not been 'seen', although there is no obvious reason why they should be visible with current techniques. In an accompanying letter[7], Sheetz and colleagues report that their Con A labelled particles "on" fish keratocytes sometimes move long distances forward at great speed. Could it be that they have discovered just those *intracellular* vesicles they claim do not exist?

In the light of all this, the accompanying and enthusiastic obituary of the "lipid-flow model" in *New and Views*[8] seems premature.

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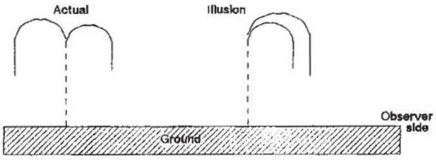
# Pyrotechnic illusion

SIR—While watching a recent display of fireworks, I observed a robust illusion of motion. Clearly, when a flare shot into the sky bursts, and its payload of self-luminescent fragments scatters, there must be a uniform distribution of horizontal directions of fragment trajectories, with respect to the vertical axis formed by the initial shot. However, all fragments appear to come towards the observer, or at least into the hemisphere formed around the observer and centred on the flare's explosion point. Even when one is consciously aware of the illusion, it seems impossible to decide which fragments are




really going away. Apparently trajectories going away are so similar to trajectories coming towards the observer that the brain interprets all motion parsimoniously as movement towards the observer. It is important that the background is black, with respect to the bright, moving fragments; fireworks seen against clouds or against textured stadium backgrounds can be analysed for towards/away fragment motion. Even when viewed through the limited field of binoculars, the initial burst of fragments retains the illusion of motion only towards the observer.

Of course, after a second or so all horizontal motion of the fragments ceases and only earthward motion is seen. However, there are special fireworks with fragments which change direction after the initial burst, and some of these fragments can be seen going momentarily away from the observer. Pyrotechnics seen on television show the same illusion, but less dramatically than those seen in person.

I have found no mention of this phenomenon in books. Colleagues have suggested various explanations, my favourite being the notion that the initial burst is rapidly enlarging and and an enlarging object is interpreted as coming towards the observer (S. Ullman, personal communication). I wonder if other readers of *Nature* can offer more insights.

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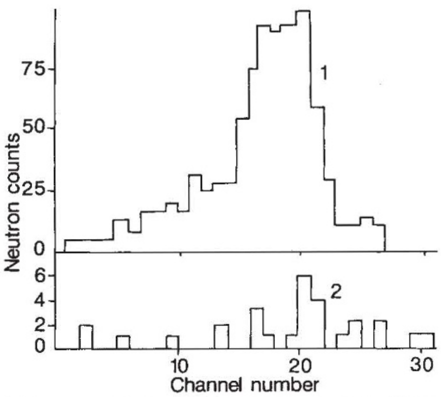
# Titanium fracture yields neutrons?

SIR—In recent experiments[1,2], we showed that violent mechanical action on heavy ice and lithium deuteride lead to neutron emission at levels substantially above the background, indicating the occurrence of d–d nuclear reactions. Because of current interest in the possibility of d–d reactions as a result of saturating titanium and palladium with deuterium[3,4], we felt that a test of mechanical agitation of titanium in the presence of deuterium was warranted.

Titanium chips of technical purity were tested in conjunction with heavy water, deuterated polypropilenium (PP) and lithium deuteride. Ti chips were put in a vibromill, operated at 50 Hz and with an amplitude of 5 mm (the power applied was $\sim$ 10 $Wg^{-1}$). Two-thirds of the volume of the vibromill drum was filled with steel




Histogram of neutron counts *versus* analyser channel for a calibrated neutron source (curve 1) and for Ti chips agitated with 10% $D_2O$ and 4% $PP(D_6)$ (curve 2).

balls 6 mm in diameter[5,6], the remaining one-third comprising Ti chips and deuterated material. In control experiments, finely crushed Ti chips were used separately, as well as $D_2O$ and $PP(D_6)$.

Our neutron detector was a block of seven proportional counters, immersed in a tank of oil and covered with cadmium sheet, placed 15 cm from the vibromill drum. Detector counts were brought out to an AI-256-6 analyser. Detector efficiency was measured using a source of 200 neutrons $s^{-1}$ intensity placed in the vibromill drum (curve 1 in the figure), and at regular intervals the neutron background was measured by removing the operating drum to a large distance.

In our experiments, neither Ti chips nor deuterium containing compounds showed a neutron signal above background (0.05 counts $s^{-1}$) when put separately in the drum, but when Ti chips were combined with 10% heavy water or 4–5% $PP(D_6)$, or with both, a neutron flux 6–7 times background (0.31 $\pm$ 0.13 counts $s^{-1}$, taking detector efficiency into account) was measured, as indicated in curve 2 in the figure, which shows the results from Ti + 10% $D_2O$ + 4 % $PP(D_6)$. A constant excess over background was measured for 10 minutes, with a subsequent attenuation after crushing of the chips was stopped. The greatest effect (0.41 $\pm$ 0.14 counts $s^{-1}$) was measured using 10% $D_2O$ and 4% $PP(D_6)$ when the vibromill drum was cooled in liquid nitrogen after mechanical action was stopped. After three or four cycles of vibration, each lasting 3 minutes, neutron emission fell to the background level. Smaller effects (0.14 $\pm$ 0.02 counts $s^{-1}$) were found using LiD with $PP(D_6)$.

We conclude that d–d reactions occur when Ti particles in the drum are saturated with deuterium, perhaps as a result of deuterium diffusion through freshly created Ti surfaces produced by the fracturing[6]. At least 2 atoms of D per atom of Ti can be absorbed, and the lattice of Ti particles deforms by as much as 25% during this absorption[7]. So it is conceivable that absorbed deuterons can approach each other closely enough for fusion to occur. In addition, electric fields of up to $10^7$ V $cm^{-1}$ can be created by destruction of the crystal lattice, perhaps making d–d reactions more probable[8]. The increase of neutron counts with cooling in liquid nitrogen may indicate increased absorption of D, as it is known that cooling decreases the partial pressure of absorbed hydrogen or deuterium[7].

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