

Neuroscientist takes scientific look at art of filmmaking

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Laughter (and other facial behavior) tends to produce involuntary mimicry in an audience. In a study, people listened to jokes either alone or in groups. The group audiences laughed more. Interestingly, they didn't rate the jokes as any funnier; perhaps they laughed more not because they thought the jokes were any funnier, but as a direct result of seeing or hearing their fellow audience members yukking it up. Credit: mexikids.

Why do so many of us cry at the movies? Why do we flinch when Rocky Balboa takes a punch, duck when the jet careens toward the tower in "Airplane," and tap our toes to the dance numbers in "Chicago" or "Moulin Rouge"?

How is it that a patch of light flickering on a wall can produce

experiences that not only engage our imaginations but that feel totally real? What's really happening in our brains as we immerse ourselves in the lives being acted out on screen?

These are the questions Washington University in St. Louis neuroscientist Jeffrey M. Zacks, PhD, explores in his new book, "Flicker: Your Brain on Movies" (Oxford University Press 2014), an entertaining and thought-provoking look at what science can tell us about the art of filmmaking.

"One of the striking things about understanding [movies](#) is that you come into the theater with the brain that you evolved over three-and-a-half billion years to understand the [real world](#) and, for the most part, your brain just treats what it's seeing on the screen as if it were real," said Zacks, professor of psychology in Arts & Sciences. "Our brains didn't evolve to watch movies. Movies evolved to take advantage of the brains we have."

Zacks, who teaches courses on "The Cognitive Neuroscience of Film" and "Advanced Cognitive Psychology," has spent more than a decade exploring what happens in the brain as we observe the world around us.

A self-described film fan, he began using short films years ago as part of his own laboratory research on how the [human brain](#) segments its observance of daily activities into small, meaningful chunks that are easier for the mind to process and store as memories.

"The more I learned about filmmaking, the more I realized that people who make movies have really figured out over time how to get inside the minds of their audiences," Zacks said. "People who can make good movies turn out to be fantastic intuitive psychologists and neuroscientists."

"Flicker," one of the first books on filmmaking by a brain scientist, uses scenes from popular movies as case studies in what the latest neuroscience research can tell us about how we experience moving images. Based on extensive interviews with filmmakers and scientists, the book explores how filmmakers have learned to take advantage of the tricks our minds are already playing on us in real life.

Zacks describes his research into the science of film as a two-way street, suggesting that top-notch filmmakers have a deep understanding about perceptual psychology that he as a brain scientist needed to know.

"For every thing that I as a psychologist or neuroscientist can tell filmmakers about what's going on in their movies, they can tell me three things about what's going on in the brains of my research subjects," Zacks said. "If you start listening to filmmakers talk about what they're doing or reading editing manuals, you quickly realize that there's a hundred years of lore that's captured in current filmmaking practice about perception and memory and emotion."

A viewing experience eons in the making

Much of film's power to immerse us in the action on screen, he explains, is based on basic human traits that have evolved over eons of social interaction and shared experience, including what he describes as the "mirror rule" and the "success rule."

The mirror rule describes the powerful—yet often subconscious—compulsion to do the same thing that those around us are doing. It explains why our body language tends to mirror those around us, why we're prone to laugh or cry, to smile or grimace as we watch someone else do the same, regardless of whether these actions are occurring in real life or on a movie screen.

The success rule tells us to "do what has worked" in the past. In real life, we've learned to duck when flying objects approach us, to prepare to fight or flee when faced with danger, and we bring these same habits with us when we experience a film. It's the success rule, Zacks said, that explains why moviegoers might find themselves ducking a bit in their seats when the Jabberwock's head falls in Tim Burton's film version of "Alice in Wonderland."

"You've got to do something a little extra to override those natural responses, and keep from responding in a way that would be appropriate if you're outside a theater, but is inappropriate when you're watching something that can't reach out and touch you," Zacks said.

In "Flicker," Zacks explores how movie-making commandeers these and other human traits to make the film viewing experience so emotional, why it has such a surprising power to make us laugh or cry and how our brains struggle to draw the line between what is real and what we experience as real on the silver screen.

The future of entertainment

Zacks concludes with a chapter on where the movie-making industry is likely headed in the next 20 years. Will our entertainment be jacked directly into our brains? Will video games and movies fuse? How will the architecture of the brain shape the future of entertainment?

As researchers learn more about the [brain](#) science behind filmmaking, a key question is whether the neuroscience of film perception can help us make super movies that are better than anything that has come before.

"We're learning more and more about what makes a film gripping, what makes it engaging," Zacks said. "There are a bunch of things that films can do that take the natural parameters that we experience in our

everyday life and crank them up to 11, and that has the opportunity to make films that are more powerful, more engaging, more responsive than what we've seen before.



Whenever a character on the screen is grinning, people will tend to smile. If a character is angry, viewers' brows will knit. If someone starts crying, mouths will turn down and you may even see tears. What is particularly striking is that this seems to work even when you don't particularly like or identify with the character. Credit: Giuliamar. Public domain via Pixabay.

"I'm not sure that's a good thing or not all the time, but it's about understanding what making those technical choices does to the psychological and neurophysiological experience of the viewer," he said.

Yet Zacks does not see science replacing aesthetics. "(Science) can't tell us if it's good or bad," he said. "It might be able to tell us something about what's going to be popular or not. The most important thing that we can do as psychologists and neurophysiologists for filmmakers is to tell them, 'If you make this choice, here's what's going to happen.' Then as a filmmaker, you still have to decide, 'Is this what I want to happen, is that aesthetically pleasing, is that satisfying or not?'"

"And, of course, it's the people who buy the tickets who decide if it's commercially successful."

Provided by Washington University in St. Louis

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