

Spencer Drate & Judith Salavetz

VFX ARTISTRY

A VISUAL TOUR OF HOW THE STUDIOS CREATE THEIR MAGIC



AMSTERDAM • BOSTON • HEIDELBERG • LONDON
NEW YORK • OXFORD • PARIS • SAN DIEGO
SAN FRANCISCO • SINGAPORE • SYDNEY • TOKYO

Focal Press is an imprint of Elsevier



Focal Press is an imprint of Elsevier
30 Corporate Drive, Suite 400, Burlington, MA 01803,
USA
Linacre House, Jordan Hill, Oxford OX2 8DP, UK

© 2010 Elsevier, Inc. All rights reserved.

No part of this publication may be reproduced or transmitted in any form or by any means, electronic or mechanical, including photocopying, recording, or any information storage and retrieval system, without permission in writing from the publisher. Details on how to seek permission, further information about the Publisher's permissions policies, and our arrangements with organizations such as the Copyright Clearance Center and the Copyright Licensing Agency can be found at our website: www.elsevier.com/permissions.

This book and the individual contributions contained in it are protected under copyright by the Publisher (other than as may be noted herein).

Notices

Knowledge and best practice in this field are constantly changing. As new research and experience broaden our understanding, changes in research methods, professional practices, or medical treatment may become necessary.

Practitioners and researchers must always rely on their own experience and knowledge in evaluating and using any information, methods, compounds, or experiments described herein. In using such information or methods they should be mindful of their own safety and the safety of others, including parties for whom they have a professional responsibility.

To the fullest extent of the law, neither the Publisher nor the authors, contributors, or editors, assume any liability for

any injury and/or damage to persons or property as a matter of product liability, negligence, or otherwise, or from any use or operation of any methods, products, instructions, or ideas contained in the material herein.

Library of Congress Cataloging-in-Publication Data

Drate, Spencer.

VFX artistry : a visual tour of how the studios create their magic / Spencer Drate, Judith Salavetz.

p. cm.

ISBN 978-0-240-81162-8 (pbk. : alk. paper)

1. Cinematography—Special effects. 2. Computer drawing—Special effects. 3. Digital video. I. Salavetz, Jütka.
II. Title.

TR858.D73 2009

778.5'3—dc22

2009027186

British Library Cataloguing-in-Publication Data

A catalogue record for this book is available from the British Library.

ISBN: 978-0-240-81162-8

For information on all Focal Press publications visit our website at www.elsevierdirect.com

09 10 11 12 13 5 4 3 2 1

Printed in China

Working together to grow
libraries in developing countries

www.elsevier.com | www.bookaid.org | www.sabre.org

ELSEVIER

BOOK AID
International

Sabre Foundation

CONTENTS

INTRODUCTION	IX
FOREWORD	XXII
ARTIST INSIGHT	
DigitalKitchen	xxiv
Thornberg & Forester	xxvi
STUDIOS	
Chapter 1 Eyeball	1
Studio Philosophy	1
Target: “Art for All”	1
Bioshock: Beyond the Sea	3
Chapter 2 Intelligent Creatures	6
Studio Philosophy	6
Babel	6

	The Fountain	9
	The Number 23	11
Chapter 3	Marco Iozzi	13
	Studio Philosophy	13
	Darklands	13
	Equilibrium	15
	Infiniti	17
	Neve	19
	Fight for Life	20
Chapter 4	Jesse Jacobs	23
	Studio Philosophy	23
	Skittles: “Mindbender”	23
Chapter 5	Thornberg & Forester	27
	Studio Philosophy	27
	Target: “Fall for Less”	27
	AICP 2008 Show Open	30
Chapter 6	Digitalkitchen	33
	Studio Philosophy	33
	MindQuest Video	33
	<i>True Blood</i> Main Titles	36
	<i>The Company</i> Main Titles	38

Chapter 7	Royale	40
	Studio Philosophy	40
	<i>The Daily Show</i>	40
	<i>Flaunt</i> Magazine and Diesel: 9th Anniversary	44
	Jet Blue: “Happy Jetting”	47
	McDonald’s Best Chance Monopoly	50
Chapter 8	Adolescent	53
	Studio Philosophy	53
	PEAK	53
	<i>That 70’s Show</i>	56
Chapter 9	Freestyle Collective	59
	Studio Philosophy	59
	The Good Witch’s Garden	59
	Kung Fu HD: Cat Fight	62
	<i>Criss Angel: Mindfreak</i>	64
	MTVK Network Launch: “Lokation”	66
Chapter 10	Troika Design Group, Inc.	68
	Studio Philosophy	68
	GOLIATH: SportsCenter Rebrand	68
	ABC	72
Chapter 11	Trollbäck + Company	75
	Studio Philosophy	75
	ESPNNews Steps to Creation	75

Chapter 12	Nailgun*	79
	Studio Philosophy	79
	Universal Channel Redesign	79
	Sundance Channel—"One Punk Under God" Promo Campaign	82
	HGTV— <i>Deserving Design</i> with Vern Yip Show Open	84
Chapter 13	Velvet	86
	Studio Philosophy	86
	Gran Centenario: The Calling	86
	Clorox: Mermaid	91
	Mattoni: Star (Water Dress)	94
	Mercedes Benz USA: Race	98
Chapter 14	Ntropic	101
	Studio Philosophy	101
	Chevrolet–General Motors: "Disappear"	101
Chapter 15	Blind	105
	Studio Philosophy	105
	Russell Athletics: "Fourth and Inches"	105
	OppenheimerFunds: "Escalator"	108
Chapter 16	Rhino-Gravity Group	111
	Studio Philosophy	111
	Pelephone: "Cannons"	111
	Verizon FiOS Campaign: "Rock Star"	115

Chapter 17	Click 3X	118
	Studio Philosophy	118
	goArmy.com	118
Chapter 18	Imaginary Forces	122
	Studio Philosophy	122
	<i>Mad Men</i> Opening Title Sequence	122
Chapter 19	A52	124
	Studio Philosophy	124
	Acura: “Motion”	124
	Lexus: “Pop-Up”	127
Chapter 20	Method	130
	Studio Philosophy	130
	Pepsi	130
Chapter 21	Panoptic	133
	Studio Philosophy	133
	Lincoln MKZ: “Touch”	133
	Cole Haan	136
	Dr Dog	139
Chapter 22	Prologue	141
	Studio Philosophy	141
	<i>Across the Universe</i>	141
	<i>Iron Man</i>	146

Chapter 23	Pixeltrick	149
	Studio Philosophy	149
	Instinct	149
Chapter 24	Sea Level	151
	Studio Philosophy	151
	Toyota Prius: “Unlitter”	151
	The Coca-Cola Company: “Heidi Klum Red Dress”	154
Chapter 25	Digital Domain	156
	Studio Philosophy	156
	Halo: “Starry Night”	156
	Adidas: “Mechanical Legs”	159
Chapter 26	PMcD Design, Ltd.	162
	Studio Philosophy	162
	Starz Network: <i>Crash</i> Promo	162

INTRODUCTION

David Robbins

In a darkened room ... there is only flickering imagery on the screen ... and you, the viewer, in rapt attention.

If the director, actors, photographer, and editor have done their jobs, you have become one with the movie. Then something surreal may happen, something so fantastic or absurd by real-world standards, that you have no doubt of its validity in the seamless context of the movie, because it could only happen there. Your inner psyche whispers something like: “AWEsome!” When this happens, the visual effects people have done their job. This book is about paying homage to them.

Over the last hundred years and counting, special effects has played a significant role in the emotional way we view movies, and there is a reciprocal arrangement between the psychology of the audience and the purpose of the movie. Because visual effects are so woven into films to the point that movies are in themselves special effects, it would be shortchanging the history of the art of special effects by not regarding their context in shaping the overall history and the business of film.

THE FIRST EXPERIMENTERS

Nowadays the competition among special effects artists has become steeper with the abundance and convenience of digital technology. There is hardly a movie put out there without some sort of visual digital effect. Anyone with a desktop computer and knowledge of Photoshop can accomplish wonders only dreamed of by early special effects pioneers like Georges Méliès (*A Trip to the Moon*, 1902), Fritz Lang and Eugen Schüfftan (*Metropolis*, 1927), along with Merian C. Cooper and Willis O’Brien (*King Kong*, 1933), all of whom relied on tactile physical or mechanical special effects, and a lot of costly trial and error in order to achieve their masterful results.

Photo manipulation was nothing new even before the invention of film. Photographers such as Oscar Gustave Rejlander (1813–1875) and Henry Peach Robinson (1830–1901) used print manipulation and some in-camera techniques to create their allegorical works.⁽¹⁾ Naturally, these effects could be achieved in paintings, but photography was “authentic” and motion pictures even more so. As photography was a feast for the

eye, movies were a jolt to the id. Motion pictures evolved during a time when the telegraph, motor-cars, and airplanes served to speed up the world from agrarian to industrial, and the pace of culture began to exceed that of man’s ability to grow into it.

The first of these motion picture experiences happened in 1895, when Englishman Alfred Clarke released his film of the beheading of Mary, Queen of Scots. Using stop-action photography, the actress on her way to the henchman was replaced with a dummy with a detachable head, history was recreated as it shocked the audience.⁽²⁾

However, it took an illusionist to perfect the method of early special effects. French magician Georges Méliès (1861–1938) had bought a theater and needed to attract his audience. He chose the new medium of motion pictures, and had a camera with special lenses made for him by British inventor/filmmaker R. W. Paul.⁽³⁾ The camera’s operation was erratic and frequently jammed while he was filming. During one of these malfunctions in 1896 he had an epiphany. While reviewing his

footage of a street scene the camera jam was apparent, but when the camera started working again and the scene switched, people that were once walking one way were now walking the other, men had morphed into women, an omnibus had morphed into a hearse. Méliès not only had his magic act, he perfected the malfunction in many different ways to become the father of in-camera trickery and special effects. He turned to humor, and is most fondly remembered for *Indian Rubber Head* and his film adaptation of Jules Verne's *A Trip to the Moon (A Voyage dans la Lune)*, both released in 1902.

The outbreak of World War I bankrupted him and he had to close his theater. Also, his style of filmmaking had by then become stale, and his efforts could not compete with the epochs that were gracing the screens. He ended up in obscurity, amazing children by demonstrating toys from a kiosk in the park on the Gare Montparnasse.

Through his cinematic innovations, Méliès inspired other filmmakers not only to develop new special effects, but also to consciously think out of the box. Such technicians and filmmakers were Britishers Robert W. Paul (*The Motorist*, 1906), G.A. Smith (*The Corsican Brothers*, 1909), and Cecil Hepworth (*The Explosion of a Motorcar*, 1900, and *Alice in Wonderland*, 1903).

There are other techniques that have been attributed to Paul and Smith. Paul was the first to use the dolly shot, whereby the camera was dragged along rails. Smith is attributed with perfecting a matting technique by filming a subject against a black background, then double-exposing another image in juxtaposition with the first. He also attempted experiments with depth-of-field cuts and extreme close-ups. Most importantly, Smith was the first to use parallel editing, showing simultaneous events to enhance the rudimentary plots of his movies.⁽³⁾

In 1903, American filmmaker Edwin S. Porter produced *The Great Train Robbery*. Often overlooked among the editorial innovations in the film

was Porter's use of the traveling matte (a continuously wound loop of scenery), where he trapped a scene of moving countryside within the open doors of the train to achieve a sense of motion. The most famous scene in *The Great Train Robbery* occurred at its end, when one of the robbers, shown in head and shoulders close-up on the screen, aimed his gun at the audience and fired it. This sent some viewers running for their lives from the theater. This type of viewer reaction remains the bedrock of the achievement of special effects—hopefully without sending the audience scampering from the theater.

THE EARLY STUDIOS

In 1905–1910 there were a number of technical and psychological forces at work that would subtly change the outlook of man toward the world and toward himself. The first of these innovations was the X-ray, which, first invented in the 1870's, was by this time period commonly used as a means to look inside a person's body. Peripherally, this introduced cubism as an art style to accomplish the same sort of in-depth look abstractly on canvas. Sigmund Freud was also at work with his discoveries of the workings of the mind through psychoanalysis. Finally, by 1910, Albert Einstein had published his *Theory of Relativity*, extolling an infinite universe and its relation to the speed of light and, by extension, its relation to the passage of time.⁽⁴⁾

These futuristic techniques and discoveries made the public more accepting to cinema's sleight of hand, playing an emotional role in attracting more people to the movies, which became a form of escape for the audience. This getaway from the routine provided a rudimentary definition for a business model. Growing numbers of people paying to see more movies turned movie production into a competitive business.

In America, artists A. E. Smith and J. S. Blackton formed the Vitagraph Company in 1898, which became the first major film company. From

their studios in Brooklyn, NY, they produced a number of commercial short films, along with the creation of some "news" shorts, such as *The Battle of Santiago Bay* (1898), complete with painted backdrops and firecracker explosions around cut-out ships pulled along by underwater strings. This way of reproducing news events through special effects set Vitagraph off as a propaganda shop and led to it being respected as a production studio. Biograph Studios, Vitagraph's rival from the Bronx, used the same techniques in their news films, such as when they recreated the San Francisco earthquake intermixed with actual footage in 1906.

The traditional "one-reeler" was 12 minutes long, and producers and promoters were not convinced that an audience's attention could be held much longer than that. But during the early years of the new century, motion pictures were establishing their niche in the market as pointed, well-scripted 9–12 reelers exceeding two hours. By 1910, the average feature film was 90 minutes long.

Something had to sew the events of these 90-minute attractions together, not the least of which was a plot, but other factors were needed to weave the action together. Generally, a fixed camera filmed the customary one-reeler as a stage production, constrained under the proscenium arch. Camera position, purposeful lighting, and editing delivered cinema from this restriction. Porter, in his *Life of an American Fireman* (1903), began this transition with continuity editing: cutting between related events happening concurrently in nearby locations to heighten the suspense of the plot.⁽⁵⁾ In *The Great Train Robbery*, he used parallel editing, where disparate events are happening in different locations. Parallel editing serves the visual flow, while the purpose of continuity editing is to serve the plot, to give it emotional meaning.

Biograph Studio's D. W. Griffith mastered the balance of parallel and continuity editing in his three-hour-long spectacles *Birth of a Nation*

(1915) and *Intolerance* (1916). He introduced a number of other editorial techniques, such as the iris-in, iris-out cuts and the fade, which he accomplished by chemically bleaching the film by degrees. Griffith's editing served as a bed for purposeful optical effects, which served the film's editorial tempo. He worked with legendary cameraman Billy Bitzer, and his films, though controversial, were also marked by a sense of sentimentality and humanity. President Woodrow Wilson stated of *Birth of a Nation*: "It's like writing history with lightning."⁽⁶⁾

New York, with its less than hospitable weather, was not exactly the best venue for making movies. Feature films such as Griffith's became the production standard and required a more forgiving outdoor shooting environment. There was time to consider this inconvenience, however, for when World War I broke out, motion picture production waned.

Once the war ended, the industry moved out to Hollywood, California, where the weather was temperate and the sun always seemed to shine, in spite of the Santa Ana winds and occasional earthquakes. Mega studios, such as MGM, Paramount, Fox, Universal, and Warner Bros., were established as filmmaking became a bigger, more profit-motivated business. These studios were modeled after those, such as UFA in Germany, where films of real artistic substance were being produced by the likes of F.W. Murneau and Fritz Lang.

D. W. Griffith introduced more than editorial techniques to the industry. He also introduced stars, Lillian Gish, Blanche Sweet, and Donald Crisp, to the already developing "star system" featuring standards such as Theda Bara, Charlie Chaplin, and Mary Pickford. The stars emerged through close-ups as another force to draw audiences into the theaters—the viewer could project into a dream life through the screen stars to whom he or she vicariously related. This marriage of human instinct to what was on the screen gave movies a crucial psychological focus. Over time

this mental link would also generate the desire for thrills through the visual effect.

As the American movie industry grew in Hollywood, which became its icon, so even more did the star system. Names of such movie idols as Clara Bow, Douglas Fairbanks, Lon Chaney, and Buster Keaton, among many others, became the draw. Filtering through the star system were also genres of the film. Charlie Chaplin, Buster Keaton, Harold Lloyd, and the Keystone Kops epitomized comedy, while Theda Bara, Clara Bow, and Rudolph Valentino claimed the sex genre. Lon Chaney and Béla Lugosi were horror, and it was in this genre, and that of science fiction, where special effects found its true niche.

THE GERMAN CONNECTION

During the 1920s the German film industry developed quickly into huge movie factories, such as Berlin's UFA, which employed the key film directors and actors. Some of the first German science fiction efforts were directed by actor/director Paul Wegener, who prophesized that a "synthetic camera" would be developed and completely "artificial scenes" would be created through its abilities. Other directors such as F.W. Murnau, Fritz Lang, and Eric Von Stroheim achieved much fame through their movies at UFA.

Murnau directed a number of horror films, particularly his famous *Nosferatu* (1922),⁽⁷⁾ an intensely evocative horror film. The makeup was chilling, and his direction was more like choreography. Along with its expressionist sets, the real feature of *Nosferatu*, along with Murnau's other equally famous conventional films, such as *Sunrise* (1927), was the interplay of light and shadows. Like an editing device in its own right, light and subjective viewpoints filtering through his films (such as *The Last Laugh*, 1925) provided the basis for cinéma vérité⁽⁸⁾ and film noire. In *Nosferatu*, the light and shadow build the tension as an editing tool, further mastered by Orson Welles and Alfred Hitchcock.

The most deservedly well-known German director of science fiction films and special effects was Fritz Lang, who also produced his masterpieces from within UFA's huge studios. Among his films was an ambitious two-parter of the massive Wagner production *Die Nibelungen* (1924), wherein he had a 60-foot mechanical flying dragon constructed. Here he also utilized the Shuftan process, which used mirrors to combine miniatures with full-sized sets.⁽⁹⁾ This process was used extensively in his true masterpiece, *Metropolis* (1926). Though originally critically dismissed, *Metropolis* has held up as a testament to the art of science fiction, German Expressionism, and social metaphor. In a later classic, *M* (1931), a controversial film in which a child murderer (Peter Lorre) is brought to justice by an even more brutal Berlin underworld, he would give definition to film noire, which he would later master in the American films he would direct in the late '50s.⁽¹⁰⁾

The roots of Lang's methods extended back to 1919, when he worked with Erich Pommer, the producer of *The Cabinet of Dr. Caligari* (1920), to introduce expressionist sets in the movie to convey the mind of the tormented killer.⁽¹¹⁾ In spite of Lang's unique suggestion, it is Pommer who is remembered as the "father of German Expressionism in film," for *The Cabinet of Dr. Caligari*. Since then, German expressionism has been effectively used (and ineffectively overused) as a psychological tool in a few mainstream and genre films.

Along with their developing artistic merit, many German films conveyed a critical social message. Even *Nosferatu* was no exception, with its veiled message of the plight of the post-WWI demoralization of the German people. Later, the emerging Nazi German nationalist political attitude, offended by the editorial license of such films, would drive Murnau and many great German directors and actors like Greta Garbo and Marlene Dietrich to move to America. Germany's loss would prove to be Hollywood's gain.

THE '20s: ANIMATION AND DEVELOPMENT OF AMERICAN HORROR

In America, a growing number of production studios were establishing special effects departments as the technique developed into more of an art ... literally. Animation had been an American cinema hallmark since before the 1920s with Max and Dave Fleischer's rotoscoping technique featuring Koko the Clown in the "Out of the Inkwell" series (1914). Rotoscoping was a means to facilitate the ponderous frame-by-frame free-hand animation rendering process through tracing of cells from live film footage.⁽¹²⁾ The digital process of "tweening" has only recently replaced rotoscoping.

Throughout the mid-twenties, the process of combining live footage with animation was refined through the serialized "Alice Comedies" (1923–1926), produced by a young Hollywood newcomer, Walt Disney. The process was to be revisited a number of times in the Disney films to follow, most notably 60 years later in *The Adventures of Roger Rabbit* (1988). *Roger Rabbit* was a direct descendant of the "Alice" shorts, in which a live action character becomes involved with the dangers of a cartoon world. The principle of live animation provided a recipe for future possibilities in special effects, becoming a basis for phenomenal cinematic results.

Horror films became a standout American genre, as represented by the works of former circus performer-turned-film-director Tod Browning (*The Unknown*, 1927, *London After Midnight*, 1927, *Dracula*, 1931, and *Freaks*, 1932).⁽¹³⁾ Perhaps due to Browning's carnival roots, makeup was the special effect, along with the featuring of deformed people, in many of his films. He also introduced Lon Chaney, Sr., one of the first real superstars of horror. Browning would make about 10 films with Chaney before the star's untimely death in 1930. In 1931, he cast Béla Lugosi as Dracula, and created another

Hollywood horror icon with both the film and the actor.

In several of his films he collaborated with my grandfather, Clarence Aaron "Tod" Robbins, who wrote *The Unholy Three* (1925) and *Freaks* (1932). Because *Freaks* was so controversial and poorly reviewed even after edited, it was to be Tod Browning's undoing. Paradoxically, today *Freaks*, which is still considered notorious, has surfaced as a cult classic.

A NEW EFFECTS STAR IS BORN

The most significant development in film history started with a gamble from down-and-out Warner Brothers Studios in 1927. On the verge of bankruptcy, they produced a film, *The Jazz Singer*, featuring a new technique that was still in research and development among its competitor studios: the Vitaphone sound-on-disc method. The "talkies" were here. Fox Studios soon introduced the Movietone sound on film technique, which would become the standard. Despite its promise, many studios were slow to come around to integrated sound right away, thinking it too much of a gamble for a passing whim. But by the mid-'30s, though, most of the major studios produced sound films and they were, well ... talkative.

Once movies found a voice, there seemed to be a competition as to who could pour more words into a minute of film. As if the technique were ready to burst from bulging film cans, there were a slew of talkies from Fox and Warner Brothers. And they were vociferous beyond the pale. Within a few years, "All Talking, All Singing!" became an MGM and RKO tagline for seemingly hundreds of movie follies.

But sound came at a price. Its first casualty was the current star system. More than a few stars who might have been masters of the emotive face in silent films had voices too weak or tinny for the rigorous demands of early sound recording. By recruiting from theater performers who could project their voices, a new sort of film actor

emerged. By the mid-'30s, the new star system would be well on its way through the likes of Clark Gable, Douglas Fairbanks (also a silent star), James Cagney, Jean Harlow, and Carole Lombard, to name a mere few. Paradoxically, Charlie Chaplin wouldn't speak on film until *The Great Dictator* (1940).

THE '30s: A HIGHER PURPOSE FOR SPECIAL EFFECTS

Because the devices used to record sound were so overwhelmingly noisy, they needed to be shielded from the voices of the actors. This brought filming indoors, into the sound studio where the producers and directors could better control the creative elements of the craft. Filming in the studio required more transparent realism in traveling mattes and rear projection along with the construction of sets and detailed miniatures. The features presented new challenges and opportunities in the art of special effects. In the studio environment, studio moguls and some directors found a means to cut production costs through more creative effects. Many of these effects found purchase in the lavish MGM Busby Berkley musicals of the mid-'30s. The optical printer allowed for otherwise impossible visuals and sophisticated techniques by combining traveling mattes on film in the editing process, thus creating the "cast of thousands" effect, along with innovative wipes, also overused in many of the musicals.

The same optical techniques used for Fox's Astaire/Rogers dance scenes to make them appear flawless were also applied to what is arguably the most poignantly masterful science fiction/horror film to come out of the decade: Merian C. Cooper's *King Kong* (1933). Using a range of optical techniques, complicated miniatures, and stop action photography, the effects wove together a story of greed's inhumanity toward the natural world and rendered a movie that raised the bar for special effects.

Director James Whale picked up Tod Browning's gauntlet as master of the horror film with *Frankenstein* (1931). With some of his succeeding films, *The Invisible Man* (1933), *The Bride of Frankenstein* (1935), and *The Man in the Iron Mask* (1939), he pushed the limit of technique by majestically electrifying Frankenstein's monster, along with his wife, and by making the invisible man appear (or disappear) invisible once the bandages were removed. The characters in the horror films of the '30s also brought us the pathos of emotional threads, which characteristically weave together many successful dramas. One prime example of this (along with King Kong) was Boris Karloff's portrayal of Frankenstein's monster. Karloff was to emerge as a horror superstar for decades to follow, not because he was a "scary monster" like Nosferatu or Dracula, but because his characters, like Frankenstein's monster, were more human, with soul. It was this kind of character quality, along with the special effects, that pulled the audience in and worked to make the supernatural seem real.

THE GROWING HOLLYWOOD MYSTIQUE

During the '30s, the American movie business had more than survived the ongoing economic depression. "Hollywood" ceased to be merely a place on the map in southern California: it was a state of mind. Going to the movies had become necessary therapy, and the more escapist the movie, the better. Movies were a 10-cent escape from the national woes of the global depression. The economic situation helped to establish Hollywood as the cultural legend it has remained—and the gold standard of global film production.

The studios had their individual personalities: Warner Brothers was known for gangster and noir movies, along with poignant women's movies and Errol Flynn swashbucklers. RKO/Fox was represented by the comparatively low-budget panache of dance movies. Universal produced the

Tod Browning and James Whale horror pictures. Of all the studios, Paramount and MGM produced the most extravagant movies. MGM was mainly responsible for establishing the Hollywood legend throughout the world with epics such as the Busby Berkeley follies and huge productions such as the legendary *Gone with the Wind* (1939) and *The Wizard of Oz* (1939).

Generally, the stars under contract with the studios established the themes of the movies. Béla Lugosi and Boris Karloff, for instance, were under contract with Universal. Relatively lesser-known actors such as James Cagney, Pat O'Brian, Humphrey Bogart, Veronica Lake, Bette Davis, and Lauren Bacall were under contract with Warner's, while Astaire/Rogers worked for Fox. The stars with the biggest draw, such as Greta Garbo, Clarke Gable, Gary Cooper, and up-and-coming "kid" stars like Judy Garland and Mickey Rooney were with MGM. Star quality came at a price to the stars. Generally, and especially with MGM, the stars were under strict control of the studios, often to the detriment of their health and emotional well-being.

Films were also branded with their directors. As James Whale was associated with the horror genre, John Ford was known for his westerns, and Alfred Hitchcock for his suspense films. Walt Disney, a 33-year-old perfectionist director/producer, was the mainstay of animation. Disney studios, established in the late thirties, broke the animation mold in 1937 with *Snow White*, which was to win the Academy Award for that year. More of a work of art than the sketchy one-reeler animations shown before the feature that the public had come to expect, *Snow White* was the first feature-length color animated film. The cell animation technique would elevate the art of visual effects to a new level of precision.

The 1930s began with sound and ended with Technicolor, which was actually developed in 1925—before sound became popular. It was a costly process that required three times the light-

ing, and it wasn't until the end of the '30s, with high-budget MGM movies such as *The Wizard of Oz* and *Gone with the Wind*, that it proved more practical with high-resolution/higher speed film stock. However, color was still cumbersome for the special effects department, for instance, in the development of traveling mattes, where the three primary colors prepared for the film stock had to sync exactly to the live action they supported. Both *Oz* and *GWTW* used traveling mattes nearly flawlessly, but when it was done a little bit wrong, the result was awful. By 1939, the audience had become as sophisticated as it was demanding, and one out-of-sync color scene could destroy the emotional power of the whole movie.

ENTER THE FEDS—AND A NEW STANDARD IN FILM EDITING

One might argue that some movies of the late '20s and early '30s were over the top in the license they took in the name of entertainment. In an attempt at federal control to match the national "success" of prohibition, the Hays Code was established in 1934⁽¹⁴⁾ to oversee and purify the content of the movies. The code was to be in effect until the late '60s, when it was replaced by the current ratings system, which liberated film content. Through mandating the curtailing of sex in many mainstream films and violence in gangster films, the Hays Code had a seemingly limited effect on the content of horror and suspense films, where the suggestion of violence became key to building the suspense. Mainstream films followed this idea through the use of natural devices such as shadows and chiaroscuro to build plot tension and waves crashing on the shore to suggest a sexual encounter. The use of metaphor as an editorial device became a foremost plot builder.

THE '40s: PROPAGANDA AND FILM NOUVEAU

Many films of the '40s were in increasingly refined black and white. One of the finest examples of

artistic filmmaking was gifted to us in 1941 with Orson Welles's *Citizen Kane*, arguably one of the greatest films ever, in plot and technique. Special effects using traveling mattes and rear projections were used profusely throughout the film, yet with such transparency that the film was not even nominated in the special effects category—an oblique testament to Welles's mastery over visual effects and film editing. It was nominated for best film in 1941, but was defeated by Fox's box office comedy *It Happened One Night*. However, with *Citizen Kane*, Orson Welles set the intellectual and technical quality standards for future films, not only in his subtle use of special effects, but also in establishing a model for auteur and independent films to follow.

Films and their special effects took on a new role with the outbreak of World War II. Though Hollywood produced 40 percent fewer films during wartime, the home front attendance in theaters was high. This time people went to the movies not only to forget their woes, as was the case during the depression, but also to remember the “boys”: husbands and sons fighting for freedom overseas. Horror and science fiction films, the vehicles of the most obvious special effects, were pretty much shelved in favor of what sold: patriotism.

Actor John Wayne was a prime catalyst for the fighting spirit of the American soldier. Already having established himself as a film cowboy in John Ford's westerns, he now donned the uniform to do battle in the theater of Hollywood, and one could argue that he won the war in Peoria. “The Duke” starred in relatively few war films, but he emerged as the consummate American patriot, a box office draw and a propaganda success. The standard for the “fighting patriot” cast in celluloid defined the moviegoer as much as it did the star, and would become a pervasive box office draw—and a magnet for special effects—in the decades to follow.

Effective propaganda is spectacular, and here is where the special effect found its way into war

films. Entire war scenes were recreated using traveling mattes, rear projections, and whole fleets of miniatures. MGM erected a 300-square-foot water tank flanked with a rear projection screen. Despite the size of the tank, miniatures could not be that small because they had to show enough detail to be convincing. A 50-foot-long miniature aircraft carrier can take up a lot of space in such a tank of water, especially when surrounded by a task force of miniature Hellcats suspended from wires taking off, landing, and occasionally crashing into it. Also, as fans blew on the tank water to make it look choppy, the waves had to appear in proportion to the miniatures, or the effect was lost.

Also, explosions had to look convincing, and this gave rise to a new special effects person: the pyrotechnic artist. These guys may have come from the foxholes as explosive experts, but they had an eye for the physics that made a battlefield explosion look realistically different from an exploding gas tank or the barrage bombing of a city. So now not only did special effects have to make things look convincingly real, but the effect had to be executed with moderation. This would be a daunting task for today's effects directors, who are conditioned to make things look outrageously fantastic.

Another genre finding its way into wartime cinema was the suspense film. Though the style had been popular in the past, it now achieved a new refinement through the achievements of director Alfred Hitchcock. Having garnered directorial success in his native England, he was hired in 1939 by David O. Selznick at MGM on a seven-year contract. Fresh from his Oscar-winning production of *Gone with the Wind*, Selznick's first collaboration with Hitchcock was *Rebecca* (1940), which won Best Picture and Best Director in 1940. From the beginning of their relationship, Selznick's demand for artistic control may have crimped Hitchcock's style, but not his genius.

Like Orson Welles's controlled use of special effects, Hitchcock also wove them transparently

into his movies. In *Rebecca* he used extensive rear projection and miniatures to create the eerie atmosphere of Manderley, the English manor home featured in the film. In *Lifeboat* (1944), he used rear projection to convey the breadth of the ocean. Increasingly, he would rely on special effects treatments in his films, but like the underlying trademark of his gallows humor, the special effects would be subtle.

THE '50s: SUBURBIA AND MONSTERS IN RUBBER SUITS

The movie industry shifted gears at the end of the war and into the '50s with a surge in the economy and the resulting consumerism. The nature of movies was also retooled for another reason: they were competing against the new force brought on by television.

The movie industry took a number of hits during the '50s. The effect of TV was as pressing to Hollywood business as its growth was immediate with the growing suburban household consumer culture. The economics of advertising-supported free viewership of television significantly reduced turnout at the theaters to about half of what it had been. Adding to this was a 1948 ruling by the federal government that the Hollywood/movie theater alliance was monopolistic, and that the movie business had to relinquish its control of the theaters and the distribution of films. As a result, the cinema houses became independent and could choose what films to show.

All of this may have actually been a double-edged sword for both the film and theater industry in the sense that they could align their demographic to a growing number of kids and teenagers: the baby boomers. Without the burden of depression followed by war and more free time on their hands in a growing economy, parents would drop their kids off for an afternoon at the movies while they went to play golf. Also, teenagers would flock to the movies at night while their parents

stayed home to watch Uncle Miltie (Milton Berle) and Sid Caesar, as television revived vaudeville. In a sense, the local theater became a babysitter.

The '50s movies advanced a number of new technologies to compete with the tiny television screen. The technique and resulting quality of animation were improved, as evidenced in the Warner Brothers and Disney animations. The methods of optical printing and traveling mattes were further refined. But the two most significant '50s standouts were Technicolor and CinemaScope, two areas where television couldn't compete.

Color had been introduced in 1935 with RKO's *Becky Sharp*, but the seeming lack of audience interest coupled with the cost of the process and the war diminished its use during the '40s. The studios banked on its comeback in the '50s, and from early in the decade more and more films appeared in color. Oddly enough, audience numbers remained the same whether the movie was in color or black and white, so color became relegated to epic films and studios with bigger budgets.

CinemaScope, under any other name, seemed to produce a bigger draw. More ambitious theaters enlarged their screens to accommodate the widescreen format, while standard-sized screens projected a letterboxed version. Even on a standard screen, wide projections seemed to (at least psychologically) show more. CinemaScope also presented more challenges (thus opportunities) for the development of matte and rear projection special effects, while providing the screen real estate for more and detailed models.

Both CinemaScope and color served to revive the epic story, and there was no shortage of them in the '50s. From *The Robe* (1953) to *The Ten Commandments* (1956) to *Ben Hur* (1959), there were a slew of interpretations of biblical stories—in biblical proportions—all in widescreen color grandeur. These epics called upon a wealth of

special effects that have by now become legendary. From the raining down of toads to the parting of the Red Sea, special effects recreated acts of God in *The Ten Commandments*. From the recreation of Roman war galley sea battles to chariot races in the Coliseum in *Ben Hur*, they recreated a Hollywood version of history.

The epic film drew in audiences of all ages, but the most consistent audience was that of teenagers. Most of the major studios saw little future in catering to such a narrow market, but more independent studios sprung up with a slew of low-budget horror films featuring actors in rubber monster suits, such as *The Creature from the Black Lagoon* (1954) and *The Beast from 20,000 Fathoms* (1953), and mutated, stop motioned, mechanical ants, such as *Them!* (1954). Many of these films centered around nuclear experiments and explosions gone bad, a comparatively light-hearted account centering around the very real fear of nuclear annihilation. The reality was a bigger horror story than anything on celluloid, but as these horror stories tapped into the fear, they also served to reduce the dread, at least for 90 minutes.

The '50s saw the resurgence of the science fiction genre, which had been subdued since the '30s. Many of the sci-fi special effects for which the '50s are remembered are enduringly cheesy. Most prominent among these was *Godzilla* (translated "gorilla-whale"), the Japanese import created by Tomoyuki Tamaka in 1954.⁽¹⁵⁾ The kitschy, gigantic lizard who made his clumsy trek through a model Tokyo was to make his appearance through 12 iterations in nearly 30 films.⁽¹⁶⁾ There were also the quirky, hastily produced movies from the studio basements of Roger Corman (*Swamp Women*, 1955; *Attack of the Crab Monsters*, 1957) and of transvestite Ed Wood (*Glen or Glenda?*, 1953; *Plan 9 From Outer Space*, 1959).⁽¹⁷⁾ Wood's legacy is marked by the 1980 "Golden Turkey Award" for "The Worst Director of All Time."⁽¹⁸⁾

Throughout the '50s, though, there were a small number of quality science fiction productions. Many of these came through the efforts of George Pal, who worked with the high-budget Paramount Studios. Starting with his animated "Puppetoons" in the late '40s, Pal went on to make *Destination Moon* (1950) and *When Worlds Collide* (1951). Perhaps his best-remembered film was the CinemaScope epic *War of the Worlds* (1953), which engaged a fleet of sleek, insectine aliens and their craft, along with sophisticated blue-screening, optical effects, cells, and mattes.

Ray Harryhausen, one of Pal's assistants from the "Puppetoons" days, soon after went on to develop a name for himself with *Mighty Joe Young* (1949), another popular overgrown simian, like Kong, but with a lot more heart and a sensitive ear for music. Harryhausen went on to make other sci-fi films, such as *It Came from Beneath the Sea* (1955) and *Twenty Million Miles to Earth* (1957). But perhaps he is best remembered for the special effects he created in his mythological films such as *The Seventh Voyage of Sinbad* (1959) and *Jason and the Argonauts* (1963), in which the beleaguered Jason has a swordfight with a gaggle of skeletons.

Disney Studios solidified their place with kids during the '50s with their television shows (*The Mickey Mouse Club* and *Walt Disney Presents*) and live action films, where they forayed into special effects. The most notable of these was *20,000 Leagues Under the Sea* (1954), based on the Jules Verne novel. In the movie, the crew of the Nautilus submarine was tormented by a giant squid, with whom Kirk Douglas did battle at the end. The mechanical flaws of the squid were convincingly hidden by the turbid seawater it stirred up around it. The movie ushered in a discrete new niche for Disney, and the studio would eventually break significant ground in the art and technique of special effects, providing examples for others to follow.

THE '60s: COUNTERCULTURE, THE LONE PATRIOT, AND A SPACE ODYSSEY

The 1960s began with John Wayne and ended with Jane Fonda—a journey from conformity to counterculture. This could be applied to the cultural tempo of Hollywood as well. The attendance at theaters continued to drop, save for some of the costly epics, such as David Lean's *Lawrence of Arabia* (1962) and *Doctor Zhivago* (1966), Lewis Milestone's *Mutiny on the Bounty* (1963), John Sturges's *The Great Escape* (1963), and John Frankenheimer's *Grand Prix* (1966).

These signature epics were indeed impressive showcases of widescreen cinematography. There was less reliance on traditional use of miniatures and pyrotechnics, due to the directors wanting to keep things authentic. In the case of *Grand Prix*, for instance, real cars were shot from canons to capture the reality of car crashes. In *The Great Escape*, real airplanes were crashed during several takes. In the case of *Doctor Zhivago*, David Lean sprayed fake snow over great expanses of Spain to simulate the Ukraine.

Only the largest studios could afford to produce such films, which were directed and controlled by sometimes-desperate studio committees. As a result many of these films went over budget in an already-suffering industry economy. None went more over budget than Fox's *Cleopatra* (1963). Relying on the star attractions of Elizabeth Taylor and Richard Burton and spectacular sets, one of which floated a \$250,000 barge on a 20-acre set, which also housed a reconstructed full-scale Roman Coliseum that was larger than the 2000-year-old original, the film was produced at a cost of 44 million dollars. In today's currency, that would amount to well over a quarter billion. Such expenses would be impossible to recoup even under the best of attendance, but Fox's gamble didn't nearly pay off, making *Cleopatra* a legendary and colossal flop.

The failure of *Cleopatra* sent shock waves through the entire industry, placing future film production under the control of accountants and lawyers. The first element to suffer was special effects. Considered as unnecessary fluff, entire effects departments were dissolved, and the now-seasoned effects people either went into semi-retirement or became freelancers.

Many of the features of the '60s were British imports as, in light of the Beatles, everything with a British accent was culturally golden and offered a possibility for a profit. This was certainly true with British films marked as highbrow classics, such as *Tom Jones* (1963, Tony Richardson) and *A Man for All Seasons* (1966, Fred Zinnemann). But one film import from the UK, introduced in 1962, was destined to be a cinema cult money-maker: Bond... James Bond.

There were some landmark mechanical effects, such as the James Bond trademark bullet-firing, oil-spitting Aston Martin DB5 sports car in *Goldfinger* (1964). The perception of the James Bond film has remained legendary and fresh with each new film. Conceptually, it gave rise to the serial cult hero—the lone patriot—to be reflected in other movies and their sequels such as *Rambo* and *Indiana Jones*. One could argue that Sean Connery was the quintessential Bond, but James Bond is James Bond, a concept not tied to a particular actor.

20th Century Fox's *Planet of the Apes* (1968, Franklin J. Schaffner) revived the use of visual effects. It starred former-Moses Charlton Heston, redefining the lone patriot role as he assimilated into the ape culture. The makeup and effects were an innovative, amazingly convincing version of the rubber suit monster of the '50s. In fact, the viewer might be hard-pressed to not believe that the apes populating the planet were really humans in disguise.

The one major success that single-handedly revived and redefined visual effects as a feature through the achievements of effects-man Douglas

Trumbull was *2001: A Space Odyssey* (1969, Stanley Kubrick). One could argue that the movie saved the film business in general, but it certainly set the draw of pure special effects as vital to a movie's success. Based on the enigmatic sci-fi novel by Sir Arthur Clarke, with a plot that thoroughly confounds the viewer even to this day, it nevertheless remains an elegant effects masterpiece. The miniatures choreographed to Strauss, the blue screen techniques, and the introduction of the slit-screen “stargate” effect in the end set the caliber for the revolutionary science fiction movies to come in the seventies.

The '60s also saw the establishment of the movie code, which classified movies based on the nature of their content. This finally broke through the pervasive shadow of the ubiquitous (though now all but forgotten) Hays Code of the '30s and opened the possibility for studios to script more natural, coarser dialog and to show more sex and violence. Generally, big-name studios who wanted to keep larger audiences stuck to tamer, more family-oriented films, such as musicals like 20th Century Fox's *The Sound of Music* (1965, Robert Wise). The ratings system gave rise to the independent studio: film freelancers with enough production money to make their film the way they wanted. These movies were more “realistic,” and often called for subtle, yet convincing, special effects. Many of these independent auteur studios became associated with the larger (funding) studios, along the lines of Orson Welles's association with RKO in the making of *Citizen Kane*.

THE '70s: THE DRAW OF DISASTER IN THE DISCO AGE

The success of *2001*, though a tremendous boost to the art of the special effect, was something of an anomaly in the movie business. The television networks competed with theaters by bringing more studio films to the home screen, causing the studios to continue to lose money. There had to

be some real “blockbusters” on the big screen to draw the audience away from their homes.

Universal's *Airport* (1970, George Seaton) centered around the problems of an all-star cast running a Chicago airport and dealing with a 707 in flight with a bomb on it. The suspense-laden plot was a huge box office draw, and *Airport* spawned three sequels during the decade as “disaster films” became a formula for success, and Hollywood wanted more of them.

Irwin Allen, the director of the hit TV series *Voyage to the Bottom of the Sea*, *Lost in Space*, and *The Time Tunnel*, was hired to apply his magic to movies. After directing *The Poseidon Adventure* (1972), *The Towering Inferno* (1974), and *The Swarm* (1978), Allen was dubbed “The Master of Disaster.” Other films such as *Earthquake* (1974, Mark Robson) and *The Hindenburg* (1975, Robert Wise) also drew huge audiences. Disaster films required innovative uses of rich audio techniques, mattes, miniatures, and pyrotechnics, putting special effects departments back in business.

The film *Westworld* (1973, Michael Crichton) was centered around a place where rich vacationers in search of true adventure could match wits with robots programmed to challenge them. The movie is notable for its pioneering use of two-dimensional computer-generated imagery (CGI) to illustrate the robot's point of view.⁽¹⁹⁾ It was a painstaking process for a few minutes of footage but it paved the way for its sequel, the less critically acclaimed *Futureworld* (1976), which made use of 3D CGI.

Perhaps the most significant and lasting Hollywood phenomena of the '70s were three young directors nearly fresh out of film school: Francis Ford Coppola, George Lucas, and Steven Spielberg. They went on to direct immediate classics such as, respectively, *The Godfather* (1972), *American Graffiti* (1973), and *Jaws* (1975).

Spielberg's *Jaws* featured three sometimes-convincing mechanical sharks (all named “Bruce,”

as a tribute to Spielberg's lawyer) shown only in quick edits or murky underwater depths. The progenitor of the summer blockbuster, *Jaws* was highly promoted, over budget, and difficult to produce, as “Bruce” would not always cooperate.⁽²⁰⁾ But *Jaws*'s real strength lay in the Hitchcockian tradition of suspense, and it lived up to its hype.

It was Lucas's second major feature, *Star Wars* (1977), and Spielberg's next film, *Close Encounters of the Third Kind* (1977), that would raise the bar for the special effect, elevating it to a true art form.

THE STAR WARS PHENOMENA AND THE THREE NEW MASTERS OF THE UNIVERSE

The art and technique of special effects had come a long way since their 1930s adaptation in Buck Rogers movies and the spark-sputtering, string-drawn, bullet-shaped rocket ships with engines that sounded like a swarm of bees accented by broken fans. Drawing upon the visual elegance of *2001*, the phenomenal *Star Wars* elevated the special effect to the truly visual effect that it is today. Along with the stunning miniatures and sets that made an alien world seem entirely in synch with our own, the story line was drawn from events that happened “A long time ago in a galaxy far, far away ...” This elevated the nature of the common science fiction story to high mythology with historical significance, based in its own reality.

Lucas drew from aesthetically simple sources for many of the special effects. The assortment of aliens, particularly in the famous bar scene, allegedly began as random cloud formations and shadows on the wall. The alien sound effects were also drawn from uniquely basic sources, recalling the innovative foundations of '30s radio sound effects. Lucas's concept was to serialize the story into nine parts, six of which have already been released to dedicated sellout crowds.

20th Century Fox gave Lucas the go-ahead for *Star Wars* in 1975 but then shut down their special effects department. Rather than search for another studio, Lucas established his own, Lucasfilm. The necessity for the studio to be based in special effects called for a special team of people, generally under the age of 30. Lucas approached Douglas Trumbull of *2001* fame for the job, but he turned it down and recommended computer programmer/artist John Dykstra. Hiring a team of recent film school graduates and animators, Lucas established a special effects studio, Industrial Light and Magic (ILM), to develop the film. Though ILM closed its doors after *Star Wars* was released, it was revived in 1980 to become the gold standard of special effects big business.⁽²¹⁾

Shortly after *Star Wars* made its theater run, Spielberg's *Close Encounters of the Third Kind* was released. Bringing the fantastic closer to our own planet, *Close Encounters of the Third Kind* injected believability into the subject of abduction and aliens returning some of their abductees to earth. Unlike the nasty aliens in *War of the Worlds* 20 years before, Spielberg's take was more benign. Many viewers were captivated by the subject and came out of the theater believing that alien abduction (especially away from a depressed economy and disco) may not be such a bad thing after all.

On top of it all, the film was visually stunning. More than the traditional icing on the cake, the special effects, sets, and the eerie beauty conveyed by the dramatic interplay of light in *Close Encounters of the Third Kind* were its core recipe. This kind of quality became the lasting trademark of Spielberg's films, through the broad range of his topics, from the kid's adventure *The Goonies* (1987) to the austere gravity and importance of *Schindler's List* (1994) and *Saving Private Ryan* (1997).

Francis Ford Coppola, the most seasoned of the filmmaker trinity, made his directorial mark early with *The Godfather* (1972), followed by *The*

Godfather II (1974). Both of these films had been critical and popular successes before *Star Wars* and *Close Encounters of the Third Kind* were released. A sullen density, with characters who existed more in shadow than light, recalling the German noir styles described earlier, pervaded many of Coppola's films. *Apocalypse Now* (1979) was drawn from several novels, most notably James Conrad's *Lord Jim* and *Heart of Darkness*, in the narrative style of Michael Herr's *Dispatches*.⁽²²⁾ *The Godfather* notwithstanding, *Apocalypse Now* is arguably Coppola's masterpiece, and was as long in its production as it was reliant upon its special effects. In the case of *Apocalypse Now*, Coppola's use of effects seemed more restrained and woven into the plot than the sensational outlandishness required in the Spielberg and Lucas films to date. Coppola's controlled use of special and visual effects would find a way into the more mature films of the other two.

Naturally, films other than those produced by Spielberg, Lucas, and Coppola also rode into the late seventies inspired by the effects—and money-making—standards of *Star Wars* and *Close Encounters of the Third Kind*. *Superman* (1978, Richard Donner), *Star Trek: The Motion Picture* (1979, Robert Wise) and *Alien* (1979, Ridley Scott) were three such films typical of the new effects, and, like *Star Wars* and *Jaws*, they were all destined for sequels.

THE '80s: THE MOVIE AS THE SPECIAL EFFECT

Coppola, Spielberg, and Lucas raised the standard for moviemaking to come, as film had become something of a high culture. Audiences who had had enough of disco and the generally ordinary fare of network television shows demanded more for the rising cost of going to the movies. Like the orthodox established by Georges Méliès nearly 100 years before, amazing effects drew patronage into the theaters, and science fiction, along

with thrillers featuring beefed up heroes, were their vehicles.

No longer were sci-fi films about alien invasions by clumsy, heartless creatures. Like the bitersweet portrayal of Frankenstein's monster by Karloff in the '30s, Spielberg's *ET* (1982) showed that aliens could also be believably sentient and even humorous beings. *ET* succeeded in touching the hearts of viewers of all ages, as the stunning effects were woven so efficiently into the film that there seemed nothing unnatural about them.

George Lucas turned away from science fiction in 1981, and reached into the vaults of the 1930s to produce *Indiana Jones and the Raiders of the Lost Ark*. Creating a quintessential privateer hero swashbuckling amid a swarm of special effects, he also created a new look for a second-hand plot formula. Indiana Jones as portrayed by Harrison Ford was to launch three equally successful movies in the series over the next 25 years. The genre once again pitted the lone patriot against insurmountable odds, but we all knew he would somehow survive all perils to live to fight again in the next sequel.

Following these lines, a near future sci-fi thriller featured not a man as the protagonist, but a questionably benevolent and impassive computerized machine (okay ... a robot). *The Terminator* (1984) featured a pumped-up Arnold Schwarzenegger as the T-800 man/machine who would appear in two more highly anticipated films in the series. It would also serve to establish Schwarzenegger as a quintessential lone patriot, a beefy John Wayne, in roles where he was pitted against terrors of great proportions, where in the end he emerges as the slightly bloodied victor, in a world that is safe to carry on. The Terminator films were a riot of astounding special effects and pyrotechnics to the percussion of Taiko drums, under the directorial supervision of James Cameron.

In Ridley Scott's 1982 *Blade Runner*, traditional effects were applied as high art. Harrison Ford was cast as another 1930s-style character:

this time a detective/cop in a dreary, noir setting of the mid-21st century. The undercurrent of the film anticipates environmental degradation and overpopulation. Visual effects using mattes, blue screens, and miniatures, along with soggy lighting, created a haunting and provocatively dreary feast for the eyes. This all served to accent the growing realization that the movie, in itself, is purely the special and visual effect.

THE NEW HOLLYWOOD ECONOMY

Unlike the disaster it had once been in the '50s and '60s, the sequel had now become a Hollywood preference. The front office realized that a blockbuster film in later iterations would assure a cult-driven blockbuster audience. Now that more studios were regaining control of theaters and film distribution, and that the *Star Wars* concept had bolstered the economy of the industry, Hollywood spent more production dollars on special effects. Whereas to produce and promote a typical film would cost around \$2 million in the '70s, by the early '80s the cost would be up to \$10 million, and by the end of the decade close to \$25 million. Today, it's around \$50 million. Though still a far cry from the (projected) \$300 million 1962 catastrophe of *Cleopatra*, these costs, though substantial, were in line with blockbuster production costs. Hollywood would take such a gamble because every once and a while, there might be a chance to recoup \$1 billion, as was the case with *Titanic* (1997, James Cameron).

During the '80s, the home video and cable television industries may have caused the same threat to the film industry as television did in the '50s. But Hollywood, having learned from its mistakes, was now savvy in finding ways to work in concert with home viewing through residuals. This could reach a point where costs could be recouped through video and cable sales alone. As part of this financial formula, releasing a mediocre film to video soon after its short run on the big screen could work to turn a profit on it. Naturally, though,

studios still focused on saving production costs, sometimes so the money could be put toward advancing the film. Case in point: Ridley Scott's 1979 *Alien* cost \$10 million to produce and \$15 million to promote. In the case of *Alien*, this strategy paid off, with much of the profits coming from residuals from video distribution. It also introduced the first major female lone patriot, Warrant Officer Ripley, played by Sigourney Weaver, who waged a solo battle against the nasty aliens.

The costs of model making and editing were heightening with demand and sophistication. One studio that was becoming painfully aware of this was Disney. Having produced a good number of modest films that were predictably Disney, such as *The Shaggy D.A.* (1974), the studio made its first science fiction film, *The Black Hole* in 1979, costing Disney the most it had spent on a film to date (\$20 million to produce, plus \$6 million to promote).⁽²³⁾ The film was uncharacteristic for the studio in a number of ways. A Disney first, the film contained light swearing, which earned it the studio's first PG rating.⁽²⁴⁾ Its relatively dense plot was religiously metaphoric and ended enigmatically, along the lines of *2001*. But *The Black Hole's* most significant contribution was the most extensive use of CGI and digital audio to date. More importantly, their use had shown that fantastic effects could be generated in CGI, though a significant cost savings in their use was still 15 years away.

In 1982, Disney produced *Tron*, a story about a programmer (played by Jeff Bridges) who becomes part of a computer game, within the computer, in order to foil a greedy corporate scheme.⁽²⁵⁾ The film was roundly panned, but its true significance as to special effects was that there were large numbers of scenes that were computer enhanced, along with others that were purely CGI. Despite the kind of technical innovations only a programmer could love, the effects looked slapdash, even annoying at times, giving the movie a low-budget appearance. Audiences wanted *Star Wars*, *Blade Runner*, or even another

Black Hole, and what they felt they got was chintzy *Buck Rogers*. The true value of *Tron* was in its role as an antecedent for the most significant advance in the history of special effects.

THE '90s: CGI—FROM ATOMS TO BITS

In his 1995 book, *Being Digital*, MIT computer guru Nicholas Negroponte commented that elements of our daily lives were undergoing a transformation from “atoms to bits.”⁽²⁶⁾ Even the less skeptical among us could not foresee how that could happen, as it was beyond our imaginations. Now, 15 years later, we are routinely accepting this fact without question. Part of the path that led us to this point had its genesis in special effects in film, a transformation that had demonstrated to us the possibilities of technology.

Studios were turning to special effects houses, such as Lucas's ILM and James Cameron's newly formed Digital Domain, to efficiently create their films. Lucas and Spielberg in particular had mastered the art of working within budget and the tight, finished storyboard, which served to solidify the shoot without a lot of trial-and-error takes. Also, the films they made were based on action, rather than the temperament of actors: miniatures and static and animatronic models never complain. Finally, art worked in collusion with business, as Lucas and Spielberg were prominent creatives in their own right and knew the value of a shoot. They were the “producers' producers,” and many mega studios (now themselves run by even bigger conglomerates) longed to work with them. Many of these special effects houses had staffs and departments easily larger than the whole studio crew it would have taken to produce a 1950s feature film.

Blockbuster movies such as James Cameron's *Terminator 2: Judgment Day* (1991) drew an even larger audience than the original and demonstrated the types of wonders that could be accomplished through special effects with the innovation of computer-generated characters. In

the movie, the mercurial shape-shifting T-1000 robot, with the help of the geniuses at ILM, could morph into any form and kept audiences captivated. Movies such as the *Terminator* series and *Die Hard* (1988, John McTiernan), with Bruce Willis as the quintessential lone patriot, proliferated. Large numbers of viewers abandoned their TVs to flock to the movies to watch slo-mo action choreographed against a backdrop of pyrotechnics permeated with Dolby Digital surround sound. Many of these viewers would later rent the video or DVD to see what they might have missed the first time. This new classification of viewer was becoming involved.

The most stunning development in the art of digital graphics and animation was through something incredible made to look quite credible. Spielberg's *Jurassic Park* (1993), based on Michael Crichton's 1990 novel, required the adaptation of dinosaurs co-existing with humans. Meshing digital imagery into live action, Spielberg commissioned Stan Winston Studios and ILM to create an array of robotic animatronics dinosaurs and digital effects. The film's budget was \$95 million (\$65 million of that was for marketing and distribution), and it grossed about 10 times that, making it the 10th highest grossing film to current date.⁽²⁷⁾ Also, the computer imagery in *Jurassic Park* set the ideal for what would follow in the new millennium, notably Peter Jackson's *Lord of the Rings* trilogy (2001) and his version of *King Kong* (2005).

From *Jurassic Park*, Spielberg went on to direct the film he had intended to direct before it, *Schindler's List*. Sid Sheinberg, the president of Universal Pictures' parent company MCI, allowed Spielberg to go ahead on *Schindler's List* on the condition that he shoot *Jurassic Park* first. This directive was as wise as it was emotional. Sheinberg knew that *Jurassic Park* would not have had the “heart” and would not have been the blockbuster it was if Spielberg had first experienced the weight of *Schindler's List*. Spielberg later rea-

soned: “He knew that once I had directed *Schindler* I wouldn’t be able to do *Jurassic Park*.”⁽²⁸⁾

In 1995, Disney Studios broke the digital effects mold again with the release of *Toy Story*, in partnership with Apple’s Pixar Animation Studios for a three-film serial deal. *Toy Story* was the first fully digital film ever produced. With a budget of a mere \$30 million, the film and peripherals pulled in nearly \$370 million.⁽²⁹⁾ Inspired by the large profit that can be made with technology that was limited only by the creativity of the team, Disney/Pixar would produce seven more such high-grossing animations to date (2009), with five more to be released before 2012.⁽³⁰⁾ Many of these films have not been just cartoons for kids. Weaving 40-year-old pop culture references into the plot, they also appealed strongly to large numbers of former Mousketeers: the baby boomer market.

Success such as this does not go unchallenged. In 1994, ousted Disney corporate head Jeffrey Katzenberg (producer of such successes as *Who Framed Roger Rabbit?* [1988] and *The Lion King* [1994]) joined forces with Steven Spielberg and David Geffen to form DreamWorks Studios.⁽³¹⁾ In the the 10-year span from *Antz* (1998) to *Madagascar II* (2008), DreamWorks produced 11 digital animation films, each a succession in refinement of the art. The most anticipated of these has been *Shrek*, whose initial \$60 million budget produced \$485 million (*Shrek 1*, 2001).⁽³²⁾ All of these immensely successful digital films are totally dependent upon the kind of special effects produced in computer graphics, and have created a solid golden age for special effects opportunities—and challenges.

One key groundbreaking special effects movie, *The Matrix* (1999, Andy and Larry Wachowski), won the Visual Effects Academy Award for the year, beating out the much-anticipated *Star Wars 1: The Phantom Menace*.⁽³³⁾ *The Matrix* was significant for its trademark visual effects using stop action photography morphed together as a clip, called “bullet-time.” With a technique borrowed

from the 1870s photographer Eadweard Muybridge, a battery of still cameras was set up to capture fluid movement.⁽³⁴⁾ *The Matrix* was also significant in that it raised the bar higher still for visual effects production, as it seemed to close out an era of optical, tactile effects to usher in yet a new digital revolution in film. The sequels *Matrix Reloaded* (May, 2003) and *Matrix Revolutions* (November, 2003) would use primarily digital techniques.

The astounding value of CGI did not progress from the rudiments of *Tron* to the perfection of *The Matrix* through a vacuum of ideas. Around 1986, five years after *Tron* was released, the home computer was a growing staple in many workplaces and households. Around the same time, computer gaming, which had been a growing phenomenon since the early ’70s, was making its move from the arcade to the personal computer.

Computer games had vastly improved in their quality and depth of interaction. By the mid-’90s, games had incorporated many special effects devices in their production, such as character motion capture.⁽³⁵⁾ Three-dimensional role-playing games (RPGs) such as the first-person *Doom* (1993) and *Myst* (1993) would soon lead to more sophisticated third-person games, such as *Lara Croft-Tomb Raider* (1996) and *Grand Theft Auto* (1997). These employed user-controlled characters within an interactive—and debatably violent—story. In interactive computer games, corporate Hollywood found a new extremely lucrative option for extending the life of their blockbusters, assuring more sequels, such as *The Matrix*. Games were also (relatively cheaply) developed for some box office bombs in an attempt to recoup the lost costs.

The later ’90s ushered in more sophisticated RPGs, but more importantly, gave definition to the “user”—a separate generation of audience who would command more action and more immersion into the film. This tactic has often sacrificed the depth of plot demanded by the more tradi-

tional, profitable, older generation of viewer. The making of today’s movies is faced with striking this balance, which is continually changing, as each generation of filmgoer is influenced by new technical advances.

One in particular is arguably the most significant techno-cultural invention since the wheel—the Internet. It is here where virtual, interactive, real-time social environments are making new demands upon the role of special effects. In this sense, the user has become the media, as much as the media is the user. Marshall McLuhan’s ubiquitous “Global Village”⁽³⁶⁾ has finally been realized.

THE NEW MILLENNIUM

From 2000 forward, visual and special effects has continued to be a work in progress, and these recent innovations are covered in the pages to follow. I suggest that conceptual formats for very real possibilities were presented in two badly reviewed movies early in the decade. The first was *Simone* (2002, Andrew Niccol), wherein a clandestinely digitized avatar replaces a real actress who has walked off the set. Believing she is real, the media make her a sensation. Real-world applications of digitized actors are not that far afield. Consider a real Brad Pitt playing a role with a virtual Clark Gable. Concepts like this were hinted at long ago in films such as Woody Allen’s *Play It Again, Sam* (1972), where a Humphrey Bogart look-alike plays against Woody.⁽³⁷⁾ However, digitally created actors can be made to look and act flawlessly real, and they make no demands and work (relatively) cheap.

Another movie to consider is 2001’s *Final Fantasy*. Though also badly received, the film cannot be slighted for its convincing animation. The viewer is hard-pressed at times to not accept the animated characters as real. Such real-world advances in digital animation make just about everything possible.

These developing ideals have created a whole new kind of audience. The viewer-turned-user eventually may wish to change the outcome of the film to their liking. This could change the traditional definition of “special effects.” Once creating a purely audio/visual shared experience, these elements are now taken for granted. Special effects could now become much more about what isn’t readily seen, but what is truly experienced through programming. The work is cut out for the special effects artists, as we are now only beginning to realize Georges Méliès’s illusion through the magician that is special effects. All in all, though, the progress isn’t bad for a century’s worth of special effects.

REFERENCES

The Overall Resource for This Writing

Rickitt, R. (2007). *Special effects—The history and techniques*. Billboard Books, an imprint of Watson-Guptill.

Supplementary Resources

- Handy, E. (2004). “Robinson, Henry Peach (1830–1901).” *Oxford Dictionary of National Biography*, Oxford University Press.
- Special effect. (n.d.) Retrieved from http://en.wikipedia.org/wiki/Special_effects
- Cousins, M. (2007). *The story of film, a worldwide history*. New York: Thunder’s Mouth Press, an Avalon Publishing Group, Inc.
- Miller, A. I. (2001). *Picasso, Einstein, Picasso: Space, time and the beauty that causes havoc*. Basic Books.
- Cousins, M. (2007). *The story of film, a worldwide history*. New York: Thunder’s Mouth Press, an Avalon Publishing Group, Inc.
- Cousins, M. (2007). *The story of film, a worldwide history*. New York: Thunder’s Mouth Press, an Avalon Publishing Group, Inc.
- Nosferatu. (n.d.) Retrieved from <http://en.wikipedia.org/wiki/Nosferatu>
- Murnau, F. W. (n.d.) Retrieved from http://en.wikipedia.org/wiki/F._W._Murnau
- Shüfftan process. (n.d.) Retrieved from http://en.wikipedia.org/wiki/Shuftan_process; Pinteau, P., & Hirsch, L. (Translators) (2005). *Special effects: an oral history—interviews with 37 masters spanning 100 years*. Harry N. Abrams, Inc.
- Fritz Lang. (n.d.) Retrieved from http://en.wikipedia.org/wiki/Fritz_Lang
- Cousins, M. (2007). *The story of film, a worldwide history*. New York: Thunder’s Mouth Press, an Avalon Publishing Group, Inc.
- Max Fleischer. (n.d.) Retrieved from http://en.wikipedia.org/wiki/Max_Fleischer; Fleischer, R. (2005). *Out of the inkwell: Max Fleischer and the animation revolution*. University Press of Kentucky.
- Tod Browning. (n.d.) Retrieved from http://en.wikipedia.org/wiki/Tod_Browning
- Borden, D., Duijsens, F., Gilbert, T., & Smith, A. (2008). *Film: a world history*. New York: Abrams.
- Godzilla. (n.d.) Retrieved from [http://en.wikipedia.org/wiki/Godzilla_\(1954_film\)](http://en.wikipedia.org/wiki/Godzilla_(1954_film))
- Godzilla. (n.d.) Retrieved from <http://en.wikipedia.org/wiki/Godzilla>
- Ed Wood. (n.d.) Retrieved from http://en.wikipedia.org/wiki/Ed_Wood
- Medved, H., & Medved, M. (1980). *The Golden Turkey Awards*. Putnam.
- Westworld. (n.d.) Retrieved from [http://en.wikipedia.org/wiki/Westworld_\(film\)](http://en.wikipedia.org/wiki/Westworld_(film))
- Jaws. (n.d.) Retrieved from [http://en.wikipedia.org/wiki/Jaws_\(film\)](http://en.wikipedia.org/wiki/Jaws_(film)); *Spotlight on Location: The Making of Jaws*. (2005). *Jaws* 30th Anniversary DVD documentary.
- Industrial Light & Magic. (n.d.) Retrieved from http://en.wikipedia.org/wiki/Industrial_Light_and_Magic
- Apocalypse Now. (n.d.) Retrieved from http://en.wikipedia.org/wiki/Apocalypse_now
- The Black Hole. (n.d.) Retrieved from http://en.wikipedia.org/wiki/The_Black_Hole; Cinefantastique Magazine, “Black Hole Special Issue,” Spring 1980.
- The Black Hole. (n.d.) Retrieved from http://en.wikipedia.org/wiki/The_Black_Hole
- Tron. (n.d.) Retrieved from [http://en.wikipedia.org/wiki/Tron_\(film\)](http://en.wikipedia.org/wiki/Tron_(film))
- Negroponce, N. (1996). *Being digital, Chapter 1*. Alfred A. Knopf, Inc.
- Jurassic Park. (n.d.) Retrieved from [http://en.wikipedia.org/wiki/Jurassic_Park_\(film\)](http://en.wikipedia.org/wiki/Jurassic_Park_(film))
- Jurassic Park. (n.d.) Retrieved from [http://en.wikipedia.org/wiki/Jurassic_Park_\(film\)](http://en.wikipedia.org/wiki/Jurassic_Park_(film)); McBride, J. (1997). *Steven Spielberg*. Faber and Faber.
- www.the-numbers.com/movies/1995/0TYST.php
- List of Disney feature films: upcoming releases. (n.d.) Retrieved from http://en.wikipedia.org/wiki/Disney_films#Upcoming_releases
- Jeffrey Katzenberg. (n.d.) Retrieved from http://en.wikipedia.org/wiki/Jeffrey_Katzenberg
- DreamWorks Animation. (n.d.) Retrieved from http://en.wikipedia.org/wiki/DreamWorks_Animation
- The Matrix (series). (n.d.) Retrieved from [http://en.wikipedia.org/wiki/The_Matrix_\(film_series\)](http://en.wikipedia.org/wiki/The_Matrix_(film_series))
- The Matrix. (n.d.) Retrieved from http://en.wikipedia.org/wiki/The_Matrix
- Motion capture. (n.d.) Retrieved from http://en.wikipedia.org/wiki/Motion_capture
- McLuhen, M. (1964). *Understanding media*. Cambridge, MA: MIT Press.
- Play It Again, Sam (1972 film). (n.d.) Retrieved from [http://en.wikipedia.org/wiki/Play_It_Again,_Sam_\(1972_film\)](http://en.wikipedia.org/wiki/Play_It_Again,_Sam_(1972_film))

FOREWORD

Jakob Trollbäck

In the beginning, there was imagination. When we first gained consciousness, there must have been precious little knowledge around. We were basically guided by instincts, but besides that, we must have been pretty perplexed. Our brains must have compensated for the lack of understandable facts by making up stories. Those early stories attempted to explain what reason couldn't readily grasp. Occurrences in the outside world as well as our innermost, sometimes inexplicable, thoughts and dreams were ascribed mystical, imaginative meanings. The arch of those stories became part of our reality. Archetypes made our lives a little more understandable, and through mythology, we attempted to find a larger purpose for our lives.

As a kid in Sweden, I learned everything about the old Norse Gods. I was taught that in the past, people believed that whenever they heard the loud cracks of thunder, it was the mighty Thor riding the sky with his power girdle and iron gloves, throwing his mighty hammer to create striking bolts of lightning. I thought it was cool. Man, those Vikings were really loopy. Hadn't they ever heard

about discharge of accumulated atmospheric electricity?

But imagined realities can sometimes help to anchor us. Like Einstein's famous fudge factor, the stories can be what make the equation work. From an existential point of view, it may be better to live in a fantastic, slightly made up but somewhat understandable reality than one that is totally opaque.

Besides the ability to fill in the blanks when reason grinds to a halt, imagination is essential when we try to figure out how things work. It allows us to experiment with different ideas and get a better perspective on life. In the game of imagination, it is much, much better to be original, weird, and passionate than to be right and true. The ability to inspire and project a different reality is essential for human progress. Imagination, and nothing else, makes us ask "what if?" and "why not?"

People with open minds full of creativity are vital if you want to initiate change. But before we go ahead and change things at random, it's important to first be able to conjure images of a better

life, a more interesting future. If you can't imagine where you're going, why would you have an urge to go there at all? However unbelievable and far-fetched the stories of Jules Verne were, they surely inspired us to dream of an amazingly different tomorrow. I'm sure that after reading his stories, thousands of kids became explorers and scientists. The true genius of a visionary mind is the ability to project and inspire.

Still, our creative mind is not limited to finding explanations for what we can't comprehend and inspiring us to move on. Imagination—and its physical manifestation which we call magic—is essential for our well-being. To have the ability to stretch our thoughts and imagine a different life is a powerful antidote to hardship and suffering. We see it clearly in hard times, when we flock to the theatre and to the movies. There, we have a chance to take flight and trade our worries for a journey to magical places. Stories take us to other places where we can feel strong, righteous, and happy.

It is no wonder that magic, in whatever form, has fascinated people for thousands of years. In

the past, magic was conjured through primitive, but cleverly hidden, effects that depended on distractions to mask the fib that made the wonderful deception possible. Magicians were behind the first rudimentary special effects in the movies. Looking at them today, they seem pretty transparent and it's hard to believe that anyone actually bought the deceit. But back then, we were still very much in awe of the large screen, and not much was needed to make us believe. If the monster was scary enough—and the musical score made that abundantly clear—few people noticed, or cared, that it was clearly made out of papier-mâché and that a 2 × 4 was sticking out the bottom. To eyes not yet used to visual tricks, and minds that wanted to believe, that imaginary beast was real. The wish to believe in wonder is the best friend of all visual effects. Only cynics deny themselves the joy of being carried away.

Even the simplest of setups had the power to capture our imagination. Remember the infamous first screening of the Lumiere brothers' train film where the audience stampeded out of the theatre in panic as the train seemed to overtake them? Amusingly, in that case the only effect was a cleverly positioned camera. But to the virgin eye still not familiar to movement on a two-dimensional plane, it was all too real. As our eyes have become more used to filmic tricks, visual artists are working

hard to find new ways to amaze us with their visions. The first goal has always been to make the effect look more real. Robotic monsters and matte paintings were largely retired when rapid developments in computer graphics made it possible to enhance and manipulate the visual experience in new ways. Though those early computer-generated visual effects may have my 10-year-old son in stitches, back then it worked wonders.

All too soon, all that over-the-top CGI started to wear off. Here lies the true challenge in visualizing fantastic images: as soon as you have seen the effect on a screen, you know that it was all made-up. It can still inspire our imagination the way a book does, but when the fantastic gets juxtaposed with the known world, it tends to lose some of its imaginative power. Could it be that the more you try to visualize the fantastic, the more common it becomes?

To counter this dulling effect, today's visual effects are carefully incorporating the physics of real life, and the best effects are carefully inserted into the world we live in. An enhanced reality is much more believable than one that is totally over the top. The movie *Blade Runner* set the stage by showing a future where levitating ships and video pay-phones were worn and riddled with graffiti. Twenty-five years later, computing power has

increased about 30 thousand times and we have seen a hundred other futuristic visions, but the film still stands out as one of the most amazing trips into the future. The seamless integration of effects and reality is incredibly powerful.

But what makes the visual effects field so endlessly fascinating is that you can never stay still. Renewal is a must because the ultimate achievement lies in making us believe in imagination, something that can only happen if we see something that our minds haven't already processed and filed under Effects, comma, Visuals. Great storytellers and ingenious image-makers are well aware of this as they try to find new ways take us on fantastic expeditions. In the end, though, it's not about showing us things that we haven't seen before. We are only truly moved when the images tell a story that we haven't heard before.

In the end, the most important thing is to never lose the ability to believe. If we do, we'll quickly turn old and gray. Whenever you hear a child tell a story and sense the fantastic power of imagination, pray that she will always keep that spark. If she can hold onto that gift and stay afloat above the gravitational pull of life, her stories will be beautiful and true, and thus in the end, we will all be well.

Visual effects, circa 2008. Take a quick moment to stand up, stretch, and ask yourself, is it everything it promised you it would be?

Like a shimmering black Hummer with mud flaps reading “Back Off,” the greater VFX industry still maneuvers astonishingly well, chasing down and often catching (in fleeting two-hour spells) an insatiable audience appetite for a faster, louder, deeper, more visceral experience. But as the challenge of fooling the eye becomes ubiquitous and expected, the overdue discourse between the science of what can be done and the art of what should be done will be forced to take place within the industry.

We only ask one thing of the realm of VFX: to transport us. Truly moving visual effects find their power by honoring the existing, diverse psychologies of the viewer. Effects work that opts for emotional connection and service to story retains significance well after the technique, science, and execution grow repeated, dated, or even obsolete. The distinction is as important as the difference between a homemade dinner and a plastic facsimile in the microwave. Spielberg acciden-

tally—intentionally discovered this subtle, powerful difference with *Jaws*. A mechanical shark was not fully functional when shooting began. Most of the film shoot transpired shark-free, but audience fear is only magnified thanks to the glitch. Spielberg instead shot from the point of view of the shark. This serendipitous difficulty created a film that played not on our fear of sharks, but on our fear of being helpless in the water. We as an audience brought the most immensely powerful visual effect with us: our own psyche.

It seems that some work, several decades old, holds such strong relevance, while other pieces, shortly after their completion, are relegated to an uncanny valley floor of unwatchable, toy-like trivia. This valley is littered with artwork that banked on the effect as the story. VFX work that remains loyal, obedient, and conforming to the story maintains a remarkable level of transportive power, even if the execution itself runs past its expiration date.

Today’s logistical, high-render workflows make it all but impossible for filmmakers to create, re-assess, and create again. Green motion-

capture sets and actors crying to tennis ball tracking markers leave little room for the serendipity, failure, and flaw that filmmakers often cite as the saving grace of the finished work.

The idea that VFX as a craft can execute in a style that moves with and toward audiences with accessible flaws is more the exception than the rule. As filmmakers, we would do well to let our audiences in on our joke occasionally. The do-it-yourself VFX work of Michel Gondry connects to its audience by exposing and celebrating the hand of the filmmaker. Older, analog techniques, including stop motion animation, continue their resurgence. Nonetheless, much of the contemporary VFX industry seems content to expand the distance between maker and viewer, establishing bragging rights via a “you could never do this” philosophy.

Take, for instance, the notion of the “uncanny valley,” the idea that human characteristics are perceived in forms that are very non-human, generating great empathy. Meanwhile, “almost human” forms stand out. Viewers’ negative reactions range from distanced to repulsed. Belea-

guered audience reactions to the *Beowulf* and *The Polar Express* characters are cited as being caused by the uncanny valley. Surely there are countless other as-yet-undiscovered valleys in the vast VFX mountain range.

It sounds like Jungian gibberish, but consider audience psyche as part of the equation for success—or even most of the equation for success. A truly “affective effect” does not assume that all viewers are transported to the same place in the same way. Working away from spoon-feeding FX imagery to audiences goes a long way in allowing audience participation in the story (*Alien*, *Cloverfield*, *Jaws*). The heart of the viewer, the history that viewers bring to the table, should take a higher priority in the art of visual storytelling.

The moment Jar Jar uttered his first line, so began the desecration of audience psychological

participation. No longer could we absorb Jar Jar with our own informed history, for he is so over-characterized that there is no room for interpretation. We were gifted with a coloring book that had already been filled in. Take Chewbacca, on the other hand. Now there was a character. He was not only wildly accessible from a filmmaking perspective (put an actor in a fur suit), but he set off tiny sparks of emotional access, like our first family dog, our childhood teddy bear, and our instinctive desire to connect with something that cannot speak to us in words. That puppy-like throttle-mourn that emanates when Chewy learns of his best friend’s demise? Wait, stop ... apple in the throat just thinking about it.

So, will audiences continue to regard execution as the pre-eminent aspect of visual effects work? Does reliance on the power of VFX dull or

delude our emphasis on storytelling? The craft of VFX has its best days ahead. There is a wealth of untapped power waiting in the form of personal memory, psychology, and tangible connection to the image on the screen, and the real magic lies in our ability as viewers to bring our own experiences into the story. Here’s to the expectation that we as audiences will begin to scrutinize and question visual works that play stand-in for story and experience. Our imaginations are not seeking a surrogate. We’re still hungry, but not for more rations of empty-calorie, over-rendered fare. We’ll settle most days for the beautiful flaw of a Wookiee suit and a chipped platter of mom’s macaroni and cheese. It just tastes better.

THORNBERG & FORESTER

ARTIST INSIGHT: VISUAL EFFECTS 2.0: MASTERING THE IMPOSSIBLE

Artists have been manipulating images since the birth of photography in the 1820s. From the beginning, mattes, superimposition, and dodging and burning techniques were used to alter images with stunningly convincing results. Visual effects have continued to evolve over time and now utilize miniature sets, models, animatronics, CGI, motion matte paintings, global illumination, and ray tracing among other newer practices, in addition to the original techniques that began these visual illusions so long ago. Those who produce this magic with an ever-growing arsenal of smoke and mirrors strive to create the new illusion, one that has never been seen or achieved before. In a world where there is so much beyond our scope of view and understanding, it is no surprise that we are smitten with the magic of visual effects. This realm allows the human race to master forces that otherwise remain beyond our comprehension and control.

Eadweard Muybridge is considered by many to be the father of visual effects. This happened purely by chance. He was hired by railroad tycoon Leland Stanford to settle a bet over whether all

four hooves of a galloping horse ever left the ground at the same time. Muybridge successfully photographed a horse in fast motion using a series of 12 cameras controlled by trip wires. Muybridge's photos showed the horse with all four feet off the ground. This series, "The Horse in Motion" (1878), helped push the boundaries of the photographic process as well as break down the physiology of movement to smaller units than were previously possible. We can see a similar, albeit more high tech, version of this process being used today, 130 years later, in the special effects of *The Curious Case of Benjamin Button* (2008). The head of "old Benjamin" is entirely computer generated. It was created using a new camera system, Contour, which was developed by former Apple Computer engineer Steve Perlman to capture facial deformation data. The use of this new camera system combined with the skills of talented artists and engineers allowed director David Fincher and the artists at Digital Domain to achieve, over the course of two years, something that was previously deemed impossible.

This concept of entertainment being a driving force in the development of new technologies is common. The need for better visual effects to entice audiences combined with the wish for cheaper production costs (on both the studio and personal level) led to the move toward digital film processes. The digital production of films eventually led to the digital projection of films. Digital projection, in turn, led to the resurrection of the 3D movie and an overhaul of the 3D process, another evolutionary step in visual effects. On January 16, 2009, Lionsgate released *My Bloody Valentine 3D*, the first horror film and the first R-rated film to be projected in RealD 3D. The RealD 3D system is based on the push-pull electro-optical modulator called the ZScreen, conceived by Lenny Lipton, an American inventor and film innovator. As an interesting side note, Lipton also wrote the lyrics to the song Puff the Magic Dragon as a 19-year-old at Cornell University and has been granted 25 patents in the area of stereoscopic displays.

Unlike the 3D technology from the 1950s, RealD cinema does not require two projectors.

Instead, a high-resolution digital projector using Texas Instruments' DLP Cinema technology is used. A RealD 3D movie can be projected with a single Christie, Barco, or NEC DLP cinema projector at 144 frames per second, six times as fast as a normal movie. This single projector alternately projects the right-eye frame and left-eye frame and circularly polarizes these frames, clockwise for the right eye and counterclockwise for the left eye, using a liquid crystal screen placed in front of the projector lens. The very high frame rate, 72 frames per second per eye, guarantees that the image looks continuous, and each frame is projected three times to reduce flicker. The source video is typically only 24 frames per second. The result of this technology is a 3D picture that seems to extend behind and in front of the screen itself without the imbalance of colors that occurs with the old form of 3D, a new and improved visual effect that has the potential to revolutionize film viewing.

Much of the current innovation in the visual effects field is possible through proprietary methodologies, dynamic algorithms, and faster hardware. The effects in the later films of the Harry Potter franchise look much more sophisticated and natural than those in the first film, *Harry Potter and the Sorcerer's Stone* (2001); this is mostly due to the speed increase in computer processors. Visual effects in films have become so prolific that we take for granted the fact that there are

visual effects in almost every film produced today. This saturation of effects combined with the speed at which they are improving have led many a production down the path of "more effects, less story." It is tempting to use the shock and awe of visual effects to stand in for a good plot. Unfortunately for those who succumb to this strategy, these films usually underperform at the box office and are quickly forgotten.

In some instances the visual effects are so spectacular that they trump the story. This can be seen in Michael Bay's *Transformers* (2007), based on Hasbro's Transformers franchise. Bay's dedication to a realistic portrayal of the robots transforming into and out of vehicle form resulted in the creation of extremely intricate digital models of each Autobot and Decepticon. Even the simplest notion of turning a wrist needed 17 visible parts. Each of the guns of the character Ironhide is composed of 10,000 parts. The photorealistic look of the Transformers was achieved by utilizing the ray tracing technique, wherein an image is generated by tracing the path of light through the pixels in an image plane. The audience became enamored with the immensely complex, realistic-looking robots and as a result, that is what was remembered when they left the theater. The story of Transformers may not be that memorable, but this film reminds us how visual effects have evolved to encompass a dramatic range of techniques, from a green screen

shoot to the creation of extremely complicated algorithms, all of which serve to create scenes that surprise and delight viewers. These processes, while new and highly technical, evoke the same reactions as Georges Méliès did with his groundbreaking effects film *Voyage to the Moon* in 1902. The rate of advancement in both visual effects and other technologies over the past century has been exponential. It is inspiring to think about how the media landscape will look in another 100 years.

Our imaginations are infinite. Humans love to fantasize, and visual effects provides a vehicle with which to transcend time and space. The use of visual effects in film, commercials, and television makes the ordinary extraordinary and enables society to connect on levels that are both primitive and futuristic. We share knowledge and wisdom through storytelling. Our mechanisms of control and simulation within this tract of shared stories is what sets the human experience apart. Visual effects heighten the drama and intrigue of such narratives by employing techniques to make an otherwise simple narrative more engaging on screen. Effects are much more than entertainment; we stand at the edge of human potential at an intersection where art, science, and technology all converge and continue to drive us toward radically new innovations that never fail to surprise and delight viewers.