MUSEUM OF THE MOVING IMAGE

SLOAN SCIENCE & FILM

TEACHER'S GUIDE

A Guide to Short Science-Related Films for the Classroom

INTRODUCTION

Filmmakers are making many different types of films and Museum of the Moving Image publishes *Sloan Science & Film* to enhance public understanding of science through film. This is a guide to 46 short narrative (fiction) films–all supported by the Alfred P. Sloan Foundation's nationwide film program–available for streaming in your classroom, which explore science and technology themes and characters. Our goal is to help teachers engage elementary, middle, and high school students in STEM learning.

- Films range from 4 to 33 minutes, averaging 20 minutes in length
- Each film correlates with National Standards, New York State Standards, and New York City Science Scope and Sequence (with a comprehensive appendix of all three attached), and can be customized to meet your needs
- Subjects include astronomy, biology, chemistry, ecology, evolution, genetics, mathematics, physics, psychology, technology, and the history of science
- Included with each film are possible questions to explore and science resources for further engagement

Sloan Science & Film (scienceandfilm.org) is an online publication that covers all things science and film. The site is published by Museum of the Moving Image and funded by the Alfred P. Sloan Foundation in New York. *Sloan Science & Film* publishes articles four times a week and hosts a growing archive of over 40 short films available for streaming any time, featuring science and technology themes, made by emerging filmmakers. The site also catalogues over 500 film projects, including short and feature films, which have been funded beginning in 1997 via the Foundation's twelve institutional partners. The site publishes news, interviews with scientists and filmmakers, and commissions critical pieces from notable scientists about films.

Each short film was made by filmmakers from: New York University (NYU), University of California Los Angeles (UCLA), University of Southern California (USC), Columbia University (CU), American Film Institute (AFI), or Carnegie Mellon University (CMU). Each filmmaker was paired with a science professor who advised the filmmaker on the accuracy of the science content.

INDEX OF SUBJECTS

JOSHUA TREE (Click here to watch)

2002. 23 minutes.

AGE GROUP: High School

STANDARDS: NYC: Grades 9-12, Earth Science (Astronomy) NY State: The Living Environment (Astronomy) National: Grades 9-12, Earth and Space Science (Origin and Evolution of the Universe); History and Nature of Science (Science as a Human Endeavor)

SUMMARY: *Joshua Tree* is about a loving but frayed mother-daughter relationship, a burgeoning friendship between a lonely girl and her new neighbor, and a widowed environmental scientist. It is a meditation on how the heavens have inspired both scientific inquiry and imagination.

QUESTIONS TO EXPLORE: What can stargazing reveal about the history of the universe? Why does it take so long for starlight to reach earth? How are stars "born"?

RESOURCES:

Activity to measure the distance and size of the universe: https://stardate.org/sites/default/files/pdfs/teachers/StarsGalaxies.pdf

Why light takes time to reach Earth: http://csep10.phys.utk.edu/astr162/lect/cosmology/lightspeed.html

A book, *What Scientists Actually Do*, by a former space engineer: http://www.thespacereview.com/article/1214/1

Introductory lesson plans about the universe: http://www.smithsonianeducation.org/educators/lesson_plans/universe/index.html

Classroom activity on the color of stars: https://stardate.org/teachers/plans/color-stars

TALENT: Directed by Jonathan Messer. Written by Chris Raymond. Produced by Petra Erikssen. Edited by Byron Smith. Photographed by Kevin Krupitzer. Production design by Kristy Thomley. Music by Sean Morris. Principal cast: Taylor Dayne, Madison Eginton, Rebecca Klinger. Funded by a AFI-Sloan Production Grant.

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THE KITE MESSENGER (Click here to watch)

2003. 16 minutes.

AGE GROUP: Middle School and higher

STANDARDS: NYC: Grades 6-12, Earth Science (Astronomy); Energy and Simple Machines NY State: Grades 5-12, The Living Environment (Astronomy) National: Grades 5-12, Earth and Space Science (Earth in the Solar System); Science and Technology (Abilities of Technological Design)

SUMMARY: When teenager Allie discovers that her mother has passed away, she is forced to return home and confront her father. He is a distant astrophysicist who has always been more focused on his daughter's prospects as a scientific prodigy than her need for love.

QUESTIONS TO EXPLORE: How does a telescope work? What is a constellation?

RESOURCES:

Articles and artifacts related to astronomy at the National Air and Space Museum:
https://airandspace.si.edu/topics/astronomy

Classroom exercises about telescope technology:
http://mcdonaldobservatory.org/teachers/classroom/ttt/TelescopeTechnology.html

TALENT: Directed by Debra Bellon. Edited by Debra Bellon. Photographed by Hugh Scott. Music by Martin Wallace. Principal cast: Kristen Torrianni (as Allie), Stephen Hastings (Max), Karina Stow (Emily). Funded by a UCLA-Sloan Production Grant.

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GRAY MATTER (Click here to watch)

2000. 26 minutes.

AGE GROUP: High School

STANDARDS: NYC & NY State: Grades 9-12, Living Environment (Scientific Inquiry) National: Grades 9-12, Science as Inquiry; Life Science (Matter, Energy, and Organization in Living Systems)

SUMMARY: *Gray Matter* follows a Los Angeles coroner from his visit to a crime scene to the autopsy on a young girl who was apparently the victim of sexual abuse.

QUESTIONS TO EXPLORE: What is the medical purpose of an autopsy? When were autopsies first performed, and how have they impacted medical diagnoses? What causes a brain aneurysm?

RESOURCES:

The history of autopsies: http://www.ncbi.nlm.nih.gov/books/NBK458/

An interactive exercise to perform a virtual autopsy: http://www.le.ac.uk/pathology/teach/va/welcome.html

An overview of brain aneurysms: http://www.mayoclinic.org/diseases-conditions/brain-aneurysm/basics/definition/con-20028457

TALENT: Directed by Anthony Dominici. Written by Leonard Hartman. Produced by Arlene Knight. Photographed by Hyun Sung Kim. Edited by Matt Kregor. Principal cast: William Beck, Rudy Moreno, Detective Marcos, Robert Madrid, Dr. Neylan, David T. Hayman. Funded by a AFI-Sloan Production Grant.

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MAY (Click here to watch)

2012. 15 minutes.

AGE GROUP: High School

STANDARDS: NYC & NY State: Grades 9-12, Living Environment (Genetics) National: Grades 9-12, Science in Personal and Social Perspectives (Personal and Community Health)

SUMMARY: David's father is a record-holding skydiver, runs a successful business, and has a perfect family. He is also blind. At the age of 50, he discovers that he is a perfect candidate for a new stem cell and cornea transplant procedure. Though there are huge health risks involved, the operation could give him vision after a lifetime of blindness.

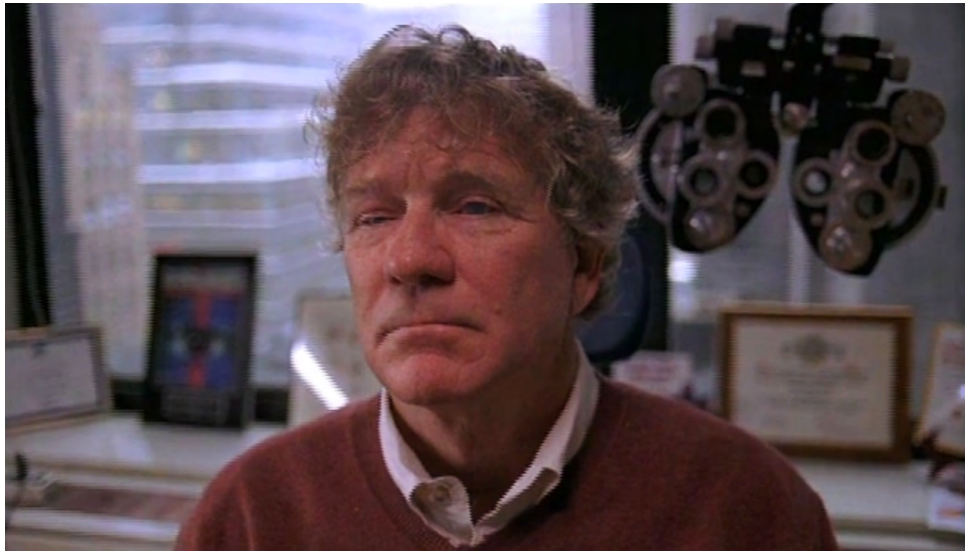
QUESTIONS TO EXPLORE: What is the function of the cornea? What areas of the brain affect vision and translate what the eye sees? What has to be rehabilitated in those that have been born blind?

RESOURCES:

Interview with surgical patient Mike May, who inspired the film: http://www.npr.org/templates/story/story.php?storyId=129731859

A panel of neuroscientists discussing on television the biology of the visual system:
https://charlierose.com/collections/3/clip/14569

A comparison between an eye and a movie camera:
http://www.theatlantic.com/magazine/archive/1953/10/movies-and-tv-murder-or-merger/306082/?single_page=true



TALENT: Directed and written by Jesse Israel. Produced by Ryan Key and Nick Panama. Edited by Isaac Cole. Photographed by Adam Newport Berra. Production design by Laura O'Hara. Music by Daniel Fujikawa. Principal cast: Ned Cray (as Mark), Matt Nardozzi (Young David), Rob Herring (Grown David), Kim Anderson (Mark's Mom), Harriet Trangucci (David's Mom), William Otterson (Sydney Bradford). Funded by a NYU-Sloan Production Grant.

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MELODY OF CLOCK AND ARROW (Click here to watch)

2006. 12 minutes.

AGE GROUP: High School

STANDARDS: NYC: Grades 9-12, Living Environment (Reproduction and Development); Physics (Energy) NY State: The Living Environment; The Physical Setting (Physics) National: Grades 9-12, Life Science (The Cell); Science in Personal and Social Perspectives (Personal and Community Health); Physical Science (Conservation of Energy and Increase in Disorder)

SUMMARY: When a young biologist stricken with cancer is visited by his estranged father, the two try to reconcile their relationship, and the second law of thermodynamics.

QUESTIONS TO EXPLORE: What is apoptosis? How does cancer interfere with the normal functioning of cells? What is the second law of thermodynamics?

RESOURCES:

The process of apoptosis explained:
http://www.ncbi.nlm.nih.gov/books/NBK26873/

Changes in cell physiology that occur with cancer: https://www.sciencebasedmedicine.org/a-new-perspective-on-the-war-against-cancer/

A PBS film which surveys the history of cancer treatments:
http://www.pbs.org/kenburns/cancer-emperor-of-all-maladies/home/

Lesson plans for grades 7-12 about cancer:
http://www.pbs.org/kenburns/cancer-emperor-of-all-maladies/educators/

A worksheet on the second law of thermodynamics:
http://hyperphysics.phy-astr.gsu.edu/hbase/thermo/seclaw.html

TALENT: Directed and written by Seth Dalton. Produced by Ilana Lapid and Paolo Borraccetti. Edited by Seth Dalton, Elia Petridis. Photographed by Mark Apicella. Music by Geoslav. Principal cast: Michael Salzer (as Ray), Shelly Kurtz (Stanley), Griffin McCalla (Young Ray), Cerris Morgan-Moyer (Elisa). Funded by a USC-Sloan Production Grant.

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STANDING8 (Click here to watch)

2014. 15 minutes.

AGE GROUP: High School

STANDARDS: NYC & NY State: Grades 9-12, Living Environment (Evolution) National: Grades 9-12, Life Science (Biological Evolution), Science in Personal and Social Perspectives (Personal and Community Health)

SUMMARY: In the months between beating an opponent to death in the ring and battling for the next title, a journeyman boxer, Abdul Gillings, is forced to examine if he can survive the sport. Abdul is preparing for the biggest fight of his career. But, when a neurologist suspects a chronic brain injury, she hesitates to sign Abdul's health certificate, threatening his chances of becoming a champion.

QUESTIONS TO EXPLORE: What are the symptoms of Chronic Traumatic Encephalopathy (CTE)? Why is CTE so difficult to diagnose? What areas of the brain are affected in CTE?

RESOURCES:

An overview Chronic Traumatic Encephalopathy (CTE):
http://www.bu.edu/alzresearch/ctecenter/chronic-traumatic-encephalopathy-faqs/

How CTE affects the brain:
http://www.pbs.org/wgbh/frontline/article/the-four-stages-of-cte/

Premiere of *Standing8*: http://scienceandfilm.org/articles/2735/premiere-michael-molina-minards-standing8

TALENT: Directed and written by Michael Molina Minard. Produced by Ophelia Harutyunyan and Michel Stolnicki. Photographed by Angelos Rompolis. Principal cast: Jon Michael Hill (as Abdul), Alfie Fuller, Germar Gardner. Funded by a CU-Sloan Production Grant.

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HABER (Click here to watch)

2008. 33 minutes.

AGE GROUP: High School

STANDARDS: NYC: Grades 9-12, Chemistry (Atomic Concepts, Kinetics and Equilibrium) NY State: Grades 9-12, The Physical Setting (Chemistry); The Living Environment National: Grades 9-12, Physical Science (Structure of Atoms, Structure and Properties of Matter, Chemical Reactions); Life Science (Interdependence of Organisms); History and Nature of Science (Science as a Human Endeavor, Historical Perspectives)

SUMMARY: Fritz Haber was a brilliant German-Jewish chemist with one of the most amazing dual legacies in history. His revolutionary process for creating synthetic fertilizers averted the greatest overpopulation crisis the world has ever known and won him a Nobel Prize in 1918. However, Haber used his genius to create the first chemical weapon, which was used during World War I.

QUESTIONS TO EXPLORE: How is ammonia made and what are some of its practical uses? What were Fritz Haber's contributions to the military? What is Fritz Haber's legacy?

RESOURCES:

A teacher's guide to *Haber*:
http://www.haberfilm.com/PDFs/HABER-TeacherResources.pdf

A radio interview about the life and legacy of Fritz Haber:
http://www.radiolab.org/story/180132-how-do-you-solve-problem-fritz-haber/

Fritz Haber's acceptance speech for the Nobel Prize:
http://www.nobelprize.org/nobel_prizes/chemistry/laureates/1918/press.html

A brief history of chemical warfare:
https://www.chemheritage.org/distillations/article/brief-history-chemical-war

TALENT: Directed and written by Daniel Ragussis. Produced by Daniel Ragussis, Shannon Factor, Brian Hwang, and Chris Spanos. Photographed by Carlos Verón. Edited by Sara Corrigan. Music by Simon Taufique. Production design by Kay Lee. Principal cast: Christian Berkel (as Fritz Haber), Juliane Köhler (Clara Haber), Wolf Kahler (Ludendorff), Mark Margolis (Bremer), Ted Pejovich (Dean Ostwald). Funded by a CU-Sloan Production Grant.

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PAPRIKA (Click here to watch)

2004. 7 minutes.

AGE GROUP: Elementary School and higher

STANDARDS: NYC: Grades K-12, Food and Nutrition; The Human Animal; Chemistry (Chemical Bonding) NY State: Grades K-12, The Physical Setting (Chemistry) National: Grades K-12, Science as Inquiry; Science in Personal and Social Perspectives (Personal Health); History and Nature of Science (Science as a Human Endeavor, History of Science)

SUMMARY: *Paprika* celebrates the Hungarian scientist Albert Szent-Györgyi who received a Nobel Prize in 1937 for his work on the isolation of Vitamin C.

QUESTIONS TO EXPLORE: Who was Albert Szent-Györgyi? How does the body digest Vitamin C? Why is Vitamin C important for healthy bodily functions?

RESOURCES:

The biography of Albert Szent-Györgyi: http://www.nobelprize.org/nobel_prizes/medicine/laureates/1937/szent-gyorgyi-bio.html

A factsheet about Vitamin C: https://ods.od.nih.gov/factsheets/VitaminC-HealthProfessional/

The history of the discovery of Vitamin C: https://www.acs.org/content/acs/en/education/whatischemistry/landmarks/szentgyorgyi.html

A book, *Vitamania: How Vitamins Revolutionized the Way We Think About Food*, about the history of vitamins: http://thepenguinpress.com/book/vitamania-our-obsessive-quest-for-nutritional-perfection/

TALENT: Directed and animated by Katalin Nivelt Anguelov. Produced by Sharon Barnes. Sound design by Juri Hwang. Music by Patrick Kirst. Voices: Philip Proctor (as Narrator), Damian Mordano, Caroline King. Funded by a USC-Sloan Production Grant.

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YELLOW RAIN (Click here to watch)

2014. 21 minutes.

AGE GROUP: High School

STANDARDS: NYC: Grades 9-12, Living Environment (Scientific Inquiry, Ecology, Human Influences on the Environment); Chemistry (The Physical Nature of Matter) NY State: Grades 9-12, The Physical Setting (Chemistry); The Living Environment National: Grades 9-12, Science as Inquiry; Physical Science (Structure and Properties of Matter); Life Science (Behavior of Organisms); History and Nature of Science (Historical Perspectives)

SUMMARY: Near the end of the Cold War, the U.S. government received numerous reports from Southeast Asia of chemical weapons being used against democratic insurgents. After investigating, the U.S. accused the Soviets of supplying chemical weapons to the communist governments in the area. Matthew Meselson, a Harvard molecular biologist, reviewed samples of the substance but was unconvinced that what the U.S. government found was a weapon. Meselson traveled to Thailand with Thomas Seeley, a renowned animal behaviorist, to prove that the yellow substance falling from the sky was not a chemical weapon but a natural phenomenon.

QUESTIONS TO EXPLORE: What is the difference between a virus, bacteria, and toxin? How are biological weapons used and detected? Who was Matthew Meselson and what was his most important scientific contribution?

RESOURCES:

A history of biological warfare:
https://www.ncbi.nlm.nih.gov/pmc/articles/PMC1326439/

Information about the "Yellow Rain" controversy:
http://www.nonproliferation.org/wp-content/uploads/npr/81tucker.pdf

Matthew Meselson's program on chemical and biological weapons:
http://belfercenter.ksg.harvard.edu/experts/148/matthew_meselson.html

An entomologist on bees: http://insects.ucr.edu/faculty/Visscher.html

TALENT: Directed by L. Warren Thompson. Written by Christopher Sachs. Produced by Badrish Patil, Chris Roessner, Christopher Sachs, and L. Warren Thompson. Photographed by Blake Clifton. Music by Marc Uddo. Production design by Kody Busch. Principal cast: Peter McGlynn (as Alexander Haig), Fred Ochs (Matthew Meselson), Emmanuel Todorov (Thomas Seeley), Danielle Taddei (Julie). Funded by a USC-Sloan Production Grant.

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11 WEEKS (Click here to watch)

2010. 29 minutes.

AGE GROUP: High School

STANDARDS: NYC: Grades 9-12, Living Environment (Human Influences on the Environment, Organization and Patterns in Life) NY State: Grades 9-12, The Living Environment National: Grades 9-12, Life Science (Interdependence of Organisms); Physical Science (Chemical Reactions)

SUMMARY: Set in an old-age home in Kashmir, India, *11 Weeks* is a story about a 60 year-old research scientist who learns the meaning of humanity from a 10 year-old Muslim orphan visiting him for community service.

QUESTIONS TO EXPLORE: What is the function of a plant's root? What sources of fuel come from our natural environment? What are the barriers to adopting different kinds of energy fuel?

RESOURCES:

An explanation of the importance of plant roots:
http://facweb.furman.edu/~lthompson/bgy34/plantanatomy/plant_root.htm

A video series about the history of different forms of energy:
http://www.klru.org/episode/energy-at-the-movies/episode-details-2/

The basic differences between Ethanol and Biodiesel:
http://www.eia.gov/energyexplained/?page=biofuel_home

A list of feature films which feature different sources of energy: http://energyatthemovies.com/category/energyfilms/

TALENT: Directed and written by Dipesh Jain. Produced by Shuchi Jain, Dipesh Jain, and Eric Berghemanm. Edited by Tyler Earring and Beth Moody. Photographed by Prasahant Rai. Music by Layla Minoui. Production design by Sidarth Mathawan. Principal cast: M.K. Raina (as Nir Nehru), Dion Deboulle (Aslam Jehangir). Funded by a USC-Sloan Production Grant.

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ECOLOGY, ORNITHOLOGY

BIRD IN HAND (Click here to watch)

2004. 17 minutes.

AGE GROUP: High School

STANDARDS: NYC & NY State: Grades 9-12, Living Environment (Ecology, Human Influences on the Environment) National: Grades 9-12, Life Science (Behavior of Organisms); Science in Personal and Social Perspectives (Environmental Quality)

SUMMARY: A struggling adolescent draws inspiration for her own music from working in a laboratory, which studies how birds learn their songs.

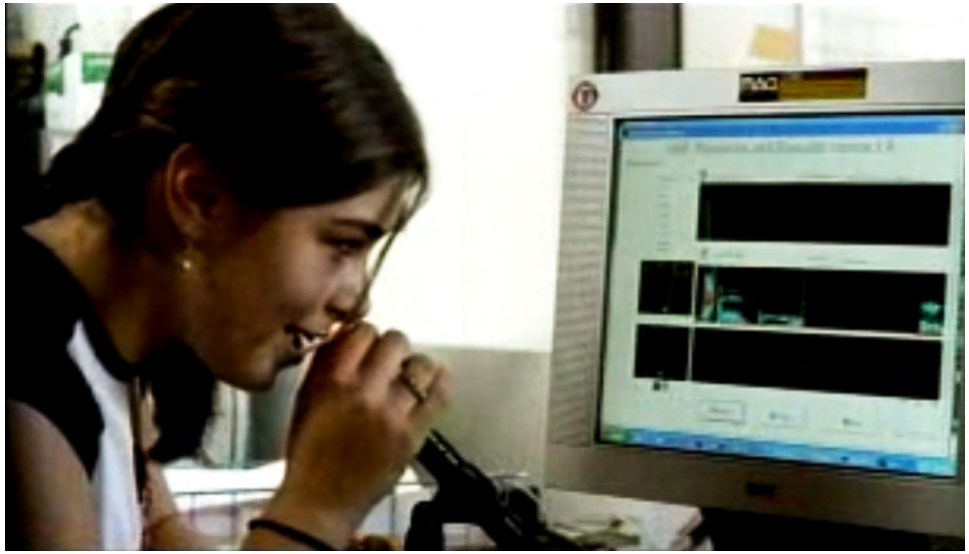
QUESTIONS TO EXPLORE: Why do birds sing? What happens when a bird is raised in isolation? How do scientists record birdcalls?

RESOURCES:

The Cornell Lab Bird Academy on bird songs:
https://academy.allaboutbirds.org/birdsong/

A study of Zebra Finches raised in isolation:
http://www.eurekalert.org/pub_releases/2009-05/cshl-ssf043009.php

A guide to recording birdcalls:
http://www.wildlife-sound.org/equipment/newcomersguide/



TALENT: Directed and written by Janet McIntyre. Produced by Liz Foley and Dan Meisel. Edited by Janet McIntyre. Photographed by Rory Hanrahan. Production design by Martha Almy and Alan Rackham. Principal cast: Eden Durbin Schwartz (as Lily Ackerman), Greg Shamie (Max Bailey). Funded by a NYU-Sloan Production Grant.

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ECOLOGY, BOTANY

CONCRETE (Click here to watch)

2000. 14 minutes.

AGE GROUP: Elementary School and higher

STANDARDS: NYC: Grades K-12, Plant Diversity; Animals and Plants in their Environments; Diversity of Life; Living Environment (Human Influences on the Environment) NY State: Grades K-12, The Living Environment National: Grades K-12, Science as Inquiry; Science in Personal and Social Perspectives (Changes in Environment); History and Nature of Science (Science as a Human Endeavor); Life Science (Populations and Ecosystems)

SUMMARY: The juxtaposition of New York City's concrete with lush greenery inspired *Concrete*, a film about a botanist who decides to make a garden behind his apartment building.

QUESTIONS TO EXPLORE: What does a botanist study? What kinds of plants thrive in a city and why? What are some negative impacts humans have on the environment where plants grow?

RESOURCES:

A selection of lesson plans about plants growing in a variety of environments: http://www.nybg.org/edu/teacher/lesson-plans.php

A working list of all plant species: http://www.theplantlist.org

An outline of the field of botany:
http://www.botany.org/bsa/careers/car-what.html

An explanation of phytoremediation:
http://www.unep.or.jp/Ietc/Publications/Freshwater/FMS2/1.asp

TALENT: Directed and written by Andy Watts. Produced by Gaye Lirot and Betsy Alton. Photographed by Patrick Cady. Production design by Bryan Johnson. Music by Randy Lee. Principal cast: Willie C. Carpenter (as Dr. Lennon Bass), Jasmyn Ledford (Jasmine Gunning), Ephriam, Martell (Victor the Super). Funded by a CU-Sloan Production Grant.

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JOLIANA (Click here to watch)

1998. 16 minutes.

AGE GROUP: Middle School and higher

STANDARDS: NYC: Grades 6-12, Diversity of Life; Living Environment (Ecology, Human Influences on the Environment) NY State: Grades 5-12, The Living Environment National: Grades 5-12, Life Science (Populations and Ecosystems, Behavior of Organisms); Science in Personal and Social Perspectives (Natural Resources)

SUMMARY: A young girl's father is a pearl diver unable to meet the quota that supports his family.

QUESTIONS TO EXPLORE: Where are pearls found? How do oysters make pearls? Why are pearls so hard to retrieve?

RESOURCES:

Notes from a Natural History Museum exhibition about pearls: http://www.amnh.org/exhibitions/pearls

The history and method of pearl diving: http://www.divingheritage.com/pearldivingkern.htm

TALENT: Directed by Carlos Vila. Written by Michelle Frances and Carlos Vila. Produced by Michelle Frances. Edited by Lisa Molomot. Photographed by Daniel Aranyo Batlle. Principal cast: Simone Perrin (as Joliana), Robert Keefe (Papa), Kelly Galindo (Mummy). Funded by a AFI-Sloan Production Grant.

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LYNX (Click here to watch)

2007. 16 minutes.

AGE GROUP: Middle School and higher

STANDARDS: NYC: Grades 6-12, Diversity of Life; Interdependence; Living Environment (Ecology, Human Influences on the Environment) NY State: Grades 5-12, The Living Environment National: Grades 5-12, Life Science (Populations and Ecosystems, Structure and Function in Living Systems, Interdependence of Organisms)

SUMMARY: Art Wilder is an ecologist working in Montana's Crazy Mountains. He studies the elusive lynx, an endangered species of cat. His research is controversial because any land shown to be a lynx habitat becomes protected, and then cannot be logged or developed. When someone plants lynx hairs at Art's survey sites, Art has to make a crucial decision: let the false data show that lynx are found in great numbers, thereby protecting the land, or defend the credibility of science.

QUESTIONS TO EXPLORE: What constitutes a species as endangered? Why are the Canada Lynx habitats in the United States protected? What are some environmental consequences of a species going extinct?

RESOURCES:

Information about the Canada Lynx:
http://www.defenders.org/canada-lynx/basic-facts

The environmental effects of logging:
http://www.forestsmonitor.org/en/reports/550066/550083

An overview of biodiversity and conservation:
https://www.fieldmuseum.org/biodiversity-and-conservation-web-life

A symposium on extinction:
http://www.amnh.org/science/biodiversity/extinction/IntroSymposiumFS.html

TALENT: Directed by Wynn Padula. Co-written by Owen Bissell and Wynn Padula. Produced by Eric Binns, Ben Harris, and Wynn Padula. Photographed by Angela How and Logan Schneider. Principal cast: Jesse Holland (as Bill), Princess Lucaj (Lucy), Lou Morris (Scotty), Ramon Hilario (Yuma), Mark Irvingsen (Mike). Funded by a UCLA-Sloan Production Grant.

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PASSERINE: A BIRD DUET (Click here to watch)

2011. 15 minutes

AGE GROUP: High School

STANDARDS: NYC & NY State: Grades 9-12, Living Environment (Ecology, Human Influences on the Environment) National: Grades 9-12, Life Science (Interdependence of Organisms, Behavior of Organisms); Science in Personal and Social Perspectives (Natural and Human-induced Hazards)

SUMMARY: On a hike in the woods, Darius, a noisy day-hiker, finds himself unwittingly at odds with The Baz, a crusty loner who claims to be an ornithologist in the midst of a delicate experiment.

QUESTIONS TO EXPLORE: Where are passerines found and what makes them ecologically significant? How does noise pollution affect bird behavior?

RESOURCES:

An overview of passerine birds:
http://press.princeton.edu/birds/unwin/passerines.pdf

An article about noise pollution and how it affects birds:
https://www.theguardian.com/environment/2012/jul/11/sparrows-urban-noise

An article discussing the design and function of bird nests:
http://www.ncbi.nlm.nih.gov/pmc/articles/PMC4242575/

A feature film about teenage birders:
http://scienceandfilm.org/projects/239/a-birders-guide-to-everything

TALENT: Directed and written by Denise Iris. Produced by Chip Hourihan and Veronica Nickel. Edited by Denise Iris. Photographed by Rick Siegel. Music by Starzetta Cremosa. Principal cast: Jason Odell Williams (as Darius), Liam Mitchell (The Baz). Funded by a NYU-Sloan Production Grant.

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TYMBALS (Click here to watch)

2010. 7 minutes.

AGE GROUP: Middle School and higher

STANDARDS: NYC: Grades 6-12, Diversity of Life; Other Organisms; Living Environment (Ecology) NY State: Grades 5-12, The Living Environment National: Grades 5-12, Science as Inquiry; Life Science (Diversity and Adaptations of Organisms, Behavior of Organisms)

SUMMARY: *Tymbals* is the story of Charlotte, an entomologist recovering from the accidental death of her husband. When the 13-year cicadas hit their peak cycle, Charlotte has to face the paralyzing grief that they bring back along with their sound.

QUESTIONS TO EXPLORE: How does a cicada make its sound? Which types of cicada stay underground? What is the job of an entomologist?

RESOURCES:

An explanation of how cicadas know when to emerge:
https://entomologytoday.org/2016/03/22/how-do-cicadas-know-when-to-emerge-from-the-ground/

The life cycle of cicadas:
http://www.amnh.org/explore/news-blogs/news-posts/all-about-periodical-cicadas

A laboratory exercise for biology classes:
http://hydrodictyon.eeb.uconn.edu/projects/cicada/citizen/Dwyer_Simon_2014.pdf

TALENT: Directed by Filippo Conz. Written by Jon Haller. Produced by Geoffrey Quan. Edited by Filippo Conz. Photographed by Marius Chira. Production design by Ola Maslik. Music by Freddie Khaw. Principal cast: Lola Glaudini (as Charlotte), Trevor Long (Rick). Funded by a CU-Sloan Production Grant.

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EVOLUTION, EVOLUTIONARY GENETICS

CAIN (Click here to watch)
2013. 18 minutes.

AGE GROUP: High School

STANDARDS: NYC: Grades 6-12, Living Environment (Genetics and Biotechnology, Evolution) NY State: Grades 7-8, The Living Environment National: Grades 9-12, Life Science (Molecular Basis of Heredity, Biological Evolution)

SUMMARY: Ixtao has always been the most curious Neanderthal in his tribe, so when he comes across an injured creature that he has never seen before—a human child—Ixtao doesn't hesitate to take him under his wing, much to his tribe's chagrin.

QUESTIONS TO EXPLORE: What are the similarities and differences between humans and Neanderthals? What are some of the pre-linguistic forms of communication and what made them effective? What tools did the Neanderthals use?

RESOURCES:

An explanation of primitive skills and how they were used:
http://www.justinsprimitiveskills.com

An article by a biologist about evolutionary genetics:
http://nyti.ms/1qCmfef

TALENT: Directed by Zijian Yan. Written by Zijian Yan and Ajani Jackson. Produced by Miroslav Macala. Edited by Zijian Yan. Photographed by Zachary Halberd. Production design by Perry Mateson. Music by Dylan Glatthorn. Principal cast: Jamyl Dobson (as Alpha Human), C.J. Bane (Haptao), Jovan Davis (Farblood), Derek Johnson (The Human Child), Christopher Stadulis (Gao the Chief). Funded by a CU-Sloan Production Grant.

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FLOOD (Click here to watch)

2016. 14 minutes.

AGE GROUP: Middle School and higher

STANDARDS: NYC: Grades 6-12, Science (Geology, Other Organisms, Reproduction, Heredity, and Evolution); Living Environment (Evolution); Earth Science (Earth History) NY State: Grades 6-12, The Living Environment (Earth Science, Geology) National: Grades 6-12, Earth and Space Science (Earth's History, Origin and Evolution of the Universe)

SUMMARY: Miriam is an unemployed journalist who has a beat on a story that could turn her bad luck around. For ten years, her dad, Gordon, has lived in the Mojave Desert running a paleontology museum, but Gordon believes that the earth was made in days, people and dinosaurs coexisted, and the fossil record is a result of Noah's Flood. Miriam ventures west to interview Gordon about what made him a creationist.

QUESTIONS TO EXPLORE: What is the job of a paleontologist? How did the dinosaurs become extinct? How do scientists study the origins of the universe?

RESOURCES:

A museum guide to fossil and geology collections:
https://www.fieldmuseum.org/science/research/area/fossils-meteorites

Multi-media educational resources about paleontology:
http://paleosoc.org/educators/educational-resources/

Interview with paleontologist Jack Horner: http://scienceandfilm.org/articles/2718/science-on-screen-interview-with-jack-horner-jurassic-world

Premiere of *Flood*:
http://scienceandfilm.org/articles/2691/premiere-katy-scoggins-flood

Short documentary film about two amateur fossil hunters:
http://scienceandfilm.org/articles/2614/exclusive-watch-four-videos-from-the-science-in-film-forum

TALENT: Directed and written by Katy Scoggin. Produced by Isabella Wing-Davey. Edited by Danielle Morgan. Photographed by Michael Rossetti. Music by Damian Quinones. Principal cast: Rosie Benton, Paul Klementowicz, and Mary B. McCann. Funded by a NYU-Sloan Production Grant.

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EXTROPY (Click here to watch)

2009. 15 minutes.

AGE GROUP: High School

STANDARDS: NYC & NY State: Grades 9-12, Living Environment (Genetics) National: Grades 9-12, Science in Personal and Social Perspectives (Personal Health); Life Science (Molecular Basis of Heredity)

SUMMARY: In *Extropy*, a geneticist whose father is succumbing to Alzheimer's Disease believes he had discovered a way to stop the aging process. He turns to an eccentric businessman to fund his endeavor, but with time running out for his father the geneticist begins to test his discovery on himself.

QUESTIONS TO EXPLORE: What are the markers of Alzheimer's Disease in the brain? How do telomeres contribute to human aging? Is Alzheimer's Disease hereditary?

RESOURCES:

Leading neuroscientists discuss Alzheimer's Disease and aging on a television panel:
https://charlierose.com/collections/3/clip/16493

An article on the role of telomeres:
http://learn.genetics.utah.edu/content/chromosomes/telomeres/

TALENT: Directed and written by Jonathan Sanden. Produced by Jonathan Sanden and Alexis Ward. Photographed by Chris J. Lytwyn. Edited by Ian Ogden. Production design by Lilian Cohen. Music by Cameron Bossert. Principal cast: Gregory Waller (as Philip Zephyr), Austen Cooke (Cedric Vickers), Gene Morra (Frank Zephyr), Clare Stevenson (Kate Zephyr), Ralph DeMatthews (Stephon Roissi). Funded by a NYU-Sloan Production Grant.

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THE FIRST VAMPIRE (Click here to watch)

2002. 24 minutes.

AGE GROUP: Middle School and higher

STANDARDS: NYC & NY State: Grades 7-12, Reproduction, Heredity and Evolution; Living Environment (Genetics) National: Grades 7-12, Life Science (Molecular Basis of Heredity); Science in Personal and Social Perspectives (Personal Health); History and Nature of Science (History of Science)

SUMMARY: The story of *The First Vampire* centers on the true origins of the Western Vampire Legend: fourteenth century Scandinavia. A Viking fleet is decimated by an unknown force, which drains men of their blood. The main character tries to make sense of the horror unfolding in front of him.

QUESTIONS TO EXPLORE: What are the causes of Congenital Erythropoietic Porphyria (also known as Guenther's Disease)? What parts of the body are affected in Congenital Erythropoietic Porphyria? Why are some people susceptible to contracting Porphyria?

RESOURCES:

A thorough description of the various causes and symptoms of Porphyria: https://www.niddk.nih.gov/health-information/health-topics/liver-disease/porphyria/Pages/facts.aspx

An article on the origins and possible treatments for Porphyria: http://www.scientificamerican.com/article/born-to-the-purple-the-st/

TALENT: Directed by Jason Todd Ipson. Written by Kevin Burke and Jason Todd Ipson. Produced by Jaime Lynn Ipson, Jason Todd Ipson, Frederick Wedler, and Randy Weiss. Edited by Chad Galster. Photographed by Michael Fimognari. Principal cast: Ben Livingston, Derrick O'Connor, Susan Duerden, Dan Merket, Sarah Ann Schultz. Funded by a USC-Sloan Production Grant.

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LOVE CHANCE (Click here to watch)

2005. 26 minutes.

AGE GROUP: High School

STANDARDS: NYC & NY State: Grades 9-12, Living Environment (Genetics and Biotechnology, Reproduction and Development) National: Grades 9-12, Science in Personal and Social Perspectives (Personal Health); Life Science (Molecular Basis of Heredity)

SUMMARY: In *Love Chance*, a pregnant genetic counselor and a young couple on the verge of getting married all face the unhappy potentialities inherent in their genes.

QUESTIONS TO EXPLORE: What can genetic sequencing predict? What is Cystic Fibrosis and Huntington's Disease? What effect can the environment have on genes?

RESOURCES:

An article about the role of genetic counselors:
http://www.marchofdimes.org/pregnancy/genetic-counseling.aspx

Neuroscientists discuss Huntington's Disease and its treatments on a television panel:
https://charlierose.com/collections/3/clip/15489

An overview of Cystic Fibrosis:
https://ghr.nlm.nih.gov/condition/cystic-fibrosis#

TALENT: Directed by Gregory Lehane. Written by Mary F. Unser. Produced by Shirley J. Saldamarco. Edited by Ralph Vituccio. Photographed by Mark Knobil. Production design by Cletus R. Anderson. Principal cast: Lissa Brennan (as Rose), Daniel Krell (Mike), Stephen Schellhardt (Spencer), Aimée DeShayes (Traci), Nicholas Lehane (TJ). Funded by a CMU-Sloan Production Grant.

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MUERTO CANYON (Click here to watch)

2001. 29 minutes.

AGE GROUP: High School

STANDARDS: NYC & NY State: Grades 9-12, Living Environment (Human Influences on the Environment, Reproduction and Development) National: Grades 9-12, Life Science (Molecular Basis of Heredity); Science in Personal and Social Perspectives (Personal and Community Health; Environmental Quality, Science and Technology in Local, National, and Global Challenges)

SUMMARY: *Muerto Canyon* is a medical thriller. The hantavirus sweeps through a Native American community in New Mexico. A dedicated Native American doctor and a Center for Disease Control researcher work to find the cause of the debilitating and sometimes fatal virus.

QUESTIONS TO EXPLORE: What are the mechanisms of transmission of the hantavirus? How do people contract a hantavirus infection? What steps can be taken to prevent outbreaks of hantavirus?

RESOURCES:

A TED talk about pandemics: https://www.ted.com/talks/laurie_garrett_on_lessons_from_the_1918_flu?language=en

The history of the 1993 hantavirus epidemic: http://www.cdc.gov/hantavirus/hps/history.html

A description of how doctors diagnose a patient with a disease: http://www.sciencemuseum.org.uk/broughttolife/themes/diagnosis

A book, *The Coming Plague*, on the history of emerging diseases: http://lauriegarrett.com/the-coming-plague/

TALENT: Directed and written by Jennifer Peel. Produced by Jennifer Peel and Heather E. Peel. Edited by Jennifer Peel. Photographed by Paul Gentry. Music by Jamie Hall. Principal cast: Keith Egawa (as Dr. Ben Hicks), Jake Waid (Dr. James Reed). Funded by a NYU-Sloan Production Grant.

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GENETICS, EPIDEMIOLOGY

NZARA '76 (Click here to watch)

2014. 19 minutes.

AGE GROUP: High School

STANDARDS: NYC: Grades 9-12, Living Environment (Reproduction and Development, Homeostasis and Immunity, Genetics and Biotechnology) NY State: Grades 9-12, The Physical Setting National: Grades 9-12, Science in Personal and Social Perspectives (Personal and Community Health, Science and Technology in Local, Global, and National Challenges); Life Science (The Cell)

SUMMARY: 1976. A deadly disease spreads in people on the border of Zaire and Sudan. The responding team of doctors find themselves caught between local cultural customs and the extreme measures needed to stop the diseases' spread.

QUESTIONS TO EXPLORE: What are the similarities between Ebola and the disease depicted in *Nzara '76*? What is the difference between a virus and a bacterial infection? What is role of the World Health Organization?

RESOURCES:

The research of an infectious disease expert:
http://www.einstein.yu.edu/faculty/4218/louis-weiss/

A visual guide to antibiotic resistance: http://blogs.scientificamerican.com/sa-visual/a-visual-guide-to-antibiotic-resistance/

Information about the World Health Organization:
http://www.who.int/en/

TALENT: Directed and written by Jon Noble. Produced by Bernardo Duran Jr., Micaela Colman, and Meenakshi Ramamurthy. Edited by Saira Haider. Photographed by Sean McDaniel. Music by Jon Licht. Production design by Angel Herrera. Principal cast: Tad Shafer (as Dr. James Howell), Neil Ellice (Dr. Peter Franklin), Gladys Nyoth (Nyawela), Ratidzo Mambo (Shifaa). Funded by a USC-Sloan Production Grant.

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THE PROS AND CONS OF BREATHING

(Click here to watch)
2005. 21 minutes.

AGE GROUP: High School

STANDARDS: NYC & NY State: Grades 9-12, Living Environment (Genetics and Biotechnology, Reproduction and Development) National: Grades 9-12, Life Science (Molecular Basis of Heredity); Science in Personal and Social Perspectives (Personal and Community Health)

SUMMARY: A young man with Cystic Fibrosis awaiting a transplant which will save him. However, he decides to execute a robbery that may kill him faster than the disease ravaging his lungs.

QUESTIONS TO EXPLORE: What are the underlying genetics of Cystic Fibrosis? Could advances in medicine provide more treatment options for Cystic Fibrosis, and if so, what kinds?

RESOURCES:

An overview of Cystic Fibrosis including its causes, symptoms, and treatment: http://www.mayoclinic.org/diseases-conditions/cystic-fibrosis/basics/definition/con-20013731

The press release announcing Orkambi, a drug designed to treat Cystic Fibrosis:
http://www.fda.gov/NewsEvents/Newsroom/PressAnnouncements/ucm453565.htm

A list of surgery options for patients with Cystic Fibrosis:
http://columbiasurgery.org/conditions-and-treatments/cystic-fibrosis

TALENT: Directed by Seth Manheimer. Written by Bill Balas. Produced by Christopher Aagaard. Edited by Andrea Trillo. Photographed by Christopher Ekstein. Production design by Brandi Hugo. Principal cast: Dylan Purcell (as Jude), Coby Ryan McLaughlin (Nick), Tino Sutras (Jimmy), John Laughlin (Rogan), Marshall R. Teague (Doctor Benjamin). Funded by a AFI-Sloan Production Grant.

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XP (Click here to watch)
2002. 10 minutes.

AGE GROUP: Middle School and higher

STANDARDS: NYC & NY State: Grades 6-12, Weather and Atmosphere; Living Environment (Genetics) National: Grades 5-12, Life Science (Molecular Basis of Heredity); Science in Personal and Social Perspectives (Personal Health)

SUMMARY: In *XP*, a young boy is afflicted with xenoderma pigmentosum rendering him unable to venture outside into the sunlight or endure any sources of UV radiation in the home. He is torn between the admonitions of his mother and doctor, and his wish to live a normal boyhood.

QUESTIONS TO EXPLORE: What is xenoderma pigmentosum (XP)? How is XP transmitted? What are some ways to stay protected from UV radiation?

RESOURCES:

The causes and symptoms of xenoderma pigmentosum:
https://medlineplus.gov/ency/article/001467.htm

A teacher's guide outlining the harmful effects of UV radiation exposure from the sun:
http://enhs.umn.edu/current/5103/uv/harmful.html

Tips on how to stay protected from the sun:
http://www.cancer.org/cancer/cancercauses/sunanduvexposure/skincancerpreventionandearlydetection/skin-cancer-prevention-and-early-detection-u-v-protection

TALENT: Directed and written by David Barba. Produced by James Pellerito. Edited by David Barba. Photographed by Rick Lopez. Production design by Joe Kucharski. Music by Scott Starrett. Principal cast: Blake Coelho, Jennifer Elise Gould, Roberto Garcia. Funded by a CU-Sloan Production Grant.

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HISTORY OF SCIENCE, MICROBIOLOGY

SEMMELWEIS (Click here to watch)

2001. 21 minutes.

AGE GROUP: High School

STANDARDS: NYC & NY State: Grades 9-12, Living Environment (Human Influences on the Environment, Scientific Inquiry) National: Grades 9-12, Science as Inquiry; History and Nature of Science (Historical Perspectives, Science as a Human Endeavor); Science in Personal and Social Perspectives (Personal and Community Health, Natural and Human-induced hazards)

SUMMARY: In 1847, the Hungarian physician Ignaz Semmelweis discovered that many cases of childbirth fever had been caused by the fact that doctors weren't washing their hands before treating pregnant women. His findings were spurned by the medical community.

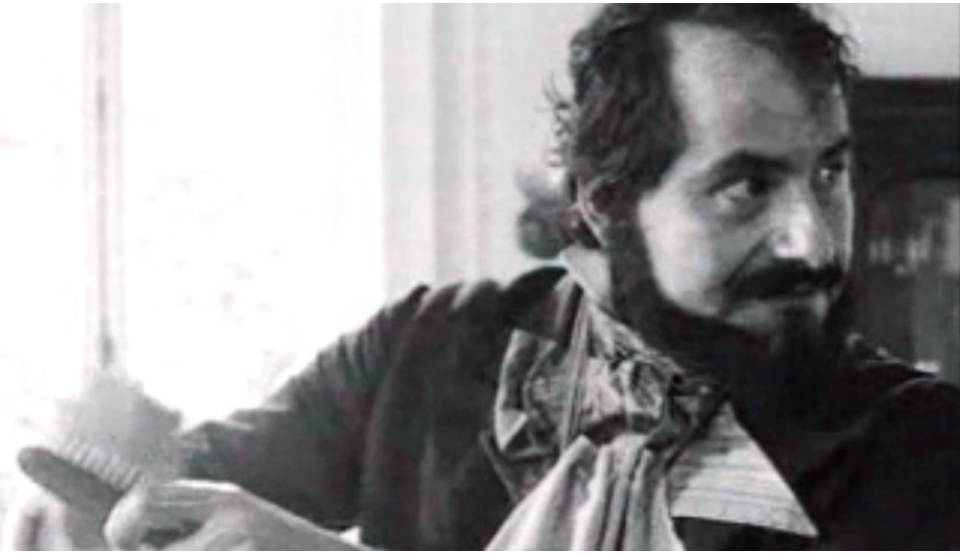
QUESTIONS TO EXPLORE: What is the germ theory of disease? Why is hand-washing important? How have hospitals changed since the late 19th century?

RESOURCES:

Historical information from the Semmelweis Museum:
http://www.semmelweis.museum.hu/muzeum/index_en.html

The history of pain and cleanliness:
http://www.sciencemuseum.org.uk/broughttolife/themes/surgery/pain

Feature article on *Semmelweis*: http://scienceandfilm.org/articles/2724/tbt-from-the-archive-jim-berrys-semmelweis



TALENT: Directed and written by Jim Berry. Produced by Jim Berry, Sam Riegel, and Fritz Michel. Edited by Jessica Sharzer. Photographed by Jim Berry. Production design by Katya DeBear. Music by Andrew Kaiser. Principal cast: Fritz Michel (as Semmelweis), Eden Riegel (Elizabeth Mueller), Keiko Agena (Heather). Funded by a NYU-Sloan Production Grant.

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SKYLAB (Click here to watch)

2005. 12 minutes.

AGE GROUP: Middle School and higher

STANDARDS: NYC: Grades 6-12, Energy and Simple Machines; Earth Science (Astronomy); Physics (Mechanics) NY State: Grades 6-12, The Physical Setting (Physics); The Living Environment (Astronomy) National: Grades 6-12, Science and Technology (Abilities of Technological Design); History and Nature of Science (History of Science)

SUMMARY: An 11-year-old spends the summer of 1979 certain that Skylab, America's First Space Station—then falling back to Earth, though no expert could say where—is about to land on top of him. It might almost make him less miserable if it did; he is spending the summer with his mother who is planning a second marriage to a guy he can't stand.

QUESTIONS TO EXPLORE: What were the goals of the Skylab Space Station? What were some of the engineering challenges that the Skylab Space Station faced? What is the International Space Station and what sorts of experiments are conducted on board?

RESOURCES:

An explanation of how Skylab led to the International Space Station: http://www.nasa.gov/content/40-years-ago-skylab-paved-way-for-international-space-station

The goals of the Skylab Space Station: http://www.history.com/news/the-day-skylab-crashed-to-earth-facts-about-the-first-u-s-space-stations-re-entry

Skylab at the National Air and Space Museum: http://airandspace.si.edu/collections/artifact.cfm?object=nasm_A19761033000

A lesson plan about how things fly: http://howthingsfly.si.edu

Article about *Skylab*: http://scienceandfilm.org/articles/2708/tbt-from-the-archive-mark-landsmans-skylab

Interviews with astronauts from the International Space Station: http://scienceandfilm.org/articles/2690/youre-calling-from-space-imax-a-beautiful-planet

TALENT: Directed and written by Mark Landsman. Produced by Shani M Rotkovitz. Edited by Brad Schwartz. Photographed by Young Rho Kim. Production design by Laura Paddock. Music by William West. Principal cast: Dennis Bendersky (as Benj), Joe Marinelli (Fred), Dorian Frankel (Helene), Adam Riancho (Sam). Funded by a AFI-Sloan Production Grant.

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HISTORY OF SCIENCE, AERODYNAMICS

THROUGH THE AIR TO CALAIS (Click here to watch)

2008. 17 minutes.

AGE GROUP: High School

STANDARDS: NYC: Grades 9-12, Earth Science (Maps and Measurements); Chemistry (Periodicity, Chemical Bonding); Physics (Mechanics) NY State: Grades 9-12, The Living Environment National: Grades 9-12, History and Nature of Science (Historical Perspectives, Science as a Human Endeavor); Science and Technology (Abilities of Technological Design)

SUMMARY: January 7th, 1785. The birds have dominated the skies and gone relatively unchallenged as rulers of the aerial kingdom...until now. Eccentric French Inventor, Jean-Pierre Blanchard and his American financier, Dr. John Jeffries, are embarking on a journey to become the first men to cross the English Channel in a hydrogen balloon. This unlikely pair is bringing: a set of wings to row through the air, the first bag of international airmail, and a bottle of cognac to celebrate their success. However, before these pioneers of aviation can celebrate, they'll need to survive the crossing.

QUESTIONS TO EXPLORE: Who was Jean-Pierre Blanchard? What is buoyancy? What are the advantages and disadvantages of using hydrogen for a balloon?

RESOURCES:

An entry on the life and inventions of Jean-Pierre Blanchard:
http://www.bbml.org.uk/ballooning-history/jean-pierre-blanchard/

The difference between hydrogen and helium:
http://www.airships.net/helium-hydrogen-airships

A detailed description of the mathematics of buoyancy:
http://web.physics.ucsb.edu/~lecturedemonstrations/Composer/Pages/36.39.html

TALENT: Directed by Joseph Mauceri. Written by Jonathan Eisen and Joseph Mauceri. Produced by Seth Kamphuijs. Photographed by Andrew Zeiderman. Edited by Mechan Hernandez. Production design by Jennifer Bash. Principal cast: Casper van Dien (as Dr. John Jeffries), Joseph Benmiloud (Jean-Pierre Blanchard). Funded by a AFI-Sloan Production Grant.

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THE WORK OF 50 MEN (Click here to watch)

2005. 19 minutes.

AGE GROUP: Middle School and higher

STANDARDS: NYC: Grades 6-12, Energy and Simple Machines; Physics: Mechanics NY State: Grades 5-12, The Physical Setting National: Grades 5-12, Science and Technology (Abilities of Technological Design), Science in Personal and Social Perspectives (Science and Technology in Society); History and Nature of Science (Science as a Human Endeavor, History of Science)

SUMMARY: *The Work of 50 Men* tells the story of Eli Whitney's invention of the cotton gin in 1794. Whitney was an American inventor and his invention helped shape the economy of the South, and had a huge impact on the slave trade.

QUESTIONS TO EXPLORE: Who was Eli Whitney? How does a cotton gin work and what technologies preceded it? What were some of the consequences of the invention of the cotton gin?

RESOURCES:

A historian discusses the effects of the cotton gin on slavery: http://teachinghistory.org/history-content/ask-a-historian/24411

Eli Whitney's original patent, along with an explanation of the invention: https://www.archives.gov/education/lessons/cotton-gin-patent/

A selection of classroom activities about cotton: http://www.agintheclassroom.org/TeacherResources/TerraNova/clr_cottonnews.pdf

TALENT: Directed by Gregory Lehane. Written by Lynne Kuemmel. Produced by Shirley J. Saldamarco. Production design by Cletus R. Anderson. Principal cast: Andrew Gehling (as Eli Whitney), Laurie Klatscher (Mrs. Green), Ashley-Nicole Sherman (Alaeda), Demetrius Gross (Joseph), Don Wadsworth (Phineas Miller). Funded by a CMU-Sloan Production Grant.

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CHANCES ARE (Click here to watch)

2004. 12 minutes.

AGE GROUP: High School

STANDARDS: NYC: Grade 8, Needs and Tradeoffs; Reproduction, Heredity, and Evolution NY State: Grades: 7-8, The Physical Environment National: Grades: 7-12, Science in Personal and Social Perspectives (Risks and Benefits)

SUMMARY: In *Chances Are*, a mathematics whiz, compulsively totting up the chances on everything, uses his skills to locate the girl of his dreams after a chance encounter with her at a bar.

QUESTIONS TO EXPLORE: What is the difference between chance and probability? What are some examples of how probability can be used?

RESOURCES:

A video introduction to the concept of probability:
https://www.khanacademy.org/math/in-seventh-grade-math/seventh-data-handling/chance-probability/v/basic-probability

An explanation of probability along with basic activities:
http://www.bbc.co.uk/schools/gcsebitesize/maths/statistics/probability1rev1.shtml

TALENT: Directed and written by Joshua Kameyer. Produced by Matthew Witt and Henry Lowenfels. Edited by Mark Arbitrario. Photographed by Daniel Pfisterer. Production design by Peggy Wang. Music by Andrew Kaiser. Principal cast: Courtney Compton (as Jay), Jaime Aymerich (Randy), Keiko Agena (Heather). Funded by a USC-Sloan Production Grant.

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CHASING PATTERNS (Click here to watch)

2003. 16 minutes.

AGE GROUP: Elementary School and higher

STANDARDS: NYC: Grades K-12, Exploring Properties NY State: Grades K-12, The Living Environment National: Grades K-12, Science as Inquiry; Physical Science (Properties of Objects and Materials)

SUMMARY: The young hero of *Chasing Patterns* is lucky enough to have a teacher who encourages his fascination with the patterns he sees in sunflowers and pine cones—a passion that dovetails with his love of narrative, especially a book of Arthurian legends that belonged to his late mother.

QUESTIONS TO EXPLORE: What is the Fibonacci Sequence? Where is the Fibonacci Sequence in nature? Why does the Fibonacci Sequence occur so often in the environment?

RESOURCES:

How the Fibonacci Sequence was first invented, plus many examples of it in nature:
https://plus.maths.org/content/life-and-numbers-fibonacci

How to count spirals:
http://momath.org/home/fibonacci-numbers-of-sunflower-seed-spirals/

TALENT: Directed and written by Monika Hennig. Produced by Monika Hennig and John Halbert. Edited by Nancy Wang and Monika Hennig. Photographed by Ruben F. Russ. Production design by Marcia Scheese. Principal cast: Danny McCarthy (as Liam Ives), Donal O'sullivan (Robert Ives), Neil Fournier (Rowan), King Stuart (Mr. Emory). Funded by a USC-Sloan Production Grant.

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CALIFORNIA KING (Click here to watch)

2008. 21 minutes.

AGE GROUP: High School

STANDARDS: NYC: Grades 9-12, Physics (Measurement and Mathematics through Kinematics) NY State: Grades 9-12, The Physical Setting (Physics) National: Grades 9-12, Physical Science (Interactions of Energy and Matter, Motions and Forces)

SUMMARY: A womanizing mattress salesman, who employs false ideas about physics to get female customers into bed, falls for a skeptical insomniac who knows her science better than her heart.

QUESTIONS TO EXPLORE: What is inertia? What is the relationship between mass and acceleration? How are Newton's laws of motion applicable in *California King*?

RESOURCES:

An explanation of the law of inertia, along with some fun experiments: http://muse.tau.ac.il/museum/galileo/the_law_of_inertia.html

An explanation of Newton's second law of motion: https://www.grc.nasa.gov/www/k-12/airplane/newton2.html

An explanation of Newton's third law of motion: http://www.qrg.northwestern.edu/projects/vss/docs/propulsion/2-every-action-has-an-equal-and-opposite.html

TALENT: Directed and written by Eli Akira Kaufman. Produced by Kori Shadrick and Dena Hamama. Edited by Harry Yoon. Photographed by Vanessa Holtgrewe. Production design by Tristam Steinberg. Music by Lee Curreri. Principal cast: Don Harry (as Eric), Monique Curnen (Gwen). Funded by a UCLA-Sloan Production Grant.

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FOR ALL MANKIND (Click here to watch)

2009. 16 minutes.

AGE GROUP: High School

STANDARDS: NYC: Grades 9-12, Earth Science (Astronomy); Physics (Energy, Mechanics) NY State: Grades 9-12, The Physical Setting (Physics) National: Grades 9-12, Physical Science (Motions and Forces, Interactions of Energy and Matter)

SUMMARY: Johnny Red always wanted to be a scientist and work for NASA. After several academic mishaps, he ends up stuck in his suburban Pennsylvania town. Johnny decides to build a functioning time machine. Instead of using correct science, Johnny decides to base all of his research on action-adventure films of the 1980s and 1990s.

QUESTIONS TO EXPLORE: What is the speed of light? How does the speed of light relate to time travel?

RESOURCES:

An article on whether it is possible to go backwards in time by travelling faster than light: http://www.pbs.org/wgbh/nova/blogs/physics/2015/08/can-you-really-go-back-in-time-by-breaking-the-speed-of-light/

NASA's space-time experiments:
http://spaceplace.nasa.gov/review/momentum3/

The history of measuring the speed of light:
http://galileoandeinstein.physics.virginia.edu/lectures/spedlite.html

The physics of *The Flash*:
http://scienceandfilm.org/articles/2753/science-goes-to-the-movies-the-flash

TALENT: Directed and written by Daniel Clifton. Produced by Amanda Menaker, Mary-Michael D'Onofrio, and Daniel Clifton. Edited by Rob Malone and Daniel Clifton. Photographed by Bernard Hunt. Production design by Nicholas Shakespeare. Music by Siddhartha Barnhoorn. Principal cast: Josh Gaboian (as Johnny Red), Haley Bond Peterson (Penny), Evander Duck (Professor Lorington), Nico Bell (Nico). Funded by a NYU-Sloan Production Grant.

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JORNADA DEL MUERTO (Click here to watch)

1999. 28 minutes.

AGE GROUP: High School

STANDARDS: NYC: Grades 9-12, Chemistry (Atomic Concepts, Nuclear Chemistry); Physics (Energy) NY State: Grades 9-12, The Physical Setting (Physics) National: Grades 9-12, Physical Science (Interactions of Energy and Matter, Conservation of Energy and Increase in Disorder, Chemical Reactions); History and Nature of Science (Historical Perspectives)

SUMMARY: *Jornada del Muerto* is a tale of the psychological cost paid by those who worked on the atomic bomb. A scientist, wracked by guilt over the destruction and death that the bomb will cause, imagines that he has found a poor family living in a shack near the test site's ground zero.

QUESTIONS TO EXPLORE: What types of scientists and/or mathematicians went to work on the atomic bomb? How does an atomic bomb create such a large explosion? Why is Uranium-235 important in nuclear fission?

RESOURCES:

An historical account of the Los Alamos research facility:
http://www.lanl.gov/about/history-innovation/index.php

The importance of Uranium for nuclear energy:
http://www.world-nuclear.org/information-library/nuclear-fuel-cycle/introduction/physics-of-nuclear-energy.aspx

A visual depiction of Uranium-235 undergoing nuclear fission:
http://hyperphysics.phy-astr.gsu.edu/hbase/nucene/u235chn.html

A book review of *The Making of the Atomic Bomb*:
https://www.nytimes.com/books/99/09/19/specials/rhodes-making.html

Preview of a feature film about nuclear weapons control:
http://scienceandfilm.org/articles/2705/exclusive-eric-schlossers-the-bomb

TALENT: Directed and written by Matthaeus Szumanski. Produced by Matthaeus Szumanski and Marc Lempert. Edited by Matthaeus Szumanski. Photographed Lisa Wiegand. Production design by Deeya Loram. Music by Daniel Bernstein. Principal cast: David Bauman, Jason Cole, Bob Thompson, Michael Sheeley, Coleen Nicholas. Funded by a UCLA-Sloan Production Grant.

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THE MONSTER AND THE PEANUT (Click here to watch)

2004. 22 minutes.

AGE GROUP: High School

STANDARDS: NYC: Grades 9-12, Living Environment (Scientific Inquiry); Physics (Waves) NY State: Grades 9-12, The Physical Setting (Physics) National: Grades 9-12, Science as Inquiry; Physical Science (Motions and Forces)

SUMMARY: *The Monster and the Peanut* is about a man who believes the tragic death of his young daughter can be explained by the rules of traffic flow. It suggests that for some people, science (the repository of reason) becomes a substitute religion, which can explain away the troubling uncertainty of the world.

QUESTIONS TO EXPLORE: What principles of physics can be abstracted to relate to traffic flow? What are some changes to the system of traffic flow that could improve a city?

RESOURCES:

Experimental evidence for traffic jams being compounded from small errors:
http://iopscience.iop.org/article/10.1088/1367-2630/10/3/033001

A three-phase traffic theory:
http://guava.physics.uiuc.edu/~nigel/courses/569/Essays_Fall2012/Files/Park.pdf/

A website dedicated to studying traffic waves:
http://trafficwaves.org/

TALENT: Directed by Franklin Jin Rho. Written by Albert Crim. Produced by Brian Udovich. Edited by David Kashevaroff. Photographed by Darren Genet. Production design by Arjuna Imel. Music by Mark Schulz. Principal cast: Bo Foxworth, Anne Ramsey, Dean Haglund, Alyssa Baric, Pablo Moix. Funded by a AFI-Sloan Production Grant.

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THEREMIN: OUT OF THE ETHER (Click here to watch)

2001. 4 minutes.

AGE GROUP: High School

STANDARDS: NYC: Grades 9-12, Physics (Electricity and Magnetism) NY State: Grades 9-12, The Physical Setting (Physics) National: Grades 9-12, Science and Technology (Abilities of Technological Design); History and Nature of Science (Science as a Human Endeavor, Historical Perspectives)

SUMMARY: In the 1920's, Leon Theremin was world-renowned as the father of electronic music and the toast of Manhattan's cultural elite. He had his own studio and invented various electronic instruments, including the Theremin and the Terpsitone. Theremin's career was cut short in the late 1930s when, on a visit to the Soviet Union, he was arrested and imprisoned on false charges of espionage. He never fully returned to music. *Theremin: Out of the Ether* is an experimental film combining live-action dance, hand-drawn animation, and an imagined recreation of a Theremin-sound-light-dance performance.

QUESTIONS TO EXPLORE: What kind of instrument is a Theremin? How does a Theremin create sound? How did Leon Theremin's training as a physicist help him to invent instruments?

RESOURCES:

A biography of Leon Theremin:
http://www.bbc.com/news/magazine-17340257

A guide for making a Theremin: http://www.sciencebuddies.org/science-fair-projects/project_ideas/Music_p035.shtml#summary

An explanation of how a Theremin works: http://ffden-2.phys.uaf.edu/211.fall2000.web.projects/Jennifer%20Erland/How%20it%20Works.html

The history and mechanics of a Terpsitone:
http://120years.net/the-terpsitoneleon-termenusaussr1930/

Article about THEREMIN: OUT OF THE ETHER:
http://scienceandfilm.org/articles/2624/tbt-from-the-archive-brian-e-f-oakess-theremin

TALENT: Directed, animated, and designed by Brian E.F. Oakes. Sound design by Ben Martin. Music by Sara Rockmore. Production design by Angel Herrera. Principal cast: Maria Colabelli. Funded by a USC-Sloan Production Grant.

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*THE VISIONARY**(TESLA)* (Click here to watch)

2005. 21 minutes.

AGE GROUP: High School

STANDARDS: NYC: Grades 9-12, Physics (Electricity and Magnetism, Energy, Modern Physics) NY State: Grades 9-12, The Physical Setting (Physics) National: Grades 9-12, Physical Science (Structure and Properties of Matter, Conservation of Energy, Motions and Forces, Interactions of Energy and Matter); History and Nature of Science (Science as a Human Endeavor, Historical Perspectives)

SUMMARY: In 1917, Nikola Tesla was awarded the Edison Medal for inventing alternating current. He was consumed with the desire to completely remake the world's energy systems into a wireless model that anyone, anywhere, could tap into. Tesla spent all of his money and personal capital on the project eventually resulting in his professional demise.

QUESTIONS TO EXPLORE: What was Nikola Tesla's major scientific contribution? What was the basis of the rivalry between Edison and Tesla? What use could the Wardenclyffe Tower have been?

RESOURCES:

Information on Nikola Tesla from the Tesla Memorial Society of New York: http://www.teslasociety.com/index.html

An article about Tesla's achievements: http://www.worldsciencefestival.com/2014/07/nikola-tesla-father-death-ray/

Resources for classrooms to study Tesla: http://www.pbs.org/tesla/index.html

Article on *The Visionary**(Tesla)*: http://scienceandfilm.org/articles/2670/tbt-from-the-archive-joel-o-shapiros-the-visionarytesla

TALENT: Directed by Joel O. Shapiro. Written by Joel O. Shapiro and Al Davidian. Produced by Sushil Tyagi. Edited by David Fishel. Photographed by Kev Robertson. Production design by Glen Hall. Music by Paul Hogan. Principal cast: Caitlin FitzGerald (as Katharine Johnson), Toumis Hil (Tesla), Victor Warren (Bernard A. Behrand) and Bob Ari (Edison). Funded by a CU-Sloan Production Grant.

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THE WORMHOLE (Click here to watch)

2002. 19 minutes.

AGE GROUP: High School

STANDARDS: NYC: Grades 9-12, Physics (Energy) NY State: Grades 9-12, The Living Environment (Astronomy) National: Grades 9-12, Physical Science (Interactions of Energy and Matter); Earth and Space Science (Energy in the Earth System, Origin and Evolution of the Earth System)

SUMMARY: Young Wally watches as his grandmother lectures her college students about wormholes, which connect black holes to white holes. As he listens, he remembers the time before his little brother was kidnapped and his own family wrenched apart.

QUESTIONS TO EXPLORE: What is a wormhole? Why have wormholes been so difficult for scientists to find?

RESOURCES:

A video of a physicist speaking about blackholes, wormholes, and time travel:
https://milq.com/worldsciencefestival/black-holes-wormholes-and-time-travel-340

An article on wormholes and time travel:
http://news.nationalgeographic.com/news/2005/09/0916_050916_timetravel.html

TALENT: Directed and written by Jessica Sharzer. Produced by Sydney Burtner and Andrij Parekh. Edited by Jessica Sharzer and Adam Walsh. Music by Christopher Libertino. Principal cast: T.J. Sullivan (as Wally), T.J. Stanton (Michael), Claire Beckman (Elaine), Suzanne Shepherd (Grace). Funded by a NYU-Sloan Production Grant.

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ATROCITY (Click here to watch)

2004. 7 minutes.

AGE GROUP: High School

STANDARDS: NYC & NY State: Grades 9-12, Living Environment (Scientific Inquiry) National: Grades 9-12, Science as Inquiry; History and Nature of Science (Science as a Human Endeavor, Nature of Scientific Inquiry, Historical Perspectives)

SUMMARY: An experiment on obedience to authority conducted at Yale University in the early 1960s, by social psychologist Stanley Milgram, was a shock to the publics' notion of its own goodness. Researchers were astounded by the results, which showed the extent to which subjects would inflict harm on others at the order of the researcher.

QUESTIONS TO EXPLORE: Why did Stanley Milgram's peers question the ethics of his experiment? What were the resounding psychological effects of Stanley Milgram's experiment on the test subjects? What did the Milgram experiment demonstrate?

RESOURCES:

Stanley Milgram's essay "The Perils of Obedience," which explains his experiment: http://www.paulgraham.com/perils.html

An article questioning the ethics behind the Milgram Experiment: https://lareviewofbooks.org/article/psych-lies-and-audiotape-the-tarnished-legacy-of-the-milgram-shock-experiments/

Interview with a psychologist about Milgram's experiment: http://scienceandfilm.org/articles/2527/sundance-2015-the-notorious-milgram-and-zimbardo-experiments

Interview with a playwright who researched Milgram: http://scienceandfilm.org/articles/2658/interview-with-playwright-frank-basloe

TALENT: Directed, written, produced, and photographed by Adam Kargman. Principal cast: James Bolt (as Stanley Milgram), John Funk (Earl), Hollis Doherty (Julie), Linda Wilkens (Mary), Mitch Lippman (David), Mario Bickham (Ric), Derek Bentley (Learner), Jennifer Jessum. Funded by a USC-Sloan Production Grant.

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THE DISAPPEARANCE OF ANDY WAXMAN

(Click here to watch)
2005. 24 minutes.

AGE GROUP: High School

STANDARDS: NYC & NY State: Grades 9-12, Living Environment (Evolution) National: Grades 9-12, History and Nature of Science (Historical Perspectives)

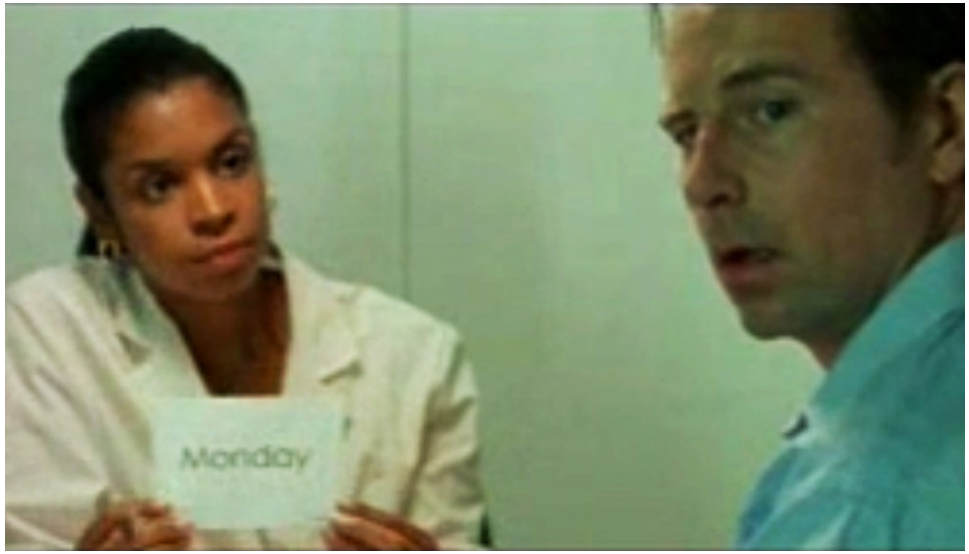
SUMMARY: The mystery of memory—how it disappears and what remains of our identity when we lose it—is the tragic core of *The Disappearance of Andy Waxman*. The main character loses his short-term memory after a car accident. He figures out a way to live with this brain disorder.

QUESTIONS TO EXPLORE: What parts of the brain are involved in forming long-term and short-term memory? What is anterograde amnesia? What causes anterograde amnesia?

RESOURCES:

Neuroscientists talk about the brain and memory on a television panel: https://charlierose.com/collections/3/clip/16493

Anterograde amnesia in Disney's *Finding Dory*:
http://scienceandfilm.org/articles/2729/finding-dory-the-amnesic-royal-blue-tang



TALENT: Directed and written by Till Osterland. Produced by Karen Dillon, Hank Norman, Ken Kristensen, and Michael Kaufman. Edited by Garrett Tezanos. Photographed by Trish Govoni. Music by Garrett Tezanos. Production design by Don MacLean and Seth Wachtel. Principal cast: Rain Phoenix (as Holly), Stephen Barker Turner (Andy). Funded by a CU-Sloan Production Grant.

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IN VIVID DETAIL (Click here to watch)

2007. 19 minutes.

AGE GROUP: Middle School and higher

STANDARDS: NYC: Grades 6-12, The Human Animal; Reproduction, Heredity and Evolution NY State: Grades 5-12, The Living Environment National: Grades 5-12, Life Science (Diversity and Adaptations of Organisms); Science in Personal and Social Perspectives (Personal Health)

SUMMARY: *In Vivid Detail* is a tender love story which profiles Justin—an architect who is face blind—as he begins a new romance. Similar to people who are colorblind and still see colors but are unable to tell them apart, people with face blindness (prosopagnosia) perceive faces but cannot distinguish them. Justin and Leslie must decide whether their new relationship can overcome the obstacles ahead of them as they try to cope with this rare diagnosis.

QUESTIONS TO EXPLORE: What part of the brain is affected in prosopagnosia? What does prosopagnosia reveal about the brains' ability to recognize faces? What is an agnosia?

RESOURCES:

Neuroscientists discuss prosopagnosia on a television panel:
https://charlierose.com/collections/3/clip/14590

A personal account of prosopagnosia:
http://www.newyorker.com/magazine/2010/08/30/face-blind

An information page on prosopagnosia:
http://www.ninds.nih.gov/disorders/prosopagnosia/Prosopagnosia.htm

TALENT: Directed by Dara Bratt. Written by Dara Bratt and Kieran Dick. Produced by Sharon Barnes. Edited by Dara Bratt. Photographed by Kathryn Westergaard. Principal cast: John Ventimiglia (as Justin), Piper Perabo (Leslie). Funded by a NYU-Sloan Production Grant.

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THE REALITY CLOCK (Click here to watch)

2011. 7 minutes.

AGE GROUP: Middle School and higher

STANDARDS: NYC: Grades 6-12, The Human Animal NY State: Grades 5-12, The Living Environment National: Grades 5-12, Life Science (Regulation and Behavior, Behavior of Organisms); Science in Personal and Social Perspectives (Personal Health)

SUMMARY: *The Reality Clock* is an animated portrait of a watchmakers' struggle to accept the influences of early stage dementia on his identity and sense of time. Autobiographical works by individuals with dementia inspired this impressionistic film.

QUESTIONS TO EXPLORE: What are common symptoms of dementia? How do doctors diagnose people with dementia? What is the relationship between emotion and memory and how can this be used to treat dementia?

RESOURCES:

An encyclopedic entry on dementia:
http://www.ninds.nih.gov/disorders/dementias/detail_dementia.htm

An explanation of the memory loss which is associated with dementia:
https://www.alzheimers.org.uk/site/scripts/documents_info.php?documentID=123

A standardized assessment for dementia:
http://www.clocktestrcct.com/about_rcct.htm

An article about music and memory:
http://www.alzfdn.org/EducationandCare/musictherapy.html

TALENT: Directed by Amanda Tasse. Animated by Amanda Tasse. Designed by Amanda Tasse. Fabricated by Chris Swanson. Music by Igor Nemirovsky. Principal cast: Marco Tazioli (as Young Man), J Louis Reid (Voiceover). Funded by a USC-Sloan Production Grant.

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THE WITNESS (Click here to watch)

2012. 16 minutes.

AGE GROUP: High School

STANDARDS: NYC & NY State: Grades 9-12, Living Environment (Scientific Inquiry) National: Grades 9-12, Life Science (Behavior of Organisms); Science and Technology (Abilities of Technological Design)

SUMMARY: Sam, a neuroscientist and specialist in neuro-imaging, is called to testify as an expert witness in a criminal trial and becomes caught in a network of intense emotions, which conflict with his scientific findings. Sam's greatest challenge is to separate his emotional allegiances and his professional ones, while staying true to both.

QUESTIONS TO EXPLORE: How can brain images be used in the courtroom? What areas of the brain affect moral decision-making? What are different kinds of brain imaging technologies?

RESOURCES:

Neuroscientists discuss the biological basis of decision-making on a television panel:
https://charlierose.com/collections/3/clip/14510

An explanation of the brain areas involved in decision-making:
http://healthland.time.com/2012/09/04/making-choices-how-your-brain-decides/

A series of videos of experts talking about brain imaging as used in the courtroom:
http://brainsontrial.com/watch-videos/video/episode-1-determining-guilt/

TALENT: Directed and written by Ioana Uricaru. Produced by Andrew C. Richey, Phoebe Shackeroff, Joshua Tate, and Ioana Uricaru. Edited by Michael P. Shawve. Photographed by Skye Borgman. Music by Paul Apelgren. Principal cast: Patrick Lander (as Sam), Aric Cushing (Simon), Baadja Lyne (Florence), Mo Hine (Joseph), Maeva Asare (Rebecca). Funded by a USC-Sloan Production Grant.

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APP (Click here to watch)

2013. 22 minutes.

AGE GROUP: High School

STANDARDS: NYC: Grades 9-12, Information Systems NY State: Grades 9-12, Expanded Process Skills National: Grades 9-12, Science and Technology (Abilities of Technological Design, Understandings about Science and Technology)

SUMMARY: Normally, you wouldn't catch shy software developer Paul at a trendy club. But tonight is different. Paul's new mobile dating app is ready for beta testing, but if he doesn't pay his bills by the next day, his "Siri on steroids" will be deleted. Desperate, Paul tracks down suave venture capitalist, Mike, and begs him to invest in his app. Mike takes one look at Paul and devises the perfect plan to put the app to the test: if Paul can use the app to "make it," with the beautiful Zoey, Mike will invest.

QUESTIONS TO EXPLORE: What is an algorithm? How do facial recognition technologies work, and how are they being used? Who are the key people involved in developing an app?

RESOURCES:

Resources from the biological anthropologist who helped to develop the OK Cupid algorithm: http://www.helenfisher.com/

Educational resources from the Computer History Museum: http://www.computerhistory.org/education/

Comedian Chelsea Handler interviews Silicon Valley experts: http://scienceandfilm.org/articles/2699/science-on-the-small-screen-chelsea-does

TALENT: Directed and written by Alexander Berman. Produced by Edouard de Lachomette. Edited by Jeremy Lerman. Photographed by Edward Salerno, Jr. Production design by Matthew Novak. Principal cast: Braden Lynch (as Paul), Sara Sanderson (Zoey), J.R. Cacia, Ashley Lambert. Funded by a AFI-Sloan Production Grant.

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TECHNOLOGY, COMPUTER ENGINEERING

THE KING'S PAWN (Click here to watch)

2015. 17 minutes.

AGE GROUP: Middle School and higher

STANDARDS: NYC: Grades 6-12, Information Systems NY State: Grades 6-12, Expanded Process Skills National: Grades 5-12, Science in Personal and Social Perspectives (Science and Technology in Society)

SUMMARY: *The King's Pawn* follows a former chess prodigy who challenges the world-champion with a super computer he spent his life designing. With so much media attention and such high stakes surrounding the event, is it possible that someone from the computer's side might have interfered with the match's outcome?

QUESTIONS TO EXPLORE: What defines a turn-taking game and why are those the easiest games to program? What happened in the 1997 Gary Kasparov vs. Deep Blue tournament? What are recent advances in the field of computer versus human gaming?

RESOURCES:

The history of computer chess programs: http://illumin.usc.edu/188/deep-blue-the-history-and-engineering-behind-computer-chess/

A computer chess collection at the Computer History Museum: http://www.computerhistory.org/collections/computerchess/

An article on man versus machine: http://www.nybooks.com/articles/2010/02/11/the-chess-master-and-the-computer/

Interview with a computer scientist about the future of AI and the feature film *Computer Chess*: http://scienceandfilm.org/articles/2683/science-on-screen-prof-clare-congdon-on-computer-chess

Article about *The King's Pawn*: http://scienceandfilm.org/articles/2748/premiere-jonah-bleichers-the-kings-pawn

TALENT: Directed by Jonah Bleicher. Written by Darren Anderson and Jonah Bleicher. Produced by Rob Cristiano and Josh Cohen. Photographed by Zachary Halberd. Principal cast: Collin Ware (as Martin Bloom), Jakob von Eichel (Christoph Wolff), Shanga Parker (Vik), Julian Murdoch (Young Christoph Wolff), Logan Riley Bruner (Young Martin Bloom). Funded by a CU-Sloan Production Grant.

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TECHNOLOGY, ELECTRICAL ENGINEERING

THREE LIGHT BULBS (Click here to watch)

2012. 15 minutes.

AGE GROUP: Middle School and higher

STANDARDS: NYC: Grades 6-12, Energy and Simple Machines; Living Environment (Scientific Inquiry, Human Influences on the Environment); Physics (Energy, Electricity and Magnetism); Earth Science (Climate) NY State: Grades 6-12, The Living Environment National: Grades 5-12, Science as Inquiry; Physical Science (Transfer of Energy, Interactions of Energy and Matter); Science and Technology (Abilities of Technological Design, Understandings about Science and Technology); Science in Personal and Social Perspectives (Science and Technology in Society, Environmental Quality); History and Nature of Science (Science as a Human Endeavor)

SUMMARY: A girl returns to her hometown, which is a remote village in China where most young people have left for big opportunities in the city. The town has a power shortage, which she tries to alleviate by installing a solar panel. However, introducing this new technology proves more difficult than imagined.

QUESTIONS TO EXPLORE: How is electricity produced?
How do solar panels draw energy from the sun?
What causes power outages?

RESOURCES:

Classroom exercises about electricity:
https://www.fi.edu/sites/default/files/EducatorGuides_edguide-electricity.pdf

The basics of solar energy:
http://energy.gov/eere/energybasics/articles/solar-energy-technology-basics

The history of energy inventions:
https://www.fi.edu/history-resources/electricity

Some causes of blackouts:
http://insideenergy.org/2015/04/10/ie-questions-what-causes-blackouts/

Interview about a Museum exhibition on electricity in art:
http://scienceandfilm.org/articles/2733/electric-paris-interview-with-curator-margarita-karasoulas

TALENT: Directed by Min Ding. Written by Min Ding and Yen-Chiao Huang. Produced by Cindy Hu. Edited by Wei-Hsin Yang. Principal cast: Wen-Ying Tan (as Tree), Yu-Zhi Tan, Man Yang, Ning Yuan, Di An. Funded by a CU-Sloan Production Grant.

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ACKNOWLEDGEMENTS

Sonia Shechet Epstein is the Executive Editor of *Sloan Science & Film*. She produces all content for the site. She also conducts interviews with scientists and filmmakers, commissions features from scientists, and collaborates with other publications and partner organizations. For questions or comments please email sloanfilm@movingimage.us.

The Alfred P. Sloan Foundation is a non-profit philanthropic organization which awards approximately $100 million per year in grants supporting original research and broad-based education in science, technology, engineering, economic performance, and mathematics. The Foundation's Public Understanding program supports the arts—awarding grants to film, theatre, radio, television, books, and new media projects to build bridges between the two cultures of science and the humanities translating science and technology for the public.

Museum of the Moving Image advances the understanding, enjoyment, and appreciation of the art, history, technique, and technology of film, television, and digital media. In its stunning facilities—acclaimed for both its accessibility and bold design—the Museum presents exhibitions; screenings of significant works; discussion programs featuring actors, directors, craftspeople, and business leaders; and education programs which serve more than 50,000 students each year. The Museum also houses a significant collection of moving-image artifacts.

Special Thanks to the Museum's Education Department and to Noah Regen, Sloan Science & Film intern.

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APPENDIX: SCIENCE STANDARDS

MUSEUM OF THE MOVING IMAGE
SLOAN SCIENCE & FILM

In accompaniment to the *Sloan Science & Film* Teacher's Guide, here is an appendix of standards in the sciences. Our goal is to help teachers by correlating each film in the Teacher's Guide to National Standards, New York State Standards, and New York City Science Scope and Sequence for K-12.

NEW YORK CITY (NYC) SCIENCE SCOPE AND SEQUENCE:

Standard 1 – Analysis, Inquiry and Design
Standard 2 – Information Systems
Standard 3 – Mathematics
Standard 4 – Science
Standard 5 – Technology Education
Standard 6 – Interconnectedness: Common Themes
Standard 7 – Interdisciplinary Problem Solving

Grades K-5 (click here)

Grade K: Unit 1 Trees through the Seasons, Unit 2 Exploring Properties, Unit 3 Animals
Grade 1: Unit 1 Animal Diversity, Unit 2 Properties of Matter, Unit 3 Weather and Seasons
Grade 2: Unit 1 Earth Materials, Unit 2 Forces and Motion, Unit 3 Plant Diversity
Grade 3: Unit 1 Matter, Unit 2 Energy, Unit 3 Simple Machines, Unit 4 Plant and Animal Adaptation
Grade 4: Unit 1 Animals and Plants in their Environments, Unit 2 Electricity and Magnetism, Unit 3 Properties of Water, Unit 4 Interactions of Air Water and Land
Grade 5: Unit 1 The Nature of Science, Unit 2 Changes in the Surface of the Planet, Unit 3 Food and Nutrition, Unit 4 Exploring Ecosystems

Grades 6-8 (click here)

Grade 6: Unit 1 Energy and Simple Machines, Unit 2 Weather and Atmosphere, Unit 3 Diversity of Life, Unit 4 Interdependence, Unit 5 Geology
Grade 7: Unit 1 Geology, Unit 2 Energy and Matter, Unit 3 The Human Animal, Unit 4 Other Organisms
Grade 8: Unit 1 Reproduction, Heredity and Evolution, Unit 2 Forces and Motion on Earth, Unit 3 The Sun Earth and Moon System, Unit 4 Need and Tradeoffs

Grades 9-12 (click here)

LE | Living Environment
-Unit 1 Scientific Inquiry
-Unit 2 Ecology
-Unit 3 Organization and Patterns in Life
-Unit 4 Homeostasis and Immunity
-Unit 5 Reproduction and Development
-Unit 6 Genetics and Biotechnology
-Unit 7 Evolution
-Unit 8 Human Influences on the Environment

ES | Earth Science
-Unit 1 Maps and Measurement
-Unit 2 Dynamic Earth
-Unit 3 Rocks and Minerals
-Unit 4 Landscapes
-Unit 5 Earth History
-Unit 6 Insolation
-Unit 7 Meteorology
-Unit 8 Climate
-Unit 9 Astronomy

CH | Chemistry
-Unit 1 The Physical Nature of Matter
-Unit 2 Atomic Concepts
-Unit 3 Nuclear Chemistry
-Unit 4 Chemical Bonding
-Unit 5 Periodicity
-Unit 6 Moles/Stoichiometry
-Unit 7 Kinetics and Equilibrium
-Unit 8 Acids and Bases
-Unit 9 Oxidation and Reduction
-Unit 10 Carbon and Organic Chemistry

PH | Physics
-Unit 1 Measurement and Mathematics through Kinematics
-Unit 2 Mechanics
-Unit 3 Energy
-Unit 4 Electricity and Magnetism
-Unit 5 Waves
-Unit 6 Modern Physics

NEW YORK STATE STANDARDS:

Elementary Level Science, Core Curriculum Grades K-4 (click here)

Standard 1: Analysis, Inquiry, and Design
Standard 4: The Physical Setting
Standard 4: The Living Environment

Intermediate Level Science, Core Curriculum Grades 5-8 (click here)

Standards 1, 2, 6, and 7: Expanded Process Skills
-Chemistry, Physics
Standard 4: The Living Environment
-Physical Setting/Earth Science: Geology, Astronomy, Meteorology
Standard 4: The Physical Setting
-Chemistry, Physics

NATIONAL EDUCATION STANDARDS:

Science as Inquiry: Content Standard A
Physical Science: Content Standard B
Life Science: Content Standard C
Earth and Space Science: Content Standard D
Science and Technology: Content Standard E
Science in Personal and Social Perspectives: Content Standard F
History and Nature of Science: Content Standard G

Grades K-4 (click here)

Science as Inquiry: Content Standard A
Physical Science: Content Standard B
-Properties of objects and materials
-Position and motion of objects
-Light, heat, electricity, and magnetism
Life Science: Content Standard C
-The characteristics of organisms
-Life cycles of organisms
-Organisms and environments
Earth and Space Science: Content Standard D
-Properties of earth materials
-Objects in the sky
-Changes in earth and sky
Science and Technology: Content Standard E
-Abilities of technological design
-Understanding about science and technology
-Abilities to distinguish between natural objects and objects made by humans
Science in Personal and Social Perspectives: Content Standard F
-Personal health
-Characteristics and changes in populations
-Types of resources
-Changes in environments
-Science and technology in local challenges
History and Nature of Science: Content Standard G
-Science as a human endeavor

Grades 5-8 (click here)

Science as Inquiry: Content Standard A
Physical Science: Content Standard B
-Properties and changes of properties in matter
-Motions and forces
-Transfer of energy
Life Science: Content Standard C
-Structure and function in living systems
-Reproduction and heredity
-Regulation and behavior
-Populations and ecosystems
-Diversity and adaptations of organisms
Earth and Space Science: Content Standard D
-Structure of the earth system
-Earth's history
-Earth in the solar system
Science and Technology: Content Standard E
-Abilities of technological design
-Understandings about science and technology
Science in Personal and Social Perspectives: Content Standard F
-Personal health
-Populations, resources, and environments
-Natural hazards
-Risks and benefits
-Science and technology in society
History and Nature of Science: Content Standard G
-Science as a human endeavor
-Nature of science
-History of science

Grades 9-12 (click here)

Science as Inquiry: Content Standard A
Physical Science: Content Standard B
-Structure of atoms
-Structure and properties of matter
-Chemical reactions
-Motions and forces
-Conservation of energy and increase in disorder
-Interactions of energy and matter
Life Science: Content Standard C
-The cell
-Molecular basis of heredity
-Biological evolution
-Interdependence of organisms
-Matter, energy, and organization in living systems
-Behavior of organisms
Earth and Space Science: Content Standard D
-Energy in the earth system
-Geochemical cycles
-Origin and evolution of the earth system
-Origin and evolution of the universe
Science and Technology: Content Standard E
-Abilities of technological design
-Understandings about science and technology
Science in Personal and Social Perspectives: Content Standard F
-Personal and community health
-Population growth
-Natural resources
-Environmental quality
-Natural and human-induced hazards
-Science and technology in local, national, and global challenges
History and Nature of Science: Content Standard G
-Science as a human endeavor
-Nature of scientific knowledge
-Historical perspectives