

The Arc of History

by Laurence Scales

The Electric light is as old as lightning. In the 18th century natural philosophers joyfully generated momentary sparks of static electricity by rubbing glass bottles. Clive of India's secretary even managed to get a tiny spark out of a fish, but it could barely be seen in a dark room let alone light the street.



Generating electricity in 1878 (Illustrated London News image by courtesy of the Royal Institution)

'Half a dozen harvest moons shining at once in the Strand,' were lit outside the Gaiety Theatre in August 1878. The 'hard working people' of London would not have been aware of the coming of electric light until they saw those harvest moons. They were installed by the theatre manager, John Hollingshead who brought them over from France. Hollingshead (formerly one of Charles Dickens' best hacks) took some trouble as there was then, of course, no plug sockets.

The incandescent bulb is often presented as the key component needed to light the world with electricity. Hollingshead had arc lights (explained shortly) which preceded bulbs. There were other key inventions, a long time coming, that brought us the life electric. Why do we not honour the inventors of the generators that lit the light bulb?

After the battery was invented in Italy in the 1790s it was then only natural for someone to make a bigger one. A few years into the 19th century, Humphry Davy at the Royal Institution assembled two hundred window-box sized cells capable of making a white hot spark

across a four inch gap. From the heat it produced air began to rise and the spark was distorted upwards into an arch or arc. Unlike the brief flash from the discharge of static the battery produced a sustained current, if only for seconds. Davy was investigating the effects of the spark in decomposing matter, but he saw the possibility of a new form of lighting, the 'arc light'. At that time, a short walk away in Pall Mall, gas flames were first being demonstrated (in modern times) as street lighting.

Davy's attention turned in 1815 to another kind of light, the safety lamp that would allow miners to work in safety even in the presence of explosive atmospheres. It was still an oil lamp. William Grove, himself a stalwart of the Royal Institution, had been experimenting with filament light bulbs and attempted to bring the Davy lamp into the electric age in 1845 by electrically heating a platinum wire safely isolated inside a glass bulb. It did not last long enough to be practical but his bulbs were the ancestor of the modern bulb.

With the arrival of an improved battery in 1836 the electric telegraph could be born, but the current it needed was too small to be of any use for lighting. Davy's successor at the Royal Institution, Michael Faraday, had found in 1832 that he could generate a feeble current by hand, by simply turning a piece of copper between the ends of a horseshoe magnet. Frederick Hale Holmes was able to demonstrate to him a generator 20 years later still with horseshoe magnets, but now rows of them, able to support an arc. The intensity of the arc light was perfect for a lighthouse. (It was around this date that the present Trinity House experimental lighthouse was constructed at the mouth of the River Lea.) But lighthouses were usually the last places on earth convenient to electrify. How did you deliver coal, run steam engines and maintain temperamental new generators on an isolated rock?

In 1862 a German chemist, Herman Sprengel, moved to London and stayed. Within a few years he had invented a device entirely unrelated to electricity that little he knew would revolutionise science and help light the home. It was an air pump, an essential item in the laboratory of any showman 'natural philosopher' since the days of alchemy. It removed the air from a vessel. His was the best yet and it could provide almost a complete vacuum. Again, many years had to pass before his innovation found its potential.

Londoner Charles Wheatstone and German Werner von Siemens invented a generator in 1867 that, as it were, pulled itself up by its own bootstraps. As it got going its own current created the magnetism that enabled it to generate electricity. Sadly Wheatstone, who thus helped to usher in electric light (he was also behind the first telegraph) did not live to see it lighting the city.

Hard on the heels of the Gaiety Theatre experiment more arc lights appeared in the Victoria Embankment Gardens. These were 'Jablokoff Candles' in which the arc leapt across the small gap between two

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The Arc of History (cont).

carbon rods which were slowly eaten away in the ferocious heat. The system needed nursing so that the small gap did not widen beyond the reach of the spark. Anyone who has seen a welder's arc will know the painful intensity of such a light – rather more than is comfortable. They may have lit up the gardens with the audible sizzle and the whiteness of a flare.

The world was now ready for the light bulb and Joseph Swan and Thomas Edison provided it after years of trial and error in 1881, thanks partly to Sprengel's vacuum pump which emptied their glass bulbs and prevented the glowing filament from burning up. Lady Randolph Churchill claimed to have the first house in London lit by electricity but she was beaten by the eminent chemist Sir William Crookes because he had the necessary expertise to install it himself. Numerous small scale London power stations soon sprang up at such places as Kensington Court, Carnaby Street, Notting Hill, St James's, Manchester Square, Paddington, Maiden Lane, the Grosvenor Gallery, Whitehall Court and Sardinia Street. The current soon lost its potential in the wires so it could not initially be sent far.



Joseph Swan Light Bulb c.1877. Image by the author.

At exactly the moment when gas lighting might have had its day, the gas mantle was invented, producing a bright white light instead of a flickering flame and it kept gas lights in the home for many more decades – despite the soot. But the cleanliness of electricity gave it an advantage, particularly in shops.



Kensington Court Electric Lighting Station. Image by the author.

But the electric arc was not - and is not - yet dead. It has remained in use for search lights and cinema projectors. Herman Sprengel's pump was used in the discovery of the inert gases such as neon, used in later light sources such as neon tubes and lasers. William Crookes experimented with tubes in which he played with a current passing through a vacuum. In the hands of Wilhelm Röntgen a Crookes tube revealed the existence of an invisible light: X rays. Paradoxically, the power source needed to 'light up' the first X ray tubes was a very high voltage momentary spark of static electricity. And that's where we started.

Laurence Scales is a guide specialising in offbeat historical walking tours, and a writer focusing on intriguing and amusing tales of discovery, invention and intelligence. He is a volunteer working at the Royal Institution for which he has devised walking tours, and also guides walks and tunnel tours for the London Canal Museum. Welcoming residents and visitors who want to look beyond the main London attractions he reveals a wealth of lesser known historic sites and offers a double-take on some famous ones.

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