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Celluloid: the story of the plastic that made Hollywood

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From billiard balls to Hollywood films, celluloid revolutionized technology and entertainment, transforming how we capture memories and tell stories through a groundbreaking material that made cinema possible.

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History can sometimes take an unexpected turn. One of these curious, revolutionary twists came in the mid-19th century, when the tale of an unassuming everyday object – the billiard ball – ended in cinematic proportions.

Billiard balls were originally made of ivory, and the need to replace this scarce material led to the invention of a new, extraordinary material: celluloid. Considered the first semisynthetic plastic, this substance did more than just pave the way for future plastics – it was also vital in the earliest systems for capturing and projecting moving images.

Without it, cinema would not exist as we know it today.

From billiard halls to Hollywood

In the mid-19th century, the game of billiards was all the rage, and the industry surrounding it moved large sums of money. Michael Phelan was perhaps the most famous industrialist, and indeed player, of the game at this time.

The game's success meant large amounts of ivory were needed to manufacture the balls, to the point where, in 1867, The New York Times warned that demand for elephant tusks could put these animals at risk of extinction. In his search for an alternative material, Phelan offered an extraordinary prize:

$10,000 worth of gold to whoever could find a suitable substitute for ivory. This reward would be forever linked to the birth of both plastics and cinema.

The solution was found by inventor John Wesley Hyatt and his brother. It took the form of celluloid, a material obtained from cotton-derived cellulose and set with camphor. This material could be heated and repeatedly moulded, making it one of the earliest thermoplastics.

Hyatt's promotion of the material encapsulated the spirit of the age. One pamphlet declared: "As petroleum came to the relief of the whale, so has celluloid given the elephant, the tortoise, and the coral insect a respite in their native haunts; and it will no longer be necessary to ransack the earth in pursuit of substances which are constantly growing scarcer."

As the historian Jeffrey Meikle highlighted in his 1996 book American Plastic, by replacing scarce or costly materials, celluloid also played a major role in democratising a vast array of products for the rapidly expanding middle class.

Celluloid in the cinema

In the end, celluloid was only briefly used to make billiard balls. However, it did become synonymous with another world altogether: cinema.

In 1880 businessman George Eastman, who manufactured cameras, visited Hyatt with a clear proposal. He wanted to swap cumbersome photographic glass plates for a lighter material. Celluloid seemed ideal.

This new material allowed Eastman to put photographic emulsion onto long, flexible rolls, allowing multiple photos to be taken with the same compact camera. The first Kodak camera was released in 1888. It popularised photography and transformed the way people recorded their daily lives.

Just a few years later, thanks in large measure to the work of Hannibal Williston Goodwin, celluloid film opened the doors to the development of cinema.

In France, the Lumière brothers, sons of a renowned Lyon photographer, were working with this flexible material. By the end of the 19th century, their family came to own one of the most important photography factories in Europe.

An old film camera image. Prawny/Pixabay

The Lumière brothers and the birth of cinema

Louis and Auguste Lumière went beyond the confines of still photography. Inspired by the technology's advanced optical and mechanical capabilities, they developed the Cinématographe, a device that made ingenious use of perforated 35mm film. With a turn of a handle, it captured a quick succession of images that could then be projected onto a screen.

Each scene lasted only a few seconds, but it was enough to create the entirely new sensation of witnessing reality in movement. Cinema had begun.

The Lumière brothers' factory would go on to become the first-ever cinematic studio. It was where they filmed La sortie de l'usine Lumière, which premiered on December 28, 1895, at the Salon Indien du Grand Café in Paris. The film only showed workers leaving the Lumière factory, but the mere fact of seeing moving pictures projected on a screen was a revelation for audiences at the time.

The Lumière brothers' Cinématographe, 1895. NDLA

Celluloid was what made this technical marvel possible, and its name became synonymous with the film industry.

Within a few years, cinema had become widespread and democratised access to spectacle and entertainment. On the screen, audiences could now laugh at Buster Keaton and, with the advent of cinema audio or "talkies" in the 1920s, hear voices like Al Jolson for the first time.

The dangers of early cinema

Despite its vital role in cinema's beginnings, celluloid also carried some major risks. Nitrocellulose film was extremely flammable and would break down or catch fire at relatively low temperatures. It also released toxic gases over time.

The material's instability caused many fires in projection rooms and storage facilities, meaning large amounts of early cinema's heritage have been lost forever. Film historians estimate that less than half of the films recorded before 1950 – and a far smaller fraction of earlier silent films – have survived to the

present day.

Some incidents were especially dramatic. During the 1897 Bazar de la Charité in Paris, a film projection ended in tragedy when nitrocellulose film caught fire. The event claimed more than 100 lives and starkly highlighted the dangers of this new technology.

The film industry soon found a solution. In the early 20th century, Kodak developed an alternative material based on cellulose aceteate, which was much safer than the nitrocellulose used up to this point. This change marked the beginning of the end for celluloid in cinema.

Despite its dangers, celluloid left an immense legacy. It made cinema possible and also opened the door to a whole new family of materials – plastics – that would profoundly change modern society.

If a material could receive an honorary Oscar, it would undoubtedly be celluloid. Without it, cinema may never have become the great industry of ideas, dreams and stories that we know today.

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