

Figure 1: Roy Jennings' photograph (monochromatic copy)

# HOW NOT TO PHOTOGRAPH BALL LIGHTNING



Figure 4: The scene of the Jennings photograph in daylight in 1980. Notice the streetlamp just behind the bungalow



Figure 5: The scene of the Jennings photograph in daylight in 1965

Stuart Campbell investigates the authenticity of the only photograph thought to have been taken of this phenomenon to date accepted by the scientific world.

### Introduction

Ball lightning is a rare meteorological phenomenon thought to be caused by atmospheric electricity, but photographs of it are even rarer. In fact there is no photograph that is universally accepted as authentic. A photograph that is often thought to show ball lightning is that taken by Roy Jennings in 1961 at Castleford in Yorkshire (Fig 1). This picture has often been used to illustrate ball lightning, although some authors have recognized the doubt concerning its authenticity. Despite this doubt it continues to be used almost as if it were the definite photograph of the phenomenon.

### How the picture was taken

At the time, Jennings lodged at 188 Smawthorne Lane, Castleford, occupying a small front bedroom on the first floor. He attempted to photograph lightning flashes which occurred during a severe thunderstorm. The camera was a Diax 2A (35mm) loaded with Kodachrome film, probably Kodachrome

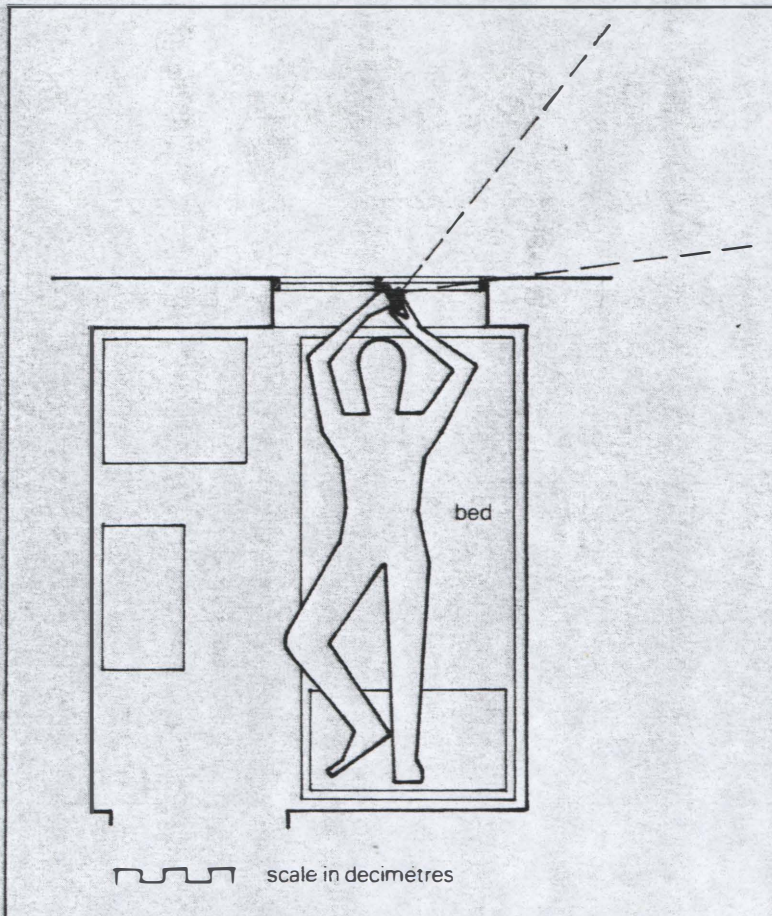


Figure 2: The layout of Jennings' room, and the position he adopted while holding the camera for the picture shown in Figure 1.

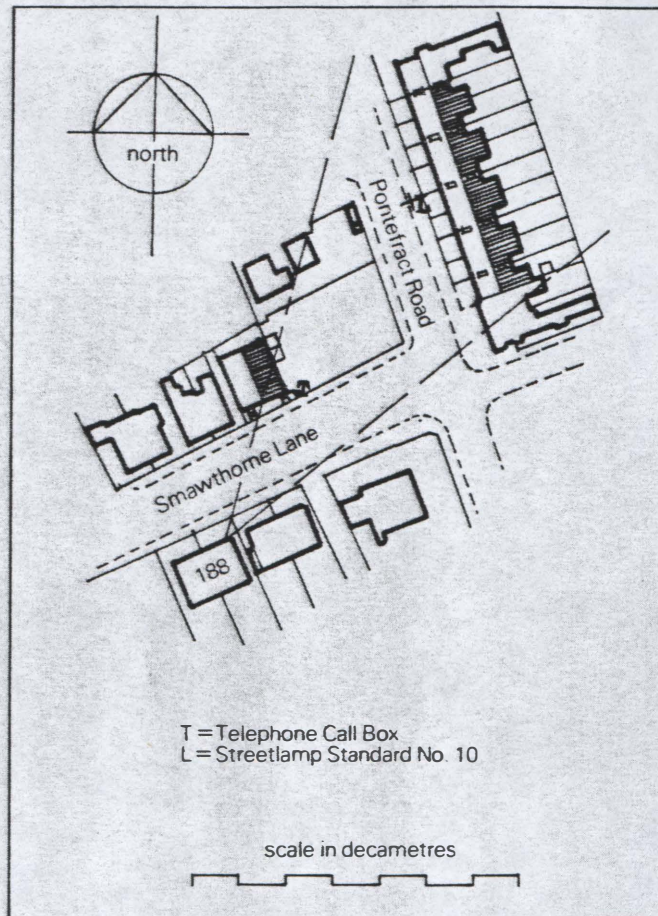


Figure 3: Plan of the site of the Jennings photograph

ASA64. His method was to lie on his bed holding the camera against the window during the time exposure (Fig 2). He opened the shutter and only released it after a flash of lightning. Figure 1 was the result of trying to photograph lightning to the extreme right, looking towards Pontefract Road (see layout in Fig 3). Jennings squinted through the viewfinder to aim the camera before settling down to wait. During the exposure there was a loud explosion; subsequently it was found that the roof of a house in Pontefract Road had been damaged. Only after the film was developed did he discover the anomalous trace. He was told he had captured a 'thunderbolt' and sent the picture to a scientific journal, who were the first to publish the matter.<sup>1</sup>

### What the picture shows

The original diapositive is in the possession of photographic agent Frank Lane, but I have examined a copy diapositive. The brightest source, at the end of the trace, is a horizontal bar, and much of the pulsed trace exhibits the same horizontality, whether it is moving vertically or horizontally. The result is a distinct difference in the shape of the pulses between the two directions. At the over-exposed bright patch the colour is white, but between that patch and the roofline of the houses the trace

is yellow. Above the roofline the trace is white, but shading to yellow again in the dark margin at the right-hand side. The facades of some houses near the termination of the trace are illuminated by some bright source, and there is evidently illumination within the telephone box and some of the houses in Pontefract Road. The reflection in the wet roadway appears to be partly due to the telephone box light, and partly due to whatever caused the bright illumination. It is observed that the anomalous trace itself is reflected neither in the roadway nor in any of the windows. Movement of the camera has blurred the scene, but the movement is coherent, i.e. all in one direction.

### The street lamp

A daylight view (see Fig 4) shows that the luminaire of a street lamp, No. 10, Pontefract Road, lies at the position of the brightest patch; the luminaire is just in front of a chimney stack. Projection of the diapositive of Fig 4 onto a print of Fig 1 showed that the lamp coincides exactly with the termination of the trace. Since the lamp standard is on the north-east side of Pontefract Road, the standard is to the right of the luminaire, and shows in Fig 1 as a blurred vertical streak. Atkinson mistook this for a 'ray of light from the centre of the explosion'.<sup>2</sup> Since 1961 a new lamp standard, and a

bungalow, have been built in Smawthorne Lane, and the telephone box has been removed. But the daylight scene before these alterations can be seen in Fig 5; this view was taken by Jennings in 1965. Because a tree then obscured the view from the window, he had to take the view from the front garden. The tree has since been removed, but because of lack of access to the house, my own view (Fig 4) was taken standing on a garden wall, fairly close to the window.

### The colour of the trace

Clearly the trace could have been caused by the street lamp. But why does the colour of the trace change at the roof line, and can distinguish between the ball lighting and street lamp hypotheses? The colour of the trace is consistent with that of a sodium vapour discharge lamp, and Pontefract Road is lit by such lamps. But it is also possible for ball lightning to show this colour. It is clear that light from a yellow source will react with the cyan and magenta layers in the colour film to produce a yellow colour. But where these reactions overlay the part of the film which has been exposed to light from the blue sky, where a reaction will have occurred in the yellow layer, the result is white. Thus the colour at the skyline is due to the addition of light from the sky to that from

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continued

the yellow source, whatever it was. However, the same reasoning leads to the conclusion that the yellow colour of the trace at the right-hand margin is due to the absence of light from the sky. Consequently the dark margin must be due to something which obstructed the sky. It was not due to a darkened sky; dawn was approaching from that direction.

### Was the street lamp lit?

Jennings is sure that the street lamp was unlit at the time of the photograph and that he would not have aimed his camera at a street light. In what circumstances could the lamp have been unlit? The thunderstorm did cut some local electricity supplies, but not in the immediate area. In any case, power could not have failed when the telephone kiosk lamp and lights in adjacent houses were still functioning. The timelocks for all street lights in Castleford were set on a 'Dusk to Dawn' basis, i.e. from about 2000 to 0400 GMT, although the precise switching time is not known. The local electricity board does not consider that the lamps could have been operating on an abnormal setting, e.g. following a previous power failure. So we have to conclude that Jennings is mistaken and that the lamp was lit. We would need to call on perceptual psychology to explain why a photographer would aim his camera in the direction of a blazing street light without, apparently, consciously registering the light and the effect it would have on his picture.

### The street lamp hypothesis

That the lamp was lit does not mean that ball lightning did not appear, but it does mean that an adequate explanation is available without involving ball lightning. Naturally we should prefer the simplest hypotheses. This hypothesis was first advanced by Davies and

Standler in 1972,<sup>3</sup> although they presented it only as a hypothesis for which the evidence was stronger. They showed that the dark margin must be due to some solid obstruction so close to the camera as to be out-of-focus. In fact the obstruction was the window jamb. Consequently, they argued, the fact that the pulses cross this margin indicates that trace originates at the street lamp, not a moving aerial object.

The hypothesis requires that after Jennings released the shutter button the shutter did not fully close. Either the shutter was slow to close or when shut left a pinhole at the centre of the shutter. The latter could have been a permanent defect which was not noticed ordinarily. In a cheap camera like the Dixax (no longer available) shutter defects are likely. The pulsing of the trace would have been due to the fact that British mains discharge lamps pulse 100 times a second. It is entirely feasible to move a camera fast enough to capture these individual pulses. It has been objected that the trace cannot be caused by camera movement with an open shutter because other highlights, such as the light of the telephone kiosk, have not made similar traces. But these highlights are very much lower in intensity; low intensity sources are much less likely to leave a trace upon a moving film.

### The shape of the trace

If, after completing the exposure, Jennings sat up on the edge of the bed, and he had to move the camera through a particular course. This course is the necessary result of the body movements involved in sitting up. First the left arm is raised. Then one rolls onto the right side, pivoting the right forearm on the right elbow. The legs are then drawn up until they are free of the edge of the bed. The legs swing down and so lift the trunk into the sitting position, and the arms are drawn back to the body.

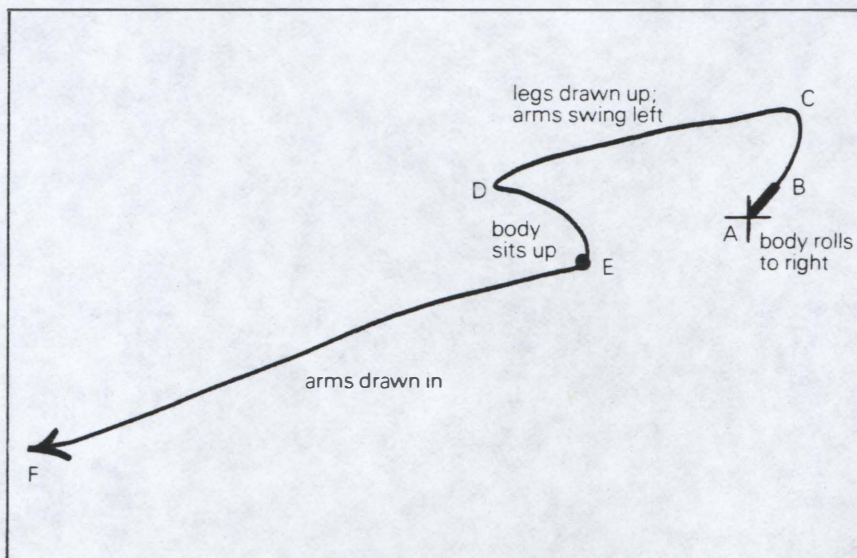


Figure 6: Movement of body and camera necessary to produce the trace image from street lamp

This series of movements produces movement of the camera as shown in Fig 6. In fact, Fig 6 is the *exact* outline of the anomalous trace in Fig 1, but inverted and reversed; the camera lens inverts and reverses not only images, but directions. Thus the direction and shape of the trace is just what would be expected if the shutter was not fully closed while Jennings sat up after taking the photograph.

Attempts to duplicate such a trace have not been successful, probably due to difficulty in reproducing the exact circumstances.

### The case against the ball lightning hypothesis

Although the photograph was taken during a thunderstorm, and while ball lightning is known to occur as a result of lightning discharges, no-one reported seeing the phenomenon at the time. While ball lightning may be almost any colour, it is usually red or orange. It is almost always spherical, never bar-shaped. It would be remarkable that the ball should have exploded *exactly* in line of sight with the only other bright illuminant in view. The lack of a reflection of the 'flight path' and the fact that the pulses cross the dark margin indicate that the source was not a flying object.

### The case for the street lamp hypothesis

The illuminated street lamp offers an adequate conventional explanation. Provided that the camera shutter did not fully close, the evidence: the colour of the trace, its origin at the lamp, its shape and direction, and the shape and orientation of the individual pulses, is consistent with the hypothesis.

### When was the picture taken?

Jennings cannot remember the exact date of the storm, but examination of meteorological records for August and September 1961 showed that the only early morning thunderstorm in the area occurred on 3 September between 0200 and 0900 GMT.

### Conclusion

The street lamps were functioning normally, and one was caught by Jennings's camera as he photographed lightning sometime between 0200 and 0400 GMT on 3 September 1961. The explosion was due to a nearby lightning strike, but not those caught in his photograph. After the flash, Jennings sat up on the bed, but during this movement his camera shutter was not fully closed. The anomalous trace was caused by the street lamp, and not by ball lightning. ■

### References

- 1 'Path of a thunderbolt' in *New Scientist* 13/270 (1962 Jan 18) p156.
- 2 Atkinson, B. W.; 'Riddle of ball lightning' in *Geographical Magazine* 41 (1968) pp204/5.
- 3 Davies, D. W. and Standler, R. B. 'Ball Lightning' in *Nature* 240 (1972 Nov 17) p144.