EDITORIAL

Check for updates

Did you check for ravens?

To celebrate the Ig Nobel prizes traditionally awarded in September — honouring research that "first makes people laugh and then think" — we collected some examples of unusual noise sources in physics experiments.

It's 1995 and you want to know if your train out of Geneva is running on time. Have you asked CERN? In June that year, CERN researchers realized there were small, unexplained fluctuations in the bending magnetic field at the Large Electron–Positron (LEP) collider. These fluctuations were attributable to small currents flowing in the LEP beam pipe, but the origin of the currents themselves was a mystery.

It was an electrician from the Swiss electricity company who came up with the explanation. What he knew — but perhaps the physicists had not been taught in graduate school — is that some of the current from electrified railway lines, such as those passing by LEP, leaks from the rails to the ground. Once in the ground, the current flowed through the beam pipe. This explanation also explained the dramatic reduction in magnetic field fluctuations during a French railway strike. In collaboration with the Swiss railway company, researchers were able to measure time series of the potential difference between rails and the ground on a line running out of Geneva, and the fluctuations correlated beautifully with the magnetic field fluctuations at LEP, making LEP "the most accurate check on punctuality of trains running in and out of Geneva"[1].

This incident is by no means the only time scientific infrastructure has had an accidental second purpose. Maybe you are interested in the particularities of how ravens behave. In which case, you should talk to scientists at the Advanced Laser Interferometer Gravitational-Wave Observatory (LIGO). In 2017, they noticed new transient noise events (glitches) in the gravitational wave channel at the Hanford interferometer. Interestingly, these glitches didn't look like any of their known noise sources.

Microphone recordings from outdoors around the facility suggested the glitches were happening at the Y-end of the interferometer — where there were exposed liquid-nitrogen pipes, covered in frost. The layer of ice showed tell-tale peck marks, which immediately cast suspicion on the ravens that had been seen in the area. Tapping the pipes led to glitches like the ones previously observed, but all doubt was removed when a raven was observed chipping ice from the pipe, presumably to quench its thirst[2]. (Unfortunately for the ravens, but fortunately for gravitational-wave astrophysics, the pipes have since been insulated to prevent ice build-up.)

But perhaps what you really want to know is whether your colleague has finished microwaving their lunch. The Parkes Radio Observatory in Australia can help. In 2007, researchers identified the first known fast radio burst (FRB) from archival data from Parkes, but doubt was cast on that finding by the existence of other transient signals, known as perytons, that shared some of the characteristics of FRBs but were unmistakably terrestrial in origin.

For years, perytons were an annoying mystery, but their secrets were revealed in 2015. A radio-frequency interference monitor had recently been installed on-site, and this showed the perytons were associated with radio emissions at 2.5 GHz, which is the frequency that microwave ovens emit at. But this circumstantial evidence needed to be backed up by something more direct. The researchers tried running the microwave in the staff kitchen to deliberately generate perytons, but without success — until someone stopped the microwave by opening the door rather than letting the timer run out[3].

Although these examples have not (yet) been awarded an Ig Nobel, they clearly fit the criterion for nomination. They make you laugh then you take a moment to think and appreciate the extraordinary levels of sensitivity these instruments operate at and how these experiments run not in an ideal lab but in the real world, where their operators have to tackle very unexpected problems.

1. LEP data confirm train time tables. Les données du LEP confirment l'horaire des trains. *CERN Bulletin* **48**, 1–2 (1995).
2. Nuttall, L. K. Characterizing transient noise in the LIGO detectors. *Phil. Trans. R. Soc. A.* **376**, 20170286 (2018).
3. Petroff, E. et al. Identifying the source of perytons at the Parkes radio telescope. *Mon. Not. R. Astron. Soc.* **451**, 3933–3940 (2015).