Ada's Algorithm: How Lord Byron's Daughter Ada Lovelace Launched the Digital Age

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Over 150 years after her death, a widely-used scientific computer program was named “Ada,” after Ada Lovelace, the only legitimate daughter of the eighteenth century’s version of a rock star, Lord Byron. Why?

Because, after computer pioneers such as Alan Turing began to rediscover her, it slowly became apparent that she had been a key but overlooked figure in the invention of the computer.

In *Ada Lovelace*, James Essinger makes the case that the computer age could have started two centuries ago if Lovelace’s contemporaries had recognized her research and fully grasped its implications.

It’s a remarkable tale, starting with the outrageous behavior of her father, which made Ada instantly famous upon birth. Ada would go on to overcome numerous obstacles to obtain a level of education typically forbidden to women of her day. She would eventually join forces with Charles Babbage, generally credited with inventing the computer, although as Essinger makes clear, Babbage couldn’t have done it without Lovelace. Indeed, Lovelace wrote what is today considered the world’s first computer program—despite opposition that the principles of science were “beyond the strength of a woman’s physical power of application.”

Based on ten years of research and filled with fascinating characters and observations of the period, not to mention numerous illustrations, Essinger tells Ada’s fascinating story in unprecedented detail to absorbing and inspiring effect.

From the Hardcover edition.

Ada's Algorithm: How Lord Byron's Daughter Ada Lovelace Launched the Digital Age Details

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From Reader Review Ada's Algorithm: How Lord Byron's Daughter Ada Lovelace Launched the Digital Age for online ebook

Janta says

This is a fairly short book. In reading it, I frequently felt like the author had "padded" the book with irrelevant detail (e.g., a mention of Charles Dickens includes his birth date and the aside that his birthday made him "a few months shy of being exactly older than Ada by four years"); it put me in mind of writing high school and college papers where there was a word count and every extra word you could cram in was important. The subject matter seemed a little haphazardly organized as well: that same mention of Dickens -- he'd arrived to visit Ada on her deathbed -- warrants a several-page detour into the history of their acquaintance. I just wonder why that information wasn't better integrated into the chronological order of the book. Aside from those quibbles, the book was an okay read.

Miles says

The author argues, persuasively, that it was Lady Ada Lovelace herself, and not her mentor, the scientist Charles Babbage, who truly grasped the potential of algorithmic computation. The year of her great work was 1843. In the misogyny of the time, even the wealthy Ada Lovelace feared to sign her name to the 20,000 word scientific paper that was appended to her translation of a French scientific paper about Babbage's Difference Engine. A paper by a woman would not be taken seriously. But in that article, signed AAL, written collaboratively with Babbage as editor, she foresaw the future in ways that are fascinating to behold.

You can read her great scientific contribution here. http://fourmilab.ch/babbage/sketch.html

Essinger's biography walks us through upper-crust England in the early 19th century. London was dominated by its 5000 super-wealthy aristocrats who floated far above a vast pool of people living in great deprivation. London was the playground of Lord Byron, the poet, Ada's father. His brief marriage to Ada's mother quickly fell apart as he resumed his affair with his half-sister and generally libertine ways. Pursued by his debts, he left England and never saw his daughter after the age of one. The mother protected her daughter from the wagging tongues of high society and sought to prevent her from becoming a wild romantic like her father by assuring a rigorous mathematical education that would (surely!) control her passions.

Ada, however, developed a passion for mathematics, and made herself a student of Charles Babbage (and others). After marrying "well" into a titled family of her class, and producing an heir and two more children, she returned to mathematics and her work with Charles Babbage and became the first human being on earth to grasp the fundamental concepts of computer programming - data, functions, processing, the capacity of a machine to apply rules to data to reach conclusions that were implicit in the data. To read her words is to feel oneself in the presence of genius, and of a mind aware that it is uncovering something that may be utterly novel.

If Essinger's story of Ada sometimes dwells a bit too much on peripheral information about the people of Ada's world (Charles Dickens himself makes an appearance as an acquaintance, and others more obscure than he are also described), Essinger must, as a scholar, be forgiven for walking us down a few alleys of lesser interest. Overall we get a sense of the rarefied world of Ada Lovelace, and the powerful mix of abject misogyny and profound class privilege that enabled a mind such as hers to emerge, and to find an opportunity to express itself on a subject that she alone grasped to its full depth.

Essinger concludes that while Babbage provided the machine (his Difference Engine and the proposed Analytical Engine) and the context for Ada Lovelace's thought, she alone saw their implications to their full depth. Not only did she exceed him in theoretical explication of computational ideas, but she also proposed to manage his public relations and business affairs, an idea which he, perhaps in a snit of Victorian male rectitude, rejected. In hindsight it appears he would have much benefited from her connections and worldly competence, had he only chosen to accept her offer of patronage / managerial support. But instead, as it happened, Babbage never completed the gears and levers and wheels that would have enabled the Analytical Engine he had imagined to function, and its operations remained a theoretical proposition in his mind, and more deeply it seems, in the mind of Ada Lovelace. It would be at least 75 years before the mechanical systems (electricity! vacuum tubes!) that would enable Ada Lovelace's algorithmic vision to become a reality were invented and deployed.

Margaret says

This is definitely another case of I was going to like the book regardless of how it was written because the subject was fascinating. Ada Lovelace was someone I was eager to read about. But a note to biographers of women in STEM: I'm here to read about their work, not your speculation about their lovelife. This is the second book I've read in the past couple months that devotes a disproportionate amount of time to that when there's no evidence one way or the other and it doesn't even matter.

Kat Chen says

Honestly, this book disappointed me. I purchased this novel from the MIT press bookstore, high on a wave of feminism and the desire to learn more about early engineers. Though this book did provide an excellent background history on both Charles Babbage, Ada Lovelace, and Lord Byron, it was disappointing in all other aspects. At times, the word choice was confusing. It seemed that the author chose words with discrete double meanings, in which both meanings could apply in that situation. At other times, it seemed that the "circumlocution" that the author so mocked within the book, was also his preferred style of writing. Perhaps a show of camp?

However, the most utterly let-me-down moment of the book came when I realized that a lot of the behind-the-scenes work and brilliance of Ada Lovelace was inference at best and surmise at worse on the author's part. Though, he actively admits that he 'believes' and 'can deduce through logic' the role and emotions of Ada Lovelace concerning Charles Babbage and his work, it is at the end of the day, mere speculation. Finally, he spends a good chunk of the book proving through letters from Ada that his speculations are grounded in evidence which is circumstantial most of the time. Though some parts of the book were educational, I do slightly feel like I've wasted my time.

Nicholas says

Ada's Algorithm has its moments, but suffers from the same problem as *Hedy's Folly*; it feels like an

inordinate amount of time is spent on the man Ada's usually been stuck in the shadow of: Charles Babbage. At least this time I understand it a little bit more. Lovelace's monumental claim to fame is razor thin. The entirety of her professional work in the area of mathematics and information science can be found in a single document: a translation from the Italian of Luigi Menabrea's memoir on Babbage's Analytical Engine for an English audience. In addition to the rather competent translation, Ada included her own notes that elaborate upon the operation of the engine (totaling some 20,000 words, almost three times the length of Menabrea's memoir) that are mainly recognized today for their visionary quality. Lovelace seemed able to envision what even Babbage couldn't, the true capabilities of the Analytical Engine as a digitizer of information, including even, foreseeing the possibility and means of digitizing music.

One might say that Essinger's focus in this short biography is to vindicate Lovelace's contributions to the field of computer and information science. The tone is almost singularly defensive and Essinger makes it a point to refute previous attempts to marginalize Lovelace's contributions to the science by attributing her work to Babbage himself. To his credit, I think Essinger, through an examination of the epistolary evidence, successfully proves that Ada's "Notes" were entirely her own creation, including the much acclaimed "Section G" where she describes in detail how the Analytical Engine might be configured to calculate a sequence of Bernoulli numbers - the world's first attempt at an algorithm, a sort of proto-program, which is still not quite beyond controversy. Ada has been dismissed for being a fake, a dabbler and, naturally, insane or ill - incapable of the work that was published with her initials attached. The suggestion being that Babbage did the 'real work' and that Ada was nothing more than an interpreter. As the 'Ada Initiative' points out:

> Interestingly, these arguments are rarely used to question men's authorship of joint works; indeed, mental instability or difficult personalities sometimes seems to add to the reputation of male scientists and mathematicians: Nikola Tesla, John Nash and Isaac Newton to name just a few.

How absolutely true that rings doesn't it? Surely it could be expected from the time period in which Lovelace lived, but today as well? Well, of course. (See Sean Carroll's summary of the PNAS study of gender bias in science.) In any case, after reading Essinger's work I'm pretty much convinced by reading Lovelace's own words that in several passages in "Notes" she "invents the science of computing, and separates it from the science of mathematics. What she calls the 'science of operations' is indeed in effect computing" (166).

My reservation in recommending this book is that it hardly feels like an intimate portrait of Lovelace's life. Sure, a lot of the primary evidence is no longer with us - Lovelace's domineering mother, the Lady Byron, burned much of her correspondence upon her death and even went to the trouble of retrieving letters saved by other individuals and *paying* them so that she could get rid of it. What's left leaves a lot of guesswork for the modern biographer. Essinger does an admirable enough job piecing together the puzzle and identifying explicitly when he's taking and educated guess. The problem is that some of the figures in Ada's life loom as large, if not larger, than she does in the course of the narrative. Her father, the Lord Byron, figures very heavily for the first 30 or so pages, with very small mentions of a fragile young Ada's life as the notable poet's romantically expires. From thence to the meeting of Babbage we're treated with a window focused exclusively on Ada - and it's great! Upon meeting Babbage, however, we're treated to a long digression on his life, his origins, his relationship with his father, his work habits, his marriage, his children and his famous soirées. We're treated to a detailed explanation of the workings of both his Difference Engine and his later Analytical Engine, and while we are, we get only glimpses of Ada in the background. To a certain degree, I kind of understand it. Lovelace's claim to fame came in direct connection to Babbage's work and her friendship with the lonely inventor and Essinger is trying to elucidate the exact workings of their relationship in order to build his assertion that there was a professional respect between the two and that Babbage clearly thought her both capable and inventive herself to discredit more modern claims to the contrary. The problem

is that it no longer feels like Ada's story. Unlike, *Hedy's Folly*, at least *Ada's Algorithm* is more appropriately and accurately titled (and subtitled). The subject is the work, not necessarily the Lady Lovelace, so digressions into avenues that support her achievement are therefore warranted.

That being said, I ended feeling like I had only a superficial acquaintance with Lovelace. She remains as enigmatic and aloof to me as she was before reading, and that disappoints me somewhat. She was timid and shy, especially around her mother, desirous of approval and meeting her responsibilities as determined by her Age, but in private confident and willful - a woman clearly in love with understanding and knowing and with a thirst for knowledge that is all the more impressive because of the conventions she flouts in the pursuit. Disciplined of mind and yet completely imaginative, she's the perfect synthesis of her father and mother. A pretty interesting tale of a pair of visionaries born well before their time and a story of what might have been. Essinger's work is well-researched with a thorough list of sources to follow up on.

Still on the lookout for a real biography.

Brian Clegg says

Women in science have, without doubt, had a bad press, though thankfully this has now been reversed. There was a time when the likes of Caroline Herschel, Henrietta Leavitt, Emmy Noether and even relatively modern figures such as Rosalind Franklin and Jocelyn Burnell would have had their roles played down by the science writing community. Now, these individuals are rightly feted. But there is also the danger that, in the rush to right past wrongs, we overemphasise some individual's roles - not helped by science writing's urge to focus on individuals where science is often a collaborative venture.

Perhaps there is no individual subject where that tightrope has to be walked more carefully than with Ada King, Countess of Lovelace, who has become such a symbolic figure that we need to be really careful not to inflate her actual role out of all proportion. We shouldn't hide Ada away, nor should we suggest she wasn't an intelligent person. She had a strong interest in maths and thought at length about the potential applications of Charles Babbage's innovative idea for an 'analytical engine' that was a close, if dead-end, predecessor of a programmable computer. Yet we should also remember that Ada's sole claim to fame is writing about Babbage's failed invention. This is the tightrope that presents itself to James Essinger in writing Ada's Algorithm. And the test of his effectiveness will be whether or not he falls off.

It was very interesting to read about the early life of Ada Byron (as she was before marriage), and her sad, very early death, as we usually only hear about the period when she was interacting with Babbage. The impression is of a rich young woman of enthusiasms, at a time when anyone with money was not supposed to seem interested in things (arguably Prince Albert's second problem in getting accepted, after being German). This cultural expectation to avoid serious enthusiasm was doubly strong for a woman. Ada's father, Lord Byron, had little direct impact on her, being absent from when she was very young, so the formative parent was very much her mother, who while not ecstatic about Ada's mathematical interests, at least allowed her to get some training.

Essinger's first test was in his presentation of Ada's mathematical abilities. He tells us that she had the potential to be a great mathematician. This may have been true, though no direct evidence is put to us - she certainly was not producing theorems, Noether-style. Instead, though Essinger tells us of genius, what he shows us is her enthusiasm. She certainly seems to have loved maths, and that's probably as much as can be deduced from the information presented. Several times, Essinger accuses Babbage (whom he seems to have developed a dislike for) of being a dilettante. This was probably true to an extent - though he did produce designs for his calculating engines and a part of the Difference Engine - but it also seems clear that Ada,

portrayed by Essinger as the one who was more application-minded - was equally a dilettante rather than professional. You could hardly expect anything else from someone in her position at that time.

The second test is how the contribution Ada makes to the remarkable Analytical Engine idea. This was through the notes she added to the translation she made of a French description (by an Italian scientist) of Babbage's work. Lazy portraits of Ada portray her as a programmer - this clearly isn't true, though the notes include what could be considered the design for a program which appears to have been worked on with input from both of them. But the remarkable claim that Essinger makes is that Ada understood what the Analytical Engine was, foreseeing the whole business of computing, while Babbage, it is claimed, hadn't a clue what the Analytical Engine could do, other than be a better calculator.

Although Essinger presents Ada's words in support of this, they are far too vague and woffly to be definitive, and where she does make a claim that is interpreted as being non-mathematical, she seems to be referring to the approach in (then) modern maths of using operators, which certainly resembles some computing ideas, but was quite separate. There is no doubt that Ada stresses how the Analytical Engine would be something new and transformative - but it seems a bizarre assertion that Babbage had no idea of what his own invention could do, while Ada was the only one to see it.
There is also a classic example of oversell when Essinger claims that Ada 'foresaw the digitisation of music as CDs...' This is because Ada remarked that supposing the 'fundamental relations of pitched sounds in the science of harmony and of musical composition were susceptible to [the Engine's] expression and adaptations, the engine might compose elaboration and scientific pieces of music...' This is not about the optical storage of music data, but about mechanising the kind of mathematical approach Bach, for example, had played with in his work.

(I can't avoid also flagging up a strange bit of history of science, totally unconnected to Ada. When Essinger is describing the eventual development of computing, he remarks 'The dream began to start coming true in 1881, when a young engineer, William J. Hammer, who was working at Thomas Edison's laboratory at Menlo Park, New Jersey, made an accidental discovery that turned out to be of great importance. He discovered an inexplicable current in an evacuated vacuum tube that turned out to lead to the discovery of electrons.' Yet Crookes and others had already made wide investigations of cathode rays in the 1870s - this seems an odd re-write of history.)

Am I convinced, as the subtitle says, that Ada 'launched the digital age through the poetry of numbers'? No, not at all. She put a lot of effort into explaining and speculating on the application of a failed piece of technology. But she didn't launch anything, and certainly not the digital age. However, despite the book's flaws in emphasis (and an occasional tendency to use over-long quotes from the tedious writing style of the period), this is an entertaining biography of Ada Lovelace, and though it is in danger of over-emphasising her role, after so many years when women's real contributions were overlooked, such a response is hardly surprising.

Poppy says

I found this biography by chance in a charity shop, just after wondering whether I'd find a book about Ada Lovelace there. Naturally I was thrilled, and started reading it straight away. But I found it a bit disappointing - the subject matter is infinitely interesting, and I liked how we were given a good background about Ada's parents, but in the second half I felt like it just became a biography about Charles Babbage. Now I understand that you can't have one without the other, but I found that Essinger focused too much on Babbage, who, to be honest, I'm really not interested in. I appreciate his importance in Ada's life, but I felt his story could've been summed up in a chapter, but Essinger just kept going into such great detail about

him! Otherwise it was a good overview about Ada's life, though some of it felt like guess-work being supported by lots of long quotes.

Amy says

Wonderful book about Ada Lovelace which gives a clear picture about not only the woman but also the people and society around her.

Lola says

I am many things. I am a reader, a writer, a cat lover, a history nerd, and a feminist. Most importantly, I am a book opportunist. What could this mean? It means that, whenever I have a research paper or project in which I am able to chose the topic, I pick something that has a book related to it on my to-read list. This way, I can buy and read books I actually want to read and count it as my schoolwork in my schedule. I kill two birds with one stone, and I usually get an A because my generation has apparently forgotten books exist for research. They just don't know my tactics. I haven't figured out how to make Harry Potter the subject of a research paper, but I'm sure I'll work it in one day.

As both a history nerd and a feminist, Ada's Algorithm excited me. I knew a little about Ada Lovelace before reading this biography; I had listened to Stuff You Missed in History Class's podcast on Lovelace (which is excellent), but that was about the extent of my knowledge. For a busy, tired college student, Ada's Algorithm is a quick and easy read. I thought that it fleshed out the story of Lovelace's life and work well, though I guess I did need more of the technical math aspects for my project. Whatever. I also thought that it spent too much time of Babbage, but that could also be my inner feminist raging. There was actually so many gems about Lovelace in this biography. Like the fact that she wanted to build herself wings so she could fly as a girl? Or that one of her math tutors wrote to her mother worried that Ada was thinking too math like a man and that her "fragile" female body couldn't handle that sort of brainpower? God, I love history.

Ada Lovelace, you were brilliant, imaginative, and a pioneer in computer programming. I don't believe for a second that your work isn't yours because we all know what your contemporaries thought of a female mathematician. The patriarchy always tries to bring us down. You changed the world for the better; you predicted what computers would do before that was even a concept. You're awesome, and I salute you. Babbbage, I guess you're cool to.

Definitely recommended!

Heather Victoria says

I really wanted to read this, but the writing was terrible. Commentary on Ada Lovelace somehow sounded condescending and juvenile at the same time. I couldn't get past the beginning chapters. The biography follows a direction that makes very little sense. Would love to read more about her by a more competent writer.

Hannah says

This was a delightful account of Ada's life. I really enjoyed reading about her relationship with Charles Babbage. Essinger's book is very readable and entertaining. We often think of math being so cut and dry, but Ada really used it in an imaginative way. It makes me want to start to learn programming.

Ineffablyschmoo says

This book was ok as a read but never quite achieved lift-off.

I was attracted by the subject matter -Ada Lovelace, who inspired computer programmers to name a programming language after her, was Byron's daughter, a maths fanatic who saw the future of computing in the era of Dickens, before computers were even born. Who wouldn't be? Here is a woman, before suffrage and equal rights, in a time when the idea of women being educated was seriously questioned as a dangerous thing due to their 'fragility', who not only learnt with a passion but also saw clearly problems men of the day barely grasped. I wanted to know what made her different, and what made her the same - what does she desire, aim for, dream of, and why maths got a hold of her. In essence, I had high hopes that I would learn, be inspired and be intrigued by an insight into a woman who may not have been extraordinary, but who was certainly smart and driven in a time where this was unusual.

So perhaps my hopes were high. As it is, the author gives a serviceable, and occasionally intriguing, account of a subject - perhaps rather tellingly - who was admittedly poorly preserved in terms of letters, accounts, diaries etc. The book, perhaps unsurprisingly, is strongest in its accounts of her background - Byron is well-biographied, but often fails to incorporate the facts into a compelling and engaging narrative. There is almost more detailed and engaging talk about all the topics around Ada than there is about her - Charles Babbage is thoroughly discussed, and many others given a look in, yet Ada remains elusive, as I imagine, the stories of many other ordinarily extraordinary women do.

The book was interesting enough, but the writing was sometimes repetitive, sometimes unclear and often de-centred from Ada. As a biography of Ada, it misses the mark a bit,as you come away feeling distanced from her. As a compelling tale, it too misses the mark, with many deviations and many sidetracks followed. I would have loved more discussion of Ada, and less of the people connected to her. Likewise, a book which set her in a feminist context, looking at what it was to be a smart woman at that time, would have been of interest. As it was, the book was ok, a quick read that gives a glimpse of a remarkable woman - but nothing more than a glimpse.

Juan Tomás says

Si bien el libro es entretenido y ciertos capítulos - el 11 especialmente - resultan muy interesantes, da la impresión de que, con objeto de justificar las conjeturas que pueblan su texto, el autor no deja de hacer intercalar fragmentos de la correspondencia de Ada que quedan fuera de lugar, por no hablar de los devaneos con Dickens, etc. que no acaban de venir a cuento.

Katherine Payne says

Take this book with a pinch of salt. Essinger provides a lot of hearsay and unconfident assertions with phrases like ‘there is evidence’ – what evidence? For an introduction into Ada’s life it does the job, but might be best read alongside other biographies. It definitely feels padded out purposefully by full letters rather than extracts and heavy biographical info on Charles Babbage, who isn’t necessarily who you read for.

LAPL Reads says

Ada Lovelace was the only legitimate child of Lord Byron, the brilliant and disturbed poet who died at thirty-six after living a life of excessive debauchery. Her mother came from a wealthy, fairly open-minded family, and for a woman at that time she received a somewhat decent education. The marriage lasted a little over a year, when Lady Byron took the young baby, and ran away from her controlling husband. Because Lord Byron had led a most profligate life, rife with an abuse of drugs and sex, it was one of Lady Byron’s chief goals to protect Ada from her father. It was not only Lord Byron's behavior that was cause for alarm, but there was fear that Ada had inherited some of the Byron family’s less desirable characteristics. In order to rein in any of these traits, her mother exerted an enormous amount of control over the child, and the young girl was trained to be respectfully obedient, with no room for questioning her mother's authority. The young Ada was brought up by tutors and at an early age exhibited a fine mind. She was an excellent student, a talented artist and linguist, and had a unique imagination. Her mother's main goal in giving Ada an exceptional education was to have her marry well. Ada did go on to marry well and have children, but there was a good deal more to her life than what her mother planned.

When seventeen-year-old Ada and her mother lived in London she was presented to society in order to find a suitable husband, but one social evening would be momentous. Wednesday, June 5, 1833, mother and daughter stepped out to attend a party where Ada met Charles Babbage, the creator of the Difference Engine, which was an early calculation machine. For the forty-two-year-old widower Babbage, and the teenage Ada, it was kismet and the subject was mathematics. On their shared passionate interest in mathematics, mathematical theory and philosophy, and what it would mean for Ada, James Essinger says it all, ". . . Ada Byron's insight into the future of calculation would erupt into a new and most radical kind of imagining, and would give her a vision of a kind of Jacquard loom that wove, not silk thread, but arithmetic and mathematics. In other words a computer." The Jacquard Loom was a French mechanical loom that used punch cards, and Babbage's knowledge of this device prompted him to use the same method in his calculator. Ada would go on to work with Babbage on his Analytical Engine and write notes for it, and the notes have been called the first computer program. In her notes she envisaged Babbage's creation would lead to greater possibilities than being an advanced type of calculator. For over a decade they continued to work together, until her death after prolonged suffering from uterine cancer.

Among scholars there has been much debate as to the amount of credit is due Ada Lovelace, with a few writers accusing of her being a drug user/abuser like her father, and that she went mad as a result. Quite often she took laudanum (a combination of opium and brandy) to relieve the ever-increasing pain from advanced uterine cancer. She never was addicted to drugs, but rather to learning prompted by her endless curiosity. James Essinger addresses the differing opinions and attributes some of it to outright misogyny. However there is very little dispute about what she did envision for the future use of a device such as the Analytical Engine. Also, the doubters certainly must wonder why Ada has been honored throughout the world with buildings named in her honor; the computer language Ada, created by the U.S. Department of Defense, was named after her and the reference usage manual was given the number of her birth; the British Computer Society has awarded a medal in her honor; there is an Ada Lovelace Day; the Ada Initiative which encourages and supports women in technology and other endeavors; and three years ago, Google celebrated

her 197th year. She was a remarkable woman who overcame the embarrassment and notoriety of her brilliant but flawed father; her controlling and manipulative mother; financial upsets; and endured great pain at the end of her very short life at thirty-seven. And she was remarkable because her intelligence, inventiveness, and creativity persisted in spite of the obstacles.

Reviewed by Sheryn Morris, Librarian, Central Library