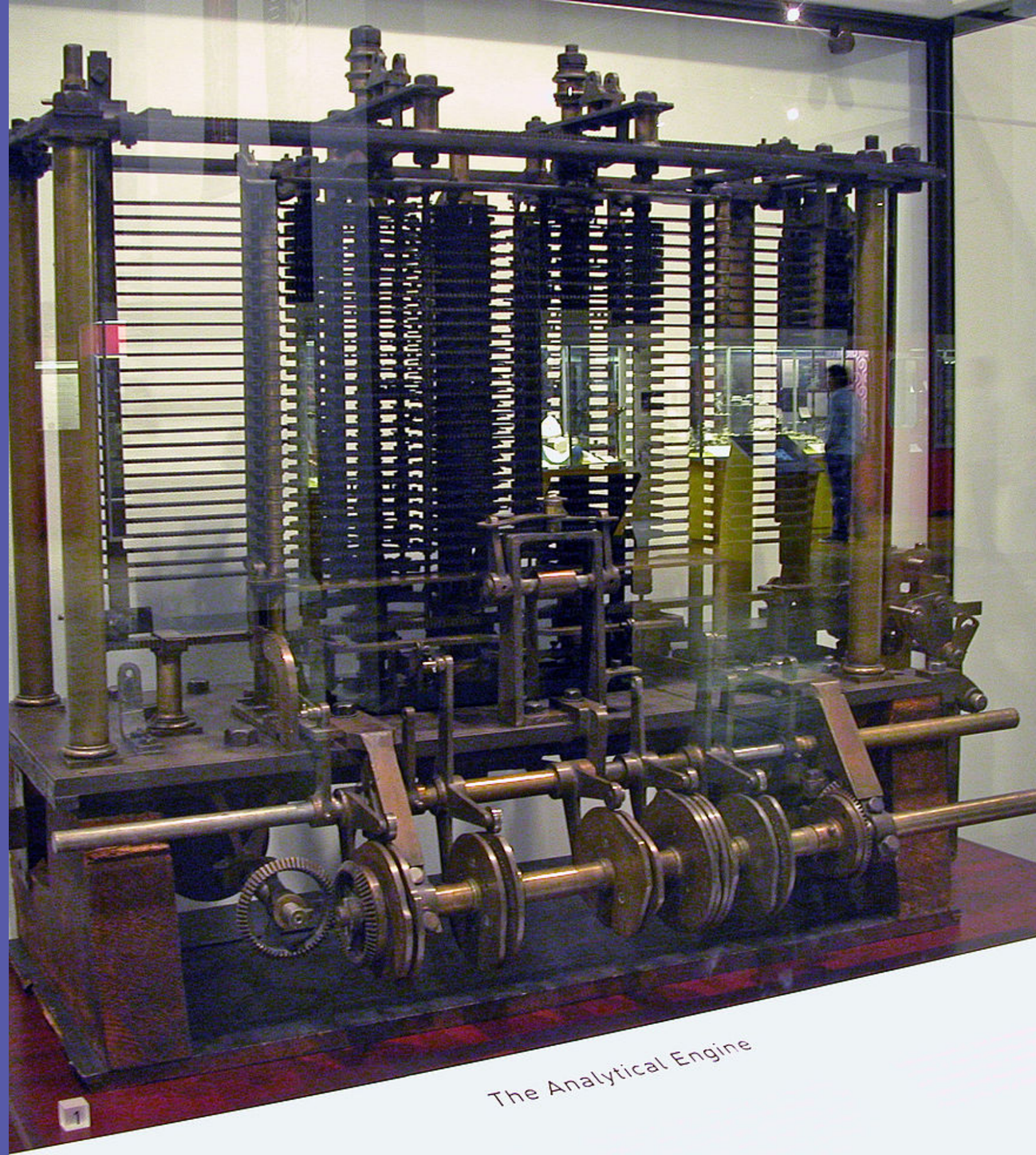
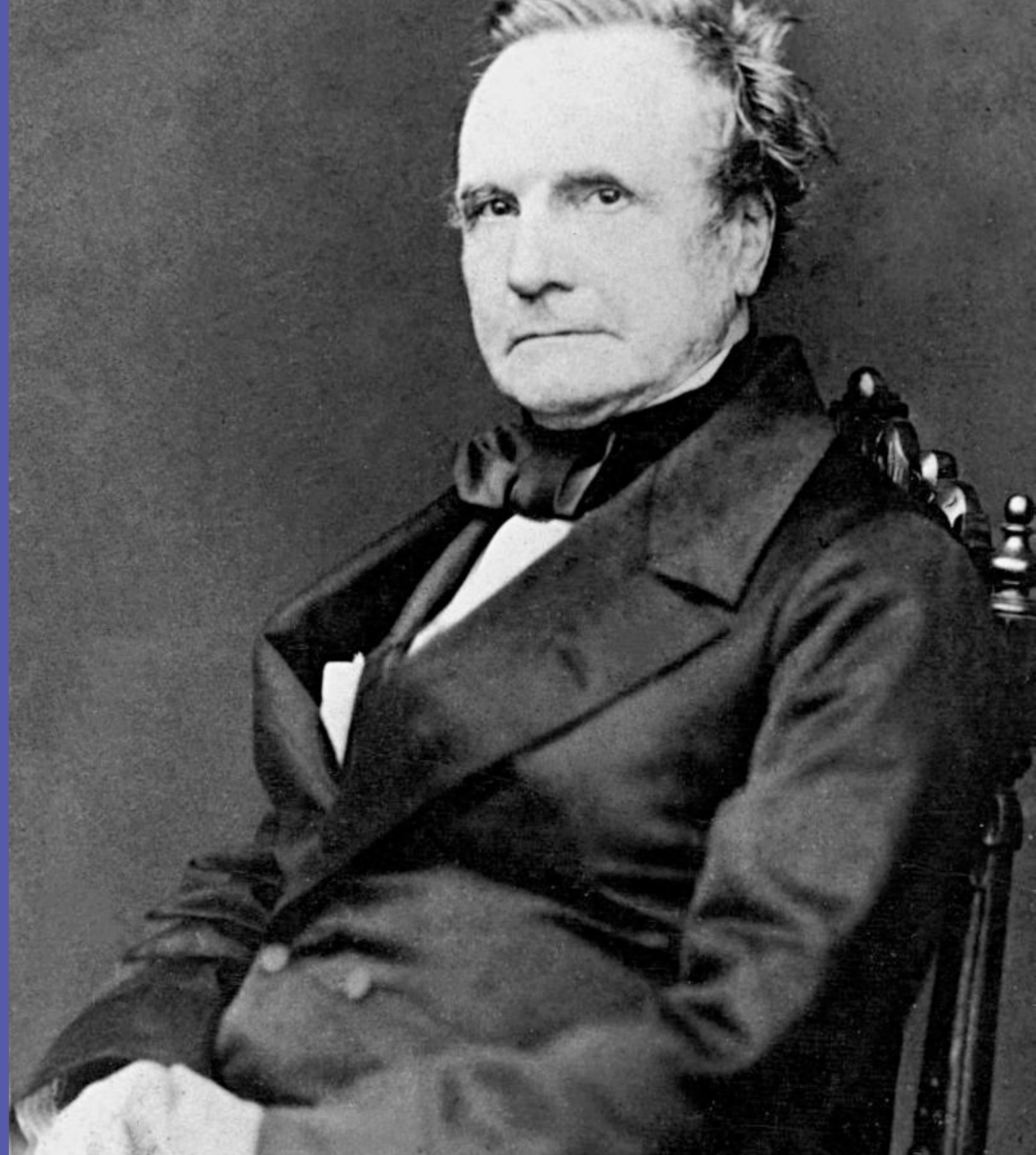
Ada Lovelace

Mathematician and Writer

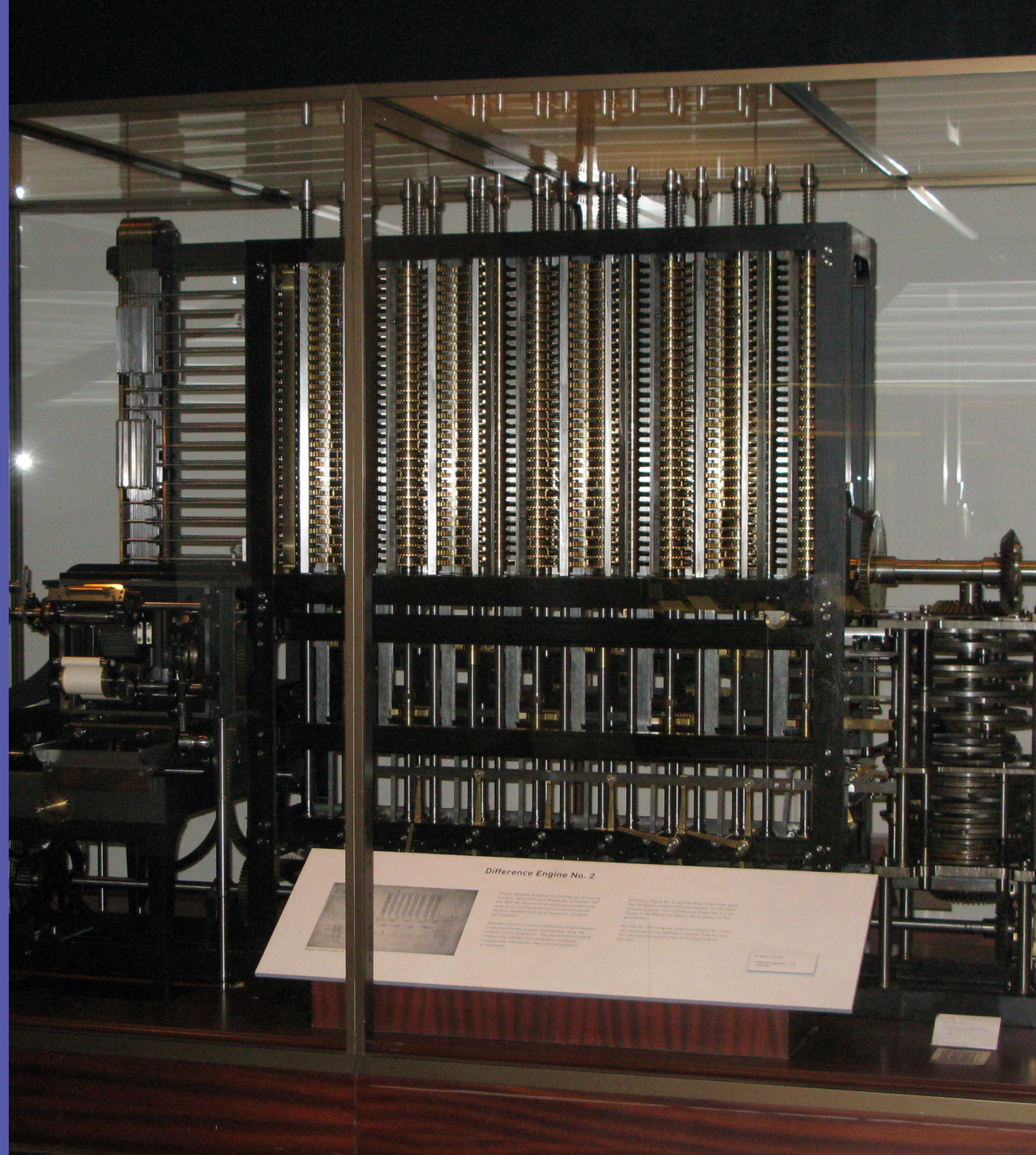
Known for her work on Charles Babbage's early mechanical general-purpose computer, the Analytical Engine.

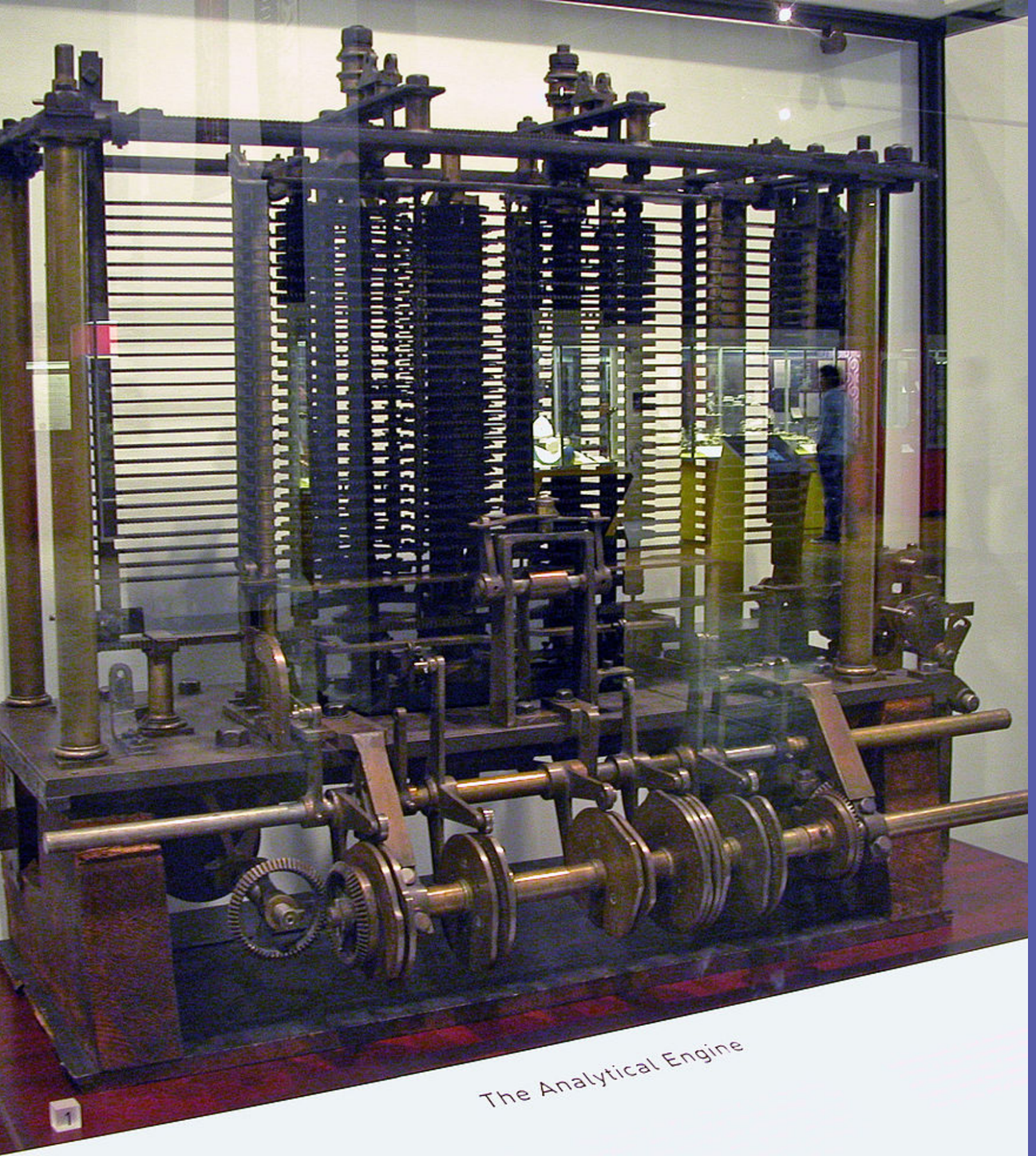


Ada met Charles Babbage through their mutual friend, and her private tutor, Mary Somerville.



Babbage had created the Difference Engine - a automatic mechanical calculator designed to tabulate polynomial functions.





Babbage was busy working on his next breakthrough - the Analytical Engine - a mechanical general purpose computer.

Ada was commissioned to translate an article in a Swiss Journal about the Analytical Engine and saw this as an opportunity.

ANALYTICAL ENGINE

INVENTED BY

CHARLES BABBAGE, Esq.

By L. F. MENABREA,

OFFICER OF THE MILITARY ENGINEERS.

WITH NOTES BY THE TRANSLATOR.

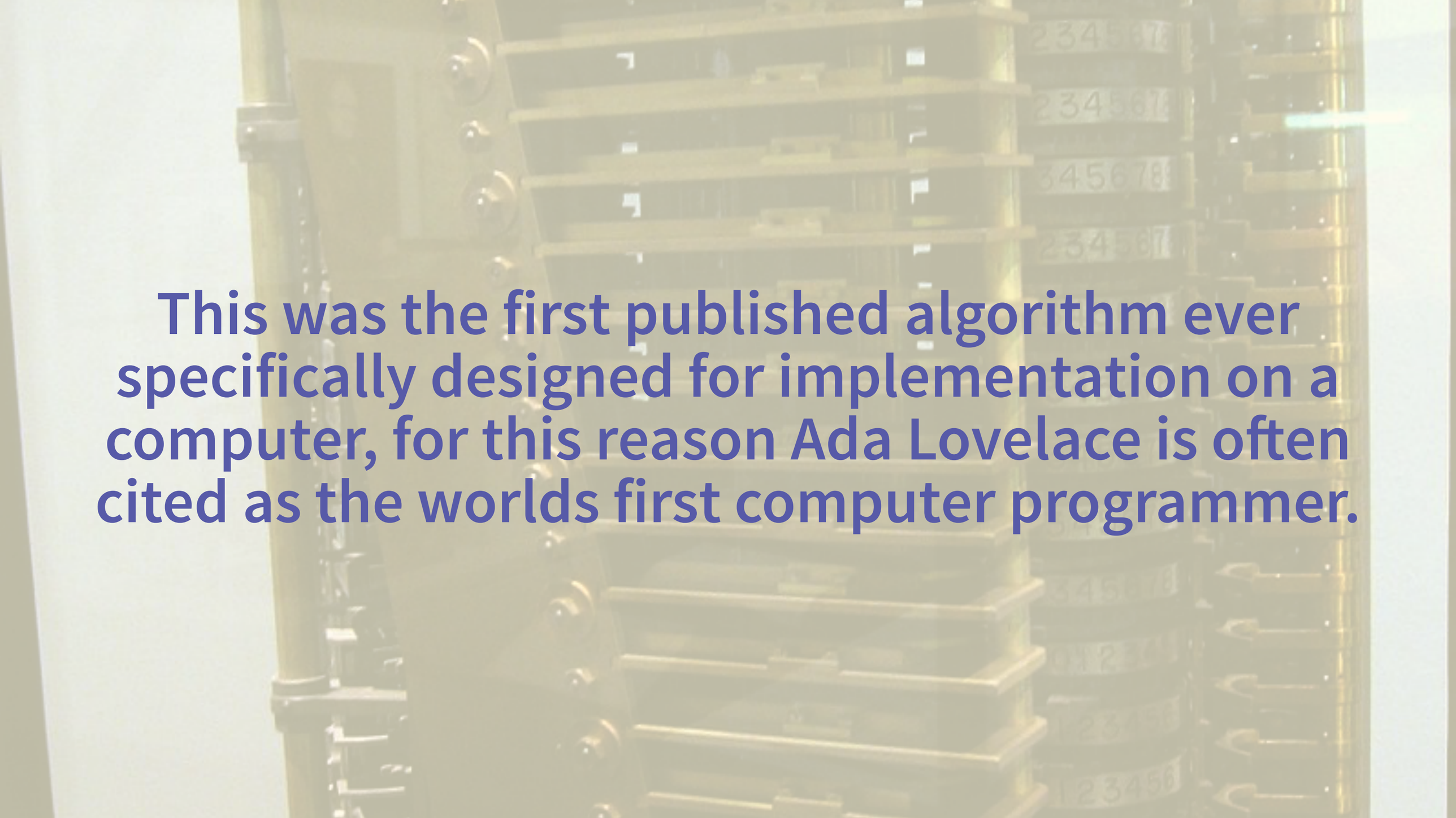
(Extracted from the 'Scientific Memoirs,' vol. iii.)

In addition to translating, she added her own notes - making the article twice as long!

In one of the notes she describes an algorithm for the Analytical Engine to compute Bernoulli numbers.

Number of Operation	Nature of Operation	Variables acted upon.	Variables receiving results.	Indication of change in the value on any Variable.	Statement of Results.	0 0 0 1 / 1	0 0 0 2 / 2	0 0 0 4 / n	0 0 0 0 / □	0 0 0 0 / □	0 0 0 0 / □	0 0 0 0 / □	0 0 0 0 / □	0 0 0 0 / □	0 0 0 0 / □	0 0 0 0 / □	0 0 0 0 / □	B_1 in a decimal fraction.	B_3 in a decimal fraction.	B_5 in a decimal fraction.	0 0 0 0 / B_7
1	×	${}^1V_2 \times {}^1V_3$	${}^1V_4, {}^1V_5, {}^1V_6$	$\left\{\begin{matrix} {}^1V_2 = {}^1V_2 \\ {}^1V_3 = {}^1V_3 \end{matrix}\right\}$	$= 2n$	...	2	n	$2n$	$2n$	$2n$										
2	−	${}^1V_4 - {}^1V_1$	${}^2V_4$	$\left\{\begin{matrix} {}^1V_4 = {}^2V_4 \\ {}^1V_1 = {}^1V_1 \end{matrix}\right\}$	$= 2n-1$	1	...	...	$2n-1$												
3	+	${}^1V_5 + {}^1V_1$	${}^2V_5$	$\left\{\begin{matrix} {}^1V_5 = {}^2V_5 \\ {}^1V_1 = {}^1V_1 \end{matrix}\right\}$	$= 2n+1$	1	...	...	...	$2n+1$											
4	÷	${}^2V_5 \div {}^2V_4$	${}^1V_{11}$	$\left\{\begin{matrix} {}^2V_5 = {}^0V_5 \\ {}^2V_4 = {}^0V_4 \end{matrix}\right\}$	$= \frac{2n-1}{2n+1}$	...	...	...	0	0	...	...	...	...	...	$\frac{2n-1}{2n+1}$					
5	÷	${}^1V_{11} \div {}^1V_2$	${}^2V_{11}$	$\left\{\begin{matrix} {}^1V_{11} = {}^2V_{11} \\ {}^1V_2 = {}^1V_2 \end{matrix}\right\}$	$= \frac{1}{2} \cdot \frac{2n-1}{2n+1}$	...	2	...	...	...	...	...	...	...	...	$\frac{1}{2} \cdot \frac{2n-1}{2n+1}$					
6	−	${}^0V_{13} - {}^2V_{11}$	${}^1V_{13}$	$\left\{\begin{matrix} {}^2V_{11} = {}^0V_{11} \\ {}^0V_{13} = {}^1V_{13} \end{matrix}\right\}$	$= -\frac{1}{2} \cdot \frac{2n-1}{2n+1} = A_0$	...	...	...	...	...	...	...	...	...	...	0	.....	$-\frac{1}{2} \cdot \frac{2n-1}{2n+1} = A_0$			
7	−	${}^1V_3 - {}^1V_1$	${}^1V_{10}$	$\left\{\begin{matrix} {}^1V_3 = {}^1V_3 \\ {}^1V_1 = {}^1V_1 \end{matrix}\right\}$	$= n-1\,(=3)$	1	...	n	...	...	...	...	...	...	$n-1$						
8	+	${}^1V_2 + {}^0V_7$	${}^1V_7$	$\left\{\begin{matrix} {}^1V_2 = {}^1V_2 \\ {}^0V_7 = {}^1V_7 \end{matrix}\right\}$	$= 2+0=2$	...	2	...	...	...	...	2									
9	÷	${}^1V_6 \div {}^1V_7$	${}^3V_{11}$	$\left\{\begin{matrix} {}^1V_6 = {}^1V_6 \\ {}^0V_{11} = {}^3V_{11} \end{matrix}\right\}$	$= \frac{2n}{2} = A_1$	...	...	...	...	...	$2n$	2	...	...	...	$\frac{2n}{2} = A_1$					
10	×	${}^1V_{21} \times {}^3V_{11}$	${}^1V_{12}$	$\left\{\begin{matrix} {}^1V_{21} = {}^1V_{21} \\ {}^3V_{11} = {}^3V_{11} \end{matrix}\right\}$	$= B_1 \cdot \frac{2n}{2} = B_1 A_1$	...	...	...	...	...	...	...	...	...	...	$\frac{2n}{2} = A_1$	$B_1 \cdot \frac{2n}{2} = B_1 A_1$	.....	B_1		
11	+	${}^1V_{12} + {}^1V_{13}$	${}^2V_{13}$	$\left\{\begin{matrix} {}^1V_{12} = {}^0V_{12} \\ {}^1V_{13} = {}^2V_{13} \end{matrix}\right\}$	$= -\frac{1}{2} \cdot \frac{2n-1}{2n+1} + B_1 \cdot \frac{2n}{2}$ ...	...	...	...	...	...	...	...	...	...	...	.....	0	$\left\{-\frac{1}{2} \cdot \frac{2n-1}{2n+1} + B_1 \cdot \frac{2n}{2}\right\}$			
12	−	${}^1V_{10} - {}^1V_1$	${}^2V_{10}$	$\left\{\begin{matrix} {}^1V_{10} = {}^2V_{10} \\ {}^1V_1 = {}^1V_1 \end{matrix}\right\}$	$= n-2\,(=2)$	1	...	...	...	...	...	...	...	...	$n-2$						
13	−	${}^1V_6 - {}^1V_1$	${}^2V_6$	$\left\{\begin{matrix} {}^1V_6 = {}^2V_6 \\ {}^1V_1 = {}^1V_1 \end{matrix}\right\}$	$= 2n-1$	1	...	...	...	...	$2n-1$										
14	+	${}^1V_1 + {}^1V_7$	${}^2V_7$	$\left\{\begin{matrix} {}^1V_1 = {}^1V_1 \\ {}^1V_7 = {}^2V_7 \end{matrix}\right\}$	$= 2+1=3$	1	...	...	...	...	...	3									
15	÷	${}^2V_6 \div {}^2V_7$	${}^1V_8$	$\left\{\begin{matrix} {}^2V_6 = {}^2V_6 \\ {}^2V_7 = {}^2V_7 \end{matrix}\right\}$	$= \frac{2n-1}{3}$	...	...	...	...	...	$2n-1$	3	$\frac{2n-1}{3}$								
16	×	${}^1V_8 \times {}^3V_{11}$	${}^4V_{11}$	$\left\{\begin{matrix} {}^1V_8 = {}^0V_8 \\ {}^3V_{11} = {}^4V_{11} \end{matrix}\right\}$	$= \frac{2n}{2} \cdot \frac{2n-1}{3}$	...	...	...	...	...	...	...	0	...	...	$\frac{2n}{2} \cdot \frac{2n-1}{3}$					
17	−	${}^2V_6 - {}^1V_1$	${}^3V_6$	$\left\{\begin{matrix} {}^2V_6 = {}^3V_6 \\ {}^1V_1 = {}^1V_1 \end{matrix}\right\}$	$= 2n-2$	1	...	...	...	...	$2n-2$										
18	+	${}^1V_1 + {}^2V_7$	${}^3V_7$	$\left\{\begin{matrix} {}^2V_7 = {}^3V_7 \\ {}^1V_1 = {}^1V_1 \end{matrix}\right\}$	$= 3+1=4$	1	...	...	...	...	...	4									
19	÷	${}^3V_6 \div {}^3V_7$	${}^1V_9$	$\left\{\begin{matrix} {}^3V_6 = {}^3V_6 \\ {}^3V_7 = {}^3V_7 \end{matrix}\right\}$	$= \frac{2n-2}{4}$	...	...	...	...	...	$2n-2$	4	...	$\frac{2n-2}{4}$	...	$\left\{\frac{2n}{2} \cdot \frac{2n-1}{3} \cdot \frac{2n-2}{3}\right\} = A_3$					
20	×	${}^1V_9 \times {}^4V_{11}$	${}^5V_{11}$	$\left\{\begin{matrix} {}^1V_9 = {}^0V_9 \\ {}^4V_{11} = {}^5V_{11} \end{matrix}\right\}$	$= \frac{2n}{2} \cdot \frac{2n-1}{3} \cdot \frac{2n-2}{4} = A_3$	...	...	...	...	...	...	...	...	0							
21	×	${}^1V_{22} \times {}^5V_{11}$	${}^0V_{12}$	$\left\{\begin{matrix} {}^1V_{22} = {}^1V_{22} \\ {}^0V_{12} = {}^2V_{12} \end{matrix}\right\}$	$= B_3 \cdot \frac{2n}{2} \cdot \frac{2n-1}{3} \cdot \frac{2n-2}{3} = B_3 A_3$	...	...	...	...	...	...	...	...	...	...	0	$B_3 A_3$	.....	.....	B_3	
22	+	${}^2V_{12} + {}^2V_{13}$	${}^3V_{13}$	$\left\{\begin{matrix} {}^2V_{12} = {}^0V_{12} \\ {}^2V_{13} = {}^3V_{13} \end{matrix}\right\}$	$= A_0 + B_1 A_1 + B_3 A_3$	...	...	...	...	...	...	...	...	...	...	.....	0	$\left\{A_3 + B_1 A_1 + B_3 A_3\right\}$			
23	−	${}^2V_{10} - {}^1V_1$	${}^3V_{10}$	$\left\{\begin{matrix} {}^2V_{10} = {}^3V_{10} \\ {}^1V_1 = {}^1V_1 \end{matrix}\right\}$	$= n-3\,(=1)$	1	...	...	...	...	...	...	...	...	$n-3$						

Here follows a repetition of Operations thirteen to twenty-three.



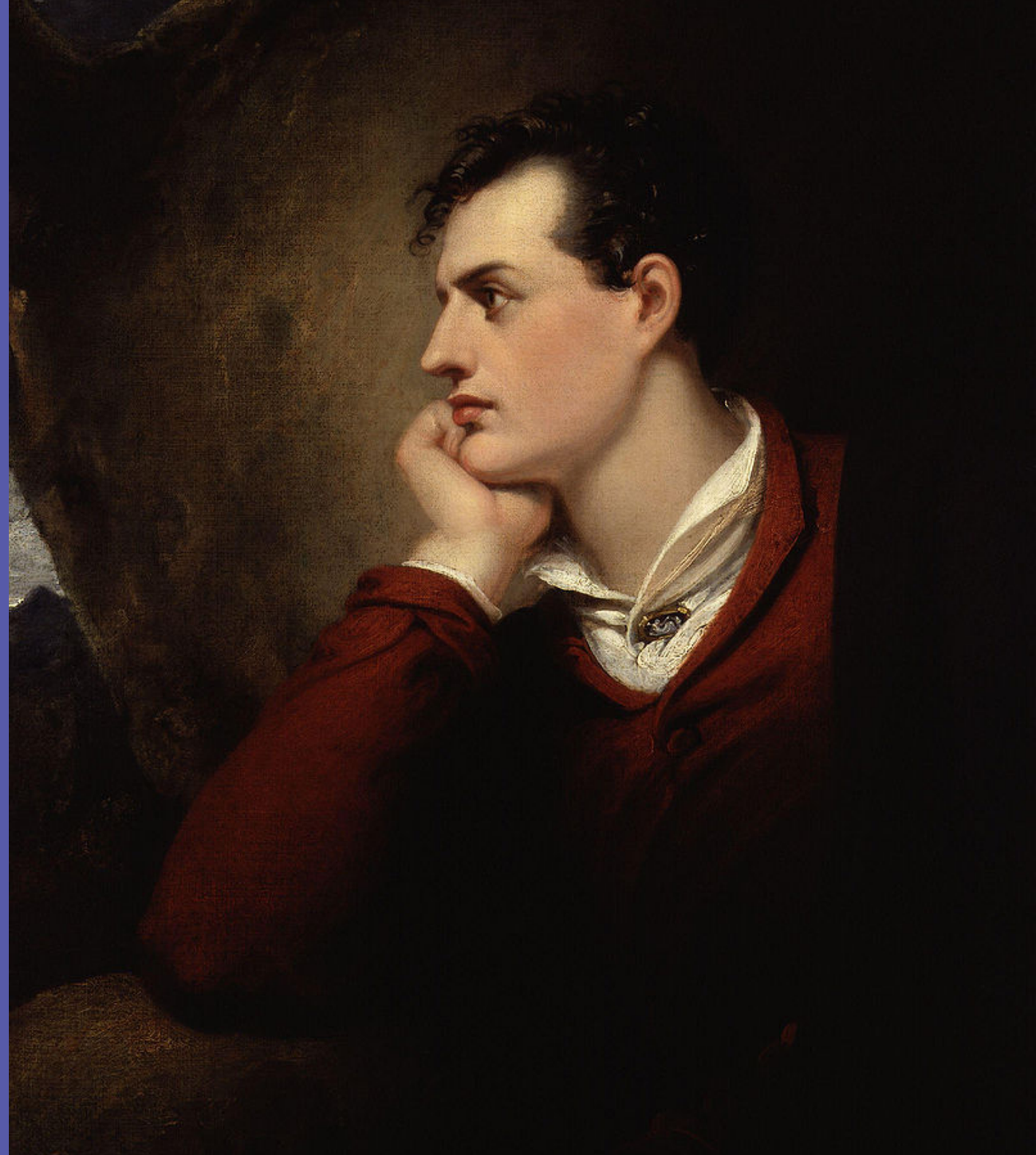
This was the first published algorithm ever specifically designed for implementation on a computer, for this reason Ada Lovelace is often cited as the worlds first computer programmer.

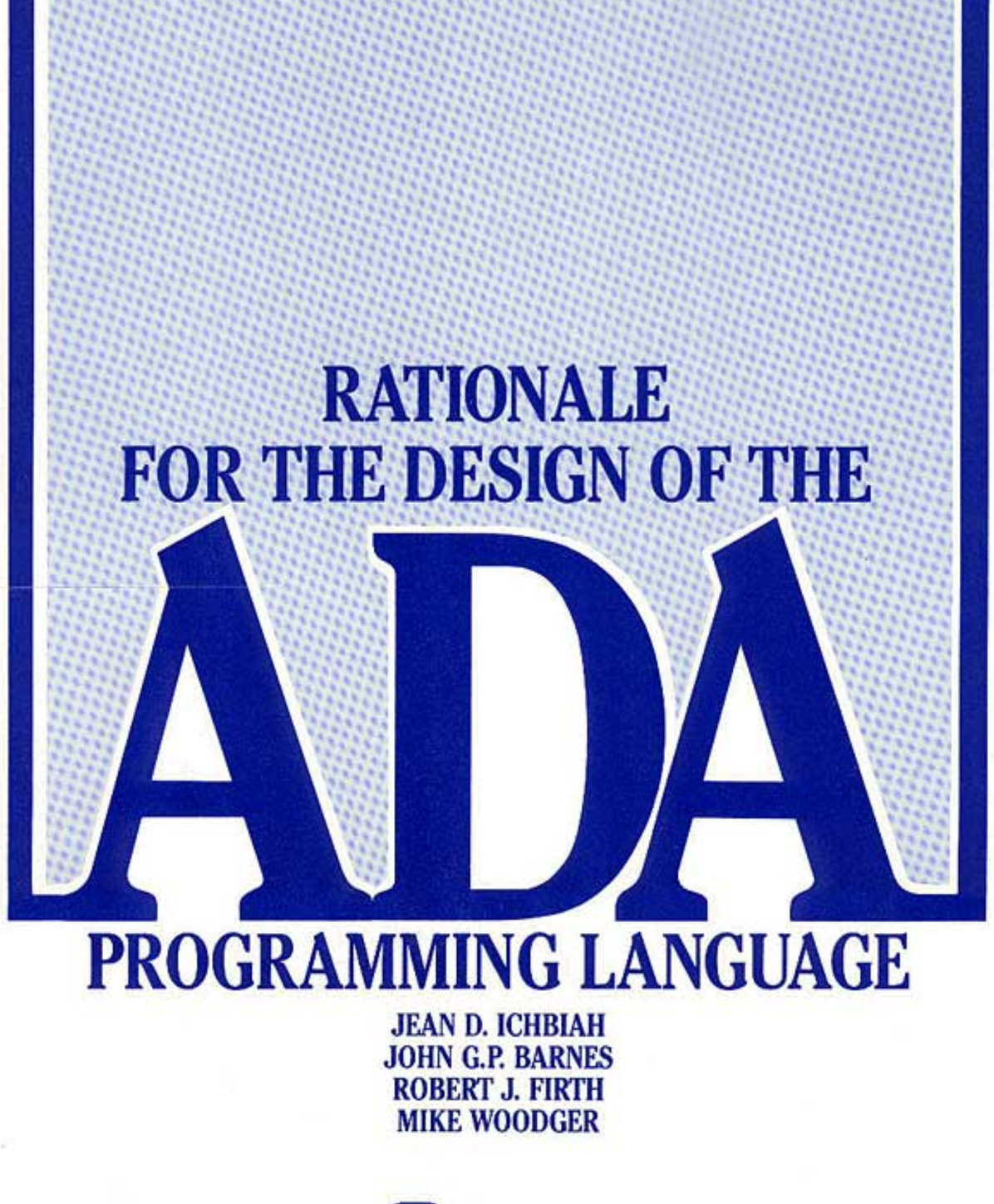
Ada imagined computers could do more than calculations - she believed they could be applied to any problem - even music composition.

Other interesting facts about Ada Lovelace.

Her mother was Anne Isabella Milbanke, Lady Wentworth - a Mathematician

Her father was Lord Byron - English poet.





The Department of Defense created a programming language named after her.

Ada Lovelace Day is celebrated in mid October.

Its goal is to "... raise the profile of women in science, technology, engineering and maths," and to "create new role models for girls and women" in these fields.

My daughter's middle name is Ada.