Pre-1900:
The Origins of Animation

Even though we think of cinema as a twentieth-century phenomenon, the art of animation can be traced back a lot further, depending on your definition of the word. Sequential drawings of human and animal figures have been found in ancient Egyptian artwork and many prehistoric cave paintings. Recent claims have been made for a 5,200-year-old bowl found in Iran's Burnt City, which apparently features a series of sequential images of a goat that could have possibly been designed to be spun, producing animation of a kind.

However, a generally agreed definition of animation would probably be along the lines of "single-frame images viewed in rapid succession by some form of mechanism, to create an illusion of movement." Using a definition of that kind, then possibly the earliest recorded animation was created for the devices of Chinese inventor Ting Huan around AD 180. Probably made purely for decorative purposes and as novelty items, these were primitive versions of what centuries later became known as the zoetrope. These early versions held series of drawings that rotated in the rising air when the device was suspended over a lamp, creating an illusion of movement when rotating at the right speed.

The beginnings of modern animation can perhaps be traced back to a paper published by Peter Roget in 1824 for The British Royal Society, titled "The Persistence of Vision with Regard to Moving Objects." This theory referred to the phenomenon whereby the eye's retina retains an image briefly after it has disappeared, which means that if images are flashed in rapid succession they appear to the human brain as one continuous image. If these images differ slightly, especially if they are sequential, then the images can appear to be one moving image. This discovery led ultimately to all cinema, television, and animation.

Spurred on by the persistence of vision discovery came the invention of many optical toys and devices. In 1825, English physician John Ayrton Paris produced his thaumatrope, featuring images on opposite sides of a disc that merged together when the disc was spun on strings. Later came the Belgian Joseph Plateau's phenakistiscope (1831) and Englishman William Horner's Daedalum (1834), essentially a spinning disc and a spinning cylinder in which a strip of sequential images are viewed. The crucial part of these inventions was that the image sequences were viewed through slits to ensure the drawings were seen one at a time to prevent them from appearing as a blur. Horner's name for the device, the Daedalum, means "the wheel of the devil," which perhaps explains why it did not become a popular optical toy until it was patented in the USA and UK in the 1860s and renamed more positively as the zoetrope ("the wheel of life") by the American developer, William F. Lincoln.

In 1877 Frenchman Charles-Emile Reynaud's praxinoscope improved clarity by viewing the sequence of drawings from mirrors mounted in the center of the cylinder. Reynaud later developed his praxinoscope into an early kind of film projector, which he called the Théâtre Optique. Reynaud's device proved a popular attraction in Paris until 1900 when audiences were drawn away from his primitive handpainted animated film strips by the Lumière brothers and their early cinema screenings. In a fit of rage, Reynaud smashed his beloved machines and died in poverty a few years later.

1872

USA/UK

Eadweard Muybridge: Sequential photographs

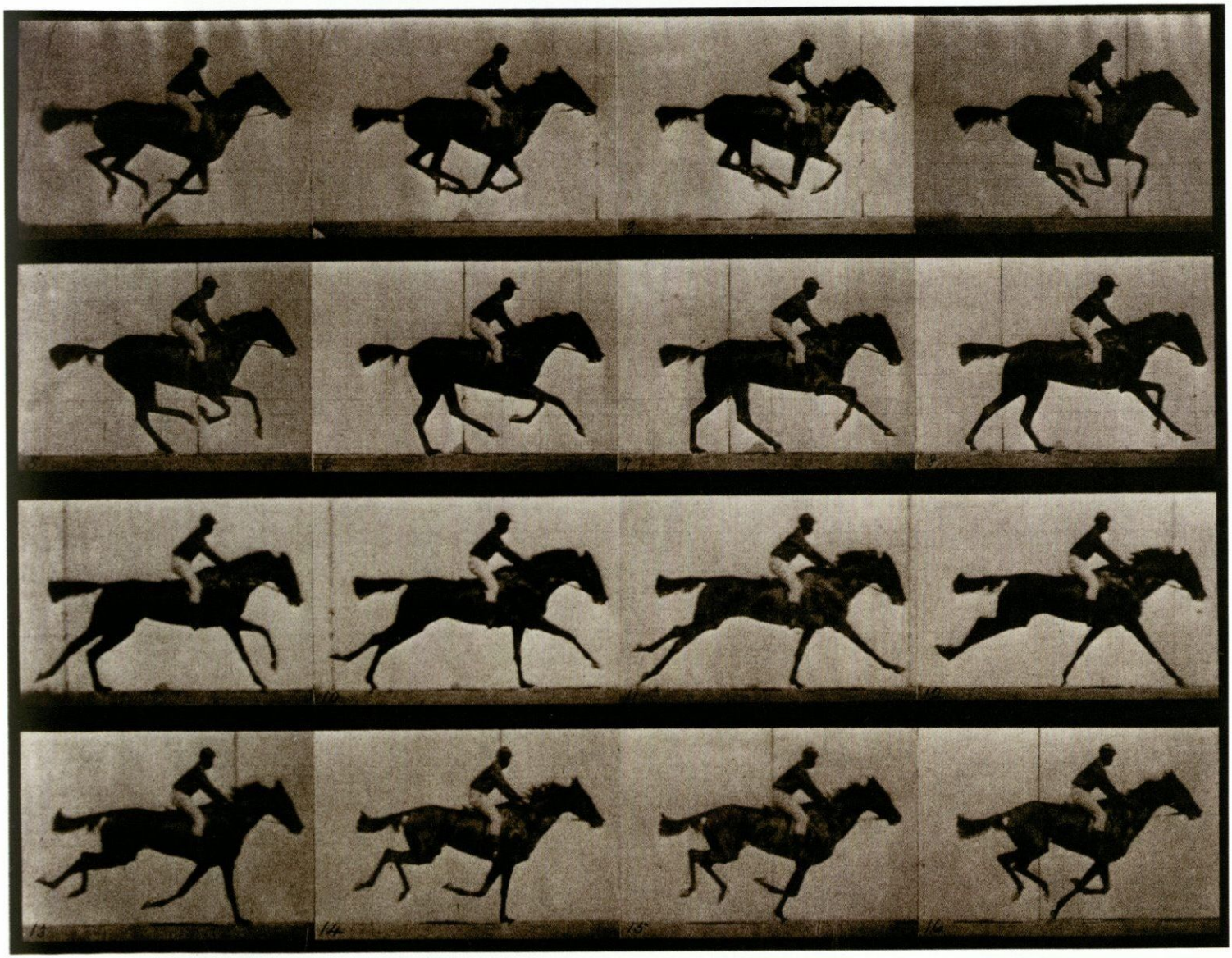
The collections of amazing photographs of animals and humans in motion produced by English photographer Eadweard Muybridge are still available in a series of reference books and are widely used by animators and artists to this day. The multitalented and inventive Muybridge had many strings to his bow, but his most famous work started as a small experiment. In 1872 the former Governor of California, Leland Stanford, engaged Muybridge to prove the hotly debated theory of "unsupported transit," which held that at some point in time during a horse's gallop, all its hooves were off the ground, contrary to the popular belief that at least one foot had to be on the ground at any one time.

By 1877 Muybridge had proved the unsupported transit theory by photographing Stanford's racehorse, Occident, in motion. Encouraged by Stanford to continue this work, he went on to produce a photographic sequence, using 12 stereoscopic cameras placed along a racetrack triggered by trip wires, which the horse passed through, an event which he invited the press to witness.

This project became Muybridge's life's work as he went on to produce series after series of his motion photographs. He galloped horses, flew birds, and walked any animals he could think of in front of his cameras, and after running out of animals, produced photostrips of humans performing a huge variety of different movements and actions.

His ingeniousness did not stop there as, in 1879, he created his own early cinema projector called the zoopraxiscope, a variant of the zoetrope designed to project his image sequences for public viewing. The device projected light through transparent spinning discs on which image sequences were handpainted or photographically transferred.

Muybridge's multicamera system has been adapted into a modern variation, the "bullet time" effect much used in movies such as *The Matrix*. This effect is also a feature of the work of quirky French genius, animator and director Michel Gondry. His early music videos involve a similar line of linked cameras, except they are generally arranged in a curve around the subject and are triggered simultaneously instead of split seconds apart. When viewed in rapid succession, the effect is almost the exact opposite of animation, giving the impression of a camera moving around a subject that is frozen in time.



Sequential photographs

1877

France

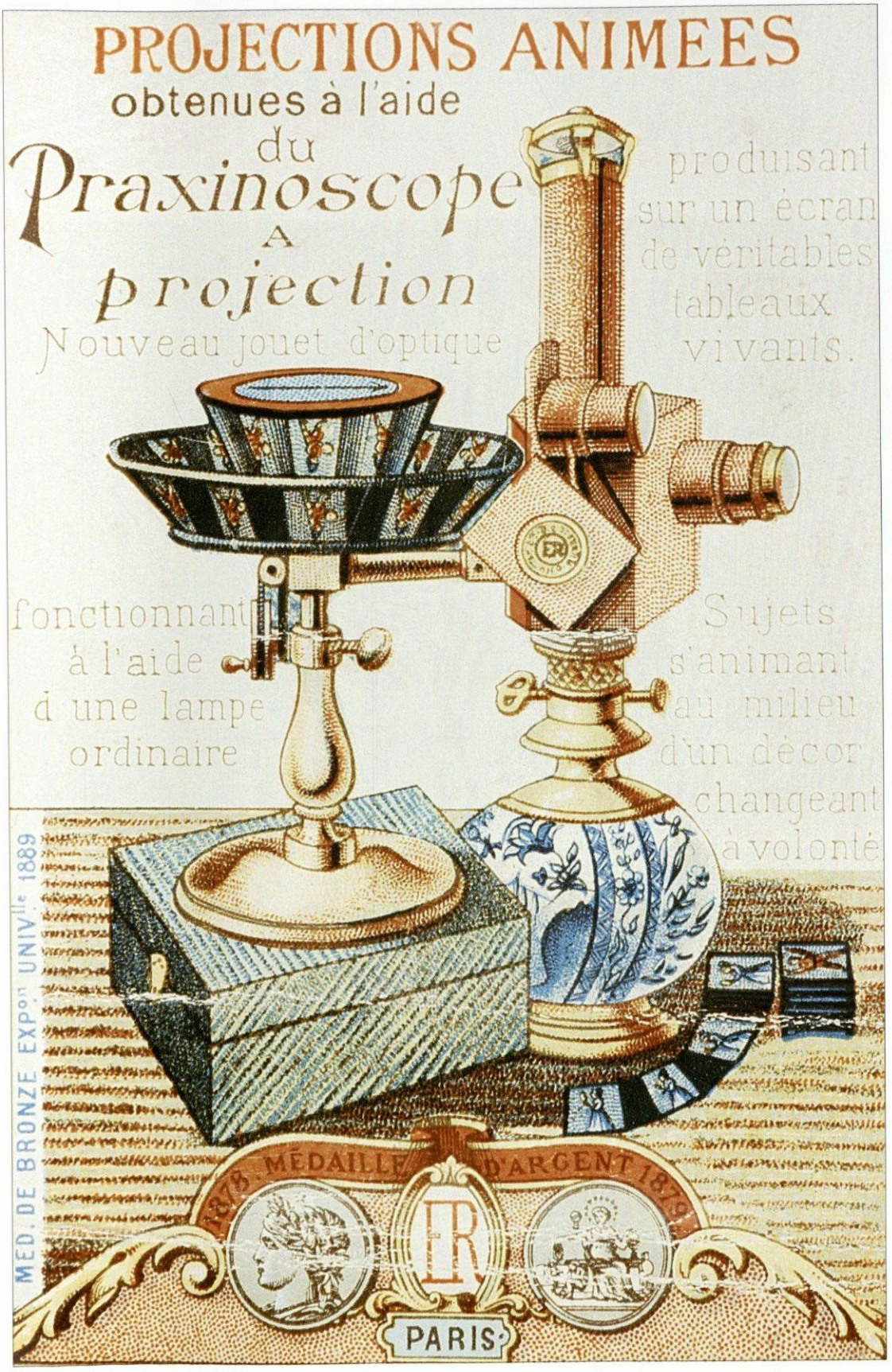
Charles-Emile Reynaud: The praxinoscope

Having developed a technical understanding of visual science as a photographer's apprentice and an aritistic sensibility from his mother, who had studied under the painter Pierre Joseph Redoute, Charles-Emile Reynaud had both the technical and artistic ability that has often produced good animators.

In 1877 he developed and patented an advancement of the zoetrope called the praxinoscope. The improvement basically consisted of adding a facility whereby mirrors, mounted in the center of the zoetrope's spinning cylinder, were fixed at such an angle that they would reflect the spinning strip of images one at a time in rapid succession as the cylinder whirled. This was a better experience for the viewer, compared with having to peep through the zoetrope's spinning slits. Reynaud achieved success in manufacturing his invention and selling it as a children's toy, but perhaps being wise enough to realize that this novelty would not last, he also looked to exploit his invention further.

Similar to Muybridge in his drive to move forward with his ideas and entertain larger audiences, he had the idea of developing his machine into a projecting device that would throw moving pictures onto a screen. In 1888 in front of a small invited audience, Reynaud demonstrated the device he called the Théâtre Optique, projecting a primitive film called *Un bon bock* (*A Good Beer*). The images for the machine were handpainted by Reynaud onto a perforated band or ribbon that unwound from one cylinder to another in much the same way as film projectors have done ever since. Meanwhile another projector created a still picture that was the backdrop for the projected animation.

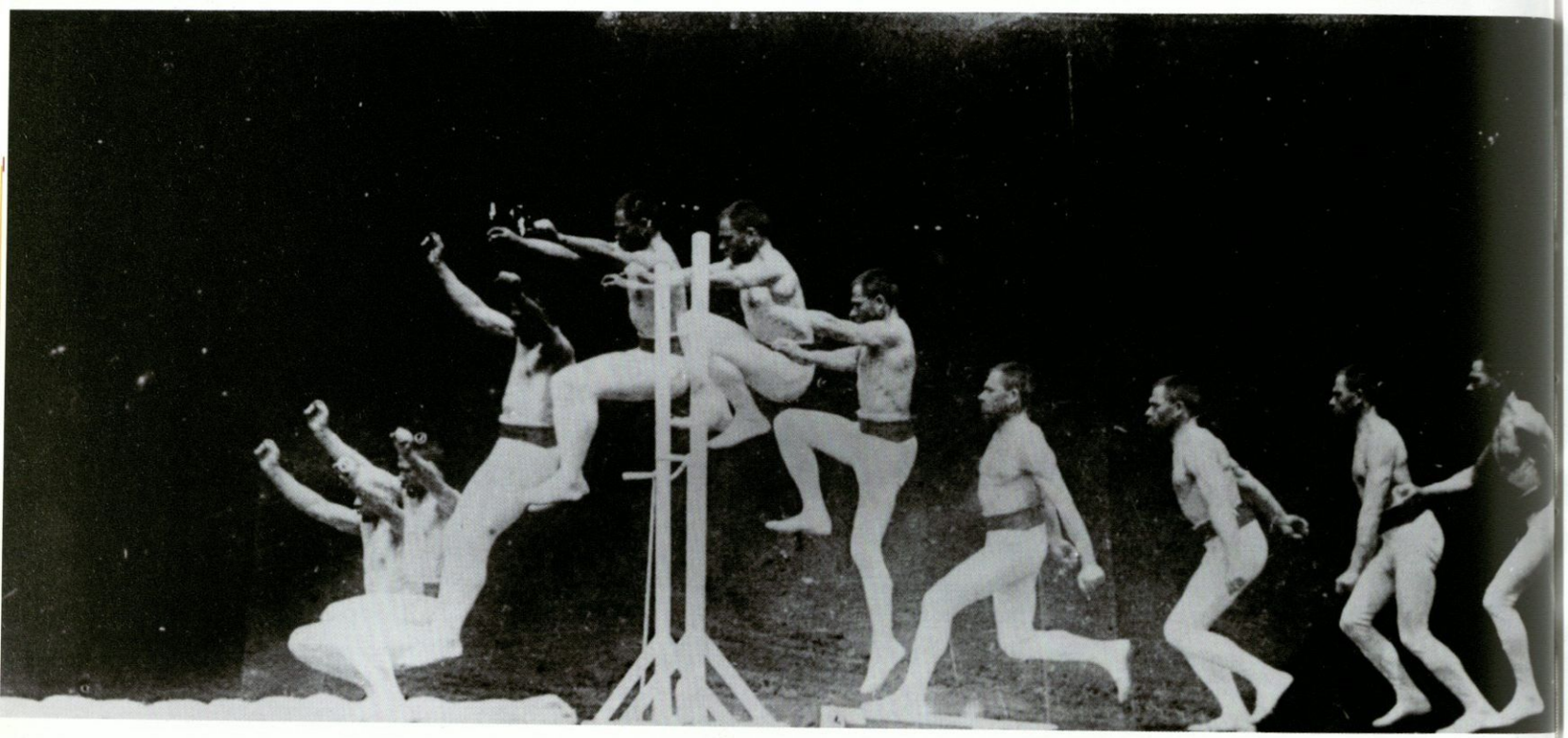
The invention had to be operated by hand, and the complexity of this task dissuaded the potential buyers that Reynaud had hoped would create a kind of franchise network for his device and films. In 1892 Reynaud settled on a contract with the Grévin Wax Museum in Paris, which required him to perform daily screenings, produce regular new films, and give away the exclusive rights to his machine. By 1895 however, the writing was on the wall for his invention when the Lumière brothers began their early cinema screenings, also in Paris. In 1900 Reynaud closed his Théâtre Optique and soon afterward sunk into depression, smashing his machines and throwing his carefully painted films into the river Seine. He died in poverty in 1918. Despite his unhappy demise, the ingenious Reynaud, with his ribbons of handpainted moving figures, can be considered one of the true forerunners of modern animation, and indeed of cinema itself.



Reynaud's praxinoscope

1882

France



Etienne-Jules Marey: Motion photographs

A French scientist, Etienne-Jules Marey, later to also become a motion photographer, had proposed in his 1873 book *La Machine Animale* the unsupported transit theory concerning a horse's hooves all leaving the ground during a gallop, the theory that Muybridge would set out to prove a few years later.

After Eadweard Muybridge's first motion photographs appeared in the USA, Marey started producing his own photography of animals in motion, for which he had invented something called a chronophotographic gun in 1882. This device took 12 photos per second onto the same photographic plate. He used it for photographing birds in flight and then later a variety of animals falling and in various forms of motion.

Muybridge visited Marey in France and the two men seemed to inspire each other. While the more flamboyant Muybridge's work was part scientific, part artistic, and part showmanship, Marey, a leading scientist, continued his experiments in a more serious academic vein, nevertheless producing some equally remarkable and beautiful photographs, which still make a great resource for animators today.

Motion photographs

1889

USA

Thomas Edison and William Dickson: The kinetoscope

The kinetoscope was conceived in 1888 by Thomas Edison and developed between 1889 and 1892 by his talented employee, William Kennedy Dickson. Rather than being a projecting device, however, it was a box into which the viewer would peer through a viewfinder. Inside were strips of film spooling in front of a strong light that flashed behind a shutter, thus "freezing" each separate image as it passed. In 1894 Edison gave the first commercial motion picture screening with 10 of his kinetoscopes in New York. The first actual film show, however, seems to have been earlier the same year in that city, when Frenchman Jean Aimé "Acme" LeRoy showed his *Marvellous Cinematograph*.

Like most of cinema's pioneers, Edison seems to have been influenced by earlier inventions. He had met with Eadweard Muybridge and had possibly seen his zoopraxiscope in early 1888 when Muybridge gave a lecture close to Edison's headquarters in West Orange, New Jersey. The resourceful Muybridge had proposed a collaboration between himself and Edison to make a device that would produce both sound and vision, by adapting and combining Muybridge's zoopraxiscope and Edison's phonograph. Nothing came of that meeting, but later that year, Edison filed a preliminary patent for a device that would provide a filmed audio and visual experience. He later dropped the audio aspect of the device and concentrated instead on a silent version of the machine.

In 1899 Edison visited France for two months to attend a science and commerce fair called Exposition Universelle, where he would have seen Charles-Emile Reynaud's praxinoscope, with its strip of spooled perforated images. He would have also seen German inventor Otto Anschuetz's electrical tachyscope, which was a disc-based projector similar to Muybridge's, except that it used brief flashes of light to "freeze" the projected sequential images. While in France, Edison also visited Etienne-Jules Marey and saw his chronophotographic gun–the first real cine camera. A lot of the elements in these ideas found their way into his 1891 patents for the kinetoscope and his cine camera, the kinetograph.

What Edison can undeniably take credit for was for organizing, fully developing, and exploiting, all these various strands of ideas, including the use of George Eastman's photographic film, into one commercially viable package, and it would be from his invention that modern cinema would take its name and grow into an industry. As is often the case with history, it's not the individual with the original idea but the person who can see the "big picture" and then formalize, organize, develop, and profit from the idea, who takes the biggest prize. The only commercial mistake Edison seemingly made, perhaps mindful of similar inventions across the Atlantic, was to obtain only a US patent for the kinetoscope instead of a worldwide one.

1896

France

Georges Méliès: Early "trick" films

Georges Méliès, a succesful magician and owner of the Theatre Robert-Houdin in Paris, saw the Lumière brothers' Cinématographe near his own theater in 1895, and immediately set up his own moving picture show. The Lumières were unwilling to sell equipment to a rival, so Méliès had equipment custom-made and also improved on other people's designs.

After some early films which, like much of the Lumières' work, concerned simple landscapes and scenes of ordinary life, Méliès started to apply his magician's art and sense of showmanship to the filmmaking process and created some of the most imaginative and original work of his era. He discovered by accident, when his camera jammed and then restarted, the crucial magic trick of stop frame: stopping the film and moving or substituting objects before continuing the shot. He exploited this endlessly in his many fantasies and "trick films," and went on to pioneer the science fiction, fantasy, and horror genres. By 1899 he was creating films like the seven-minute *Cendrillon* (*Cinderella*), which used multiple scenes to tell the story, and in the process, was making the first true narrative films. He was also a pioneer in techniques like fade-in, fade-out, and dissolves, and he produced early crude animation, like making letters of the alphabet dance around.

His most famous and successful film was 1902's *Le voyage dans la lune* (*A Trip to the Moon*), which includes the iconic image of a rocket crashing into the eye of the "man in the moon." Although this film was a worldwide hit by the standards of the day, it appears to have been an early victim of piracy as Méliès received little financial benefits from its popularity. His best and most creative period of work was around 1899 to 1902; he made hundreds of other films after this, but his mighty burst of invention seemed to fade out and his later films are uninteresting in comparison.

He was left behind by the bigger film companies and when World War I began in 1914, he closed the doors of his theater. Like fellow French pioneer Reynaud before him, when he saw the success he had worked for unspooling in front of his eyes, he reportedly started to destroy his films one by one.

In the 1920s the French surrealist movement rediscovered and reevaluated Méliès' work and tracked him down to a kiosk in a Paris train station where he was selling candy and toys. In the last part of his life, at least, he achieved the recognition he deserved as one of the pioneers of cinema.

Le voyage dans la lune
(A Trip to the Moon), 1902

Stop-frame animation

Stop frame (also known as stop motion or claymation) is the process of using models, which are moved and filmed frame by frame. This is perhaps the oldest and simplest kind of animation, and was widely used in the past to animate realistic models of monsters, etc., which were then inserted into live-action scenes. It is still popular today thanks to the work of animators and directors such as Tim Burton and Nick Park.