World's slowest-moving drop caught on camera at last

Once-forgotten 'tar pitch' experiment yields results after seven decades.

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How long would you be willing to wait for a drop of the black stuff in Dublin? After 69 years, one of the longest-running laboratory investigations in the world has finally captured the fall of a drop of tar pitch on camera for the first time. A similar, better-known and older experiment in Australia missed filming its latest drop in 2000 because the camera was offline at the time.

The Dublin pitch-drop experiment was set up in 1944 at Trinity College Dublin to demonstrate the high viscosity or low fluidity of pitch — also known as bitumen or asphalt — a material that appears to be solid at room temperature, but is in fact flowing, albeit extremely slowly.

It is a younger and less well-known sibling of an experiment that has been running since 1927 at the University of Queensland in Brisbane, which *Guinness World Records* lists as the world's longest-running laboratory experiment (see: Long-term research: Slow science). Physicist Thomas Parnell set it up because he wanted to illustrate that everyday materials can exhibit surprising properties. In the past 86 years that experiment has yielded eight drops, with the ninth drop now almost fully formed and about to fall.

Long wait

John Mainstone has been custodian of the Queensland experiment since 1961, and has yet to see or capture the fall of a drop — unsurprising given that it takes 7 to 13 years for a drop to form, but only a tenth of a second for it to fall.

Pitch-drop experiments involve heating a sample of pitch and pouring it into a sealed glass funnel. The pitch is given time — three years in Parnell's experiment — to settle and consolidate before the sealed stem of the funnel is cut.

The origins of the Dublin experiment are now lost to history. It may have been part of a push by the physicist and Nobel prizewinner Ernest Walton, a professor at Trinity College Dublin, to promote science demonstrations for educational purposes. Over the years, the identity of the scientist who began the experiment was forgotten, and the experiment lay unattended on a shelf where it continued to shed drops uninterrupted while gathering layers of dust.

Watching it fall

Physicists at Trinity College recently began to monitor the experiment again. Last April they set up a webcam so that anyone could watch and try to be the first person ever to witness the drop fall live.

At around 5 o'clock in the afternoon on 11 July, physicist Shane Bergin and colleagues captured footage of one of the most eagerly anticipated and exhilarating drips in science. “We were all so excited,” Bergin says. “It’s been such a great talking point, with colleagues eager to investigate the mechanics of the break, and the viscosity of the pitch”.

The Trinity College team has estimated the viscosity of the pitch by monitoring the evolution of this one drop, and puts it in the region of 2 million times more viscous than honey, or 20 billion times the viscosity of water. The speed of formation of the drop can depend on the exact composition of the pitch, and environmental conditions such as temperature and vibration.

Asked about the value of this demonstration, Bergin’s colleague Denis Weaire says, “Curiosity is at the heart of good science, and the pitch drop fuels that curiosity”.

Scientists used to believe glass to be a slow-moving liquid as well — in part because old church window panes are thicker at the bottom — but it is now considered a solid[1].

And the next one

Mainstone, who has spent most of his life waiting to see a drop fall with his own eyes, congratulated the Trinity College team. “I have been examining the video over and over again,” he says, ”and there were a number of things about it that were really quite tantalizing for a very long time pitch-drop observer like myself.”

The University of Queensland pitch-drop experiment can be viewed live via a webcam and has a broad following across the globe. The next Queensland drop is predicted to fall some time in 2013.

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References

1. Zhao, J., Simon, S. L. & McKenna, G. B. *Nature Communications* http://dx.doi.org/10.1038/ncomms2809 (2013).