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CVFX: Legacy Effects

Impact of Motion Control And CG Imaging In Cinema

“It’s easy to create something that has a lot of luster, but it’s very hard to make something that has a lot of depth.” These words, from John Dykstra – a motion control pioneer – encapsulate the state of mind in the film effects industry in the late 60’s. Special effects for cinema had reached a point which at audiences required more impressive visuals that were more detailed and realistic to suspend their disbelief. The weariness had set in, in the 50’s/early 60’s because of the bombardment of super low budget B-movie action and horror films. With the established use of stop motion and optical printing techniques, effects technicians- provoked by visionary filmmakers worked to push the envelope. The content also dictated the advancements necessary to tell/show the stories. One such film that changed the industry forever was Stanley Kubrick’s *2001: A Space Odyssey*. The production of the film gave birth to motion control and slit-scan photography, pushed by a visionary and a vision - “Do it right, do it better then do it all over again”(Costa 5). Kubrick helped open the door to following decades of visual marvels that have since become staples in motion picture effects work. Innovation after innovation, the technical achievements pushed forward by motion-control - soon after included: *Star Wars*, *Close Encounters of the Third Kind*, and *Superman*, and *Blade Runner*. (Edwards 2-9).

As *2001* opened the door to motion-control, subsequent films – most notably *Star Wars* adapted and advanced the technology with the minds at the newly created ILM, by George Lucas. Miniature photography at this stage employed higher frame rates

according to scale of models in order to slow the action – to make the movement more realistic. Motion-control enabled multiple camera passes that were precise and repeatable – which allowed the filming of elements in miniature/live action separately to later be composited together quite seamlessly. In consequence, this achieved things that weren't previously possible including: realistic lighting, atmosphere effects - which ultimately were combined composites, rendering complex and dynamic shots (Macarthur 7). This technology was first used by ILM under the supervision of John Dykstra – and became known as the Dykstraflex system. It was employed mostly for the space-ship/battle sequences in *Star Wars* in 1977 (Edwards 9).

At the same time, Douglas Trumbull (who also worked on *2001: A Space Odyssey*) was also pioneering effects work on the films *Close Encounters of the Third Kind* and *Star Trek: The Motion Picture*. He invented the Magicam process – in which actors performed in front of a blue screen, and nonexistent locations were projected to create virtual realities (Trumbull 2-5). Effects during this time were being pushed forward incredibly fast and being perfected film after film. In 1978, *Superman* was released – and was the first film with a computer-generated title sequence. With Trumbull and Zoran Perisic leading the effects work, there were many advancements, which included the use of streak photography– which was similar to slit-scan work of *2001: A Space Odyssey*, but employed motion-control (Filmsite 5-8). Another technological use in the film was the Zoptic camera system – which allowed for the actor to remain stationary, and projected the background behind them – resulting in an instant composite (Zoptic SFX). In 1979, *Alien* was another film that relied on special effects work. In the Nostromo spaceship, raster wireframe 3-D model rendering was used for the navigational

charts on the computer monitors and in the landing sequence on the alien planet. It showed a terrain fly-over and computer-generated mountains as wireframed images as the spacecraft landed. This was a big step forward for CG and compositing – in order to make the ship/controls realistic (Filmsite 7).

In the early 80's – Motion control had become a mainstay, and ILM was the leader in film effects work. The films *Raiders of the Lost Ark*, and *Blade Runner* (Trumbull) mystified audiences with the effects work. *Blade Runner* utilized the motion control, matte paintings, and scaled miniature techniques. The motion control work was extensive – using multipass exposures that sometimes included up to sixteen different passes. Miniature/live action sets were lit, shot, and rerecorded over with different lighting (Pierce 2-6). This film became known for its very extensive and stylized overall design – in terms of production design, cinematography, and effects. *Raiders of the Lost Ark* - released in 1981, used almost every effects trick in the book at the time. It utilized optical processing, water-tank effects, mattes, animations, and motion-control (fifty passes on final warehouse shot) (ILM).

In the mid-80's, computer generated imagery had been used previously (*Tron* 1982), but entered the scene noticeably with *The Young Sherlock Holmes*. The stained glass knight is credited with being the first 3-D full-CG character. It was scanned and painted directly onto film using a laser. Consequently, it also became the first use of compositing computer-generated animation onto a live-action background. Lucasfilm's Pixar created the 30-second effect, which took six months to complete (Filmsite 12).

In the following years – films like *The Abyss*, *Terminator 2: Judgment Day*, and *Jurassic Park* stomped into the history books with very complex CG compositing of

characters and effects. In *The Abyss* – the ‘pseudopod’ creature became the first use of CG water effects, cut into live-action footage. *T2* was a substantial milestone in CG rendering. Stan Winston Studios produced the effects, and it was the first time a CG main character was in a film. In total, over 300 CG shots were completed, with 16 minutes running time. (Anderson 9). In 1993 – *Jurassic Park* stamped through effects limitations to produce a spectacular visual marvel. It was a game changer – and arguably the first film to rely completely on the use of CG creatures for the story’s success and delivery. Previous monster films were mostly all stop motion – including the Harryhausen films *The Seventh Voyage of Sinbad* and *Jason and The Argonauts*, as well as O’Brien’s *King Kong*. Also prior to *Jurassic Park*, the closest thing to mimic animated characters was Go Motion, which incorporated motion-blur into the movement of stop motion miniatures/puppets. Dennis Muren, at ILM wanted to go further to create “full-motion dinosaurs.” To do this, clay maquettes were laser scanned, and rendered into a computer system to then animate. Skeletons, muscles, and textures were added to give realistic physicality to the dino’s. Later – the digital elements were joined with the live action footage (which were matched to actors eye-lines/positions, movements) (Morgan 4-15). Also to mention - in the film, was one (if not the first) uses of face replacement to change from stunt double to actress. Ultimately, *Jurassic Park* was the tipping point in computer graphic imagery for character/creatures. Along with the animatronic creations - 75 effects were created, and achieved photo-realistic dinosaurs that still hold up visually today. Remarkably, the same principles/processes are still being used twenty-four years later (cinefex 55).

In the following years leading through 90's and early 2000's – year after year, remarkable benchmarks in CG were produced in films that continued to push the envelope – including (among many others) *Jumanji* ('95), *Twister* ('96), *Titanic* ('97), *The Matrix* ('99), *Fight Club* ('99), *The Mummy* ('99), and *The Lord of the Rings Trilogy* (2001-2003). *Titanic* was one of the first films to generate motion/3-D digital crowds, as well as the miniature/CG ship. Two years later, in *The Mummy* - motion capture was reaching new levels, and key-frame animation was utilized to create the mummy – through the progressively regenerated Imhotep character. At the time, Imhotep (as mummy) was most realistic digital human character ever seen, with totally computer-generated layers of muscles and tissues. Skipping ahead a few years, *The Lord of the Rings* Trilogy elevated the world of cinematic visuals forever. Through processes of forced perspective, digital mattes (cycloramas), motion capture (character/facial), digital armies (MASSIVE software), miniature photography (Slave motion-control), and CG renderings – had the four-year project firing on all cylinders at Weta Workshops/Digital, as well as Park Road Post. In total, there were 2730 effects shots between the three films. These films pushed nearly all levels of CG/motion capture - into entirely new technological realms, breaking through many limitations. Alex Funke – the head of the miniature photography department revolutionized motion-control with seventy-two miniatures so large that they were named “bigatures.” Arri created a crystal sync high-speed camera for the production (Arriflex 435 Advanced). This was levels beyond the Mitchel Fries they were using at the time – and also utilized a “snorkel” lens to get very close (within inches) of the miniatures at times (ASC Dec. '01). Jackson, being heavily influenced by Harryhausen and O'Brien – ultimately helped push the field of miniature

photography to new heights (and every other FX dept.). The motion control rigs used for miniature photography relied on the same principals since *2001*, and *Star Wars*, but were now perfected to composite usually 10-30 passes of atmosphere, lighting, textures – which made the models incredibly realistic, in conjunction with their massive scale (LOTR Bigatures). Also, the motion control rigs were used for live-action photography to repeat passes for forced perspective. The new system was called the Slave Motion Control System. The camera rig was synced with the moveable sets that moved in relation to the camera – allowing dynamic movements while maintaining the same scale at all times (in relation to the lens). This allowed for complex blocking and overall dynamic shots with scaled doubles/sets – THIS has become the epitome in motion-control photography, taking it to the highest level of advancement, since the early days of model spaceships and planets (Cinefex 89, 96).

Effects in cinema, since the days of magicians and vaudevillians – craftsmen/women continue to push the boundaries and limitations of visual storytelling. From filmmakers - Melies, to O'Brien, to Harryhausen, to Kubrick, to Lucas and Spielberg, to Cameron, to Jackson – escapist visionaries see past what is in front of them to grab hold of what's to come. In trying to visualize the future (or past) – they ended up bringing the future closer to us. Audiences leave their daily lives to sit in a dark room full of strangers to be transported – and it is these 'magicians' who bring us there – through uses of double exposures/mattes, stop motion, optical printing, animation, motion-control, compositing, computer graphics, and motion capture – there seems to be no end to the amount of technical processes used in making fiction - reality. Just like in the early days, to amaze audiences with a trick - the magicians slave away and make

elaborate processes with the latest machines and gadgets to create the impossible. In the words of motion control/miniature photographer Alex Funke, “If the audience is thinking about our process, then we’ve lost them, and we’ve failed to do our jobs. We need to do the work, then erase our tracks and disappear.” (ASC Jan. 2004).

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