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Ball Lightning

Moments after hearing a sound like a thunderclap, a Parisian man reportedly witnessed an extraordinary sight: a fireball the size of a human head emerging from the fireplace of his fourth-story Paris apartment. It pushed aside the frame covering and darted toward him "like a cat." He hastily withdrew his feet, and the ball moved to the center of the room. Though bright, it gave off no discernible heat. It ascended slightly, headed back to the fireplace, and rose up the chimney, exploding just before it escaped into the open air. It caused considerable damage to the chimney top.



This illustration depicts ball lightning inside a farmhouse at Salagnac, Correze, France, in 1845. (Courtesy Mary Evans Picture Library.)

This incident, which occurred on July 5, 1852, is one example of a strange and so far unexplained natural phenomenon, ball lightning, whose existence some scientists still dispute. The skeptics' objections are strikingly like those raised against reports of unidentified flying objects: the evidence is primarily anecdotal, most if not all of the photographs are open to question, and no conceivable scientific theory can make sense of the phenomenon.

The alternative (in other words, debunking) explanations also echo those voiced in the UFO debate. The "objects," the debunkers say, are either optical illusions – most likely visual afterimages formed by the observation of lightning strikes – or natural occurrences such as St. Elmo's Fire (a corona discharge from an object protruding above the ground during an electrical storm), misperceived or exaggerated. The former explanation requires witnesses possessed of breathtaking stupidity. The latter has the virtue of at least surface plausibility, but as James Dale Barry, a leading scientific authority on ball lightning, notes, "A characteristic

distinction between St. Elmo's Fire and ball lightning is the apparently independent motion of the latter. Although St. Elmo's Fire has been observed to move about, it may move along a conductor, sometimes pulsating as it moves, but it does not free itself from the conductor. Thus, it does not exhibit the descending, hovering, or flying motions that are common to ball lightning."

The first investigator to describe ball lightning in the scientific literature was G. W. Richman, a Russian. Tragically and ironically, his interest led to his death. The incident took place in 1754 during a thunderstorm, when Richman was attempting to measure the energy of a lightning strike. As he stood behind his equipment, a small, blue, fist-sized sphere came out of the electrodes and floated toward his face. A moment later it exploded violently, killing him and knocking his assistant unconscious.

Fortunately, deaths related to ball-lightning manifestations are rare, but many observers have witnessed its destructive qualities. In Paris in July 1849, during an electric storm, a red ball hovered about twenty feet above a tree. Abruptly it caught fire, burned up, and burst open, freeing jagged streaks of lightning to shoot in all directions. One hit a nearby house and blew a cannon-sized hole in it. What remained of the ball started to spin and spark and then exploded with great force, knocking down three pedestrians.

At 6:30 p.m. on October 8, 1919, at a busy downtown intersection in Salina, Kansas, a "ball of fire as large as a washtub floating low in the air" struck the side of a building, ripped out bricks, and demolished a second-story window. It then exploded with a "bang that resembled the noise made by the discharge of a large pistol, filling the air with balls of fire as large as baseballs, which floated away in all directions," according to a *Monthly Weather Review* correspondent in the October 1919 issue. "Some of these balls followed trolley and electric-light wires in a snaky sort of manner and some simply floated off through the air independently of any objects near by. An electric switch box across the street was ripped open and a transformer destroyed, leaving the east side of the town in darkness."

In the summer of 1960, as Louise Matthews of South Philadelphia, Pennsylvania, lay on her living room couch, she looked up to see a huge red ball coming through a window and the Venetian blinds, both closed and neither damaged in any way by the object's passage. When the ball, which was making a sizzling sound, passed by her, Mrs. Matthews felt a tingling on the back of her neck. She put her hand to the spot but felt nothing. The ball went through the living room and into the dining room, exiting – again without damage – through a closed window. She called her husband, who came home from work to find the back of her hand burned. The hair at the back of her head fell out, leaving the skin there as smooth as that in the front of her face.

During a violent early-evening thunderstorm on August 12, 1970, a "red ball of fire" appeared above Sidmouth, England, crackled for a few seconds, then exploded with a deafening roar. Jagged flashes of lightning shot from it toward the ground. At that moment 2,500 area television sets were cut off.

Photographed in
Austria in 1978,
this image may be
ball lightning.

(Photo by Werner Burger,
courtesy Fortean Picture
Library.)



Ball lightning is not, of course, invariably harmful. It does not even always explode at the end of its manifestation. British scientist Alexander Russell saw ball lightning behaving both ways. He wrote in *Nature* (November 23, 1930):

Many years ago I saw two globes of lightning. They were reddish-yellow in color, and appeared to be rotating. One of them struck a building and burst with a loud report, causing the inhabitants to open the windows and look out to see what had happened, but as there was no trace of anything they looked bewildered. The other drifted slowly away. Globular lightning makes a slight noise as it drifts about. It has been compared with the purring of a cat.

A particularly dramatic incident took place in January 1984 inside a Russian passenger plane. The crew saw a glowing light, four inches in diameter, in front of the cockpit. It suddenly vanished with a deafening roar, only to reappear sec-

onds later – after piercing the fuselage in some mysterious fashion – in the passengers' lounge. As the passengers looked up in disbelief, the spherical object sailed above their heads until it got to the tail section, where it divided into two glowing crescents. The crescents then merged into a single object and departed. Later, when mechanics examined the aircraft, they found a hole in front of the fuselage and another in the tail.

Theories

Hard scientific data about ball lightning are rare – a major reason for some scientists' continuing doubts about the phenomenon's existence. Even Barry, a major proponent, acknowledges, "The unbiased examination of ball lightning reports leads one to conclude that a great percentage of the reports are highly questionable and could be interpreted in several ways." (Again, these words echo those that have been said of UFO reports.) Of the many photographs alleged to be of ball lightning, Barry believes that only three "are not obviously erroneous or highly suspect."

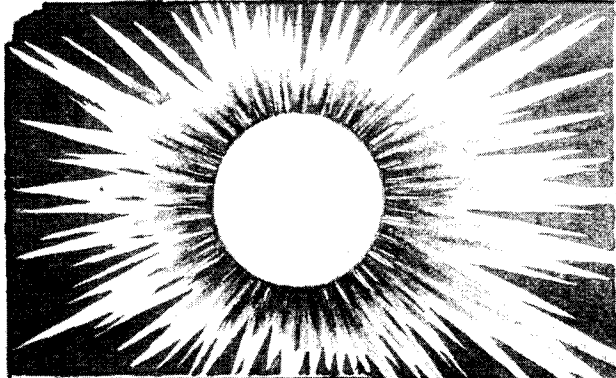
In fact, though ball lightning is now generally (albeit not universally) assumed to be real, the evidence for its reality is soft. Australian plasma physicist John Lowke, a world-class authority on the phenomenon, bases his belief in it on these considerations:

Though . . . I have never seen the phenomenon personally, I feel that there is no question that ball lightning exists. I have talked to six eyewitnesses of the phenomena and think there is no reasonable doubt as to the authenticity of their observations. Furthermore, the reports are all remarkably similar and have common features with the hundreds of observations that appear in the literature.

Anyone expressing the same sentiments to defend a belief in UFOs would be instantly challenged with a litany of objections, beginning with the well-worn debunking argument that eyewitness ("anecdotal") testimony cannot be trusted. But these remarks, made in the conservative *Scientific American*, raised not so much as an eyebrow.

Nor have such considerations discouraged some ball lightning enthusiasts from using this unproved phenomenon to explain another: UFOs. The first known attempt to link the two phenomena was in 1951, in the Swedish journal *Arkiv for Geofysik* ("Geophysical Archives"), where Carl Bendedicks published a paper titled (in English translation) "Theory of the Lightning-Balls and Its Application to the Atmospheric Phenomenon Called 'Flying Saucers'." More recently a New Zealand scientist, Peter Coleman, has theorized that ball lightning is atmospheric natural gas caught in a vortex, then ignited by ordinary lightning or static electricity; this theory – itself open to question – is then employed as a blanket explanation for many otherwise-unexplained UFO reports.

Much of the problem of explaining (as opposed to explaining away) the ball-lightning phenomenon has to do with the varying descriptions witnesses



En kvinna som stod på trappan. Plössligt kom ljuset och den farande genom taket, så att kvinnans rörelse ned, varna kulblitzerna rullade nerför trappan och vidare.



Här är ett exempel på en kulblitz, som visade sig i det fria. En ung man, som uppehöll sig i närheten av en metallredningshjälp, såg plössligt en stor eldkula flyga förbi och i nästa sekund exploderade med ett brak.

En kulblitz är ett fenomen som ofta beskriver sig som en ljusstrål som faller från himlen. Den är vanligtvis förknippad med de så kallade "fallande stjärnorna". I själva verket är det en fysikalisk process som innebär att en meteoroid, som består av en bit av ett meteorit, faller genom atmosfären och brinner upp. Detta skapar en ljusstrål som kan ses som en kulblitz. Fenomenet är vanligtvis förknippat med de så kallade "fallande stjärnorna".



En mycket liten kulblitz, inte större än ett häpnad. Beskriv här en man i huset. Den lille eldkulan använde människans radioapparat som väg in i huset och förstörde fullkomligt den dyrbara mottagarapparaten.



En yngling, som befann sig på hemväg från skolan, sprang vid gatörnet rakt på en kulblitz, som strök längs husväggen. Han kunde tydligt känna lukten av ozon, som är märkes efter ett uppstråkande åskregn.

En man gick en kväll vid stranden av en öad, då han plössligt fick på bilden härnadan ser man en scen med en kulblitz, som genom fönstret trängde in i ett rum, fall ned på golvet och slutligen sprang sönder med en knall, då den stötte mot den ena damens fot.



Under ett stortregn sågo tre personer från sitt hotellfönster en kulblitz falla högt över samt och gravitativt utmed en elektrisk spänningsledning, tills den exploderade följande ett hus, som därvid skadades.



När man talar om blizzar, så menar man i regel de välbekanta sicksackformiga blizzarna, som under häftigt åskväder flamma på himlen och fylla nervösa människor med skräck och fruktan. Det finns emellertid i själva verket flera slag av blizzar. Om man icke så ofta hör talas om dem, så beror det på, att de äro mera sällsynta än de sicksackformiga blizzarna, men flera av dem äro i stället så mycket intressantare fenomen än de vanliga blizzarna, icke endast vad beträffar själva fenomenet i och för sig, utan också emedan de äro omströmda av en gloria av mystik och äro till dag är höra till vetenskapens oösta gåtor.

Vi tänka nu icke på de s. k. yllblizzarna, som väl icke äro annat än i taket på huset därpå kastade hette omkull, under det den rullade ut för avlagna sicksackformiga blizzar, vilka tyso fram bakom molnen och därifrån trapparna och krossade allt vad som fanns i dess väg (parlor, trappor).

en röd eldkula komma långsamt glidande genom luften. Han blev så betagen av den egenomliga synen, att han gatt på vägen, att även andra skulle få njuta av den, varför han skyndade sig tillbaka och berättade några av sina väntar. Då de kommit ned till floden, fanns den eldröda kulan kvar och många människor kunde samtidigt iakttaga det besynnerliga fenomenet. Några minuter senare försvann eldkulan helt stilla i den rödbrända skymningen.

I detta fall var kulblitzen av en biza och oskadlig karaktär, men det är icke alltid de uppföra sig så oskyldigt. En dam upplevde en gång, då hon stod högt upp i en trappgång, att en kulblitz först slog ned genom trapporna och krossade allt vad som fanns i dess väg (parlor, trappor).

have given. The ball either explodes loudly or vanishes silently; it is white, orange, red, blue, or purple; it is small or it is large; it survives for a few seconds or a couple of minutes. "These may seem like trivial distinctions," science writer Gordon Stein observes, "but they cause theorists no end of difficulties. Explanations that will work for a ball of one second's duration, for example, cannot account for a 10-second ball." A ball that lasts one minute or more "requires an energy content so high that there is no known way for it to be formed."

Ball lightning also has the strange habit of penetrating the metal walls of in-flight aircraft. On March 19, 1963, R. C. Jennison, a professor of electrical energy, saw a ball-lightning globe first outside, then inside, an airliner he was taking from New York to Washington. An electrical storm was in progress. Of this report Stein notes, "Microwave, electric, radio or heat energy – all of these figure in the various theories – could not have gotten through the metal fuselage. We can also eliminate antimatter as a possible cause of ball lightning [an extraordinary hypothesis proposed by E. T. F. Ashby and C. Whitehead in *Nature*, March 19, 1971]. When antimatter (matter with exactly the opposite charges from those on normal matter on each of its subatomic particles) comes in contact with normal matter, both are annihilated. . . . Antimatter would have a difficult time getting through the body or window of an airplane without colliding with some regular matter, thus destroying itself."

If the evidence for ball lightning is almost all anecdotal and if it seems too bizarre for any so-far-imaginable physical theory to explain, why is it at least marginally acceptable to much of the scientific community when UFOs, the evidence for which shares many of the same problems, are not? If anything, the UFO evidence is better; no ball-lightning case is so well-documented as, for example, the January 1981 Trans-en-Provence physical-trace case investigated by France's official UFO-investigative agency.

The answer is not that no scientists have seen UFOs. In fact, many scientists, including some prominent ones, have seen UFOs, and some have acknowledged as much publicly. More likely, scientists see ball lightning as a natural, even if deeply enigmatic, phenomenon, whereas UFOs, if they exist, imply the operation of an alien intelligence in the Earth's atmosphere – a prospect so incredible that it causes scientists, on some unconscious level, to see the ball-lightning evidence as a cup half full and the UFO evidence a cup half empty.

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These illustrated examples of ball lightning appeared in a Swedish magazine in 1925.

(Courtesy Mary Evans Picture Library.)

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Brown Mountain Lights

Brown Mountain (alt. 2,600 feet), situated in the Blue Ridge Mountains of western North Carolina near Morganton, is celebrated in story and song (such as Scotty Wiseman's bluegrass standard "The Brown Mountain Light") as the location where luminous phenomena have baffled observers for – well, for how long depends upon whom you believe and how much documentation you require.

In 1925 Robert Sparks Walker had this to say of the Brown Mountain mystery:

The descriptions of the strange lights made by various observers do not agree. One person says that it is pale white, as is ordinarily observed through a ground-glass globe, with a faint, irregular halo encircling it. He claims that it is restricted to a prescribed circle, and appears from three to four times in rapid succession, then conceals itself for 20 minutes, when it reappears within the same circle. Another observer, who was standing about eight miles from Brown Mountain, says that suddenly after sunset there blazed into the sky above the mountain a steady glowing ball of light. To him, the light appeared yellowish, and it lasted about half a minute, when it disappeared rather abruptly. It appeared to him like a star from a bursting skyrocket, but much brighter.

To some people it appears stationary; to others, it moves sometimes upward, downward, or horizontally. A minister says that it appeared like a ball of incandescent light in which he could observe a seething motion.

So far as is known, the first printed reference to the lights appeared in the *Charlotte Daily Observer* for September 13, 1913. Citing the testimony of a group of fishermen, the newspaper reported that the "mysterious light is seen just above the horizon almost every night. . . . With punctual regularity it rises in the southeasterly direction just over the lower slope of Brown Mountain. . . . It looks much like a toy fire balloon, a distinct ball, with no atmosphere about it . . . and very red." Not long afterwards D. B. Sterrett of the U.S. Geological Survey investigated and

Ball Lightning Penetration into Closed Rooms: 43 Eyewitness Accounts

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Abstract—43 Eyewitness Reports on the ability of ball lightning to penetrate into rooms through window glass (very often leaving no holes) and to enter houses through radio and electric sockets are presented.

Introduction

Many mysterious and unexplained events are related to ball lightning (BL)—a largely unexplored geophysical phenomenon. Present science is not ready to provide a reasonable explanation for the formation, structure, shape and lasting existence of this physical object. Meanwhile, ball lightning appears to be a dangerous phenomenon of nature and close contact with it sometimes leads to unpleasant consequences for accidental witnesses. It is this danger that provides a ground for creating myths. A number of abilities attributed to ball lightning are pure fantasy. Others—like the ability to melt and vaporize wires and ruin radio equipment—can be explained within the framework of known physical laws. But among other mysterious BL properties its ability to penetrate through window glass leaving it unaffected and to leap out of radio and electric sockets are distinguished for their being unrealistic from a physical viewpoint. Nevertheless, many eye witnesses of different ages and education levels, from different cities and countries claim to have seen these processes with their own eyes. And the fact that their descriptions are similar suggests that they are telling the truth.

Since BL is an insufficiently explored geophysical phenomenon, collecting and analyzing information on its natural behavior remains the main source of information about BL, as it was centuries before. This is the main aim of the authors of this paper, who during several years have collected 5315 previously unknown descriptions of BL and prepared them for statistical analysis by computer. Some preliminary results of this research were published by Grigor'ev (1989, 1991). See also the collections of BL descriptions by Rayle (1966), McNally (1966), and Stakhanov (1985). Given in the present paper is the evidence of extremely exotic properties of BL reported by independent observers, which cannot yet be reasonably explained within the framework of contemporary science, but understanding them may provide a clue to the mystery of the origin and structure of BL.

Window Glass Penetration by Ball Lightning Without Damage

Any science is based on facts. Facts in BL studies are the reports by eye-witnesses who are often frightened by the unexpected and dangerous appearance and as a result are not always objective. Nevertheless, scientists do not have at their disposal anything better than BL descriptions. So let us refer to eye-witnesses and begin with the description given in one of the earliest scientific books on ball lightning written by W. Brandt (1923), who was the first to introduce BL properties into the category of those deserving scientific exploration.

1. June 22, 1914, Hanenkleee.

Between 6:00 and 6:30 p.m. during a heavy rain, counselor Kulgatz was sitting at the table with two neighbors in a closed veranda, his left side to a glass wall. Another group of people sat at the next table. The eyewitness saw a fire ball 10–15 cm in diameter pass into the room through upper glass, flying slowly in the direction of the nearby table, above which it exploded producing sound as loud as a cannon report. No one suffered, but telephone and electric wires in the room were melted. There was no hole in the window glass through which the ball had passed.”

And here is a description from the collection of the facts of BL observations in Germany (Rodewald 1954), not included in the book by Brandt, which was later frequently referred to. See for example, Silberg (1965) and, Powell (1969).

2. July 27, 1952, witnessed by T. W. Kohn of Hamburg meteorological observatory.

“A few seconds after a close discharge of lightning we saw outside behind a window a bright luminous ball the size of a fist moving downwards along a curved trajectory. This luminous ball passed inside the room through the glass of a closed window, moved one meter into the room, made a 90° turn, moved further into the room parallel to the wall and then disappeared with a sharp loud blast. The ball had a violet-and-blue color tinged with red. The observation lasted three seconds. The ball caused no damage either inside or outside the room. After the explosion there remained an odor typical to electric discharges.”

A description taken from the monograph on ball lightning by S. Singer (1971) is equally interesting:

3. The year 1960.

KC-97 USAF tanker airplane was on a blind flight in the clouds at an altitude of 5400 m. There was weak precipitation with a temperature above 0° C. St. Elmo lights appeared at the binding of front windows. The pilot saw a yellow-white ball penetrate inside through the windscreen passing between him and the second pilot at a speed of a running man. The pilot waited tensely for an explosion to come. The ball flew along the passage, passing the navigator and the flight mechanic. In approximately three seconds the refueler reported by intercom from the rear compartment that a fire ball had rolled through the rear compartment and disappeared into the clouds moving along the right wing. The ball did not produce any sounds.

Among 5315 previously unknown descriptions of BL collected by the authors of the present paper there are 42 cases where BL penetrates through glass without damaging it. We now give some of them.

4. July 1957, Biysk, a town in Altai territory, observer M. D. Treshetkina.

"It was the middle of the day, around 3 p.m. It rained heavily and there was a thunderstorm. At the table beside the window sat my elder son, his face to the window; to his left on the bed sat my younger son. They were doing their homework. I was sitting on another bed, not near the table, but somewhat further away. Suddenly, during a strong discharge, a little ball that looked very much like a bright electric bulb of 100 W flew in through the window glass. It flew over the elder son's head 0.5 m from him, then lowered a little towards the furnace. The ball moved rather fast, but at the same time somewhat smoothly since we all distinctly saw a bright ball, not just a glaring line. The ball turned back from the furnace and, after flying a little backward, exploded near my feet (15 cm above the floor and 8–10 cm from my leg). I was barefoot but felt no heat. As for the sound, it was like someone had smashed an electric bulb. I observed the ball lightning not very long, 3–5 seconds. I stood up to check the glass. It was intact, but from the outside there remained a round dry area, while the rest was all wet with heavy rain."

5. Summer 1948–1949, Sursk, a town in Penza Region, observer V. Rubtsova, born in 1906, a nurse.

"In the hospital there was a small two-bed ward some 3 meters long. A woman patient lay on one bed, I sat on the opposite one. There was a large high window between the beds, a bedside table, a small passage. It was afternoon. A thunderstorm roared outdoors. Suddenly I heard the ringing of glass in the upper part of the window and immediately an orange fire ball approximately 22–23 cm in diameter appeared. Very even, without changing direction the ball flew from the window through the room, simply penetrated the wall above the door and disappeared. The hospital is a brick building, its walls very thick. I walked out of the ward but nothing was there and nobody saw anything. There was no explosion, the ball penetrated the wall quietly without a single spark. But when it entered through the window there was a strong sound of vibrating glass, it even seemed to me that the glass broke. But when I climbed the window-sill and examined the glass it was completely intact, without damage. It all occurred in 8–10 seconds."

The brightness of the ball lightning was like that of the full moon when it is red. Its speed was about 30–40 cm/s. It passed the observers at 1 m distance, they felt no heat.

6. August 1969, village Kortkeross, Komi Autonomous Republic., observer N. K. Arkhimenko, born in 1938, a teacher.

"During a thunderstorm, the woman who owned the apartment where we were hiding from rain suggested to turn the lights off, went to a socket and pulled out a plug, while I clicked the switch since I was sitting nearby. At this moment

from two places simultaneously—from the radio socket and from inside the switch—came strange hissing, not very strong sharp clicks (two, one after another), and two brightly-violet balls a little larger than billiard balls (6–7 cm) rapidly fell out from the socket and from the switch. The balls moved fast along the diagonals of the kitchen, touched one another producing one more clicking sound similar to a weak spark discharge, and leaped outside through the window glass. We all rushed to the window. The balls were already on the ground, in one or two seconds they disappeared. The glass on the windows was intact, but the socket and the switch were charred. The wires were undamaged—the safety device was in place.”

The observation lasted 3–4 seconds inside the house and 1–1.5 seconds outside through the window. The balls themselves looked not uniform, but as if composed of a vast number of smaller balls, in fact dots, 1–1.5 mm in diameter, engaged in chaotic motion but remaining within the limits of the big ball.

7. *The middle of August, 1986, Kholmsk, a town in Sakhalin Region., observer V. I. Polzikova, a kindergarten employee 30 years old.*

“At about 3 p.m. a thunderstorm was about to begin, lightning flashed one after another, it started to rain. During the thunderstorm I closed all upper windows and stood in the kitchen watching the thunderstorm. Suddenly, simultaneously with a flash of lightning, through the closed upper part of the window a bright yellow ball of the size of a tennis ball (2–3 cm in diameter) flew in like a bullet. It collided with the wall between a switch and an electric meter and stopped, spinning around its axis. Small sparks sprinkled from its surface, and its swift motion was like that of a sunbeam reflection. Then came a not very loud sharp electric discharge. No traces remained on the wall near which the ball had rotated. It all took place during some 4–5 seconds. In about five minutes a woman neighbor with whom we shared the apartment came out of her room. Suddenly lightning flashed again, and once again an extremely bright white ball flew into the room, but this time not through the upper part of the window, but from the window sill level. This “unexpected guest” flew into the kitchen like a bumble-bee, turned sharply into the corridor, began to fling back and forth there illuminating everything around. In two or three seconds there was an electric discharge a little louder than the first one and the ball disappeared. The ball lightning moved a speed of approximately 5 m/s and had the brightness of an electric arc.”

8. *July 1978, village Lys, Kemerovo Region, observer H. I. Jakovleva, 48 years old.*

“At 6:20 p.m. that day a mighty thunderstorm broke out, clouds hung very low above the earth, lightning struck one after another. My husband and I were eating supper at the table that stood right under a big window. My husband finished eating, stood up from a wooden stool to switch off the refrigerator. Suddenly I saw a very bright, round ball, 10–12 centimeters in diameter, fly through the window glass, and with a thunderous sound hit against the edge of the stool on which my husband sat, and fall into pieces. I was very frightened, my hus-

band said: 'My foot hurts, the toes.' We examined his foot but there were no injuries. The stool was also undamaged, no traces of burns or scratches. And then suddenly a second similar ball flew in from the window, struck with the same thunder against the edge of the stool and fell to pieces producing sparks like those from electric welding. The stool again remained intact."

The balls that flew in were light-yellow, their brightness reminiscent of a full moon. They moved at a speed of approximately 1 m/s and during collision broke into a number of fragments 40–50 cm from observers who felt no heat. About 10–12 seconds passed between the moments when the first and the second ball lightning appeared.

9. *Moscow, observer I. G. Orekhova.*

"It was a powerful thunderstorm with rain. Streak lightning discharges flashed one after another. Practically simultaneously with a flash of a very strong discharge a luminous orange ball began to puff out of an electric socket (as a soap-bubble out of a straw). Its shape constantly changed. When its size reached the size of a football, it separated from the socket and flew across the room toward the window. It passed through the glass without slowing down or changing shape, as if there was no glass at all. Later I found no hole in the glass. Outside, after flying several meters from the window, the ball loudly exploded."

10. *September 1984, village Pyrja, Khanty-Mansiysk region, observer L. P. Doronin.*

"During a very severe thunderstorm into the room right through the window glass slowly entered a glaring little ball 4–5 cm in diameter. It passed through the glass without changing its shape as though there was no glass at all. It struck against a metal ball decorating the bed, bounced back towards the window and left through the glass as slowly as it had entered. When the ball hit the bed there came a melodious sound similar to the sound of a tuning fork. It all lasted 5–7 seconds. The glass through which the ball passed twice bore no traces whatsoever."

11. *July 1950, 8 p.m., Orsk, a town in Orenburg Region, observer H. A. Shachneva.*

"After a short thunderstorm with heavy rain a big puddle was formed in the yard, and my son with his friends began running in it. But then a new thunderstorm was about to start and I called my son home. As soon as he came in I began to wash his feet in a basin that stood on the floor. It was then that I heard a cracking sound coming from the window. I raised my head and saw a fire ball 8–10 cm in diameter that flew through the window glass. The ball did not change as it passed through the window. It flew directly at us and blew up between me and my son (approximately 15 cm from me). The sound was like a shot of an air rifle. My son and I were not injured. I found no hole in the window glass."

12. *The summer of 1956, Pskov, observer K. G. Ustinova.*

"At noon, during a strong thunderstorm I was serving at the table. Just as I turned towards the window, I saw a fire arrow flying directly through the win-

dow glass. Rather, it looked like a stick 2–4 cm wide and 40 cm long. At a speed of 3–4 m/s this 'arrow' flew one meter from my father who was sitting on a bed besides the window, passed very close to me and, after skirting the Russian furnace, flew out through a closed door. How it could have passed through the door neither I, nor my father were able to see from where we were. But it did fly towards the door and vanished there in complete silence, probably flew away. The color of this 'arrow' was orange and it shone as a 75 W lamp. We felt no heat. It all lasted 1–2 seconds. My father was 81 at that time. There was no hole left in the glass. The 'arrow' flew as if there was no glass at all."

13. July 27, 1987, village Golosilovka, Ludinov district, Kaluga Region, observer V. N. Vojnova, an accountant, 66 years old.

"At about noon a light thunderstorm began. Through the double-glass window frame three meters from me a little fire spot entered the room, hung in the air and took the shape of a ball approximately 3 cm in diameter. Its brightness was like that of a 100 W yellow-light electric bulb. It did not move anywhere, just hung there, and later began to turn pale until it faded completely. It all lasted about 6 seconds. Nearby, approximately 70–80 centimeters away, there was a kapron blind and an electric meter, but the ball lightning caused no damage."

14. July 1938, Tukulinsk, a town in Omsk Region, observer M. G. Tukanov, born in 1899, a bore foreman.

"At noon there was a meeting in the office. 20 men or so gathered, all were sitting on chairs and benches along the walls. The doors and windows were tightly shut. Outdoors a thunderstorm was about to start, but there was still no rain. Suddenly, a bright-red fire ball approximately 15 cm in diameter entered through the glass in the window. Somewhere in the center of the hall about two meters above the floor it exploded with the sound of a rifle-shot. Sparks fell down cracking throughout the entire hall; the hall was filled with smoke, it smelled of burned straw. No one got hurt, there was no damage on the glass. It all lasted about 2 seconds."

15. June or July 1977, countryside, Dnepropetrovsk Region, observer T. A. Varfolomeeva, born in 1955.

"It was evening. There was a strong thunderstorm outside. We were living near the forest, and lightning was striking directly into the forest. We both were in a dormitory room. Suddenly, a ball lightning 1.5–2 cm in diameter flew in through a closed window 1.5–2 m from us. The lightning flew in with a loud cracking sound and hung still between us 1 m away. We did not move. Slowly, at the speed of approximately 20 cm/s, it moved towards the door and left through a keyhole. There it discharged—exploded loudly. We were afraid to touch the door, but someone opened the door, came in and nothing happened to him. In the next room a TV set got out of order, though it seemed to us that the lightning exploded right inside the keyhole. We found no damage on the window glass. It all lasted 25–30 sec."

16. *Village Sosnovka, Novokuznetsk Region, observer B. I Botnar, a fireman.*

"During a fire safety inspection in a boarding-school (an old one-story log building) I drew the tutor's attention to the lamps in the corridor that hung without bowl shades, that they might cause fire. She said that there was no electricity, probably because of a thunderstorm. Then, mechanically, I went and turned the switch. A 150 W lamp flashed brightly, and out of it flew a bright ball 1-2 cm in diameter and fell to the floor. A dark spot formed on the floor paint, but the paint did not start to burn. When I turned the bulb out and thoroughly examined it I found that its base was intact, its glass was intact, no hole whatsoever. There were those long nibs that support the tungsten filament, but no filament."

Damage Caused by Ball Lightning

Among 5315 descriptions of BL collected by the authors of the present paper, there are also 26 cases where eye witnesses report that BL left holes in glass.

17. *May 25, 1897, Bad Szliaes, a small town in Hungary (From Brandt, 1923).*

"During a thunderstorm a fire ball flew into a lobby of a hotel through an open window, flew past two executives at a distance of one meter or so and flew out through a closed window leaving a hole in the glass the size of a fist. Some 15 steps from the building the fire ball collided with a big silver poplar and exploded chipping off a chip 20 cm wide, 2 cm thick and about 10 meters long. The sound of the explosion was similar to a rifle shot. No one was hurt."

18. *Midsummer, 1944, Borovichi, a town in Novgorod Region, observer A. G. Redkinsky.*

"In the middle of the day three of us sat at the table in a little room eating dinner. There was a strong thunderstorm outdoors. Suddenly, after a strong discharge, an orange ball the size of a goose egg that shone as a 200 W lamp, flew through the window into the room. Rather slowly, with a cracking sound, it drifted above the table, rolled along a nickel-plated back of the bed, along the strings of a guitar that hung on the wall (the strings immediately started to sound), then again flew right in front of me (half a meter away) above the table and left through the window. It seemed to me that I felt slight heat coming from it. When we recovered from shock, we examined the window glass and found two perfectly round holes in it the size of the lightning. There were no drops of melted glass. We found nothing wrong with the back of the bed and the strings. There was a light smell of burning in the room. We were watching the ball lightning for approximately 20 seconds."

19. *August 1938, village Parny, Chastin District, Perm Region, observer M. N. Aristova, born in 1921.*

"August 11 was my birthday. In the afternoon (1-2 p.m.) a very strong thunderstorm began, lightning discharges made the windows shake. My father was in

the room, my mother was in the kitchen. I was standing before the mirror trying on my new dress. Suddenly, the whole sky lit up and a fire-yellow round ball with a blue tinge in the middle flew into the room through the window, crushing the glass. It was 8–10 centimeters in diameter, shone like a 100 W bulb, moved at a 2 m/s speed, crackled and produced smoke. It flew to me, touched the fingers of my right hand. It felt very hot, as if someone stuck a needle into my fingers. Then it flew toward the door that had a 10 x 10 cm hole below for a cat to pass. The ball passed out through the hole into the porch. In the porch there was a separator screwed onto a table, and above it 1.5 m from the floor a shelf nailed to the wall with jars of milk and sour cream on it. At that moment a terrible explosion shook the porch, all jars fell to the floor from the shelf. We were all very frightened, my father rushed to me crying 'Are you alive?'. I said 'I am,' but my hand was as if made of cotton. My mother started to rub my hand with liquid ammonia. Daddy went to the porch and when he returned he said that there was a smell of rotten apples. Our neighbors came hurrying in and said that they also saw how a 'fire ball' flew into our window. My hand recovered, but it took a long time before I was back to me senses, probably because I was so frightened. There remained a hole in the window glass the size of a plate, its edges blackened a little. It all lasted 3–5 seconds."

20. *Summer of 1910, Odessa, observer-correspondent M. N. Erlichman, an engineer, the story told by his mother.*

"Until 1910 my mother was a nurse in one of the hospitals. Once in the summer a powerful thunderstorm broke out, lightning flashed, the rain was heavy and intense. Mother stood at the terrace behind a glass door. Behind her there was another door that led to a machine room. Suddenly, mother saw a white ball tinged with blue, as large as a head of a newborn baby, and it moved directly at her. Mother threw herself aside, the ball drifted slowly past her, leaving neat round holes in the glass in both doors, and moved towards a working machine. There came a peculiar crackle, as if two electric wires came into contact, and the ball disappeared."

21. *Summer 1978, Narva, Estonia, observer A. G. Artsivenko.*

"Once I was repairing a TV set. I opened the back cover, turned the TV on and began searching for a defect by replacing tubes. I removed a big tube from the right side of the video amplifier (6 M or 6.5 M, I do not remember exactly). Suddenly my attention was caught by a buzzing medium-pitch sound. I started to search for the source of the sound and found it. There is a damper diode in a sweep unit and inside it bounced a small fire ball no more than 3 mm in diameter. Then it remained still for a moment, burned out a hole in the glass bulb of the diode and flew away into the window. I was very frightened—the TV was not mine, neither was the house, and playing with lightning does not do any good. The hole in the bulb was neat, round, no more than 2 mm in diameter. Melted contour of the hole was twisted outward, it was smooth, without sharp edges."

22. *Late September–early October 1960, Vladivostok, observer N. O. Vlasova.*

“I was living in a room in a cellar of a two-story house. It was a cold autumn day and it rained. I lit the stove, first by firewood, then I put in some coal. The fire grew stronger and it became warm. There was nothing on the stove. Suddenly, something red flashed in a slot between cooking-rings and a fire-red ball flew out into the room. I understood at once that it was ball lightning. The ball was not big, 7–8 cm in diameter. It started flying back and forth across the room that was 3 m wide. It was approaching me, but not fast. It was flying in the room from wall to wall at low speed. When approaching the wall, the ball did not touch it, but turned back some 15–20 cm from it. The ball itself looked fire red as if it was red hot. Then, the ball headed along the room to the window at the same low speed. Before my eyes, it flew outside through the glass, absolutely quietly, without any noise or crackle, and as it was flying outdoors it was the same ball as before. I saw how it left through the glass, but did not notice any diminishing or lengthening while it was passing through the glass. However, a little hole remained in the glass, considerably smaller than the ball’s diameter. The hole was of the size of a coin, with cindered edge, melted 0.5 cm outward.”

23. *August 1943, railroad station “Povorino” (in Siberian direction from Stalingrad), observer N. V. Kurnos.*

“A train to Stalingrad was getting ready for departure. We lined up to get permission to board the train from the military commandant. It rained heavily, lightning flashed far away, thunder roared. We crowded into a small corridor. The outside door of the corridor was wide open, opposite it stood a big tree. Above the door there was glass. The door to the commandant’s office was opened into the corridor. To the left, at the table sat the commandant and stamped our documents. Opposite the door was an open window. It was my turn, but I did not have time to enter the office. The Commandant took a telephone receiver, and suddenly a small dazzling fire ball flew in through the window and headed toward him. It touched the telephone receiver, rose to the ceiling and flew out into the corridor. There came the smell of ozone and we bent down. The ball flew over our heads outside, not through the door, but through the glass in which it melted out a neat round hole. The blazing ball struck the tree, broke into two halves and disappeared. It all lasted about a second. I was a military assistant doctor and as soon as I came to my senses, I rushed to the office where, pale and silent, lay the commandant. I thought he was dead, but then sensed a weak heart-beat, and soon he recovered consciousness.”

These same forms of ball lightning do melt holes in glass. It also may be pointed out that ball lightning which leaves holes in glass more often explodes, causing considerable damage. And this suggests that the energy stored in this kind of ball lightning is greater than the kind which passes through glass without a trace. Nevertheless, a number of facts do not fit into this simple explanation.

24. *August 1965, Vladivostok, correspondent S. V. Kalinchenko.*

“There was a thunderstorm. I was sitting at home near an open furnace. Suddenly, a bright nearly white luminous ball as big as a ping pong ball emerged

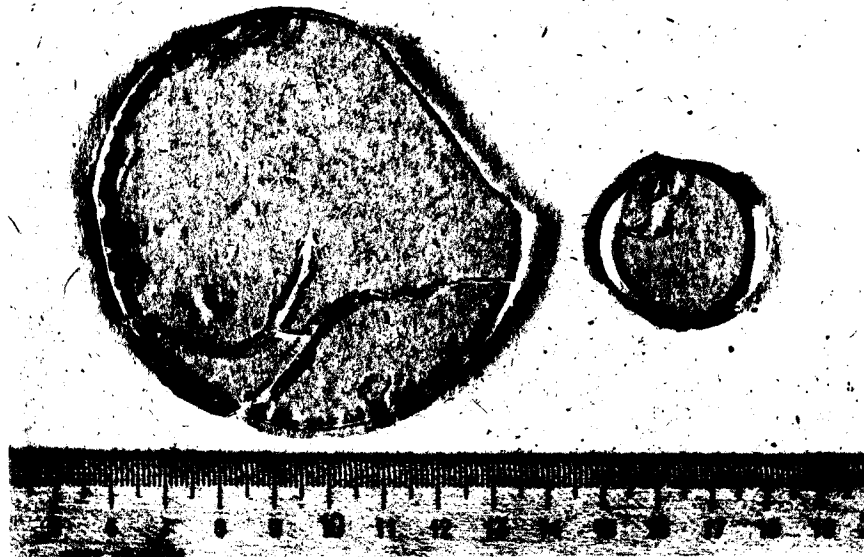


Fig. 1. Photo of round glass pieces that fell out of window glass during thunderstorms.

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inside the furnace flame. It flew into the room, immediately turning dim orange and growing to the size of a fist. The ball flew past me at a distance of 10–20 cm. There were no unusual sensations or pain in the eyes. I tried to touch it with my hand, but the ball moved rather fast (like a walking man) and at the moment when I raised my hand it was already near the window 4–5 m away from me. More than 10 seconds passed since the ball appeared when grandmother entered the room. The air wave from the opening door literally pressed the ball lightning to the window glass (there were single-glass frames in the window). There came a sound resembling a hiss of a flying bullet or a click, and the lightning was already outside. It was caught by a gust of wind, headed upward and out of sight. There remained a hole in the glass through which an index-finger could hardly pass. The edges of the hole were sharp, not melted, its form slightly oval.”

25. July 19, 1981, Tyumen, observer M. I. Sidorov, electric engineer.

“It was around 8 p.m. The thunderstorm was nearly over, there were practically no lightning flashes seen in the window. I was about to open the window to let in some fresh air when there came a sharp blast. My wife who stood near the sofa, her face to a glass balcony door, screamed with horror seeing how a luminous little snake flew fast through the glass into the room, immediately melted forming a bright glowing puddle on the floor that vanished right away. A piece of glass was knocked out from the balcony door glass that had the shape of a truncated cone with smaller base approximately 2 mm (inlet hole) and bigger base 6 mm (outlet hole).”

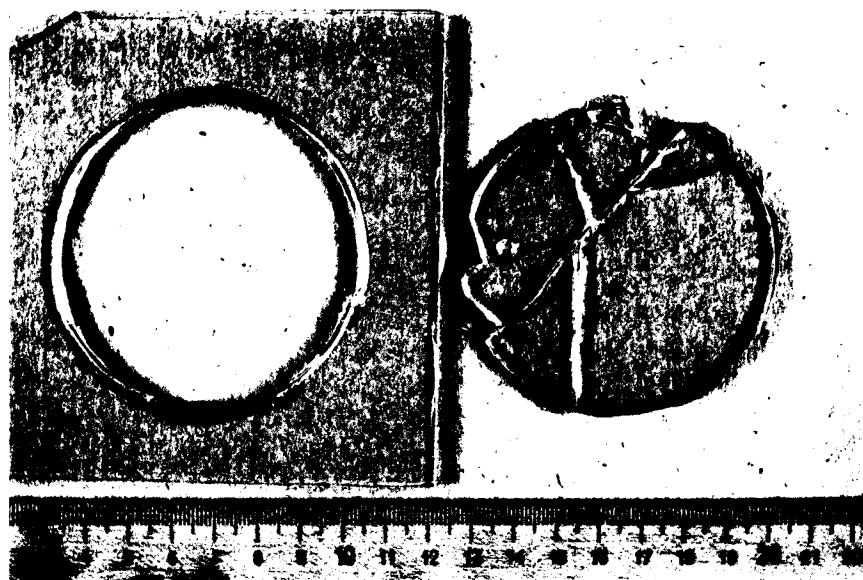


Fig. 2. Photo of window glass with a hole in it formed during a thunderstorm, and of the glass piece that fell out of this hole.

The last report is confirmed by material evidence: M. I. Sidorov has sent us at the University of Yaroslavl the damaged glass together with the knocked-out piece. It has sharp edges and shows no signs of melting. It is worth mentioning that here in Yaroslavl we receive reports on holes formed in window glass during thunderstorms rather often. Unfortunately, in the majority of cases eyewitnesses discover holes in the glass only after the thunderstorm is over and inform us only assuming that the holes were made by BL. Shown on Figure 1 are photographs of round glass pieces that fell out of window glass during thunderstorms sent to us by L. V. Nivina from Arkhangelsk and T. V. Novikov from Taganrog. In all cases the edges are very sharp and it is impossible even to speak of their melting. Shown on Figure 2 is a photograph of a window glass with a hole in it formed during a thunderstorm, and of the glass piece that fell out from this hole, sent by I. M. Barkovsky from Saratov. In the paper by Muller-Hillebrand (1965) a very similar photograph of a window glass with damage is given as an example of heat influence of ordinary lightning. But the same photograph from Muller-Hillebrand (1965) in the book by Imyanitov and Tikhy, (1980) about BL is given as an example of an effect of BL. For completeness sake is worth mentioning that the damaging of window glass described by Muller-Hillebrand (1965) and interpreted differently by Imyanitov and Tikhytook (1980) place without witnesses, as in the cases illustrated by Figure 1 and Figure 2.

In (Egely, 1987) and (Kolosovskii, 1981) thermal mechanism of BL interaction with glass is proposed. According to Egely (1987), if the heating of glass by

BL is not very strong BL passes through the glass freely. If the heating is considerable, melting and vaporization of glass as well as its cracking due to arising thermal mechanical stresses result in hole formation. In fact, the idea of thermal origin of BL interaction with glass was first proposed and experimentally tested by Kolosovskii (1981).

26. *Summer 1977, Friezino, Moscow Region.*

"Ball lightning looking like a hairy red ball approximately 5 cm is diameter approached from outside the outer glass of a double-glass window frame of a classroom situated on the second floor of a school building. In the classroom was a teacher and a group of children. A small round hole with luminous red contour was formed in the glass. Then the diameter of the hole enlarged reaching 3–4 cm, and the BL disappeared with a burst of light and loud sound. At the moment when the BL disappeared the teacher who was holding an epidiascope plugged into electric socket in his hands, experienced electric shock. The BL interacted with glass for approximately 5 seconds. As a result, the internal glass remained intact, while a round hole was formed in the external one."

It was this description that the research by Kolosovskii (1981) was based on. During examination of the damaged glass it was found that the edges of the hole were sharp, not melted as one might expect, and the glass at the edge of the hole did not have mechanical stresses. To find the mechanisms that can form such holes, experiments on glass heating by the radiation of a powerful gas laser were performed. It was established that during intense heating of glass the heated region melts and vaporizes. Then as the glass cools a ring-shaped crack forms around the melted region, and a disk containing the melted region falls out. The hole thus formed has sharp edges and does not have mechanical stresses as in BL description cited by Kolosovskii (1981).

It would thus appear that both types of glass damage in descriptions 17–25 can be explained within the framework of (Kolosovskii, 1981). In one case thermal mechanical stresses in the glass are small, the ring crack does not form and the ring does not fall out, the edges of the hole remaining melted. In the other case all proceeds according to the scenario described in (Kolosovskii, 1981), and the resulting hole has sharp edges. But there are two facts that make questionable the reality of such a simple explanation: 1) no one of the eyewitnesses has found a glass ring with melted internal edge and sharp external edge: it appears that there were no glass rings found at all; 2) it remains unclear how BL passes through glass without damaging it.

Interaction of BL with glass is not limited to the two described types: sometimes BL simply breaks the glass when passing through it.

27. *July 1956, village Tartyshevo, Bashkir Autonomous Republic, observer N. M. Jidina.*

"Heavy rain was falling outdoors, lightning flashed. My younger brother and I were home along. There was no electricity in the village. We had a "Roding"

radio set that operated when connected to a battery. Suddenly, lightning flashed and a fire ball of the size of a football flew in unexpectedly through the window. It was tinged with red and blue. We could look at it without blinking since it appeared transparent. There was a hole left in the glass 7 by 10 cm with round edges. This fire ball was flying under the ceiling slowly and silently as a soap bubble, producing blue sparking flashes approximately 1 cm long. There were a great number of these flashes flying around. It became stuffy in the room, and blue gas formed. After skirting a samovar covered by a knitted napkin that stood on the table, the ball approached the radio. After this the radio's power supply was burned out. Then, the ball flew outside, breaking the lower glass in the window."

Such a type of BL interaction with glass was also discussed by Egely (1987) and Kolosovskii (1981) within the framework of thermal mechanisms of BL acting on the glass, where the conclusion is made that such damage may occur during non-locally concentrated slow heating of glass. In this case the glass breaks or cracks appear

28. 1941–45, Leningrad, observer A. V. Lebedeva, an accountant, born in 1910.

"Our apartment is on the fifth floor. Around 6–7 p.m. the family was sitting drinking tea. A thunderstorm began and I closed the window. I went away from the window and stood near the table. At that moment the lightning flashed very close behind the window, and a golden ball tinged with red of the size of an Antonov apple separated from the window. The ball flew slowly 10 cm above the head of a boy who was sitting at the table, right before the face of a girl, silently hit the side of cupboard that stood nearby, bounced back, flew close to an electric switch and 'broke' into sparks like a Bengal light. The window glass turned out to be cut as if by a diamond. There was a crack across the side of the cupboard from bottom to the top. The switch was not damaged. The ball emitted no heat. It all lasted about 30 seconds."

It turns out that BL may form right on the glass.

29. The summer of 1941–42, Pereslavl Zalessky, observer V. S. Kirilyuk.

"In the evening a thunderstorm was about to begin, but there still was no rain. Mother came home from work, lighted the Russian furnace and was cooking food. The kitchen in our village house was small, mother was in it near the furnace, and not far away near the window were my sister and I. On the window, somewhere on the glass, appeared something like a soap bubble, as big as a half of a man's palm (no more than 15 cm). As I remember, it was not exactly a ball, but had a slightly pulled-out shape. When inside the house, it 'vibrated' for a second, like a soap bubble before breaking away from a tube. Then it flew from the window along the kitchen past three of us towards the furnace. Maneuvering between us, changing shape, gleaming, it leaped into the furnace and we lost the sight of it in the fire. It might have 'escaped' through the chimney. There was no sound. It was flying not fast (~ 1 m/s) and was moving along a curved trajectory

carefully skirting us. It lasted 3–4 seconds. My sister and I ran outside to examine the window. In that spot there was a small slot between the glass and the frame, but too narrow even for a mosquito to pass through. There was no trace of a burn or anything like it on the frame. It may have seeped through the slot, but we did not see that. Its color was a pale yellow and pink.”

Here is an example of BL interaction with glass that is even more puzzling.

30. *June–July 1938, Orenburg Region, the Yulaly mine, observer A. S. Andreev.*

“I came to the window. There was a strong rain. It was a wonderful sight: lightning was flashing, rain was as heavy as a waterfall. I stood with my face very close to the glass, my hands holding the window jambs. Suddenly a bright white ball 6 centimeters in diameter emerged outside in front of the glass. It moved right at me, and, when it struck the glass, it broke into little sparks. It all lasted only an instant. I was frightened. It turned dark in my eyes. The sound that came when the ball hit the glass was like a sharp clap. I cannot tell whether there was any trace of the strike left on the glass since I was too scared, and it was very long ago.”

31. *The summer of 1940, Sudzha, a town in Kursk Region, observer L. T. Fedorovich, an economist, born in 1920.*

“During a thunderstorm, a yellow and orange ball about 15 cm in diameter with an undefined permanently vibrating contour crawled into the room through an open upper part of the window. It was not too bright to look at. Silently and slowly it rolled along the wall. It rolled over the door where I stood leaning on the door post to the other room, continued to move towards the window at the opposite side, and crawled outside, squeezing itself through a crack in the glass 1–2 mm wide. The ball flew 20–30 cm above my head. It did not emit any heat. There were no traces left on the wall. It all took place during 1–2 minutes.”

32. *February 3, 1981, Buzuluk, a town in Orenburg Region, observer Z. A. Samoylova, born in 1903.*

“The weather was overcast, the sun could not be seen behind the clouds. There was wind, snow, the temperature was 0–1° C. About 4 p.m. I was sitting in my room, sewing. The sewing machine was on the sofa, and I was sitting on a small bench near the window. Suddenly, through the double-glass window, a fire ball as large as a football (25–27 cm in diameter) flew into the room. Inside the ball I could see a play of different colors: bright red, dark purple, and orange. It resembled the fire of burning wood in a big bonfire or of firewood in a Russian furnace. The ball illuminated the entire room, everything in it. The door to another room was open. Freely and silently, the ball flew across my room and moved rapidly to the next one. After flying 2 meters there, it stopped in the middle of the room. Its appearance changed, now it resembled a white cloud on a blue sky, or smoke, or white colored gas. Then, without moving, it dissolved in the air, disappeared, leaving the smell of burning sulfur. The entire event lasted

2–3 seconds. When I recovered my senses, I stood up, opened the balcony door, checked all electric devices—everything was all right. The smell in the room lasted for 2 hours.

33. July 1957, village Degutishky, Zarasai district, Latvia, observer N. V. Svetlova.

“During a strong thunderstorm my daughter-in-law and I were sitting at home reading. Suddenly there came a terrible clap of thunder and a fire ball, its size 6–7 cm, flew in through a closed window. When it was flying in the room there was a loud crackle. After making a circle in the room, the ball flew out through the same window.

34. June–July 1965, countryside, Kiev Region, observer A. I. Kulish, born in 1911.

“At noon a strong thunderstorm broke out. I was standing and smoking 1.5 meters from a closed window. There came a horrible clap of thunder and after some 15–20 seconds, a ball 13–15 cm in diameter flew in right through the closed window. It was light gray, not bright, like cigarette smoke. It flew slowly, constantly changing shape, as a soap bubble. Heading towards me, half a meter away, it suddenly exploded with a loud crackle, and turned into a spark that flew like a fire arrow into a socket. A cloud of smoke remained at the spot where the explosion occurred. I watched the ball for 3–4 seconds. After the explosion, I could not move for 10–15 seconds. Then I saw that the socket was burned and the wall was all black around it. It turned out later that the whole underground wire got burned. The entire wiring had to be rebuilt.”

Emergence of Ball Lightning from an Electrical Socket

We have compiled statistical data on the conditions of BL formation obtained on the basis of 1138 descriptions where our correspondents were witnesses of the fact of BL birth. In 65% of the cases, BL appears to form on conductors (see descriptions 6, 9, 16, and 21).

35. July 1974, Ivanovo, observer E. A. Kniazeva.

“The thunderstorm began early in the morning. I stood up and closed the windows and the chimney. Just as I approached the bed to go back to sleep, a terrible thunder roared and out of the radio-socket above the bed, a spark burst out like lightning, followed by a fire ball the size of a walnut. It fell on the bed and started rolling over the mattress. I stood stone-still with horror, while the ball, after rolling a meter or so, stopped, made a strange rustling sound, and bunches of sparks 20 cm long suddenly began to spurt out of it. All of this reminded me of electric welding. It all vanished as suddenly as it appeared. Only a small hole remained in the bedsheet and in the mattress.”

36. May 10, 1978, village Korotygino, Podolsk district, Moscow Region, observer T. V. Vasilyeva.

"About 10–11 a.m. a thunderstorm began. At the moment when I entered the room there came a very strong roar of thunder and the room turned bright with light. At the same instant a very bright, shining ball tinged with mauve, 16–18 cm in diameter, appeared on the light switch above the bed. The next moment the switch started to burn with yellow fire. Both fires touched the wallpaper. 'It's fire! All the village will burn!' I thought, and hit the flame as strongly as I could with the palm of my right hand, and grabbed the burning switch. The shining ball immediately fell into smaller balls that spread around the woolen blanket. It started to smell of burning wool. Both flames faded. With an effort I shook a piece of switch from my hand. Then thunder struck again, and once more a fire ball of the size of my fist appeared on the remaining part of the switch. This time the cord broke and the ball disappeared. Only then was I seized with horror. My hand was burned to the bone, the wound had a white bottom and black burned sides. The skin on the fingers was also burned and black as coal. This wound left a white scar across my palm. The first big ball lasted 2–3 seconds, while the small ones lasted 0.5 seconds. Only the pile was burned on the woolen blanket."

37. October 6, 1967, the Moscow "Vnukovo" airport building, observer N. A. Kitrossky, candidate of chemistry.

"During operation of a cleaning machine, a short-circuit occurred. At this moment from under the panel of a socket connected to the machine by a 5 m long cord, a dazzling yellow ball 10–15 cm in diameter flew out. The ball immediately headed horizontally towards a man who stood no less than 2 m from the socket. When the ball hit this man, he fell. His clothes caught on fire at the point of impact and completely burned out, leaving a hole 20 centimeters in diameter. The victim was carried to the medical room. The socket was almost completely burned, but the cord remained undamaged."

38. June–July 1953, village Troitskoe, Tulgan district, Orenburg Region, observer V. F. Prokhodtsev, a mechanic.

"At 4–5 p.m. the sky was quickly covered by a thunder cloud and lightning discharged approximately a kilometer from our house. I looked at the radio socket to be sure that the radio was unplugged, but it was plugged in. At that moment a light yellow fire ball came out of the socket with the plug in it, and started moving towards me. The ball emitted a bright light. I was sitting in the kitchen reading a book and was so frightened that I could not move. The ball changed direction and began to skirt a plant 1.5 m high and 1.5 m wide, and headed towards the window. The ball, the size of a chicken egg, moved slowly, and shone weakly. Suddenly, with a weak crackle and rustle, the ball broke into a multitude of sparks the size of a pea and spread all over the plant. To my surprise, I found no damage on the plant, when I examined it. It all lasted 5 seconds or so, and during this time, the ball flew 2.5–3 m."

39. May 28, 1977, village Novobureisky, Bureisk district, Amur Region, observer S. S. Rudnoy.

"Around 9 p.m. I was preparing to go to sleep. I turned out the lights and detached the TV antenna. Suddenly there came a loud sound like a shot. The room filled with a horrible blue white light. I lay still, afraid to move. A huge blue white ball hung at the socket, 40 cm or so in diameter. For about 5 seconds it remained unchanged, and then began to diminish. After it reached 10 cm in diameter, it remained this size for about 10 seconds, then disappeared. A green spot the size of a cigarette pack remained on the wall. It turned out that the wire leading to the socket was bare in two places. Approximately one fifth of the socket was broken away, and the antenna plug was burned off. My ears rang for two days after that shot."

The examples cited above lead to the conclusion that BL may form on electric conductors connected to radio or electric wires. However, eye witnesses report that BL may also form at compact metal objects not connected to radio or electric wires, where over voltage formation is very unlikely.

40. Early July, 1934, Ivanovo Region, observer I. N. Galkin.

"Around 6-8 p.m. a strong thunderstorm with hail broke out. I was standing beside my father and mother in the middle of the house. During a strong discharge of lightning, a bright light blue ball the size of a goose egg, covered by a multitude of small lighted needles, separated from a metal rod (1.3-1.4 m long) on which a kerosene lamp hung. After it separated, it flew in the air quietly and easily, like a toy balloon, lowering slowly to a bench near the wall. A still hot samovar was on the bench. When the ball lightning approached the upper part of the samovar, there came an explosion like rifle-shot, and the ball disappeared. From the point where we first saw it to the samovar the ball lightning traveled 3-4 m. All outside doors, furnace cover and chimney shutters were closed. On the upper cover of the samovar there were traces of melting."

This description also points to the fact that BL frequently discharges into metal objects, and is absorbed by a conductor (see descriptions 28, 34).

41. July 1976, Temirtau, a town in Karaganda Region, observer M. A. Mironova.

"The weather was cloudy, but there was no thunderstorm activity. Around 5 p.m. I heard hissing. At the same time a luminous ball that consisted of double dotted lines 2.5-3 mm thick flew through an open balcony door into the room at the height of 60-80 cm above the floor. Its color may be compared to a heated spiral of an electric stove. The ball (50-60 cm in diameter) started to spin while hanging approximately 50 cm away from the doorstep. The entire ball spun and hissed like a swarm of bees. We did not move. After spinning there for awhile, the ball began to move slowly, like a soap bubble in the air, towards the wall. It changed into a conical shape with the sharp end pointing to an electric socket. When it was only a meter from the socket, two continuous 'threads' protruded

from the cone's tip into the socket. This produced a loud noise. The entire ball was pulled into the socket. It is difficult to say how long this all lasted, perhaps about a minute. It is surprising, but the electric wiring was not damaged."

42. *Late June-early July 1975, Barnaul, observer G. E. Gustenkova, born in 1942.*

"I was working as an electrician at a high-voltage substation. Once during our shift there was a strong thunderstorm with rain. We were sitting in the machine hall where all equipment is situated. My table was near the window that was opened just a little, and the controller's table with a telephone and a radio was 12-15 meters from an empty wall. Suddenly a little snake 'crawled' into the room through the window. It flew in the air near my left ear, above the shoulder. It reminded me of a saw. The upper edge was smooth, the lower edge was saw shaped. It was approximately 0.5 m long and 1.5-2 cm wide. It was yellow blue, bright, and shined as a kerosene lamp. I could feel heat from it or smell it. The snake was not uniform in shape, but looked like it was woven of distinct 'threads'. It flew along a telephone wire to the controller's table and leaped into the telephone which made a noise and stopped working. We found out later that a coil was burned in it. The incident did not last long, a few seconds at least, but I had enough time to have a look at the 'little snake'. All equipment in the hall was grounded."

43. *August 1950- 51, the town of Syzran, observer A. I. Chekunov, a mechanical engineer.*

"Around 11 a.m. a strong thunderstorm began and lasted 7 hours. I, my aunt, and my cousins were in a central room of a 'Finnish house'. My cousin and I were sitting at the table browsing through a book. Suddenly I heard a click behind my back that reminded me of 220 V wires short circuiting. A ball shining with red light, 5-6 cm in diameter, flew between me and my cousin, stopped for awhile near my other cousin who was sitting on my aunt's lap right near the window, and with a light ringing sound slipped into a closed window. There were no traces left, either on the frame, nor on the glass. Aunt, who sat with her face to the spot where the ball appeared, said that it came out of either a telephone or a radio socket (they were close to each other). The telephone and the radio turned off."

Conclusion

Presented in Table 1 are statistical data on the disappearance of BL in 746 cases in which the BL origin was on conductors.

We mention in conclusion that, according to cited descriptions of BL and the statistical data, BL may simultaneously possess two exotic properties to which the present paper is devoted: to originate on a conductor (or to be absorbed by a conductor), and to penetrate through glass without affecting it (see descriptions 6, 9, 16, 34).

TABLE I
Peculiarities of the disappearance of BL which were born on conductors (on 746 descriptions)

BL observation stopped when it	Percent
disappeared from sight	33
exploded	20
disappeared into the ground	10
disappeared into a conductor	9
crumbled into sparks	7
faded quietly	20
provoked explosion	1

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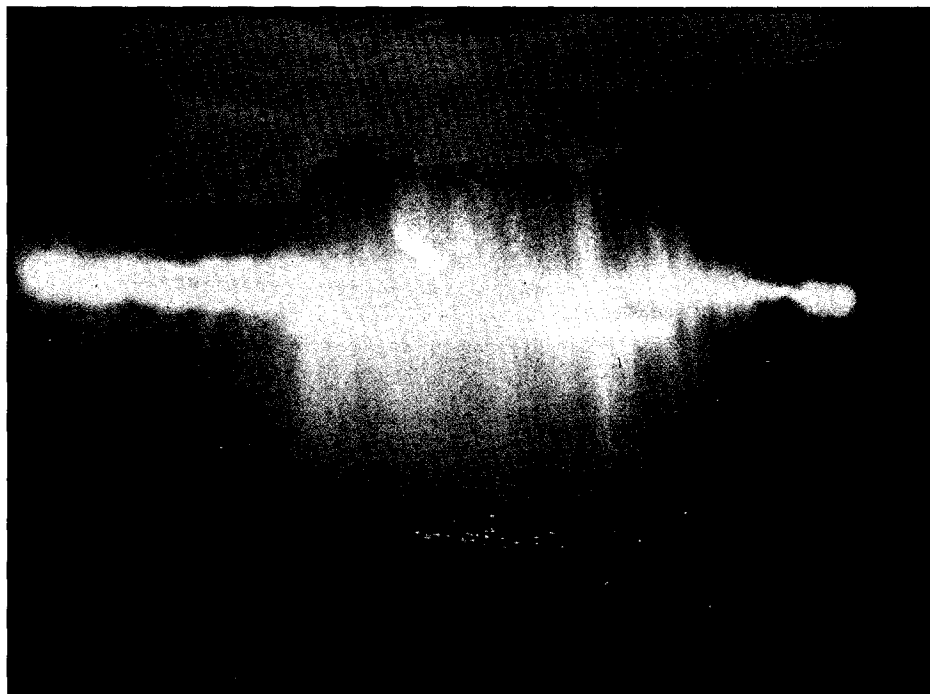
BALL LIGHTNING

EL MONASTERIO DE ¿PUNTO DE ENCUENTRO

Un monasterio español ubicado en el turolense pueblecito de Oliete ha sido durante los últimos años protagonista de diversos fenómenos "energéticos" de difícil explicación. Para el autor de este reportaje, que ha estudiado concienzudamente el caso, en este lugar se estaría manifestando una supuesta entidad muy evolucionada que demuestra una clara intención de contactar con nuestro plano dimensional. Estos son algunos de los detalles de la singular fenomenología del Monasterio de la Virgen de Arcos.

por CARLOS SCHABBATH

MA, AG-97



EN Agosto de 1978 compré una casa en Oliete, pueblo de Teruel en cuyos alrededores se encuentra el santuario de la Virgen de Arcos. Y como quiera que desde siempre he sentido un especial interés por la historia —la del santuario se remonta al siglo VIII—, su preocupante y ruinoso estado me llevó a visitarlo con frecuencia en el curso de mis caminatas. Ello me permitió comprobar que, sin embargo, la ermita que hay en el interior —y que había sido desa-

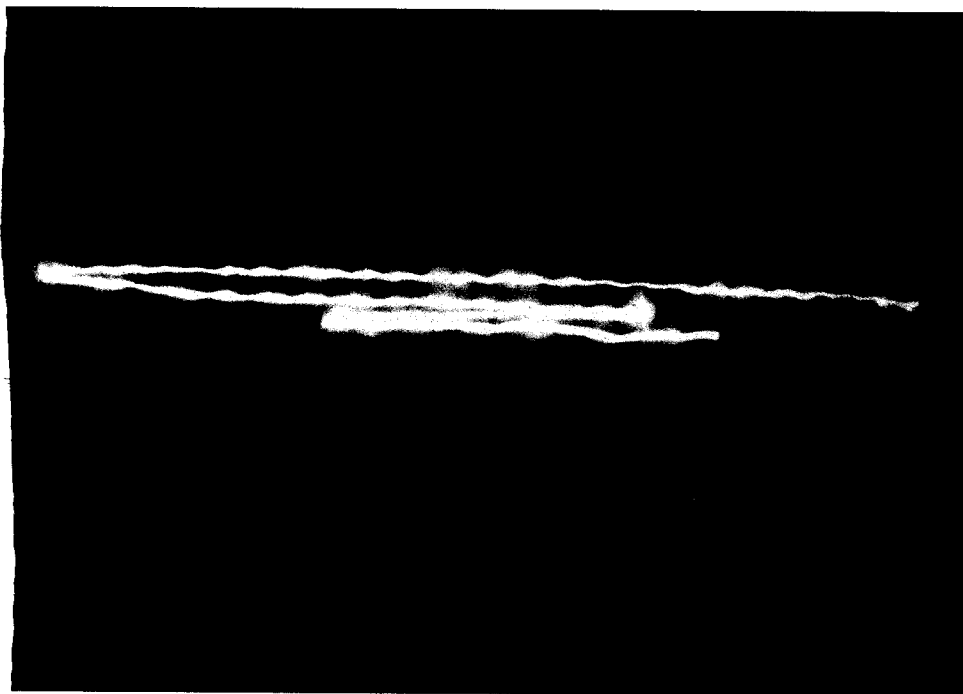
cralizada durante nuestra guerra civil— se mantenía en relativo buen estado.

Un año más tarde, en el transcurso de una de mis visitas, me sorprendió encontrar en la misma a dos "intrusas" que al parecer habían decidido instalarse en "mi" rincón favorito. En concreto, se trataba de las hermanas M. y L., quienes —tras abandonar su monasterio de Zaragoza— habían tomado la dura decisión de dedicarse a la experiencia contemplativa, pese a las reticencias de sus superiores y al hecho de carecer por completo de ayudas económicas por parte del Obispado.

Fue así cómo en aquel verano del año 1979, tras mantener largas tertulias, surgió entre nosotros una profunda amistad que habría de unirnos para siempre. El entusiasmo de las hermanas —que por razones de su vocación religiosa han solicitado mantener el anonimato— ante su nuevo proyecto de vida resultaba contagioso, pero yo no podía dejar de pensar en los terribles inviernos que les esperaban en una de las zonas más frías de España. Así que tomé la decisión de mantener mis visitas durante su primer invierno en el pueblo y ayudarlas en la medida de mis posibilidades



LA VIRGEN DE ARCOS, INTERDIMENSIONAL?



En la pág. anterior, arriba, a la izda, imagen de la fotografía tomada por los investigadores del Instituto de Investigación y Estudios Exobiológicos tomada en el prado anterior al Monasterio de la Virgen de Arcos, sito en el pueblecito turolense de Oliete, en la que puede verse la estela dejada por un tipo de energía desconocida y que no era visible a simple vista. Sobre estas líneas, la imagen después de haber sido limpiada de "ruidos" en un ordenador. En la parte inferior Carlos Schabbath y Ramón de Navia-Osorio en las dependencias del I.I.E.E.

blos colindantes, impresionados por el valor de estas dos mujeres que se habían lanzado solas a reconstruir y mantener la ermita en buen estado, decidieron echarles una mano. Patatas, cebollas, gallinas... Los alimentos se multiplicaban como en el milagro de los panes y los peces, mientras un electricista anónimo de la zona instalaba una bombilla, un carpintero colocaba una puerta y un fontanero arreglaba el aseo.

SILENCIOS CON SONIDO

El lugar era frío —con independencia de la estación del año— y el silencio resultaba indescriptible, resonando en la cabeza como un zumbido interior —en absoluto desagradable—, tan palpable que parecía poseer realidad física. Me atrevería a decir, incluso, que en ese lugar uno experimenta la sensación de una extraña presencia, siempre —por supuesto— desde mi percepción subietiva. En

complicidad se ponía de manifiesto en las sonrisas, en los guiños. Yo diría que sentía tanto respeto y admiración por aquellas dos mujeres que nuestra conexión se ejecutaba a un nivel subconsciente, para el que no existen explicaciones racionales.

De hecho, poco de lo que ocurre en torno a ese lugar —y ahora lo explicaré— tiene explicación con nuestros conocimientos actuales. Y ese es el motivo de que los misterios que rodean al monasterio de la Virgen de Arcos se vieran reflejados finalmente en un grueso expediente —el RS-235/2— en los archivos del Instituto de Investigación y Estudios Exobiológicos (I.I.E.E.) de Barcelona. Porque en opinión de los investigadores de esta entidad, el santuario es el epicentro de un fenómeno de gran complejidad que incluye —en un radio de 15 kilómetros— frecuentes avistamientos de extrañas luces esféricas de color blanquecino que han sido vistas por numerosos testigos —el I.I.E.E. tiene recogidos unos cuarenta

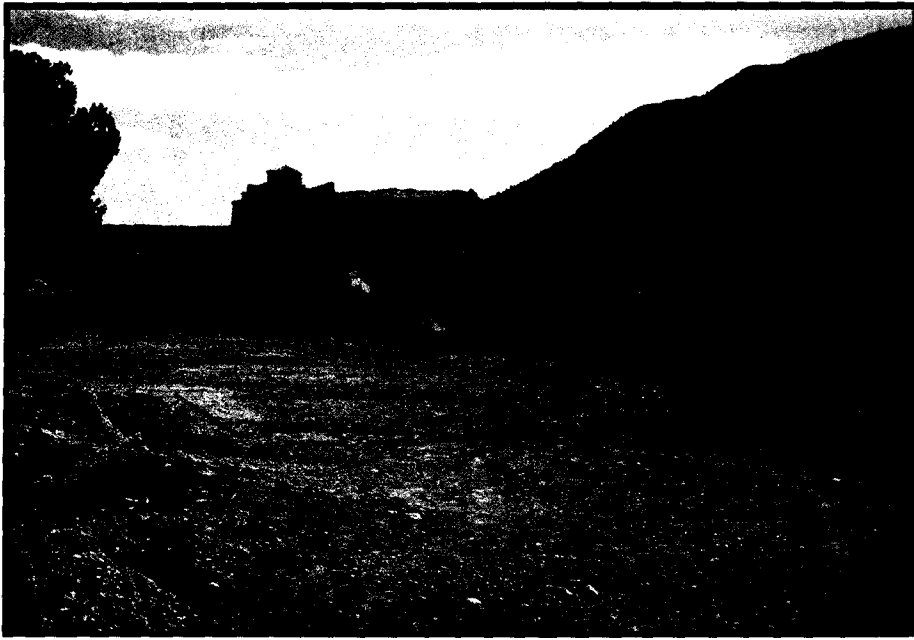
Pero, ¿se trata realmente de OVNI's? La pregunta no tiene una respuesta clara, si bien después de quince años de exhaustivos estudios —todavía lejos de concluirse—, son cada vez más los expertos que empiezan a estar convencidos de que el monasterio es uno de los casos más relevantes de la presencia de otras entidades dimensionales.

UNA ENTIDAD ESCURRIDIZA E INTELIGENTE

Bastantes años más tarde de mis primeras visitas al santuario, concretamente la noche del 19 de Septiembre de 1995, inmerso ya en mis investigaciones, la esfera energética tantas veces descrita por los lugareños pudo quedar —por fin— plasmada en la fotografía que el lector puede ver en la apertura de este reportaje. Y he de explicar a los expertos en técnicas fotográficas que podrían estar preguntándose cómo se consiguió la instantánea, que se utilizó la película más sensible disponible en el mercado, cuyo espectro oscila entre 650 y 250 nanómetros, capaz pues de captar presencias no perceptibles visualmente.

Pues bien, tras escanear la fotografía y proceder a "limpiarla" —eliminar los "ruidos", dirían los técnicos— se detectó una pequeña esfera energética de unos siete centímetros, un fenómeno que algunos científicos denominan "rayos esféricos". Sin embargo, lo curioso de estos rayos, al menos de éste en particular, es precisamente su comportamiento "inteligente". ¿Y por qué afirmo eso?

**Los expertos del
Instituto de
Investigación y Estudios
Exobiológicos consideran
que el Monasterio de la
Virgen de Arcos es el
epicentro de un
fenómeno de gran
complejidad que incluye
avistamientos de OVNI's,**



Sobre estas líneas, vista general del Monasterio de la Virgen de Arcos, en cuyo interior las hermanas M. y L. protagonizaron la curiosa experiencia visual que puede verse en la parte inferior y que recogió la cámara fotográfica, con una esfera luminosa que se posa sobre la mano de una de ellas en el momento de la comunión.

Pocos días después de conseguir la fotografía, ocho expertos del I.I.E.E. rastrearon la zona midiendo el nivel de radiación con un contador Geiger. Pues bien, en el punto central donde había acaecido el fenómeno luminoso, el aparato, por primera vez en la historia del instituto, dejó de funcionar sin explicación alguna. Y continuó inservible, aunque se revisó el mecanismo y se cambiaron las pilas. Y claro, cuando la empresa subsidiaria alemana que se ocupa de la reparación de tales instrumentos nos notificó que nuestro contador Geiger funcionaba perfectamente, la cosa nos empezó a parecer realmente extraña. ¿"Qué" nos había impedido medir la cantidad de radiación de la zona y, así, saber algo más con respecto a la naturaleza energética de la "esfera"?

Los análisis fotográficos mostraron otros aspectos de sumo interés. Por ejemplo, el hecho de que los pequeños puntos luminosos de la instantánea estaban causados por la refle-

cción de la fuente emisora de la radiación sobre unos pequeños cristales pertenecientes a una botella rota que estaba en el suelo, demostrando la realidad física de esa fuente luminosa. ¿Fue ese hecho "intencionado"? ¿Pretendía la "esfera energética" dejar así constancia no sólo de su existencia, sino de que es una energía de alto nivel vibratorio que manifiesta inteligencia?

Tengo que decir que la reacción de las hermanas cuando se les mostró la fotografía resultó aún más interesante si cabe. Porque una suave

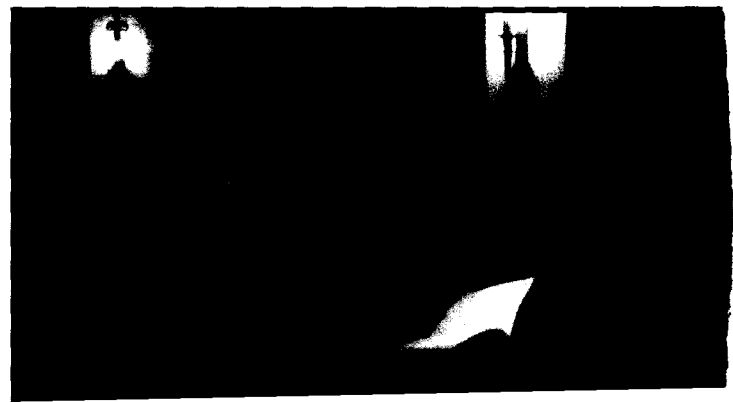
"Nos encontramos ante una entidad informe de alto nivel vibratorio que manifiesta inteligencia, una entidad no detectable visualmente pero que emite una radiación sensible a la película fotográfica."

sonrisa de complicidad dio paso a una inocente confesión por su parte: ellas también tenían sus propias fotografías: dos instantáneas que nos mostraron con cautela antes de pasar a relatarnos cómo habían sido obtenidas.

Y así, nos explicaron que cuando finalmente el Obispado reconoció su labor —merced, todo hay que decirlo, a las múltiples visitas que el santuario recibiría de gente procedente no sólo de España sino de todo el mundo—, el propio obispo viajó hasta el lugar para oficiar una misa, consagrandolo a ambas como monjas. Pues bien, durante esa celebración la "esfera energética" hizo acto de presencia, dejando constancia de ello en las dos fotografías que uno de los asistentes —un parraco de pueblo—, realizó con una sencilla cámara. ¿Un nuevo indicio de que las esferas luminosas podrían ser en realidad la manifestación física de entidades de otros planos vibratorios?

Porque quizá lo más destacado de este fenómeno sea el hecho de la aparente "intencionalidad" del mismo, la voluntad de interferencia de esa entidad en nuestra realidad espacio-temporal demostrando poseer inteligencia propia.

Personalmente, y tras una exhaustiva investigación, entiendo que la "entidad" que se manifiesta en forma de "esfera luminosa" —como es denominada por unos—, "rayo esférico" —por otros— y OVNI's —por algunos más—, posee una altísima vibración, por lo que podemos deducir que las sutilísimas partículas de su "vehículo corporal" deben encontrarse bastante liberadas del influjo de los campos gravitatorios. Es decir, se trataría de una "esfera energética" que ha superado los mundos de las formas arquetípicas. Ahora bien, ¿"quién" o "qué" se esconde detrás de esa manifestación inteligente de energía? Me temo que la respuesta aún habrá de esperar. ☉



FOO FIGHTERS, FENÓMENO FÍSICO

**Abelardo Hernández
y Alberto Borrás Gabarró**

Con cierta frecuencia, la naturaleza nos ofrece acontecimientos insólitos cuyo origen ha permanecido en el misterio a lo largo de los siglos. Uno de éstos son los "foo fighters": esferas resplandecientes que aparecen y desaparecen fugazmente dejando a los testigos sumidos en el asombro y la perplejidad. ¿Son, como a veces se ha sugerido, entidades de origen inteligente o, por el contrario, se trata de objetos naturales cuya existencia puede ser explicada por la ciencia? El presente trabajo muestra una breve panorámica de esta casuística, aventurándose a emitir algunas hipótesis que acaso podrían dar cuenta del fenómeno.

BALL LIGHTNING

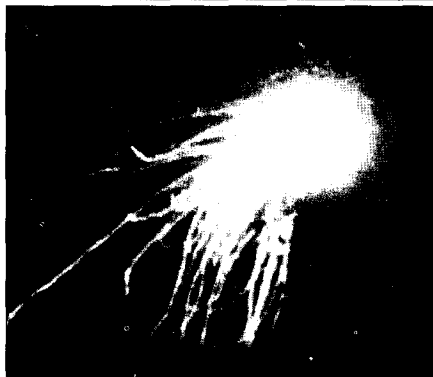
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tachar aquella visión de simple
alucinación o de mentira prefabricada. Y ésa fue justamente la
suerte que debieron
correr otras muchas per-
sonas que a lo largo de
los siglos no recibieron
sino burlas, críticas o –la
mayor parte de las
veces– el más olímpico
desprecio. Pero otro tan-
to les sucedió a quienes
informaban haber visto
caer piedras envueltas
en llamas; las
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racionales de
que semejantes
acontecimien-
tos pudieran
suceder fueron
suprimidas de
un plumazo por
la famosa sen-
tencia del cien-
tífico francés
Lavoisier: “No
pueden caer

piedras del cielo, porque en el cie-
lo no hay piedras”. Al parecer,
tampoco podían existir bolas ígneas
que se pasearan impunemente

Es un fenómeno conocido desde la antigüedad. En el s. VI de nuestra era, san Gregorio de Tours asistía a una ceremonia religiosa cuando una resplandeciente bola de fuego apareció súbitamente por los aires sobre las autoridades laicas y eclesiásticas. Según las crónicas, el suceso resultó tan impresionante que los integrantes del cortejo se arrojaron al suelo atenzados por el terror. No es extraño que aquellas buenas gentes interpretaran el hecho como un milagro. Todavía hoy los científicos no han conseguido explicar el misterio de las bolas de fuego.



Fotografía tomada de madrugada en Yorkshire (Gran Bretaña). El fotógrafo dejó abierto el objetivo con el fin de registrar el desplazamiento de la bola luminosa.

Bola fotografiada durante una tormenta en 1951. Poco antes de tocar el suelo, estalló produciendo una especie de “fuegos de artificios”.

sobre las cabezas de los más altos dignatarios eclesiásticos.

Hablando de observadores cualificados –al menos desde el punto

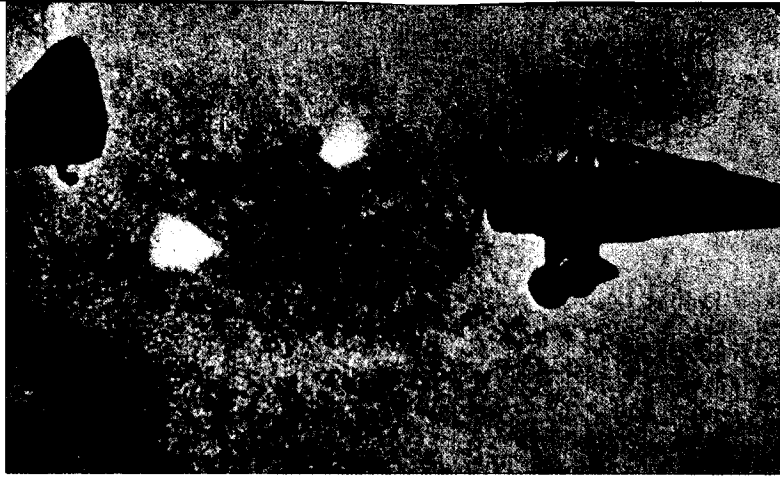
de vista de su consideración social– es imposible no recordar una anécdota protagonizada por aquel personaje singular que fue Pedro II de Alcántara, emperador del Brasil durante casi cincuenta años. Se hallaba reunida la prestigiosa Academia Francesa de Ciencias para examinar los testimonios de quienes aseguraban haber contemplado numerosas bolas resplandecientes con ocasión de una tormenta sucedida en 1890. Los testimonios –procedentes fundamentalmente de campesinos– decían haber visto varios de tan inquietantes objetos. Éstos incluso llegaron a penetrar en algunos hogares por las chimeneas o ventanas, habiéndose paseado durante un corto tiempo por la vivienda, saliendo poco después de ella, o bien explotando con gran violencia en su interior.

Tras examinar y debatir acaloradamente algunas declaraciones de los testigos, uno de los académicos llegó a la tajante conclusión de que las observaciones, sobre todo si procedían de individuos rústicos,

En una granja de Salagnac, en Correze (Francia), una bola de fuego causa la alarma a dos muchachas, pero la única víctima es un cerdo del establo contiguo. (Mary Evans Picture Library).



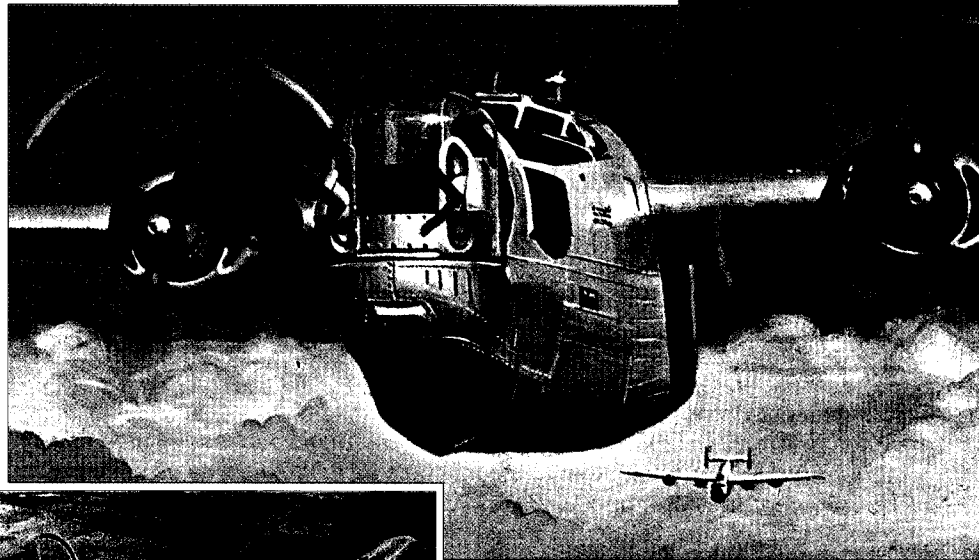
carecían de valor científico alguno. En esas, don Pedro se levantó del puesto que ocupaba como miembro honorífico de la Academia y le dijo al ilustre ponente que él mismo había visto bolas con sus propios ojos, bolas de fuego en todo semejantes a las que habían sido descritas por los campesinos.



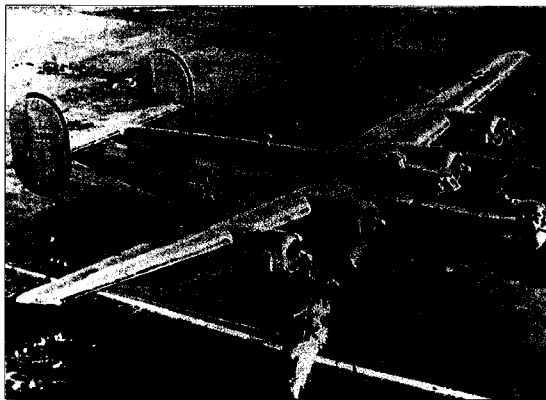
Una de las más célebres fotografías de "foo fighters" tomada durante la Segunda Guerra Mundial.



Testimonio imperial o no, es poco o nada probable que el dictamen científico de la Academia se viera alterado en lo más mínimo por las observaciones personales de don Pedro. Como dijera en cierta ocasión un científico cuyo nombre más vale olvidar piadosamente "si los hechos no concuerdan con mi teoría, habrá que cambiar los hechos". Y no se trata de una simple anécdota. Como ejemplo, cabe citar la actitud de un científico canadiense llamado Edward Argyll. Este caballero liquida las bolas de fuego archivándolas como simples "ilusiones ópticas" creadas cuando un observador contempla a corta distancia la caída de un rayo vulgar. El tremendo brillo es tan cegador que deslumbra al testigo, haciéndole creer que está viendo un punto brillante esférico. Pero, ¿qué hacer en los casos en los cuales se han desplazado durante un cierto tiempo, causando incluso quemaduras a las personas a medida que establecían contacto físico con ellas? Pues, sencillamente, se prescinde de ellas. "Si la bola luminosa es realmente una ilusión óptica -dice Argyll- no parece irracional caracterizar esos informes como 'poco fiables'". Con semejantes criterios se confecciona el "lecho de Procusto" de la vieja mitología grecorromana. Si a un fulano le sobresalen los pies de la cama, para ajustar uno a otro no es preciso alargar el mueble: basta con cortar un poco por arriba y por abajo las extremidades del sujeto.



Brian Withams ilustró el caso de un bombardero norteamericano B-24 Liberator, como el que aparece en la fotografía, que sufrió el "acoso" de dos "foo fighters".



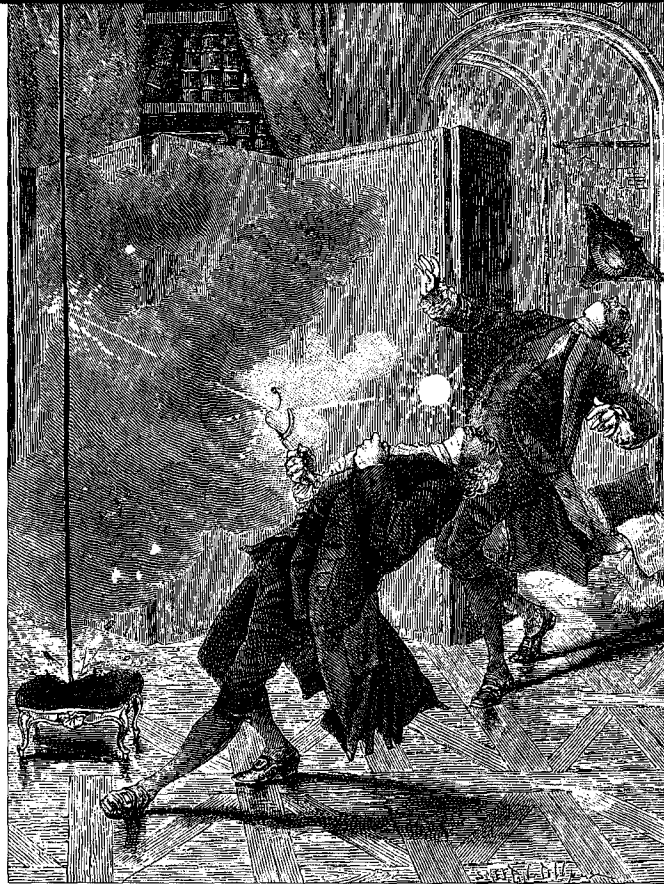
Pero tampoco hay que cargar las tintas excesivamente sobre la incredulidad de los científicos que vivieron en tiempos pretéritos. La explicación más simple quizá proviniera de un hecho fundamental: probablemente tanto los meteoritos como las bolas de fuego son fenómenos demasiado infrecuentes en la naturaleza; consecuentemente, el número de sus testigos también lo es. Por fortuna, también en épocas posteriores ha habido observadores de tanta fiabilidad como los altos personajes de antaño. Incluso científicos. ¿Algunos ejemplos? En 1967 fue un químico ruso llamado M.T. Dimitriev quien observó una bola de fuego junto al río

Omega. En 1933, el doctor Stanley Singer, un experto en la evaluación de los daños causados por tormentas, tomó casualmente la imagen de un "rayo esférico" cuando fotografiaba diversos tipos de descargas eléctricas durante una tormenta. Incluso la prestigiosa revista *Nature* publicó en 1991 el trabajo de un físico británico llamado Brian Pippard, quien aseguró haber visto varias de estas bolas luminosas en compañía de otros científicos. Sólo algunos ejemplos entre otros muchos casos.



¡Cruceros de los rayos!

Mas lo cierto es que nadie conoce la naturaleza real del fenómeno, y la mejor prueba de ello es que jamás ha podido ser reproducido en un laboratorio, aunque hace ya tres o cuatro años un equipo de científicos japoneses aseguró haber fabricado "objetos" semejantes. Lo único que se sabe casi con certeza hasta el momento es que parecen ser de naturaleza eléctrica y que la mayoría de las veces —pero no todas— aparecen en el curso de una tormenta. La mayoría de las observaciones las han descrito como esferas resplandecientes de pequeño diámetro —entre 10 y 30 centímetros—, una coloración blanca, roja o naranja y, menos frecuentemente, verde o azul. Algunos físicos teóricos hablan entonces de "rayos en bola" y han especulado con el concepto del plasma para explicar su génesis. Este plasma, que con fre-



El científico ruso Richmann resultó muerto a consecuencia de una bola de fuego durante un experimento en San Petersburgo. (Mary Evans Picture Library).

cuencia ha sido definido como un cuarto estado de la materia —ni sólido ni líquido ni gaseoso— se hallaría compuesto por una esfera de gas ionizado a muy altas temperaturas. Plasma es el componente fundamental de una estrella en ignición y plasma es también esa diminuta y potentísima esfera cegadora que se ha formado en los reactores experimentales de fusión durante algunas fracciones de segundo cuando los núcleos de hidrógeno se unen desprendiendo enormes cantidades de energía: en suma, una estrella

en miniatura. Claro que, si estas brillantes esferas estuvieran hechas de plasma, se plantearía un problema científico de no pequeño calibre. Pues si en la actualidad no disfrutamos ya de la energía inagotable que nos promete la fusión atómica, es porque los científicos no saben cómo mantener la bola de fuego que describíamos dentro de los límites físicos del reactor. Ningún contenedor material sería capaz de retenerla en su seno sin quedar absolutamente volatilizado. En la actualidad, los investigadores la están manteniendo virtualmente suspendida en el espacio, como en un truco de prestidigitador, mediante poderosos campos magnéticos tan intensos —en los dispositivos llamados de "confinamiento magnético"— que su producción se lleva buena parte

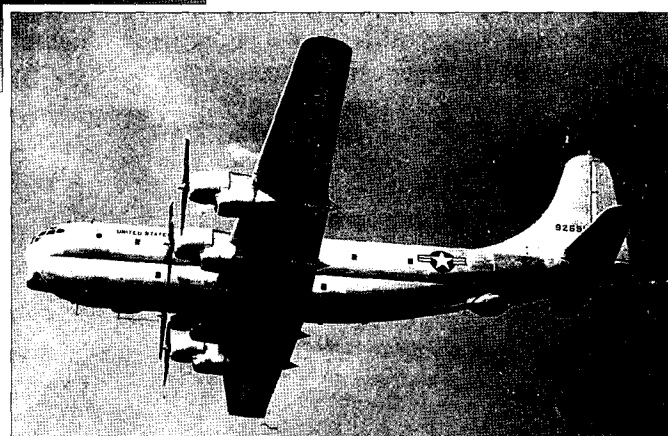
de la energía que genera el reactor. Pero, al parecer, los "rayos en bola" flotan alegremente por el espacio como (don) Pedro por su casa. ¿Cómo puede tener ese plasma la impudicia de hacerlo sin contar con un laboratorio de fusión adecuadamente equipado?

Porque, sin duda, las esferas de fuego viajan con la despreocupación propia de quien ignora estar vulnerando tanto las leyes físicas como los reglamentos aéreos internacionales. En 1960, la tripulación de un avión cisterna KC-97 de las Fuerzas Aereas norteamericanas que volaba a casi seis kilómetros de altitud se vio sorprendida por la presencia de un inesperado visitante:

una bola resplandeciente de casi medio metro de diámetro se colaba en la cabina y, tras evolucionar de acá para allá entre el personal de a bordo, salía de nuevo a cielo abierto sin causar el más mínimo daño a los seres humanos, al instrumental ni a la estructura de la aeronave. Valga la anécdota para ilustrar otra curiosa característica del fenó-

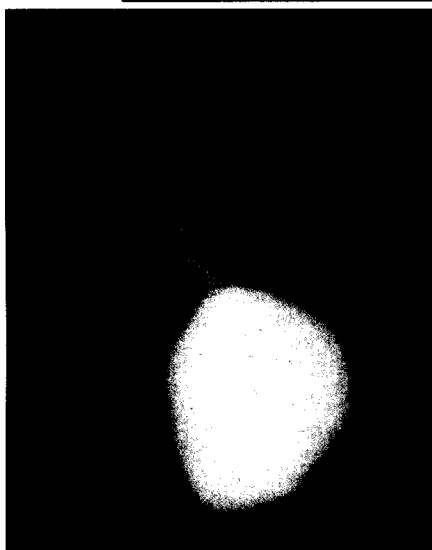


Dos aspectos de un avión cisterna KC-97, tal vez el mismo que en 1960 recibió la inesperada visita de un rayo en bola que, tras atravesar el fuselaje, recorrió el interior del aparato ante el asombro de la tripulación para luego irse como había venido, sin causar daño alguno.



meno. Característica atribuida tradicionalmente a las almas en pena, las bolas de fuego también son capaces de atravesar limpiamente las paredes y cualesquiera otros obstáculos materiales que se interpongan en su camino. Si, como parece, el hecho se produce realmente, ello implicaría algún tipo de "permeabilidad" a nivel atómico. El objeto pasa a través de la materia sin que sus partículas subatómicas choquen contra las de la barrera que atraviesa. Pero no nos asombremos en exceso: también las ondas radioeléctricas lo hacen y, con seguridad, ellas no son objetos de otra dimensión.

¿Podríamos incluir en la categoría de bolas de fuego a estas misteriosas esferas de luz conocidas como "foo fighters"?, de las que tantas veces se ha hablado? Sin entrar a juzgar la compleja casuística ovni, es probable que algunos de tales objetos fueran estos supuestos prodigios de la naturaleza cuyas evoluciones, como ya hemos visto, parecen sugerir el tranquilo andar de un paseante sobrenatural que no pretendiera causar daño alguno a sus asustados observadores.



En contra de lo que se pensaba, los aviones con cabina presurizada también pueden ser visitados por rayos en bola. Al menos hay un caso registrado en un Boeing 747.

Los meteoritos emiten un resplandor luminoso cuando entran en contacto con la atmósfera terrestre. Al surcar el cielo aumentan su temperatura para después quemarse y precipitarse sobre la tierra. Este meteorito, que fue fotografiado en estado incandescente el 24 de marzo de 1933 al sur de Estados Unidos, se encontraba a una altura de 40 kilómetros.

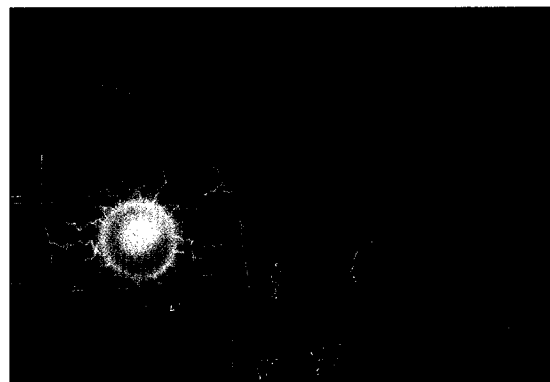


Que su andar sea tranquilo no significa que sea inofensivo. Porque los físicos han especulado con la posibilidad de que esta superdensa concentración de energía se halle a una temperatura próxima a los 30.000 grados centígrados. La pregunta del millón en este caso podría ser la siguiente: si en verdad se hallan a tan alta temperatura ¿por qué, en lugar de elevarse como globos de aire caliente, flotan y se desplazan tanto en sentido vertical como horizontal? ¿Y cuál es la razón de que ese intenso calor no se disipe inmediatamente en el aire? Pues recordemos que algunas de esas bolas de fuego han sido observadas durante tiempos inusualmente largos, del orden de treinta segundos.

Y La última interpretación que trata de explicar la génesis del fenómeno ha venido de Antonio Fernández-Rañada, un prestigioso científico español perteneciente a la Universidad Complutense de Madrid, que ha visto su trabajo publicado en *Nature*. La hipótesis de Fernández-Rañada para dar cuenta de los "rayos en bola" se basa en una teoría que el mismo había elaborado hace cinco años: la del nudo electromagnético. Una entidad difícil de describir sin recurrir a las matemáticas, pero que vendría a ser algo así como un ovillo cuya estructura está formada, no por hilos, sino por líneas de campo magnético. Como su nombre indica, los campos electromagnéticos son una combinación de campos eléctricos y magnéticos, engendrando la variación de uno de ellos la existencia del otro, y así

sucesivamente. Cuando estos campos se ensamblan varias veces y se refuerzan mutuamente, se genera una presión hacia el interior que mantiene cohesionada toda la estructura. En suma, una especie de "botella magnética" similar a las que describíamos al hablar de los reactores de fusión atómica, dentro de la cual queda almacenada la energía durante un tiempo inusualmente largo en relación a la vida media de este tipo de fenómenos. Si así fuera, sólo falta ya producirlos.

Abelardo Hernández

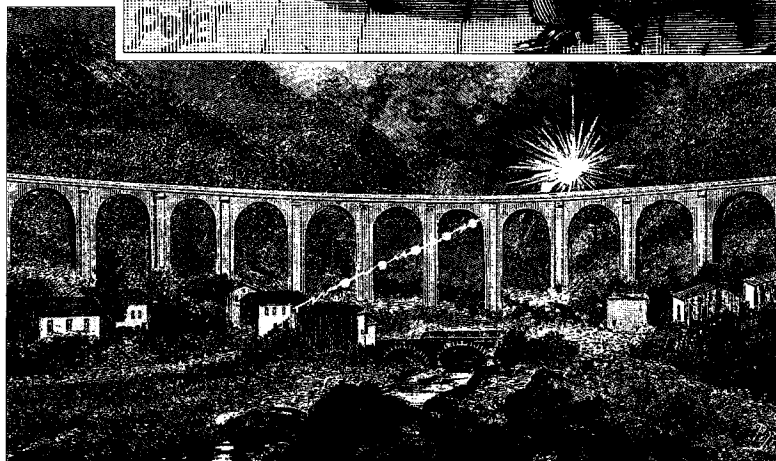
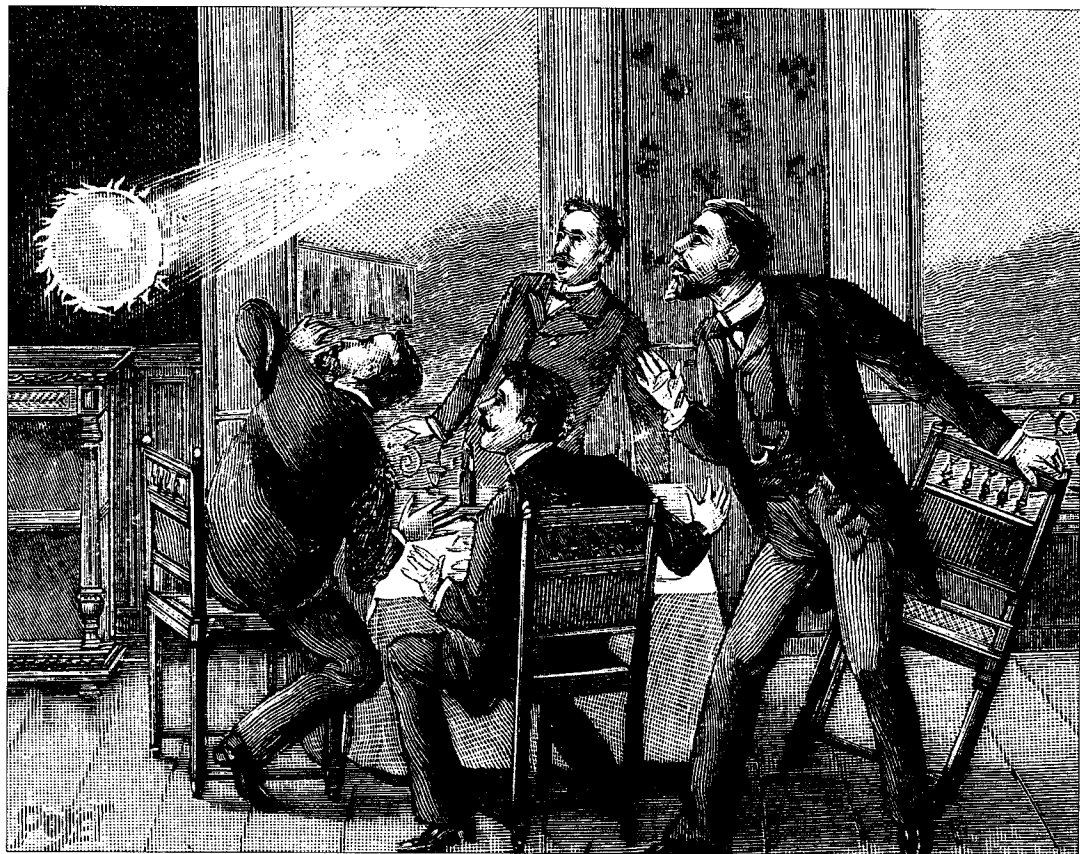


Los llamados rayos en bola, RB, se producen naturalmente en las tormentas, sobre todo cuando éstas se relacionan a tornados, más frecuentes en las latitudes semitropicales o en las zonas de Estados Unidos del Sur; por eso, la mayor

parte de sus observaciones actuales proceden de allí. También se han registrado en accidentes "tecnológicos" como, por ejemplo, descargas eléctricas de altísima intensidad y bajo voltaje. Su forma no parece ser esférica, sino tórica —de rosquilla o mejor de donut— con un mínimo hueco central. Su luminosidad produce un deslumbramiento que hace difícil apreciar su forma exacta, sobre todo cuando el donut se comprime por los lados y el "tubo" se aplasta, simulando una forma esférica. Es lo que se llama **Plasmoide anillado en vórtice** (*Plasmoid vortex ring*), el cual integra una suerte de movimiento rotatorio interno que mantiene su coherencia, estabilidad y forma durante un tiempo relativamente largo.

Es el mismo fenómeno de los anillos de humo que hábiles fumadores logran con los labios, o que cualquiera puede conseguir llenando de humo de tabaco una caja de cartulina con un agujerito y dándole unos golpecitos. Así como el humo normal se mezcla y difunde con el aire que le rodea, que acaba enturbiándose y transformándose en neblina, estos anillos de humo mantienen su individualidad mientras se desplazan lentamente. Su movimiento no se debe a un empuje inicial del soplo del fumador o de la caja, sino a que su movimiento rotatorio los empuja a través del aire. Suponiendo una rotación del "tubo cerrado sobre sí mismo", nos encontramos que la

Lejos de románticas especulaciones, los tal vez inadecuadamente llamados rayos en bola —puesto que en realidad suelen tener forma toroidal— son un fenómeno físico conocido, aunque, tanto en su génesis como en su comportamiento, constituyen un apasionante enigma que nos pone en relación con aspectos desconocidos de la electricidad y, una vez más, parecen confirmar la existencia de la "energía libre".

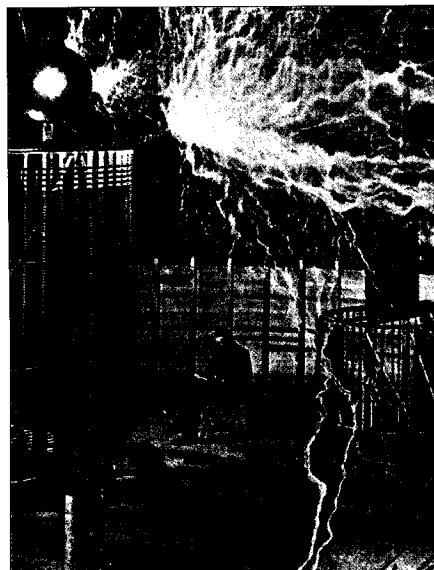


En Gorges du Loup (cerca de Niza), una bola de fuego entró en la habitación de Louis Otto que se encontraba junto a tres compañeros. A la izquierda, se puede contemplar la trayectoria que, según los testigos, siguió el rayo en bola antes de entrar en la casa. (Mary Evans Picture Library).

parte externa presenta una superficie mucho mayor que la interna. Este fenómeno, debido al principio de reacción, crea una diferencia entre el pequeño empuje hacia adelante de la zona central y el grande de la periferia hacia atrás, con una resultante a favor de este último; fuerza resultante que, finalmente, hace avanzar el anillo. En los RB que se desplazan lentamente en trayectorias aparentemente caprichosas sucedería algo similar.

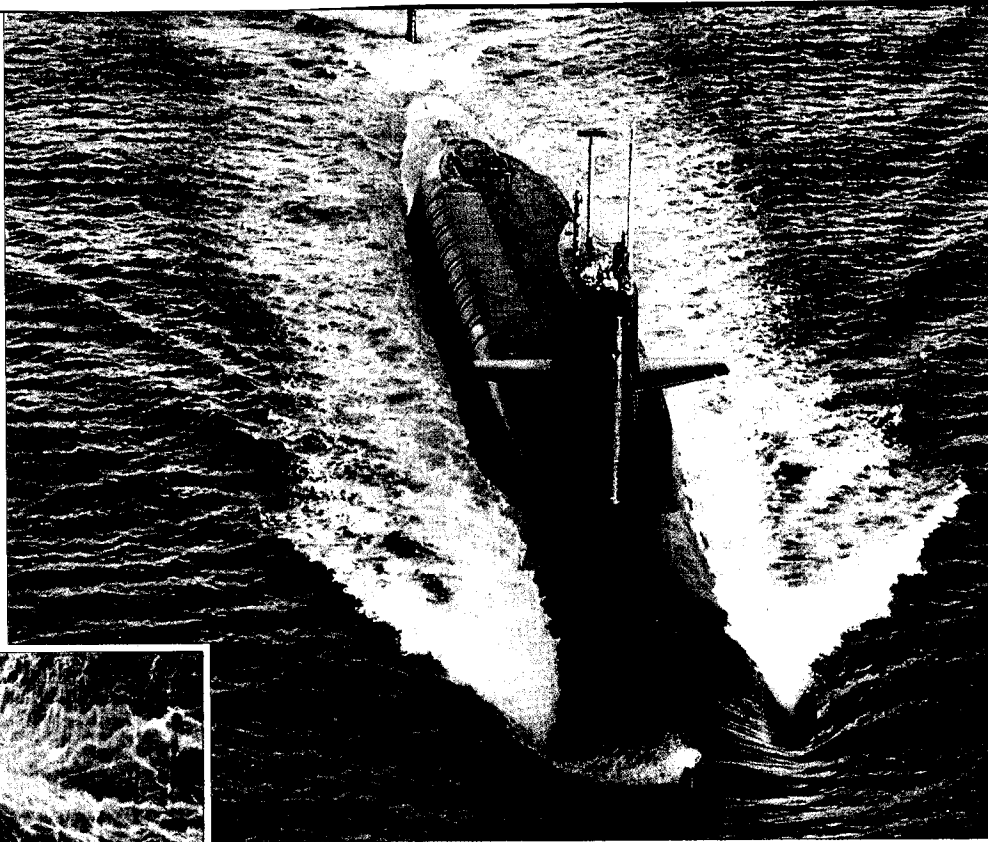
Lo más sorprendente de los RB es su capacidad de penetración sin perder su forma en los aviones militares, cuyas cabinas tienen una amplia parte acristalada hecha en metacrilato o plásticos similares, la cual está ensamblada con nervios metálicos, lo que sugiere un comportamiento de "efecto túnel". En tiempo no tormentoso, la formación de estos fenómenos en los aviones podría iniciarse con un "fuego de San

Telmo" que, en determinadas condiciones de humedad, evoluciona de la siguiente forma: en los extremos de las alas la sobrepresión inferior que se escapa hacia la depresión superior produce alrededor de este borde externo un componente rotatorio con características de vórtice. Y es precisamente este vórtice el que podría constituir el núcleo del RB, que de este modo no necesitaría para su formación una tormenta con aparato eléctrico. En el caso de una tormenta, cuando una chispa alcanza el avión puede producir un pequeño agujero y formarse el RB dentro del fuselaje, como los anillos de humo que salían del poro de la caja. Así ocurría principalmente en los antiguos aviones no presurizados. Sólo se conoce un caso de RB en aviones con cabinas a presión —en un Boeing 747— que, según información suministrada por la Boeing Corp., acabó sin graves consecuencias.



En los submarinos en inmersión equipados con baterías de enorme capacidad e intensidades de miles de amperios (hasta 100.000 A., eso sí, durante cortos intervalos de tiempo), estos RB probablemente se han formado por una utilización errónea de los interruptores cuando se desconecta o se invierte el sentido de la corriente para dar marcha atrás al navío. Estos RB, de menor tamaño que los naturales, han viajado durante 30 segundos por el interior del casco, colándose por las compuertas hasta terminar estallando. Eran de color verde, quizá por acarrear algunos átomos de cobre del interruptor que se quemaba. El comandante Stuart Albert logró fotografiar uno en la sala de máquinas de su submarino.

Es difícil hallar una explicación para justificar la larga persistencia y estabilidad que suele mostrar el fenómeno. Una sería la "cohesión y oclusión accidental de la Energía



Generados por sus propios equipos eléctricos, los submarinos en inmersión han sido recorridos a veces por rayos en bola de pequeño diámetro.

Las grandes bobinas de electrodos esféricos creadas por Nikola Tesla producían ocasionalmente rayos en bola.

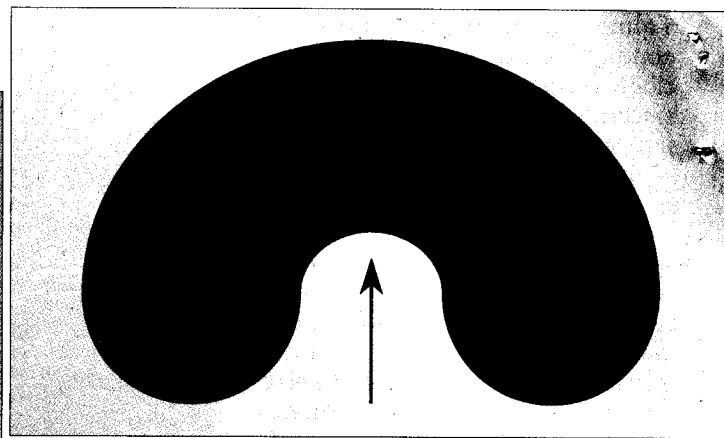
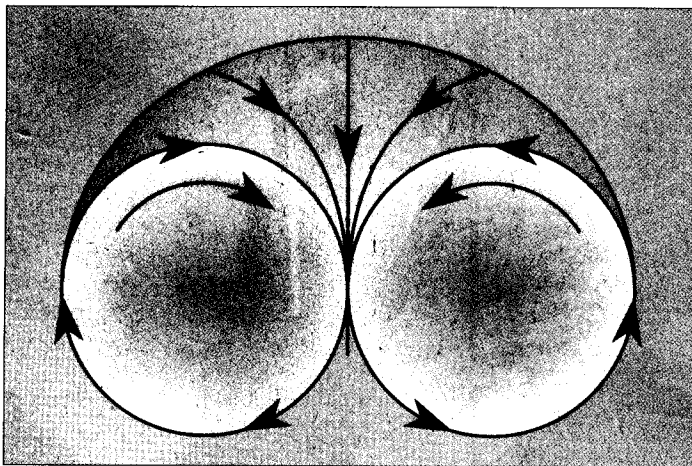
del Punto Cero (EPC)", lo que además explicaría su alto contenido energético y su sorprendente comportamiento de efecto túnel capaz de atravesar algunos materiales. Esto se apoyaría en que los vórtices, incluidos en los tornados, que se asocian a los RB, se consideran sistemas capaces de cohesionar esta EPC. Han sido los investigadores interesados en esta EPC, para desviarla dimensionalmente hacia una energía utilizable (sistemas de Energía Libre), los que más se han interesado en los RB y han desarrollado procedimientos para producirlos. Los RB se podrían comportar como Tokamak naturales. El Tokamak es el toroide (¡el donut!) de confinamiento magnético de plasma para ensayos de Fusión Nuclear. Los potentes campos magnéticos que lo rodean mantienen alejado de las paredes el plasma que se encuentra a una temperatura de 10 o 12 millones de grados.

Los RB están formados por plasma, pero la rotación de las cargas eléctricas del toro que los compone crearía un campo magnético que confinaría la parte más caliente en el centro, como ocurre en los Tokamak. Así se explicaría que, manteniendo esa forma que sugiere una temperatura externa aparentemente fría, al estallar liberen en forma de calor la energía que tenían confinada, tanta que en algunos casos se ha producido la ebullición repentina de una gran tina de agua.

Nikola Tesla ya observó ocasionalmente RB en las grandes bobinas con electrodo esférico que llevan su nombre. Que se generen en estas bobinas de altísimos voltajes e intensidades ridículas parece contradecir a otros sistemas de altas



Plasmoide toroidal que se vería como una forma cercana a la esfera.



Sección de un anillo de humo que se desplazaría en la dirección indicada por la flecha.

intensidades que se han utilizado para formarlos. Otros investigadores han usado cátodos en disco o una especie de cañón cónico. Los campos magnéticos de polaridad opuesta también se han asociado a los RB, ya que en estas bobinas de Tesla pueden ser generados por bruscas oscilaciones de fase. Algunos autores especializados en EPC y Energía Libre, como Moray B. King, suponen que la oscilación abrupta y repentina de los campos magnéticos en oposición de fase incrementan la tensión de la estructura del espacio-tiempo, causando una "involución espacial" que gira 90° el flujo de EPC hacia nuestro espacio tridimensional. A ello se debería la enorme energía liberada por estos RB que, sin embargo, se generan partiendo de energías muy inferiores.

Moray B. King propone un procedimiento para producir estos RB de una manera reproducible en las bobinas de Tesla. Se trata de man-

tener un vórtice de vapor de agua sobre el cátodo de su bobina, manteniendo el ánodo en la parte superior del vórtice. De acuerdo con este autor, el vórtice rotatorio combinado con los campos electromagnéticos de alta frecuencia en oposición de fase liberarían un pedacito de EPC que formaría el rayo en bola dotado de una energía muchísimo mayor que la que debería proporcionar la bobina.

Otros investigadores los han conseguido cortocircuitando corrientes de 60 ciclos y una intensidad "tan baja" como 1.200 amperios, entre electrodos de cobre y aluminio sumergidos bajo 1,25 cm de agua. Estos RB median unos 6 mm y duraban del orden de 5 segundos, hasta que por fin estallaban. En este caso, parece que su energía procedía de la corriente.

Los japoneses como T. Matsumoto, que han profundizado en los mecanismos de liberación de energía durante la Fusión Fría (una

serie de publicaciones en Fusion Technology), han producido plasmoides RB de tamaño microscópico (9,5 micras de diámetro) en las superficies de los electrodos de las células de Fusión Fría, de los cuales incluso se han publicado imágenes. Matsumoto supone que en la zona de anillo de éstos que ha fotografiado se producen transmutaciones nucleares, lo que explicaría el exceso de energía liberado en la Fusión Fría. Nos encontramos, pues, ante tamaños muy diversos de los RB, desde los microscópicos hasta algunos formados en los tornados, estimados en un tamaño de 50 pies (15 m), pasando por los medianos, observados en aviones y submarinos.

Volviendo a los más grandes RB producidos en fenómenos naturales como los tornados, el problema es que la mayoría de las personas que tienen la mala suerte de hallarse en el núcleo de uno no sobreviven, y los que consiguen salvarse no están para observaciones científicas. Así sucedió con el tornado Silverton, que el 15 de mayo de 1957 mató a 20 personas en Texas. Un observador que se encontró atrapado en su interior dijo haber visto una enorme luz en forma de anillo, de 12 a 15 m de diámetro, a unos 12 m del suelo. Por suerte para la ciencia, ha habido al menos un caso en el cual dos meteorólogos entrenados pudieron sobrevivir en el interior de un tornado; al parecer, su profesionalidad pudo más que su miedo y consiguieron llevar a cabo interesantísimas observaciones.

La mayoría de los tornados no son luminosos. La columna o trompa que desciende de las nubes pue-

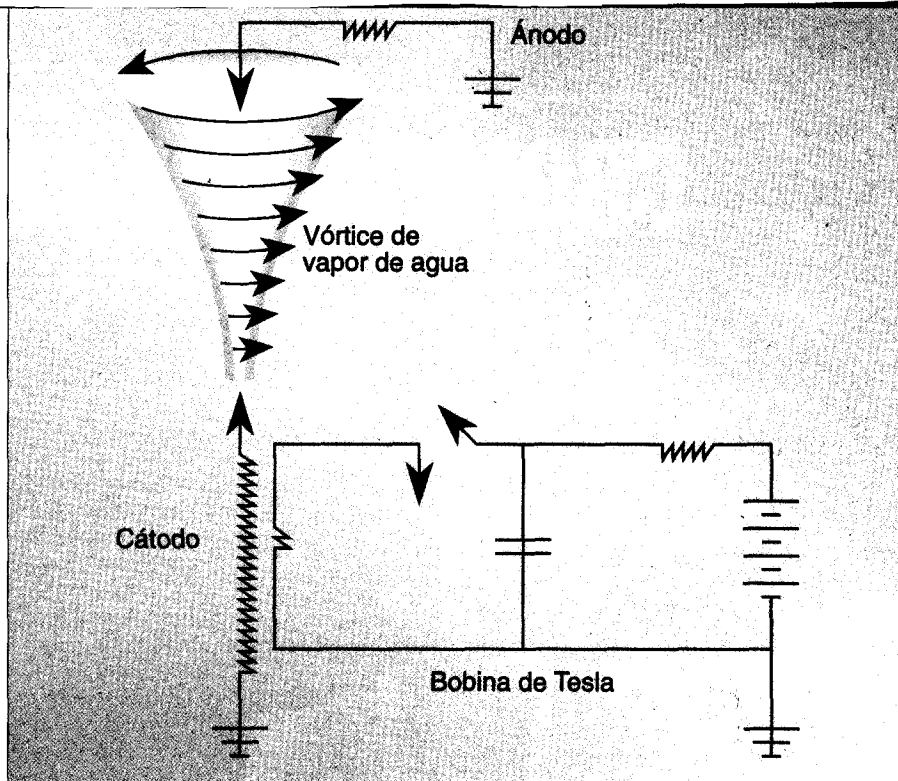
No sólo un fenómeno físico

Aunque, como exponen los autores de ambos artículos, los RB pueden ser explicados desde un punto de vista físico, más especulativo que verificable en el momento actual, lo cierto es que las esferas luminosas son vistas con más frecuencia de la atribuible a un fenómeno natural y con un comportamiento que, lejos de sugerir imprevisión, parece ajustarse a una intención, como si, efectivamente, actuasen bajo control. Por otra parte, en numerosos casos, su presencia y evoluciones se prolonga a lo largo de varios minutos, lo que los aleja aún más de un origen natural. Como ejemplo de ese comportamiento enigmático, el lector puede consultar el reportaje sobre la "Luz de El Pardal", publicado en ENIGMAS, año III nº 1.

de ser oscura por los desechos que arrastra, pero su color negro como un tizón sugiere que se produce algún extraño fenómeno que absorbe totalmente la luz externa. Tal vez exista una luminosidad interior que se produce en todos los casos, aunque la mayor parte de las veces esta capa oscura del exterior impide verla. Lo cierto es que hay constancia de tornados luminosos, sobre todo cuando en contadas ocasiones el fenómeno ha tenido lugar durante la noche.

F. Montgomery, uno de esos meteorólogos supervivientes del tornado de Blackwell (Oklahoma) el 25 de mayo de 1955, describió un plasmóide de unos 120 metros de ancho situado a unos 250 metros del suelo, tan deslumbrante como un arco de soldador y que giraba vertiginosamente. La parte inferior del tronco de la tromba se desgajaba en raíces que giraban y despedían otros RB más pequeños. El otro meteorólogo, R. Hall, que estuvo dentro de un tornado en 1948 en Texas, vio una columna de luz que estaba separada de las paredes oscuras y opacas. Esta columna se hallaba formada por anillos que, a medida que iban descendiendo, se convertían en RB.

La formación de RB en la parte baja de los tornados, de donde se desprenden para salir de su columna, es un fenómeno que han presenciado muchas personas, ya que es perfectamente visible desde fuera. Las mediciones de campos eléctricos y magnéticos registrados en las cercanías de tornados han



Según M.B. King, una bobina de Tesla con un vórtice de vapor de agua es capaz de producir rayos en bola. El vórtice podría formarse dentro de un embudo de forma adecuada.

demostrado la liberación de inexplicables y enormes energías muy superiores a las de una fuerte tormenta, lo que se ha confirmado por repentinos calentamientos del ambiente de hasta 3°C.

Otro fenómeno inexplicable que sugiere extrañas curvaturas del espacio-tiempo con anomalías gravitatorias ha sido la elevación de personas y coches sin el más mínimo viento, como arrastrados por un RB alargado de algunos metros de diámetro. El dr. Pettier notó una especie de presión sobre él y luego se sintió elevado, pero no por el viento —que no lo había— sino por una fuerza invisible. En este mismo tornado se fotografiaron unos agujeros redondos en cristales, parecidos a los de las microfotografías de Matsumoto. Algunas publicaciones sobre Fusión Fría hacen referencia a estos "tornados luminosos", hecho que podría extranar a los no especialistas.

Otro fenómeno extraño asociado a estos tornados con RB es la interpenetración de materiales. Así, por ejemplo, una cubierta de coche nueva que se encontró rodeando el tronco de un árbol cuyo ramaje se hallaba intacto. O pajas clavadas en los cristales de algunas ventanas. Un fenó-

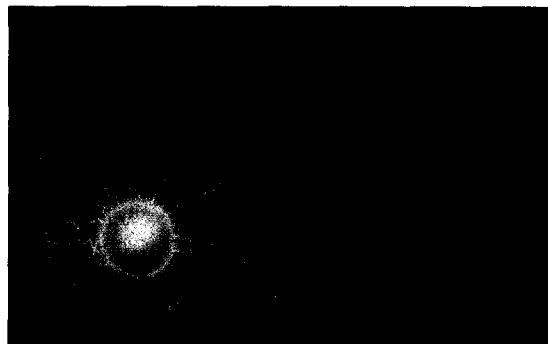
meno similar justificaría, pero no explicaría, la penetración de los RB a través de materiales sólidos.

En resumen: lo que hasta ahora era una curiosidad meteorológica se está empezando a estudiar en serio, ya que los RB están relacionados con fenómenos similares registrados en la obtención de nuevas fuentes energéticas no contaminantes como la Fusión Fría y otros sistemas de Energía Libre basados en plasmas, de los cuales ya se han admitido patentes. El vórtice, en su forma logarítmica, y sin necesidad de adoptar la forma y propiedades de los RB, es uno de los fenómenos más enigmáticos de la Naturaleza, hasta el punto de que algunos como Schwenk lo consideran la "matriz del Cosmos". Pero cuando los vórtices se hallan en estado de plasma en forma de RB, como acabamos de ver, pueden tener propiedades casi mágicas. ■

Alberto Borrás Gabarró

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Lueurs fantômes

Une nouvelle approche *BALL LIGHTING*

• par David Clarke et Granville Oldroyd

Les boules de lumières ont bien souvent été considérées par les chercheurs comme n'étant pas digne d'étude et sont ainsi devenues une partie négligée du phénomène ovni. Les auteurs pensent bien au contraire que le sujet mérite attention.

De par notre intérêt pour les vagues d'aéronefs mystérieux de 1909 et 1913, nous décidâmes de limiter nos recherches aux cas antérieurs à 1947. Nous pouvons d'ores et déjà montrer qu'il ne s'agit pas uniquement d'un phénomène moderne, des cas ayant été observés dans le passé où l'on tenta de les expliquer en fonction des références culturelles et scientifiques de l'époque. Lorsque cela nous fut possible, nous utilisâmes les sources d'origine, habituellement des journaux et périodiques, où il nous fut possible de découvrir des informations en quantité surprenante.

Les lueurs fantômes ont la capacité d'évoluer à leur guise, manœuvrant indifféremment avec ou contre le vent, parfois même en zigzagant. Ces lueurs font état d'une nature évasive et dans un certain nombre de cas, il semble exister une conscience de la présence humaine. Elles sont réfractaires à tout examen rapproché et ont alors la capacité de disparaître pour réapparaître seulement à quelque distance des observateurs.

Une réaction intelligente...

La présence d'humains pourrait créer une interaction avec le phénomène pour produire ce qui semble être une réaction intelligente. Cela suggère l'une des deux possibilités suivantes :

- la lumière s'éteint lorsqu'elle est trop proche des humains, et évolue dans cet état d'invisibilité jusqu'à ce que l'éloignement des observateurs soit suffisant pour réapparaître.
- la lumière originale, réagissant aux effets de la présence humaine, s'éteint. L'énergie génératrice quant à elle, reconstituera la lueur dès qu'il n'y aura plus d'interaction.

L'interaction avec le phénomène peut constituer un indice indispensable quant à sa composition.



En 1915-1916, les services anglais d'espionnage maritime firent l'expérience de l'élusivité du phénomène à Dartmoor, dans le Devon, alors qu'ils pensaient avoir à faire à un type particulier de signalisation illicite. Ils déployèrent bien des efforts pour arrêter ces lumières et ceux qui en étaient à l'origine, mais malgré un positionnement relativement constant, les lumières déjouèrent les efforts considérables des autorités.

Ces lumières de Dartmoor diffèrent en bien des points de celles dont nous avons eues connaissance. Elles s'élevaient perpendiculairement au sol à une altitude située entre 9 et 18 mètres en un temps variant entre 2 et 25 minutes mais, chose intéressante, n'étaient pas enclins à se déplacer. Leur positionnement constant indique une source d'énergie localisée, responsable de leur création.

Nous avons entrepris une étude approfondie des lumières observées sur les collines de Burton Dassett dans le South Warwickshire durant l'hiver et le début du printemps 1923.

Ces dernières, à l'inverse de celles de Dartmoor, évoluaient à leur guise au-dessus des collines. Bon nombre de personnes invoquèrent le gaz des marais, pendant que d'autres en attribuaient l'origine au monde spirite. Il est intéressant de noter que les observateurs se limitaient à des descriptions de lumières, aucun rapport d'avions mystérieux ou d'aéronefs, de fées, vaisseaux extraterrestres ou entités ne fut noté. De nos jours, l'ensemble de l'histoire est considéré de manière sceptique par ceux qui s'en souviennent.

Les lueurs fantômes font-elles partie de la nature ou sont-elles une composante du phénomène ovni ? La limite entre les deux semble devenir parfois assez floue, les deux phénomènes ayant pour caractéristique commune de produire de la lumière, cette lumière étant l'un des traits principaux des ovnis.

Nos considérations font l'objet d'un petit fascicule *Spooklights - A British Survey* publié en fin 1985. □

David Clarke et Granville Oldroyd



Courtesy of Mary Evans Picture Library.

BALL LIGHTNING

ME gustaría que me ayudaran a aclarar algo que tiene relación con una experiencia no muy corriente que le sucedió a un amigo mío. Resulta que hace un año, estando durmiendo en su habitación (yo había sido invitado a pasar la noche en su casa), le desperté a causa de una especie de bola con luz propia y de color verde —no más grande que el tamaño de un balón— que lo iluminaba y se encontraba encima de su cabeza. El cuerpo de mi amigo empezó a elevarse por encima de la cama —unos 30 centímetros más o menos— y esa luz pasó por debajo de él hasta desaparecer inmediatamente por la pared. Ni mi amigo ni yo sabemos de qué se puede tratar, por lo que apreciaríamos que nos dieran su opinión sobre lo sucedido. Aprovechamos la ocasión para felicitarles por el magnífico trabajo que llevan realizando desde tanto tiempo.

Antonio Rodríguez
Bascuñana
(Alcalá de Henares)

No tenemos explicación para la experiencia que nos relata; y sentimos de veras no poder ayudarle. En todo caso, publicamos su carta por si a algún lector se le ocurre alguna explicación razonable —no una mera elu-

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ON Y PEDIDOS

BALL LIGHTNING

NOTICIAS

RAMSÉS II: DOS MEJOR QUE UNO

Junto a la tercera pirámide de Gizéh, la de *Micerinos*, un equipo arqueológico ha encontrado casualmente una estatua doble del faraón **Ramsés II**, quien aparece en una con forma de hombre y en otra como el dios *Horus del Horizonte*. Las dos estatuas están esculpidas en el mis-

mo bloque de granito rosa, tienen una altura superior a los tres metros y un peso de cuatro toneladas.

Ambas estatuas están datadas en el llamado Imperio Nuevo, en el año 1200 a.C., y son por tanto bastante posteriores a la construcción de las pirámides. Los expertos creen en la posibilidad de que los dos Ramsés fueran ofrecidos como ofrenda a la Esfinge, si bien ha sorprendido que a ambos les falte el pie derecho y que ninguno de ellos tenga inscripciones o grabados.

FÍSICOS ESPAÑOLES EXPLICAN EL FENÓMENO DE LAS "BOLAS DE FUEGO"

Las *foo-fighters* o "bolas de fuego", esas pequeñas esferas de colores brillantes que fueron descritas por pilotos de combate durante la II Guerra Mundial, y que han sido con frecuencia confundidas con *OVNIs*, podrían haber encontrado una explicación científica gracias a un grupo de físicos españoles. Hasta la fecha, la docena de hipótesis que han tratado de explicar el enigmático fenómeno no habían convencido a nadie. ¿Por qué motivo estructuras que alcanzan temperaturas de 3.000 grados *kelvin* no se elevaban en el aire sino que seguían un camino horizontal? ¿Y por qué su velocidad es mucho menor de la que cabría esperar? La explicación de los españoles, que pretende contestar a estos interrogantes, ha sido recibida con expectación.

Antonio Fernández Rañada y **José Luis Trueba**, de la Universidad Complutense de Madrid, han propuesto en la revista *Nature* la teoría

del *nudo electromagnético*, el resultado de un trabajo de cinco años que versa sobre la naturaleza cuántica de la energía electromagnética. Según la misma, en un nudo electromagnético, que se forma a menudo durante las tormentas eléctricas, las líneas de campo magnético forman un ovillo en el que se entrelazan dos a dos como si se tratara de dos anillos, una estructura que, según lo demostrado por los expertos españoles, es más estable que otras puesto que se expande con menor rapidez, ya que genera una presión hacia el interior. "*El resultado* -en palabras de Fernández-Rañada-, *es una botella magnética más eficaz, una estructura muy compleja que explicaría el largo tiempo de vida de estas bolas.*"

De los varios millares de rayos que se forman durante una tormenta, los científicos siguen sin saber el motivo por el que se forma una estructura de este tipo que afecta a un único rayo. No

obstante, la nueva teoría tiene posibilidades de ser aplicada en el control de la fusión nuclear por confinamiento magnético, y, según sus autores, tal vez pudiera también explicar los resplandores y objetos luminosos avistados por algunos pilotos durante sus vuelos.

