

'Tangled' physics

November 24 2010, By Chris Gorski

Disney's new movie, "Tangled," features the familiar fairy tale character of Rapunzel. The new film promises many twists on the beloved tale, but her long locks will remain prominently featured.

In the Brothers Grimm story of Rapunzel, a witch holds a beautiful young woman captive in a tower. Rapunzel is blessed with a lovely singing voice and long, long blond hair.

One day, her voice enchants a prince passing through a nearby forest. They fall in love, and Rapunzel lets down her hair so that the prince may use it to climb the tower to meet her. This chain of events may lead curious readers to ask a question. Can human hair support the weight of another person?

On average, one strand of hair can support just under 100 grams, or about the weight of two candy bars. Strands of darker hair are generally thicker, and therefore stronger, than blond hair. But alas, Rapunzel must make do with blond locks. Given that blondes generally have about 140,000 hairs on their heads, Rapunzel's hair should easily support the weight of many climbing princes.

However, there is more to this story.

If Rapunzel simply let down her hair and the prince started climbing immediately, her hair would not break, but it might rip out. Also, the rest of her body might not be able to support the weight. Thankfully, there

are strategies that she can use to help reduce the strain on her head and body.

Nathan Harshman, a physicist at American University in Washington, suggested Rapunzel would be safer and more secure if she tied her hair around something before lowering it.

"The whole idea is that you can use the [friction](#) of the [hair](#) against itself in the knot, and whatever it is tied around will support the [weight](#) of the prince," Harshman said. That seems to be a much better idea than making Rapunzel's scalp the anchor point.

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