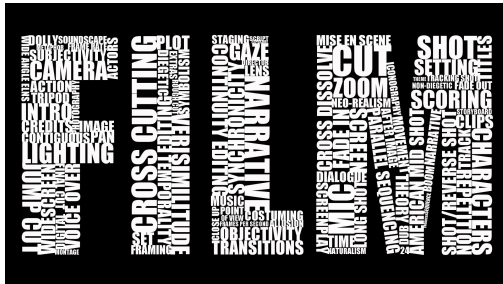


# STEM/STEAM & The Movies



Just the name alone –[The Academy of Motion Picture Arts & Sciences](#)– reveals something about the people who make movies: these filmmakers consider themselves to be artists and scientists. Who are these people? What do they do? How do they use science, technology, engineering, arts and math (STEAM) in movie making? This web page is designed to provide you, the teacher, with readings, ideas and other resources for incorporating STEAM and film into instruction.

This is also a perfect opportunity to [introduce film careers](#) which utilize STEAM. There are a number of excellent features on DVDs which not only introduce those careers, but also take students behind-the-scenes into the making of a specific film. I have created a lengthy [list of those DVDs here](#) which you might wish to consider acquiring in order to help your students better appreciate the craft of filmmaking. (Many of these featurettes can also be found on YouTube.)

(NOTE: if you have a favorite resource or lesson plan that you would like to see added here, send it to me: [fbaker1346@aol.com](mailto:fbaker1346@aol.com))

SCIENCE	FILM(S) REFERENCED	CONCEPTS
<a href="#">The Science Behind Pixar</a> (exhibit, lessons)	All Pixar films	<a href="#">Many</a>
<a href="#">Science of 3D Movies:</a> How do images on a flat screen pop out?		depth perception; stereoscopic vision; polarized light
Visible invisibility: <a href="#">the science of cinematography</a>	Saving Pvt Ryan Citizen Kane Vertigo Pulp Fiction Ben Hur Lawrence of Arabia A Space Odyssey Tangerine The Hateful Eight	exposure time chemicals resolution
<a href="#">The Future Science of Star Wars</a>	Star Wars	
<a href="#">The Science in "The Martian"</a>	The Martian	ion engines, orbital dynamics, interplanetary travel, chemistry, solar energy
<a href="#">The Physics of "Back To The Future"</a>	Back To The Future	special relativity photons general relativity
<a href="#">How Science Helps Create Realistic Explosions in Movies</a>	Avatar, Iron Man 3, Super 8, Man of Steel	wavelet turbulence
<a href="#">Physics Journal Recommends Teachers Use Interstellar</a>	Interstellar; Star Trek; Stargate	Wormholes; black holes
<a href="#">Stunts Makes A Believer of Physics Expert</a>	Fast & Furious 7	speed; terminal velocity; momentum
<a href="#">Neuroscientist Takes A Scientific Look at Art of Filmmaking</a>	Airplane, Chicago, Moulin Rouge	Brain Science
<a href="#">The Physics of Spiderman's Webs</a>	Spiderman	downward gravitational force; upward force; momentum; tension; velocity; kinematic equations;
<a href="#">Science Goes To The Movies</a>	Various	Varies

<a href="#">Great &amp; Realistic Physics Movies</a> related: <a href="#">Good &amp; Bad Examples from Movies</a> (video)	Gravity, Apollo 13, October Sky, The Abyss, IQ, Infinity, 2001: A Space Odyssey	
<a href="#">Science of Hollywood Stunts</a> (video)	The Firm; A Time to Kill; Spiderman; Mission Impossible;	solid, liquids, gas, steam, expansion, chemical reactions, metal, hydrocarbon, fluids, carbon, refraction, atoms, gravity, compression, pulleys, force, direction, load, friction, vectors, pressure, electrical circuits, magnet
<a href="#">Physics in Wall-E</a>	Wall E	Applied Physics, Gravity
<a href="#">Interstellar Film Technology &amp; Black Holes</a> The Surprising Science Behind Interstellar Christopher Nolan/Kip Thorne Discuss Physics of Interstellar	Interstellar	Black Holes, Worm Holes, Caustics, Relativity
<a href="#">Movie Magic Conjured by Science</a>	Toy Story, Harry Potter, Hellboy, Quantum of Solace, Chronicles of Narnia, Tron	Fluid Dynamics
<a href="#">Science of the Movies in 3D</a> (Video)	Terminator 2; Metalstorm, Journey to The Center of the Earth	Stereo, Depth, Polarization, Light Waves
<a href="#">How Movies Makers Use Science to Make Magic</a>	The Incredibles, Jurassic Park, Benjamin Button, Avengers, Pirates of the Carrribean, My Week With Marilyn, The Ten Commandments, Avatar	Visual effects, CG, third-degree polynomials, higher frame rates, 3D, linear perspective, aerial perspective, composition, X-Y graphing

TECHNOLOGY	FILM(S) REFERENCED	CONCEPTS
<a href="#">Motion Capture</a>	Dawn of the Planet of the Apes	MoCap; CG
<a href="#">Animal Kingdom</a>	Chronicles of Narnia	
<a href="#">How Does Green Screen Work?</a>		ChromaKey; luminance keying; compression

<a href="#">How Blue Screens Work</a>	ET, Star Wars, Return of the Jedi, Back to The Future	Traveling matte; Blue screen, CG; optical compositing, matte; diffusion
<a href="#">How do they create special effects</a>	The Matrix; Lost in Space	rotation; slow motion

ENGINEERING	FILM(S) REFERENCED	CONCEPTS
<a href="#">Lights, Camera, Engineers</a>	Avengers, Pearl Harbor	hydraulics, CG
<a href="#">The Arrrt of Engineering</a>	Pirates of the Caribbean	fluid animation
<a href="#">An Engineer's Dream Comes True: Working on Avatar (page 9)</a>	Avatar	3D
<a href="#">The Science &amp; Engineering of Sound</a> (video)		Vibration, compression, rarefaction, amplitude, frequency, longitudinal wave, harmonic content, logarithmic scale, decibel, dynamics, microphones

ARTS	FILM(S) REFERENCED	CONCEPTS
<a href="#">The Art of Designing Digital Sets</a>	Charlie and the Chocolate Factory, Catwoman, V for Vendetta, Harry Potter and the Order of the Phoenix, The Golden Compass, Gladiator, Lord of the Rings, Avatar	Various
<a href="#">How Film Composers Shape Our Feelings</a>	X-Men; Sunshine; Hoffa; Aliens; 12 Years A Slave; The Tree of Live; Gravity; Inception	Many
<a href="#">Animation adds STEAM to STEM</a>		
<a href="#">Observations on Film Art</a>	Many	Various
<a href="#">Visions of Light: The Art of Cinematography</a> (vide0)		Various

<a href="#">The Art of Movie Storyboards</a> (book)	Many	Various
<a href="#">Annual Art of Motion Picture Costume Design</a>	Various	Various
<a href="#">The Art of Foley</a>		Looping
<a href="#">Film Art Director</a>		Various

MATH	FILM(S) REFERENCED	CONCEPTS
<a href="#">What type of math is involved in Pixar animation?</a>	Inside/Out	Many (see article)
<a href="#">Math in Special Effects</a>	Music video	Algebra, Distance, Light Intensity, Exposure (photography)
<a href="#">Film Aspect Ratio video</a> Related	Captain America: Winter Solider; Citizen Kane; Ben Hur; A Serious Man; Oz: The Great And The Powerful; The Grand Budapest Hotel; Oliver; The Dark Knight	Aspect ratio
<a href="#">Jumping Out of Windows</a> (stunts)		measuring, multiplication, division, and remainders
<a href="#">Math in the Film Industry</a>		trigonometry, algebra, integral calculus, subdivision surfaces, division, geometry, and harmonic coordinates
<a href="#">How One Visual Effects Director Uses Math</a>	Harry Potter, Sweeny Todd, Prince of Persia, GI Joe	fluid modeling, gravity, viscosity, voxels, density, 3D geometry
<a href="#">A Math Breakdown of Cinematography of "There Will Be Blood"</a> Related article	There Will Be Blood	Geometry
<a href="#">Math Goes Movies</a>	Jurrasic Park, Lord of the Rings	polygons, triangles, ray tracing, vectors, caustics, precomputed radiance transfer, radiosity
<a href="#">Film Lighting &amp; Math</a>		multiplication, angles, measurements, division, skip counting
<a href="#">Geometry of Lenses</a> (Lesson plan)		geometry, areas, ratios, and square roots

<a href="#">Math Algorithm Claims to Predict Film's Success</a>		algorithm
<a href="#">Pixar combines math to make its movies</a> related <a href="#">video</a>	The Incredibles Ratatouille Finding Nemo	algebra, geometry , calculus
<a href="#">Pixar Sr. Scientist Explains Math of Movies</a> related <a href="#">video</a>	Cars 2, Brave, Geri's Game	arithmetic, algebra, geometry, polygons, calculus, combinatronics, light, fluid, gases, compression algorithm, parabolas
<a href="#">Ryan Kavanaugh Uses Math To Make Movies</a>	Batman, Zombieland, Charlie Wilson's War, Paul Blart: Mall Cop, Season of the Witch, The Perfect Getaway, Matrix, Waterworld, Jesse James, The Fighter, Evan Almighty, Bruce Almighty, Land of the Lost, Brothers, Somewhere in Time, Titanic	variables
<a href="#">Box Office Math</a> (lesson plan)		Calculations, measures, box plots (both modified and non-modified), histograms, and stem-and-leaf plots.
<a href="#">Independent Filmmakers Talk Math</a>		Calculations
<a href="#">The Croods &amp; Math</a>		Coding, effects tools, process control, fluid dynamics, Cloud computing
<a href="#">What is the average budget for a Hollywood movie?</a>	The Brothers McMullen, Avatar, Pirates of the Caribbean	

## [Science Lesson Plans Using The Movies](#) (Teach With Movies)