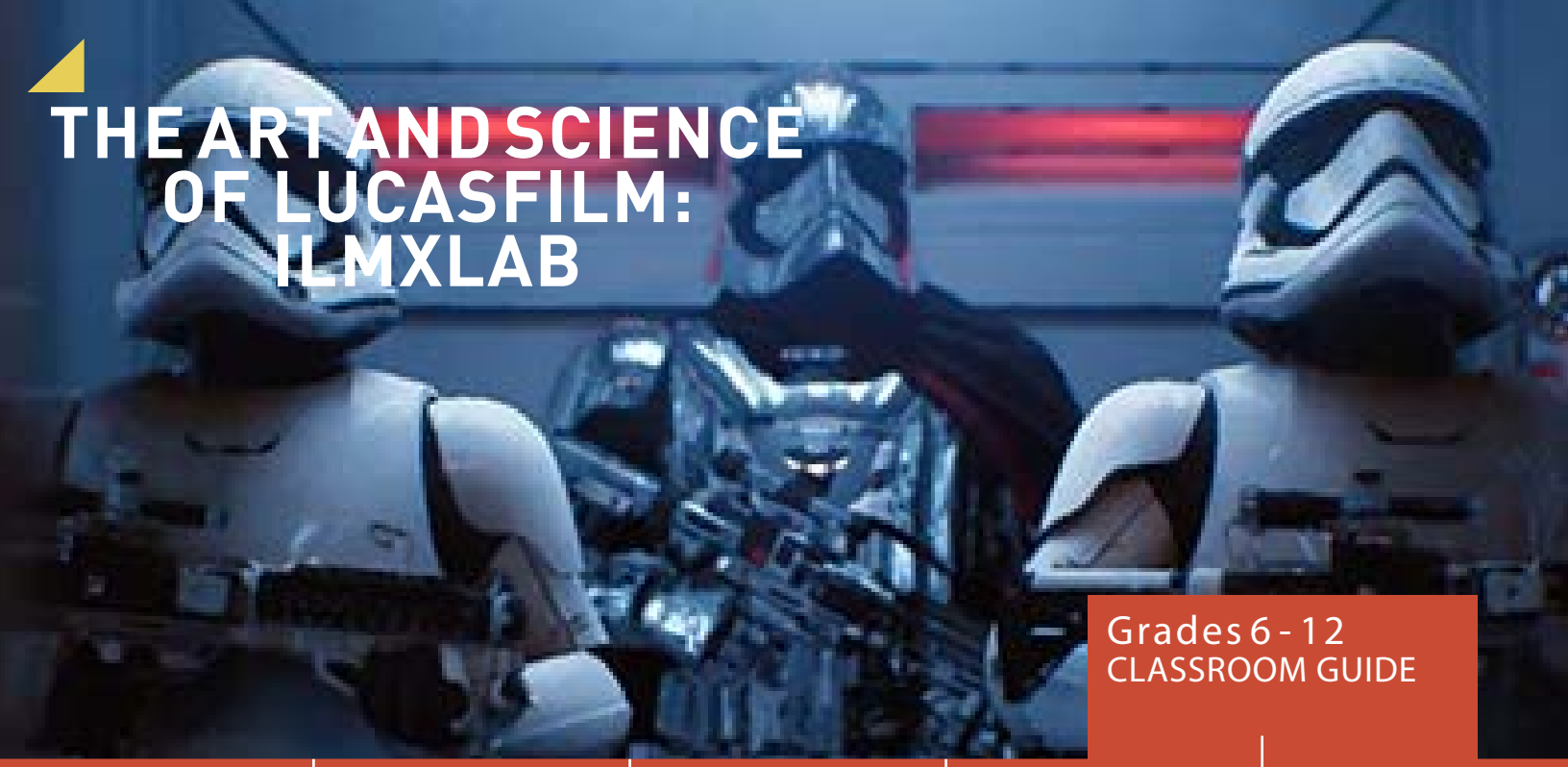
THE ART AND SCIENCE OF LUCASFILM: ILMXLAB



Grades 6 - 12
CLASSROOM GUIDE

presentation overview:

Kicking of the 11th year of our long running collaborative educational series, we are pleased to present the Art and Science of Lucasfilm: ILMxLAB. Launched by Lucasfilm in 2015, ILMxLAB embraces the next transformative opportunity in entertainment: immersive storytelling powered by real-time computer graphics. Experienced professionals from ILMxLAB will share their expertise in a behind-the-scenes, interactive multimedia presentation that demonstrates the intersection of art, science, and technology in the entertainment industry, all while making connections to current STEAM curriculum topics.The Art & Science of Lucasfilm program features experienced professionals from the various Lucasfilm divisions sharing their knowledge with Bay Area middle and high school students in a series of behind-the-scenes, interactive multimedia presentations that demonstrate the intersection of art and science in the entertainment industry. Each event includes time for discussion, where students have the opportunity to ask questions of Lucasfilm, supervisors, artists and engineers.

All SFFILM Education materials are developed in alignment with California educational standards for media literacy.
SFFILM Education welcomes feedback and questions on all printed study materials.

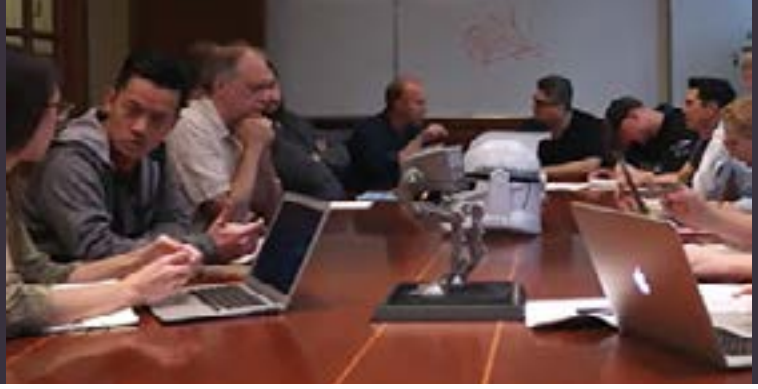
Grades 6-12

Suggested Subject Areas:
Arts/Media, Career Path Training, Math, Peer/Youth Issues, Science

ILMxLAB

LUCASFILM Ltd

SFFILM education



presenter bios

VICKI DOBBS BECK, Executive in Charge, ILMXLAB

Vicki Dobbs Beck is the Executive in Charge of ILMxLAB, a division launched in June 2015, whose mission is to pioneer in the area of immersive storytelling. ILMxLAB wants to make it possible for people to, 'Step Inside Our Stories.' The division combines the storytelling and innovation talents of Lucasfilm, Industrial Light & Magic and Skywalker Sound and builds on a foundation of pioneering R&D in real-time computer graphics and virtual production.

Under Vicki's leadership, ILMxLAB created the ground-breaking VR installation, Carne y Arena, which was the vision of Alejandro Iñárritu in association with Legendary Entertainment and Fondazione Prada. Carne y Arena was chosen as the first-ever VR Official Selection at the Cannes Film Festival (2017) and was awarded a special Oscar by the Academy of Motion Picture Arts and Sciences, "in recognition of a visionary and powerful experience in storytelling." In addition to producing multiple promotional VR experiences supporting major film releases, ILMxLAB most recently collaborated with the VOID to develop and produce the hyper-reality experience: Star Wars: Secrets of the Empire.

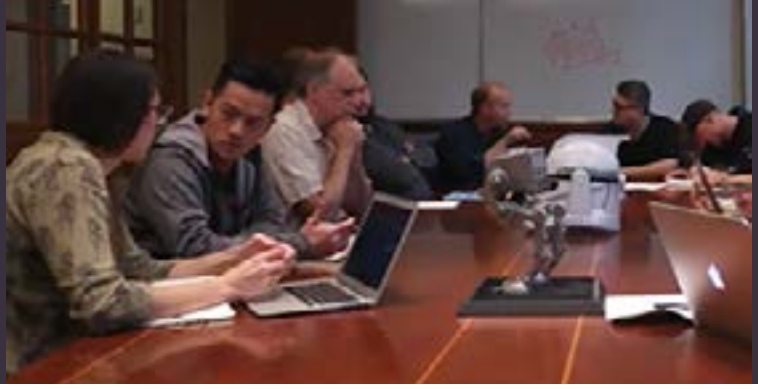
Vicki has more than 30 years of broad-based management experience in the entertainment industry. Prior to that, she received her MBA from Stanford University's Graduate School of Business where she also completed her undergraduate studies, earning a BA with distinction in International Relations.

BEN SNOW, Visual Effects Supervisor

Ben Snow has been working in visual effects for 30 years, the majority of that time at Industrial light and Magic in San Francisco California. A visual effects supervisor since 1998, his credits include Pearl Harbor, Galaxy Quest, Star Wars Episode 2: Attack of the Clones, King Kong (at Weta digital), Iron Man (1 & 2), Noah and Avengers: Age of Ultron amongst many others. His most recent film credit was Darren Aronofsky's mother! (2017). He's been working with ILMxLAB since 2015 on immersive entertainments including conceiving and creating Star Wars: The Force Awakens immersive 360 experience for Facebook and supervising Star Wars: Secrets of the Empire - a hyper-reality experience collaboration between Lucasfilm, ILMxLAB and The Void. Ben is currently supervising Vader Immortal, an episodic VR experience for Lucasfilm, ILMxLAB and Oculus that will launch in 2019.

ED FORNOLES, Lead Animator

A lifelong Star Wars fan and recognized expert on the Ed Fornoles is a Bay Area native who grew up in San Jose and graduated from Cal Poly San Luis Obispo with a degree in Computer Engineering. Inspired by films such as Toy Story and Finding Nemo, he realized he wanted to use computers to bring images and characters to life. He changed gears and attended Animation Mentor, worked on a number of games and live-action movies at Cryptic Studios and Rhythm & Hues Studios, and eventually landed at Blue Sky Studios in Connecticut, where he animated iconic characters like Scrat the prehistoric squirrel from Ice Age, and Charlie Brown from The Peanuts Movie. After a few years on the East Coast he returned home to the Bay, where he works as an animator at ILMxLAB, helping create cutting-edge immersive experiences and playing VR full-time.



presenter bios

IAN BOWIE, Experience Designer

Ian Bowie is an Experience Designer at the ILMxLAB and Lead Designer on Star Wars: Secrets of the Empire. He began his career in interactive content making indie games while pursuing his bachelors degree in Multimedia. After earning his Masters degree in Entertainment Technology from Carnegie Mellon, he designed for 5 and a half years on the Call of Duty: Black Ops video game series at Treyarch before joining the visionary team at ILMxLAB, Lucasfilm's immersive entertainment division founded in 2015.

NATY HOFFMAN, Principal Engineer & Architect

Naty Hoffman is currently a Principal Engineer & Architect at the Lucasfilm Advanced Development Group. Previously, he spent close to two decades in the game industry doing graphics research and development for various game franchises, including Call of Duty and God of War. Naty also co-authored the book "Real-Time Rendering", and has given multiple conference presentations on real-time rendering and related topics.

STEPHANIE TONG, Associate Gameplay Engineer

From a young age, I had my eyes set on the entertainment industry. In June 2016, I graduated from University of California, Riverside with a degree in Computer Science. During my college years, I've prototyped many games using Unity for fun. And in May 2017, I launched my career as an Associate Gameplay Engineer in Lucasfilm's immersive entertainment division, ILMxLAB. I have worked on the cute and adorable VR experience Droid Repair Bay, which was tied to Star Wars: The Last Jedi. My current project is the hyper-reality experience called Ralph Breaks VR, based on the Wreck-It-Ralph franchise.

STEVE HENRICKS, Lead Environment Artist

Passionate about games and entertainment all his life, Steve spent much of his childhood drawing his own characters and game levels, inspired by his favorite games like Zork, Pitfall, and Altered Beast. He enrolled in several pre-college art programs in Pittsburgh, Pennsylvania and eventually entered Carnegie Mellon's pre-college art program, gaining a formal introduction to computer graphics.

Steve earned Associates degrees in Architecture and CAD and began working for the Alleghany Power Company doing Civil Drafting and site design, but his passion for games and 3D never waned. Steve spent his free time exploring and learning 3D Visualization software and ultimately earned a Bachelor's degree Game Art and Design at the Art Institute of the Pittsburgh, while continuing to work full-time. His first job in the industry was as an Environment Artist at Ubisoft/Redstorm Entertainment in North Carolina. Steve was the first artist at Redstorm to earn Ubisoft's coveted "Expert" title. While at Redstorm, Steve worked on AAA games including: Ghost Recon: Future Soldier, Farcry 4 and The Division.

Steve's experience exploring new technologies, his pursuit of excellence in the gaming field, and his proven leadership skills earned him a position at ILMxLAB in 2017 where he is now Lead Environment Artist. During the past two years with the company, Steve has been fortunate enough to work on his favorite franchises, such as Star Wars: Secret of the Empire and the Vader Immortal episodic series, while playing a pivotal role in pioneering storytelling in AR and VR.

discussion and exercises

POST PRESENTATION DISCUSSION

1.Did you enjoy this presentation? What were your favorite moments? What was most interesting about Artificial Intelligence (AI), Augmented Reality (AR) and Virtual Reality (VR)?

2. What is AI? In what ways is AI already embedded in our world? Do you think AI has helped you? Why? What do you think the future of AI is? How would you like to see AI used? Why? Can you think of any ethical considerations in the use of AI?

3. What is AR? In what ways is AR already embedded in our world? Do you think AI has helped you? Why? What do you think the future of AR is? How would you like to see AR used? Why? Can you think of any ethical considerations in the use of AR?

4. What is VR? In what ways is VR already embedded in our world? Do you think VR has helped you? Why? What do you think the future of VR is? How would you like to see AI used? Why? Can you think of any ethical considerations in the use of VR?

5. Compare and Contrast AI, AR and VR. In which contexts is each tool best suited for use? Why? In which contexts might these tools be avoided? Why?

6. In some movies that use AI, AR and VR technology, everyone can come out with a different story. The journey differs for each person based on which direction they look, which wall they lean against, which button they push, which path they walk on etc. How will these additions to films change the experience of writing and making a film? How will this technology change the experience of seeing a film, reviewing a film or talking about a film with your friends? What is your prediction for the future of technology in film?

7. Are you interested in working on AI, AR and VR in films? Why? What skills and competencies will new filmmakers now need that are different from what they used to need? What do you think are some of the educational paths that lead to these careers?

8. Think of your favorite movies and books. AI, AR and VR can allow us to enter these stories and have immersive experiences. Which ones would you like to get a more immersive experience with? Why? Which ones might not make as good immersive experiences? Why?

9. What are some hardware needs for AI, AR and VR? What are the software needs for AI, AR and VR? Some immersive worlds require a lot of equipment to participate. What can be done to make these experiences accessible and affordable to as many people as possible? Will movie theaters offer this equipment or will people bring their own? If we share equipment is it healthy to do so?

10. People living with vision, hearing or mobility limitations may not be able to fully experience these immersive worlds. What responsibility does the industry bear to include these people? What is being done? What still needs to be done?

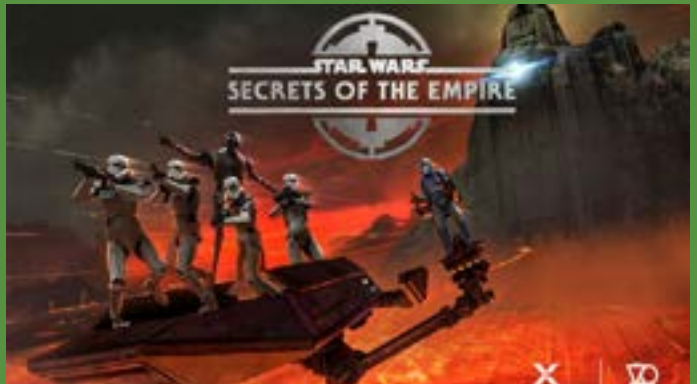
11. What are your top two takeaways from this presentation? Why?

12. Compare the skills and experiences of the presenters from their bios. What patterns do you see? What surprised you? What questions do you still have?

13. How did the presenters discuss the math involved in AI , AR and VR? Are you familiar with this math? What would you need to learn to prepare for work in this field?

14. Storyboarding is how storytellers plan each scene in a story or movie. How do you think AI, AR and VR has changed how people plan their storytelling?

15. What did you know about the STAR WARS series as a whole before seeing this presentation, and how does STAR WARS: Secrets of the Empire fit into the series?



project ideas

PROGRAMMING PROJECT

Learn to program Droids and create your own Star Wars game, in a galaxy far, far away. The challenges are on code.org. You can complete these puzzles with or without logging in to the site. If you login to an account, you can save your work and pick up where you left off at a later date. Code familiar Star Wars characters through familiar Star Wars scenes. May the Force Be With You.

Block based Hour of Code puzzle challenge

- Suitable for any grade level and any coding experience level due to being a block based coding puzzle.

Text based Hour of Code challenge

- Suitable for middle and high school level students with some coding experience due to being a text based Javascript coding puzzle.

{ CODE A STAR WARS ADVENTURE }

CREATE YOUR OWN ADVENTURE

Choose Your Own Adventure was a series of children's gamebooks where each story is written from a second-person point of view, with the reader assuming the role of the protagonist and making choices that determine the main character's actions and the plot's outcome. The Choose Your Own Adventure structure is easy to recreate using presentation software like Google Slides.

- Review this article by Eric Curts about how to plan, setup and execute a basic Choose Your Own Adventure story, with a video walk through, project samples and a starter template.
- Have students talk and brainstorm possible story ideas and branching scenarios. A branching scenario is a spot in the story where the protagonist must make a decision. Keep it simple your first time and only offer 2 decisions for each branching scenario.
- Students can use a graphic organizer to plan out their story including the branching scenarios they plan to use.
- Students begin creating their Google Slides slide deck. Have students use or create a template so the slides are consistent.
  - The slide that introduces the choice might have a place for an image, short text, and 2 buttons on the bottom, the 2 choices you can make.
  - Button 1 links to one new slide
  - Button 2 links to a different new slide.
  - When a user clicks on each button, they reveal a different part, or branch, of the story.
  - Each of these slides is different based on the choice made, so their content reflects the choice made.
  - These new slides should have a continue button to link back to the main story line or further branching scenarios.
- Once students finish the project, have a showcase day. Allow students to click through the story multiple times to experience the different branching possibilities.

project ideas

GOOGLE CS FIRST STORYTELLING MODULE

Google CS First is a free program that teaches students how to use CS to tell stories, make games, create a social network and much more, using instructional videos and the Scratch programming language. Instructional videos guide students through each activity, allowing teachers to work with learners individually. The instructional videos teach the basics of Scratch allowing the teacher to assume a coaching role.

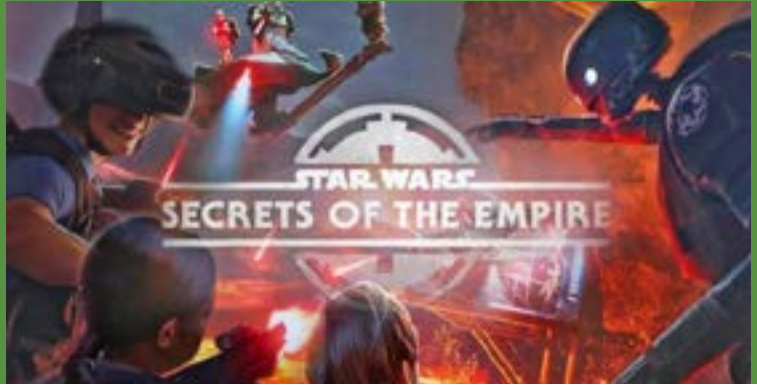
- The Storytelling module is an 8 activity learning sequence. In Storytelling, students use computer science to tell fun and interactive stories. Storytelling emphasizes creativity by encouraging learners to tell a unique story for each project.
- Storytelling covers major narrative writing elements like dialog, setting, premise and characterization. Beyond that, learners create interactive stories and personal narratives. The culminating project has learners build from Scratch, pun intended, their own Innovation Story, showcasing everything learned in the module.
- Sign up for a free Google CS First teacher account.
- Review the materials and roll out the Storytelling module.
- After the 8 projects are completed, have a showcase day. Allow learners to choose their best project from the module to share with the class.
- Consider allowing peers to give each other feedback. This could be on Scratch, in a learning management system (LMS) like Google Classroom or using web tools like Padlet.
- Consider using a feedback protocol to allow positive and critical feedback like 2 Stars and a Wish. 2 stars are the elements done well in the project and a wish is a chance to offer specific advice for improving the project.
- Your students loved it, what next? There are many CS First modules to choose from next. Try the Animation, Game Design or Art modules next. Your students are ready, are you?
- If you are ready for a deeper dive into computer science try some lessons from this 9 week computer science course used in SFUSD middle schools, based on the Scratch programming language.

TRY AUGMENTED REALITY (AR) OR VIRTUAL REALITY (VR)!

COSPACES EDU

Try out Augmented Reality (AR) or Virtual Reality (VR) using CoSpaces EDU. CoSpaces Edu is an intuitive educational technology tool enabling students and teachers to easily build their own 3D creations, animate them with code and explore them in Virtual or Augmented Reality. Pre-built experiences are available and classes can build their own. VR requires headsets, however AR only requires a touch screen, with or without a cardboard viewer.

- Try this Storytelling lesson in AR or VR
- Try this Car Building STEM lesson
- Try this 3D modeling of your dream place lesson
- Try this 3D Infographics lesson



VFX TERMS

CHARACTER ANIMATION: A specialized area of the animation process, which involves bringing animated characters to life. Character Animators must create the illusion of thoughtfulness, emotion and personality by developing every character's appearance, body language and facial expressions from scratch. While an actor generally provides the vocals in an animated film performance, the character animator provides all else.

COMPOSITING: The combining of visual elements from separate sources into single images, often to create the illusion that all those elements are parts of the same scene or space.

CREATURE ANIMATION: Not unlike character animation, creature animation is the process of bringing animated beasts, aliens and animals to life.

FACIAL ANIMATION: The detailed process of animating characters' facial features to convey particular appearances, emotions, reactions, etc.

GREEN SCREEN: A special effects film technique involving filming actors against a green screen on which effects such as computerized graphics can be added later and integrated into a single sequence.

MOTION CAPTURE: A process by which patterns of movement are captured via a series of sensory nodes applied to various body/face parts of a live actor; these nodes record data about the spatial configuration of these nodes over time; simulation software then processes these data and applies them to a virtual actor on a computer.

MOTION CONTROL: A process that generally utilizes robotic camera mounts, enabling identically configured and timed camera movement on every take. This process facilitates digital compositing on shots that involve camera movement, as it eliminates the many variables of human camera operation.

PHOTOGRAMMETRY: The age-old practice of determining the geometric properties of objects based on photographic images.

ROTOSCOPING: An animation technique in which live- action video is traced and "painted" to create 2-D animation that mimics the live-action

TELECINE: The process of transferring celluloid film footage into electronic formats.

VIRTUAL CINEMATOGRAPHY: The process of creating the illusion of camera movement by digitally compositing and sequencing background images that change position relative to live action footage.

VIRTUAL SET: A 3-D software module that collates and arranges a massive series of (background) images according to the spatial organization and geometry of a given scene setting such that live action green screen footage of actors can be dynamically combined with the virtual space.

lucasfilm overview

LUCASFILM
Founded by George Lucas in 1971, Lucasfilm is a privately held, fully integrated entertainment company. While best known for its association with the *STAR WARS* and Indiana Jones film franchises, Lucasfilm is actively involved in many facets of the entertainment industry, operating seven different divisions that lead in their respective fields. Lucasfilm is responsible for the production, promotion and strategic management of the company's various theatrical, television and entertainment companies. These include *STAR WARS,* the *INDIANA JONES* trilogy, *THE ADVENTURES OF YOUNG INDIANA JONES, THX1138, WILLOW, LABYRINTH* and more.

INDUSTRIAL LIGHT AND MAGIC
The Death Star trench run. Velociraptors versus T-Rex. *THE AVENGERS* defend New York. Industrial Light & Magic, founded in 1975 by George Lucas, has created some of the most memorable visual effects in film history. From its astounding innovations in the original *STAR WARS* trilogy to its groundbreaking CGI work in blockbusters like *JURASSIC PARK, STAR TREK,* and *THE AVENGERS, ILM* has changed and expanded the possibilities of what a film can be. ILM has won 15 Academy Awards® and 15 BAFTAs®, and has been nominated 29 and 17 times, respectively.

SKYWALKER SOUND
From Darth Vader's ominous breathing to the simple yet iconic voice of WALL-E, Skywalker Sound has moved audiences with inventive uses of audio for more than 35 years. Skywalker Sound specializes in sound design and audio postproduction on everything from motion pictures to video games. The celebrated facility has created the soundscapes and mixes for hundreds of movies, including the *STAR WARS* films, *IRON MAN,* the *JURASSIC PARK* series, a variety of independent works, and many animated features. Skywalker Sound has won 19 Academy Awards® and has received 45 nominations.

LUCASFILM ANIMATION
Formed in 2003 to produce *STAR WARS: THE CLONE WARS*, an Emmy®-winning series that ran for five broadcast seasons. Bringing an unprecedented production quality to television animation, the show broke new ground in facial expression, character movement, and detail, while maintaining the level of storytelling introduced by the live-action films. Lucasfilm has won two Emmy Awards®, and has received seven nominations, for *STAR WARS: THE CLONE WARS*. The studio is currently hard at work creating *STAR WARS REBELS*, which explores the rise of the Rebellion between *STAR WARS: EPISODE III* and *IV.*

LUCASFILM PRODUCTION
Lucasfilm shepherds projects through all evolutionary phases: creative development, physical production, and postproduction technological enhancements. In film and television, this process begins with script development and conceptualization; securing stages, actors, and completing live-action shoots follows, and the process ends with the use and creation of groundbreaking technologies to add breathtaking effects and immersive sound.

ILMXLAB
Founded in 2015, ILMxLAB is Lucasfilm's award-winning immersive entertainment division. ILMxLAB combines storytelling, design, technological innovation and world-class production to create interactive experiences that allow people to truly "Step Inside Our Stories". Using emerging technology platforms such as virtual reality and augmented / mixed reality, we build rich worlds, establish intimate connections with characters, and enable meaningful adventures whether that be in the home, theater, or public spaces.