Spiderman's webbing would be strong enough to stop a moving train, say physics students

February 25 2013

Credit: NDTV

(Phys.org)—In Spiderman 2, the superhero uses his webbing to bring a runaway train to a standstill moments before it plummets over the end of the track. But could a material with the strength and toughness of spiders' web really stop four crowded subway cars?

According to University of Leicester physics students, the answer is yes.

A group of three fourth year MPhys students calculated the material properties of webbing needed in these conditions - and found that the strength of the web would be proportional to that of real spiders.

Their paper, *Doing whatever a spider can*, was published in the latest volume of the University of Leicester's *Journal of Physics Special Topics*.

The journal is published every year, and features original short papers written by students in the final year of their four-year Master of Physics degree.

The students are encouraged to be imaginative with their topics, and the aim is for them to learn about aspects of publishing and peer review.

Students James Forster, Mark Bryan and Alex Stone first calculated the force needed to stop the four R160 New York City subway cars.

To do this, they used the momentum of the train at full speed, the time it takes the train to come to rest after the webs are attached, and the driving force of the powered R160 subway car.

The students found the force Spiderman's webs exert on the train to be 300,000 newtons.

They were then able to calculate the strength and toughness of the webs.

They found that the Young's modulus – or stiffness – of the web would be 3.12 gigapascals. This is very reasonable for spider's silk, which ranges from 1.5 gigapascals to 12 gigapascals in the orb-weaver spiders.

The toughness of the silk was calculated as almost 500 megajoules per

cubic metre. This is in line with web from a Darwin's Bark Spider - an orb-weaver with the strongest known webbing of any spider.

They conclude that the "friendly neighbourhood" superhero's webbing is indeed a proportional equivalent of that of a real spider – and, consequently, it would be feasible for him to stop a moving train.

Alex Stone, 21, from Kingston upon Thames, said: "It is often quoted that spider-webs are stronger than steel, so we thought it would be interesting to see whether this held true for Spiderman's scaled up version. Considering the subject matter we were surprised to find out that the webbing was portrayed accurately."

James Forster, 22, from Wisbech, said: "While our work may not seem to be very serious it has helped teach us about applying physics to varying situations as well as the peer review process through which scientific journals operate. This makes it an invaluable experience to anyone who wants to go into research later in life."

Course leader Dr Mervyn Roy, a lecturer at the University's Department of Physics and Astronomy, said: "A lot of the papers published in the Journal are on subjects that are amusing, topical, or a bit off-the-wall. Our fourth years are nothing if not creative!

"But, to be a research physicist - in industry or academia - you need to show some imagination, to think outside the box, and this is certainly something that the module allows our students to practice.

"Most of our masters students hope to go on to careers in research where a lot of their time will be taken up with scientific publishing - writing and submitting papers, and writing and responding to referee reports.

"This is another area where the module really helps. Because Physics

Special Topics is run exactly like a professional journal, the students get the chance to develop all the skills they will need when dealing with high profile journals like Nature or Science later on in life."

More information: You can read the full paper here: physics.le.ac.uk/journals/inde … article/view/548/354

Provided by University of Leicester