

The Theory of Everything: Stephen Hawking film is gripping despite a black hole or two

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Last week, I went to see *The Theory of Everything*, James Marsh's award-winning [film](#) on the life of [Stephen Hawking](#). I enjoyed the film immensely. It can't be easy to make a [gripping movie](#) about a [theoretical physicist](#) – there are no opportunities for cinematic shots of athletic achievement or musical virtuosity – but the film tells a compelling story from the first moment to the last.

Of course, Hawking is no ordinary scientist. Diagnosed with motor neuron disease in his 20s and given two years to live, he defied the disease to become a world leader in [cosmology](#), the branch of physics concerned with the origin and evolution of the universe. The story of a brilliant mind trapped in a crippled body has universal appeal, and the wheelchair-bound figure articulating profound ideas about the nature of the universe through a voice synthesiser has become a modern icon of science.

The film wisely concentrates on Hawking's golden years in Cambridge. His arrival from Oxford as an impish postgraduate student, his emergence as a researcher of note and his growing attraction to Jane Wilde are all deftly conveyed by Eddie Redmayne and Felicity Jones in the lead roles against the stunning scenery of Cambridge colleges.

The diagnosis of Hawking's terrible disease and its initial effect on him is described in a sensitive but undramatic way, and is all the more moving for it. Later in the film, the impact of Hawking's condition on his marriage is deftly depicted without sentimentality.

Regarding Hawking's science, a good balance is struck between [accuracy and accessibility](#). His early work on the concept of a universe that begins in a singularity is described via a fictitious re-enactment of his PhD viva, a clever ploy that allows for a simple explanation while paying due tribute to the work of Roger Penrose.

In another astute piece of drama, Jane Hawking succinctly describes the concept of a "theory of everything" to a family friend. Holding up a large piece of fruit and a peanut, Jane explains that general relativity successfully describes the world of the very large, while quantum physics describes the world of the very small, but the two theories are incompatible. To describe a universe that was once very small, a new theory is required to describe both worlds: a theory of everything.

Eureka moment

In real life, Hawking's great insight was that the study of black holes could shed light on this problem. Applying quantum theory to the relativistic theory of black holes, he was led to the conclusion that black holes are not truly black, but radiate energy.

This is presented as a eureka moment in Marsh's film, followed by a marvellous scene in which Hawking outlines the idea to a hostile audience at a physics seminar. However, in reality the concept of black hole radiation followed from ideas developed by physicists such as Jacob Bekenstein, Yakov Zeldovich and Alexei Starobinsky.

The black hole scene illustrates a common problem with media depictions of scientists. Scientific breakthroughs are invariably portrayed as the product of a brilliant mind working alone, whereas in reality scientists borrow heavily from one another, building on previous ideas.

More generally, I was disappointed that Hawking's contemporaries at Cambridge were shown but not named; Hawking's PhD supervisor Denis Sciama (ably played by David Thewlis) was an outstanding cosmologist, and several other of his research students went on to become leaders in the field.

All in all, it is a most enjoyable film and a must-see for anyone with an interest in science or intellectual triumph over physical adversity. Possibly the most poignant note occurs when the protagonist states that he is lucky to be in a profession where mind is all.

Another thought-provoking moment is the depiction of the financial problems faced by Hawking before he becomes famous; this brings to mind the systemic lack of funding for fundamental (rather than applied) science in Ireland and the UK.

It is an extraordinary fact that the general public seems to appreciate the importance of basic science in a way that government agencies do not.

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