

this change in their bonds to a reaction. Eduard jokes that Otilie will form a 'compound' with Charlotte, but himself comes to see an affinity with her. Charlotte and the Captain are drawn to each other. When Eduard and Charlotte make love, their minds are occupied with thoughts of these others. It ends tragically. Charlotte gives birth to a son (another Otto), whom Otilie accidentally drowns; Otilie starves to death, followed by Eduard.

Beyond its reading as a human analogue of chemical reactions, the novel is infused with aspects of Goethe's science expressed in his quixotic *Theory of Colour*, published the following year. Goethe believed that Newton's experiments with prisms were flawed. He contended that white light was the fundamental phenomenon, and that colours were produced by interactions between light and darkness, perceivable by the naked eye — incorrect, but an accurate record of how we perceive colour. However, it is Goethe's argument that Newton valued representation of phenomena in symbols over the phenomena themselves that has resonance in *Elective Affinities*.

Goethe's novel can be seen as an attempt to show the consequences of the urge to abstraction. The narcissistic Eduard interprets isolated phenomena, such as headaches on the right side of his head and the left of Otilie's, as symbols of affinity, and hypothesizes from that. Goethe believed that scientists should critically observe a broad spectrum of phenomena before theorizing. Eduard, driver of the tragic plot, is Goethe's personification of the flaws that he found in the science of his day.

Although *Elective Affinities* scandalized nineteenth-century readers, its theme and penetration sparked a cult following among writers. George Eliot — whose unmarried relationship with Goethe scholar George Henry Lewes was itself a scandal — admired the novel, and it may have influenced her harrowing *The Mill on the Floss* (1860). Characters and plots in Ford Madox Ford's *The Good Soldier* (1915) echo it, and protagonists of John Banville's *The Newton Letter* (1982) are named Edward, Charlotte and Otilie.

Goethe called for a "gentle empiricism", believing that advanced human development (*Bildung*) was essential to the perception of nature's wondrous realities. *Elective Affinities*, by questioning the fruits of reductionism, challenges us to recall that no observer can ever be impartial. ■

**Matthew Bell** is professor of German and comparative literature at King's College London. His books include *Melancholia: The Western Malady*. He has edited a forthcoming translation of Goethe's works. e-mail: matthew.bell@kcl.ac.uk



Calvin Bridges experimented on fruit flies to make fundamental discoveries in genetics.

#### GENETICS

## Genius on the fly

Ewen Callaway reviews a biopic of Calvin Bridges, the wild-living, wild-haired genetics pioneer.

Calvin Bridges is best known for three things: his pioneering work on genetics in the early twentieth century, his womanizing and his gravity-defying mop of hair. *The Fly Room*, a biopic told through the eyes of his daughter Betsey, also shows the scientist as a sometimes dedicated, often distracted father who struggled to balance intellectual curiosity with family obligations.

*The Fly Room* came from a chance encounter between geneticist-turned-filmmaker Alexis Gambis and Betsey, now in her nineties. It is bookended by interviews with her, but focuses on a period in the 1920s, when ten-year-old Betsey visited her father's workplace: the famed Fly Room at Columbia University in New York City. The film was partly crowdfunded through Kickstarter. Researchers including neuroscientists Joseph LeDoux and Stuart Firestein have supporting roles.

Bridges, portrayed by a wild-haired Haskell King, was a star disciple of evolutionary biologist Thomas Hunt Morgan (played by Firestein). Under Morgan's leadership, Bridges and a cadre of Young Turks characterized mutant fruit flies — most famously, white-eyed varieties — to map the locations of genes and to understand how they are transmitted. Bridges' work established that trait-determining genes are carried by chromosomes that parents pass to their offspring. He also worked out how chromosomes — X and Y — determine the sex of fruit flies.

"It was not unusual for six of us to carry on in this small room," Morgan remembered in an obituary of Bridges, who died in 1938 from

#### The Fly Room

WRITER/DIRECTOR:  
ALEXIS GAMBIS  
*Imaginal Disc*: 2014.

syphilis. To feed the flies, near-rotting bananas were a constant presence.

Those bananas dangle from the ceiling in the film's fictionalized Fly Room, where Bridges and other prominent figures in genetics sort dead flies and trade rude witticisms. Betsey crashes this world after her mother, Gertrude, sends her to spend time with her father. None of the scientists knows what to make of the curious girl, who carries her box camera everywhere. Bridges is annoyed to have his sanctum disturbed. But he warms to Betsey and puts her to use in the Fly Room, counting and characterizing flies. He becomes so comfortable having his daughter around that he neglects to hide his after-hours philandering.

Much of the film unfolds in the Fly Room. The set designers have paid close attention to detail: for example, the microscopes are the binocular version that Bridges invented.

Bridges left his family; Morgan moved his lab to the California Institute of Technology and Bridges joined him. *The Fly Room* makes no attempt to provide an authoritative history, leaving many details to the epilogue. In an interview, 95-year-old Betsey says that she never wanted to be like her dad. An apt sentiment about a father who was flawed — but who laid the groundwork for the modern science of heredity. ■

Ewen Callaway writes for *Nature* from London.