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Our brains recreate the emotions of actors such as Geraldine James when we watch them perform.

NEUROSCIENCE

Powerful acts

Giovanni Frazzetto explores how theatre exerts its psychological effects on the emotions.

From rage and grief to exquisite tendresse, emotion is laid bare in theatre. Few art forms electrify or illuminate as powerfully as stage acting. But how have theatrical greats such as John Gielgud or Vanessa Redgrave cast their spell? Acting may be one of the most ancient arts, but science is only just beginning to get to grips with it.

Science started to seep into theatre in the late nineteenth and early twentieth centuries, with the Russian actor and theatre director Constantin Stanislavski. Founder of the influential Moscow Art Theatre, Stanislavski turned to physiologist Ivan Pavlov's research on conditioned reflexes to improve his acting method. The aim was to create performance that united psychological experience and physical action.

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Stanislavski sought a way to consciously trigger an actor's emotional expression. Science had begun to discover that neural pathways underlie complex behaviour and emotions, which can be conditioned in response to a changing environment. By practising key physical actions pertinent to the character and the play, Stanislavski realized, the actor could learn, by reflex, how to express the psychological experience of the emotion — with help from the imagination. A particular posture or movement would trigger a particular emotion. So by working hard on small actions such as clenching the fists and tensing the neck muscles, the actor could trigger anger, or they could awaken feelings of despair by shuffling, drooping and bowing the shoulders.

But, as we now know, the psychology of performance is more complex than this. To deliver a believable performance, actors need to remember not just emotions, body postures and expressions, but also their cues and lines. And, more importantly, they must seek ways of engaging with their audience to evoke empathy — the recognition or sharing of emotional states.

German philosopher Theodor Lipps was the first to use the term empathy (*Einfühlung*, literally 'feeling into') in the early twentieth century as a way of describing the relationship between artwork and observer in the psychology of aesthetic experience. In the 1990s, Italian neurophysiologists Giacomo Rizzolatti, Vittorio Gallese and their colleagues at the University of Parma in Italy offered a neurological framework for studying empathy through their discovery of mirror neurons — cells that fire both when we perform an action, and when we observe someone else performing it. They showed that our visual-motor system is activated as if we were executing an action that we are simply watching: the brain simulates that action.

These discoveries have resonated widely among theatrical professionals. They extend to intentionality (thinking of a way of doing some action), imitation (the replication of an action) and action understanding (grasping the import of an action) — all central to acting technique.

The actor must also demand something else of the audience: a suspension of disbelief. The phrase was coined in 1817 by English poet and philosopher Samuel Taylor Coleridge to describe how weaving enough facts into a fantastical narrative will help readers to accept the story, rather than judge it as implausible. Film-makers suspend disbelief by exploiting the power of moving images in a darkened room, which lures an audience into their simulacrum of reality. In theatre, suspension of disbelief hinges on the switch between two realities — the set and the cast of actors, and the places and characters they represent. In the prologue to *Henry V*, Shakespeare asks the audience to transform the bare stage by seeing it as the world of the king at war with France: "Piece out our imperfections with your thoughts … and make imaginary puissance."

"Acting is predicated on technique and craft, but remains visceral and intuitive."

Twentieth-century German playwright Bertolt Brecht deliberately turned this tactic on its head in his 'epic theatre' system. By using techniques such as having the actors suddenly sing out of character, he ensured that his audiences became

emotionally detached from the characters. The audience members then became aware that they were witnessing fiction and were able to critically question the social realities represented in the play.

The cognitive processes underlying the suspension of disbelief have been the subject of several scientific studies. In 2010, Marie-Noëlle Metz-Lutz of the University of Strasbourg, France, and her colleagues used functional magnetic resonance imaging (fMRI) to scan the brains of people watching a play to pinpoint when they were transported into another reality. This was defined as when the subject's brain response tallied with a passage in the script intended to elicit such a response. The brain regions that fired at those moments included two areas involved in processing language and, specifically, in understanding metaphor, denoting the power of language to capture a spectator's attention. Both regions are also involved in processes of social and aesthetic judgements, probably governing appreciation of the writing style, plot or characterization.

The French team also found that the subjects' heart rates slowed during transportation, and that brain activity fell in areas involved in building consciousness about the self and the external world. Without activity in these regions, an observer will take the fictionalized reality of the play at face value, despite the sensory perception of the stage, set and actors. Such results point to complete absorption in a play as a sort of hypnotic state involving the temporary loss of self-reference, and a disconnection from immediate sensory information — a distinct feeling of being 'carried away'.

In theory, such scanning experiments might help playwrights to identify specific language and theatrical devices that trigger audiences to become as absorbed as possible, and so enrich acting as an art and theatre as a vehicle of meaning and 'enchantment'. With a nod to Stanislavski, playwrights could focus on what movements or expressions are the most poignant, and which are most effective at conveying grief, compassion or joy. Such studies could also reveal which metaphors express an action or thought with the most brevity and wit, and what elements of plot device or vocal emphasis can make a difference in the brain.

Yet fMRI images and statistics will never replace the unpredictability and revelatory power of what is born in the rehearsal room. Acting is predicated on technique and craft, but remains visceral and intuitive. ■

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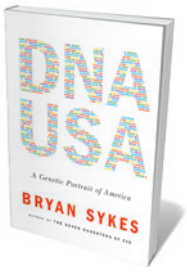
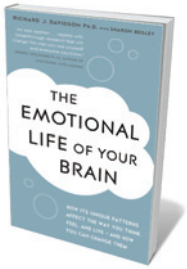
Books in brief

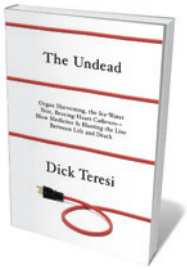


DNA USA: A Genetic Portrait of America
Bryan Sykes W. W. Norton *320 pp. £19.99 (2012)*
The US human population is a bouillabaisse of DNA. Geneticist Bryan Sykes took on the challenge of identifying its ingredients on an epic cross-country trip. He recounts the detective work — including interviews with genealogists and fellow geneticists — and methodology behind the findings. How did European genes appear in the DNA of Native Americans some 10,000 years ago, for instance? And why does the southwestern Hispanic population contain genes typically found in Jewish people? Ultimately, Sykes suggests, the country is an even richer human mix than we thought.

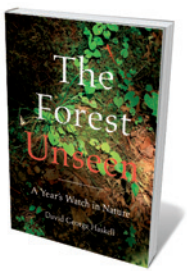


The Emotional Life of Your Brain: How Its Unique Patterns Affect the Way You Think, Feel, and Live — And How You Can Change Them
Richard J. Davidson and Sharon Begley Hudson Street Press
279 pp. $25.95 (2012)
Why do some people plod stoically through crises while others collapse? Science writer Sharon Begley and neuropsychologist Richard Davidson argue that each of us has an 'emotional style': a pattern of responses to life's events that is allied to underlying brain systems. Looking at dimensions from social intuition to context sensitivity, the authors suggest that we can achieve better equilibrium by rewiring our emotional style through research-inspired exercises.

Game Changer: Animal Rights and the Fate of Africa's Wildlife
Glen Martin University of California Press *243 pp. £20.95 (2012)*
Africa's wild megafauna are caught in the crossfire between animal-welfare campaigners and conservationists, argues environmental reporter Glen Martin. In this pacy, unsentimental account, Martin interviews seasoned conservation biologists, zoologists and game wardens, focusing on practice in Kenya, Namibia and Tanzania. He concludes that holistic strategies incorporating habitat conservation, controlled hunting and respect for local people's needs are workable — and points out that measures such as ecotourism and protection for iconic species have backfired dramatically.



The Undead: Organ Harvesting, the Ice-Water Test, Beating Heart Cadavers — How Medicine Is Blurring the Line Between Life and Death
Dick Teresi Pantheon *368 pp. $26.95 (2012)*
The moment of death, suggests science writer Dick Teresi, is harder to pin down than ever. He introduces us to those who work at this borderline: cell biologists, specialist doctors, undertakers and people who have recovered from comas. Charting historical definitions of death, the thinking of research greats and debates over near-death experiences, Teresi notes that the ethical challenges are immense, asking, for instance, whether all organ donors are unrevivable.



The Forest Unseen: A Year's Watch in Nature
David George Haskell Viking *288 pp. $25.95 (2012)*
Training a biologist's eye on ecology, geology and climate, David Haskell visited a square metre of old-growth forest in southeastern Tennessee nearly every day for a year. His observations — of lichens, snowflakes, salamanders and more — are deftly interwoven with the science. His account is fascinating, whether he's stripping off in January to experience the physiological effects of severe cold, describing the symphonic sounds of trees in a high wind, or wondering at the bacteriocidal properties of a vulture's digestive tract.